KIRAN INSTITUTE OF CAREER EXCELLENCE PVT. LTD., DELHI PRESENTS

Kiran's

SSC MATHEMATICS

CHAPTERWISE & TYPEWISE

SOLVED PAPERS

1999 - April 2017

KIRAN PRAKASHAN

8900+ Objective Questions

with Detailed Explanations & Tricky Solutions

Chapterwise Compilation of Previous Years' Solved Papers (with Detailed Explanations) of Exams Conducted by SSC (Graduate Level (CGL Tier-I &II), 10+2 (CHSL), Stenographer 'C' & 'D', Matric Level, FCI, Delhi Police SI etc.)

GET Free! SCRATCH CARD

SSC MATHEMATICS

CHAPTERWISE & TYPEWISE

SOLVED PAPERS

HOW TO USE THIS SCRATCH CARD

1. Log on to www.kicx.in
2. Click on "REGISTER BUTTON" and Register Yourself by Filling up Your Details.
3. Click on "HOME", then Click on "SSC Exam" Category.
4. Now Click on "BUY BUTTON" of "Scratch Card for SSC Math Test Series".
5. In Payment Information category, select "Payment through Scratch Card".
6. Now Scratch the Scratch Card and Enter the Code given on the card in Scratch box on the right side of the screen.
7. Now Click on "Proceed to Check Out".
8. On Right of Your Screen, You Can See the Message "Scratch Code Accepted Package Purchased".
9. Now Click on "VISIT DASHBOARD".
10. On Dashboard Now You Can Give Test By Clicking on "GIVE TEST".

TERMS & CONDITIONS

1. For Any Query Please contact us on 920-539-3696 , 011-64000195 , 011-64000196,011-64000190.
2. From Monday to Friday 11 AM to 5 PM (Business Days).
3. Please Note Once the Card is Scratched, it will not get Returned or Replaced.
4. Don't Accept the Card if it is Already Scratched.
5. Validity of Card will Count From the Date of Activation on www.kicx.in within the Period of Expiry Date.
6. All Legal Matters are Subjected to the Jurisdiction of Delhi Court only.
7. In no event Publisher or its Suppliers will be liable for any Consequential Damages to Scratch user's Hardware or other Software.

PRACTICE ONLINE www.kicx.in

Kiran Prep | Quizsolver
A radix Edusystems initiative

How to Download

"OPEN PLAY STORE APP" in your mobile.

"TYPE KIRANPREP" in google play search box & Search.

"CLICK ON KIRANPREP" appearing in the list.

"CLICK ON INSTALL" appearing on the screen.

After installation just **"CLICK ON OPEN"** .

"CLICK ON GET STARTED" button appearing at the bottom of your screen.

How To Use Our App

7

Click on **"REGISTER WITH EMAIL"** button.

8

For register yourself **"FILL YOUR CORRECT DETAIL "** and click register.

9

My Courses screen with default courses. For new course demo **"PRESS ADD MORE COURSES"**.

10

For demo **"CLICK ON ANY COURSES"**. Or if you already have activation code just type code into **"ENTER ACTIVATION CODE"** box at the top and press "GO".

11

If you want buy to complete course press **"GET FULL ACCESS** . It will take you to the product info page.

12

Scroll down the page and fill required details and **"CLICK BUY NOW"** button and do necessary action related to the payment.

Kiran's

SSC

MATHEMATICS

CHAPTERWISE

SOLVED PAPERS

1999–till date

CHAPTERWISE COMPILATION OF PREVIOUS YEARS' SOLVED PAPERS OF EXAMS CONDUCTED BY SSC

SSC Graduate Level Exams— Combined Graduate Level Pre. Exams, CPO Sub-Inspector, Section Officer (Audit), Tax Assiatant (Income Tax & Central Excise), Section Officer (Commercial Audit), Statistical Investigators, Combined Graduate Level Tier-I, Tier-II, SAS, CISF ASI, CPO ASI & Intelligence officer, FCI, Delhi Police SI Exams etc.

SSC 10+2 Level Exams— Data Entry Operator & LDC and PA / SA Exam.

SSC Combined Matric Level Exam — Combined Matric Level Pre-Exam, Multitasking (Non-Technical) Staff, CISF Constable (GD), Constable (GD) & Riflemen (GD) and Other Competitive Exams.

8900+

Objective Questions

With Tricky Solutions

For Franchisee Contact :

KIRAN INSTITUTE OF CAREER EXCELLENCE PVT. LTD.

RU-67, PITAMPURA, DELHI-110034, Ph : 27345258, 27342249, Fax : 27345258

Delhi : RU-67,
Opposite Power House,
Pitampura, Delhi-110034,
Ph. : 011-27342249,
47521267,
Fax : 011-27345258
Email : info@kiranprakashan.com
www.kiranprakashan.com

LOCATE NEAREST BOOKSELLERS

For the books & magazines of Kiran Prakashan contact your nearest booksellers.
For detailed information log on our website :
www.kiranprakashan.com

© KIRAN INSTITUTE OF CAREER EXCELLENCE PVT. LTD. (KICX)

NEW EDITION

The copyright of this book is entirely with the Kiran Institute of Career Excellence Pvt. Ltd. The reproduction of this book or a part of this will be punishable under the Copyright Act.
All disputes subject to Delhi jurisdiction.

Every possible effort has been made to ensure that the information contained in this book is accurate at the time of going to press, and the publishers and authors cannot accept responsibility for any errors or omissions, however caused. No responsibility for loss or damage occasioned to any person acting, or refraining from action, as a result of the material in this publication can be accepted by the editor, the publisher or any of the authors.

Compiled by : **Think Tank of PRATIYOGITA KIRAN, KIRAN PRAKASHAN & KICX**
Assistance : **Govind Pd. Singh Ratnesh Kumar Singh Sanket Sah Achal Gupta**
Design & Layout by : **KICX COMPUTER SECTION,** New Delhi.
Printed at : **MAA LAXMI PRINTER**, Plot No. 2-A, Khasra No. 20/20, Begumpur Extn. Delhi-110086

Must Read **USEFUL FOR ALL COMPETITIVE EXAMS** **Buy Today**

About the Book.....

The significance of past never diminishes, either in effect or substance. To forget this moot point becomes suicidal sometimes. A minute observation of the past and accumulated experiences help us in shaping our present. The positive and compendious conclusions drawn from the past become our pioneer in charting new ways and teach us to rectify our remedies. Our present is, thus, beautified. Where there is beauty, attraction cannot be negated. It is in this way that the foundation of a concrete future is further solidified. Aspirations turn into realities. This is a realistic reflection. If the past is forgotten by marginalizing this realism, the truth of past surfaces as a path strewn with pebbles. If we preserve and cherish these pebbles of the past and make correct use of them, they become the linchpin of an edifice called success. Thus, the intricacies of our path become effortless and our destination gets more and more intelligible.

Kiran Prakashan Pvt. Ltd., which has been at your service for decades and helping you with the multitude of relevant offerings, has made a meaningful effort to put together these invaluable and very useful pebbles in the form of a book, titled **Kiran's SSC Mathematics Chapterwise Solved Papers**.

It is an undeniable truth that the continuous motion of the past gives birth to change. Change gets inevitability. These changes bring coherence to the changed circumstances and fulfil the exact needs of the present. We reach our destinations only by striking coordination with these changes, lest we should find ourselves at the last row in this age of competition. The destination will be left as something impertinent. Our esteemed readers must be well aware of the changes introduced by the Staff Selection Commission (SSC) in the selection process for different posts. **Kiran Prakashan** has been keeping you updated with all the relevant information related to these very changes. According to Students, Teachers and Coaching Directors' demand this book has been changed and arranged by Topicwise/Typewise. The latest edition of **Kiran's SSC Mathematics Chapterwise Solved Papers** which is revised, enlarged and updated is another example of our sincere commitment to our readers, imparting completeness in their search for a better and secure future. We have updated each chapter with concise study material and tricky solutions have been provided wherever needed.

The book before you, **Kiran's SSC Mathematics Chapterwise Solved Papers**, has been based on the questions of Quantitative Aptitude/ Numerical ability that have been asked in the various competitive examinations at the **CGL (Tier I & II), CHSL (10+2) and Matric levels**. This book has been conceived as a holistic treatment and single solution to all the difficulties that a candidate encounters while appearing for the SSC exams. The **Think-Tank of Kiran Prakashan** has taken into account the needs and difficulties of candidates and made an attempt to simplify the subject matter by de-constructing every thread and each pattern. The questions asked in the different examinations conducted by the SSC have been not only compiled at one place, but also compartmentalized topicwise/typewise to grasp and digest easily with the help of comprehensive explanations and tricky solutions. This is a rare collection of **more than 8900 questions** and their respective explanations. It wouldn't be bragging if we say, do master these questions and their explanations, you will automatically find yourself at ease with most of what surfaces in form of examination questions. In other words, master this book sincerely; success will itself become the mistress.

This edition of **Kiran's SSC Mathematics Chapterwise Solved Papers** has been parceled out into **22 chapters**, each dealing with study materials, Topicwise and comprising bulk of questions and explanations. The chapters are : **Number System, LCM and HCF, Simplification, Power, Indices and Surds, Average, Ratio and Proportion, Percentage, Profit and Loss, Discount, Simple Interest, Compound Interest, Time and Work, Pipe and Cistern, Time and Distance, Boat and Streams, Sequence and Series, Algebra, Trigonometry, Geometry, Mensuration, Statistics and Data Interpretation and Miscellaneous.**

Explanations to the questions serve in some way as highly directed study material. We have ensured not to bombard you with bulky study materials which sometimes prove futile if a candidate is facing severe crunch of time.

Johann Wolfgang von Goethe, considered the supreme genius of modern German literature, said once: "What is not started today is never finished tomorrow."

Relating to what Goethe had to say, we are proud to have made the beginning of a start. And, that start is **Kiran's SSC Mathematics Chapterwise Solved Papers**, where facts have been consolidated and refined and presented in the easy-to-digest objective question format which have actually been already asked in the different levels and formats of competitive examinations. Scientifically it has been proved that you tend to remember anything for long if that has been asked from you and you found yourself in a testing situation.

So, this book has been scientifically weaved on the principle of **'Test to Prepare and Success.**'

As our experience suggests, SSC, to a great extent, follows the pattern of questions asked in previous examinations. But the scope has been enlarged now. Earlier syllabus was of Arithmetic alone, now it is syllabus of Mathematics. New syllabus has some new topics such as, Trigonometry, Geometry and Algebra with Co-ordinate Geometry. The new syllabus has been given in the introduction.

Last, but not the least, there is no shortcut to success. Only hard work and perseverance pays rich dividends in the long term. So, it is desirable on your part to make the best out of this unique offering before you. Let us remind you that the questions you find in this book will not only help you prepare for the SSC examinations, they will equip you with the much required knowledge and insight in 'cracking' other examinations as well.

Hugh Nibley, the famous American author and Mormon apologist said: **"Only if you reach the boundary will the boundary recede before you. And if you don't, if you confine your efforts, the boundary will shrink to accommodate itself to your efforts. And you can only expand your capacities by working to the very limit."**

Our researchers have taken painstaking efforts in the direction of accommodating and expanding to the limit. The guiding principle has been to have an eye on whatever is significant, and when you do have such a microscopic eye, there is little that can be expected to have been ignored. So, here is our new, novel and unique offering to you, **Kiran's SSC Mathematics Chapterwise Solved Papers**. You will find a CD and scratch card for online test. This will help you prepare for the SSC online exam pattern. Read this book with pen and paper and digest it thoroughly to reach the limits of life. Have a serious glance to know what it is all about.

With the Best Wishes

(Publisher)
Satyanarayan Prasad
Email : sanket2000_us@yahoo.com

SOME NOTABLE FACTS

SSC (Staff Selection Commission)

Combined Graduate Level(CGL)	Combined Higher Secondary Level (CHSL)	Matric Level
CGL Tier–I, Tier–II, Tier–III & Tier–IV, CAPFs SI & Delhi Police SI and FCI etc.	LDC & DEO and Stenographer 'C' & 'D'	Multi Tasking Staff and Constable (GD)

- Staff Selection Commission Conducts examinatiion for Graduate Level, Higher Secondary Level and Matric Level on all India basis.
- Till now SSC conducted Combined Graduation level Examination used to be held in two parts i.e. Tier-I and Tier-II. But from now onwards this examination will be held in four parts i.e. Tier-I, Tier-II, Tier-III and Tier-IV.
- Earlier in SSC conducted Tier-I Exam used to have 50 questions on Mathematics out of 200 questions, while in Tier-II a candidate had to answer 100 questions. But from 2016 onwards in Tier-I out of 100 questions, 25 questions will be on Mathematics, while a candidate has to answer 100 questions in Tier-II.
- SSC Conducts Tier-I examination for CHSL of 100 questions out of which Mathematics carries a weightage of 25 questions.
- Matric Level exams are conducted for Multi Tasking Staff in which out of 150, 25 questions are from Mathematics and in Constable GD exam weightage of Mathematics is 25 questions out of 100.
- The Changing nature of Mathematics questions in recent exams conducted by SSC make this subject very important and deciding factor in success or failure.

TOP 5 IMPORTANT CHAPTERS

- Combination of Algebra, Geometry, Trigonometry, Mensuration and Statistics & Data Interpretation in recent Exams (2011-2017)

WE DO WORRY ABOUT YOUR CAREER

That is why

TO INCULCATE CONFIDENCE IN YOU

We do publish almost all competitive books and monthly magazines

INDISPENSABLE FOR ALL THE COMPETITIVE EXAMS

Releasing shortly a very useful and comprehensive book on Reasoning catering to the needs of every student preparing for competitive examinations.

SPECIAL FEATURES :

- This Book is Unique in the sense that it follows easy methods in solving difficult questions. Step -by- step explanations have been given for easy understanding.
- Concept has been discussed citing questions asked in various competitive examinations.
- Step-by-step method has been followed, so that book becomes helpful for all aspirants. For beginners, simple and easy questions have been discussed to give them conceptual clarity and standard of questions has gradually been raised so that they can master the subject.
- This book will stand out from other books available in market as not only the chapters have been discussed in detail; large number of questions have also been included in each chapter.
- We have tried to compile questions asked in various exams (Bank PO, Clerk, SSC, Railway, Insurance, RBI, Air Force, by UPSC such as IAS CSAT, CDS, CAPF, NDA , Police, Postal Assistant, Teachers Recruitment Exams and various State Public Service Commission etc; CAT, MAT,XAT etc.). These examples have been solved by conventional methods as well as by short-cut methods.
- If you go through this book, you will get acquainted with all types and standards of questions. This will increase your level of preparation and ultimately the chances of your success.
- Latest questions i.e.(lengthy questions & tricky questions) particularly in Problem Solving, Decision Making, Ranking and Arrangement, Statement-Argument, Statement-Conclusion/ Inferences have been collected and solved in easy way especially to make you tackle every type of question.
- Unique way of solutions to Input-Output Problems.

You can also order the book by sending demand draft (D.D.) (Printed price of the book) + Rs. 25 in favour of **Kiran Prakashan**, payable at Delhi. Shop online at www.kiranprakashan.com

TOPICWISE DISTRIBUTION OF QUESTIONS OF SSC GRADUATE LEVEL (TIER-I, TIER-II, CPO, DPSI) EXAMS HELD DURING 2010–2017

QUANTITATIVE APTITUDE

S. No.	TOPICS	* Average number of Questions	EXAMINATIONS															
			SSC CGL Tier-I 16.05.2010 (Ist Sitting)	SSC CISF 29.08.2010	SSC CPO SI 12.12.2010	SSC CGL Tier-I 26.06.2011	SSC CPO SI & ASI 28.08.2011	SSC CGL Tier-II 16.09.2012	SSC CGL Tier-I 21.04.2013	SSC CGL Tier-II 29.09.2013	SSC CGL Tier-II 21.09.2014	SSC CGL Tier-I 26.10.2014	SSC CGL Tier-II 12.04.2015	SSC CAPFs SI, CISF ASI & D.P. SI 21.06.2015	SSC CGL Tier-I 16.08.2015	SSC CGL Tier-II 25.10.2015	SSC CGL Tier-I (IInd Sitting) 27.10.2016	SSC CGL Tier-II (CBE) 12.01.2017
1.	Number System	1	4	3	2	3	2	4	2	4	1	—	4	—	2	3	1	4
2.	LCM and HCF	1	2	1	1	2	—	1	2	1	3	—	—	—	1	2	—	2
3.	Simplification	1	5	7	6	7	—	—	2	—	3	2	3	2	—	1	—	**2**
4.	Power, Indices and Surds	2	6	3	7	4	4	1	3	1	1	3	3	3	1	4	—	1
5.	Average	3	2	2	3	2	2	5	2	8	7	2	6	1	1	6	1	5
6.	Ratio and Proportion	3	3	4	4	3	3	5	2	5	3	1	5	3	2	7	1	6
7.	Percentage	2	2	5	4	4	2	5	2	4	5	1	3	2	1	4	1	6
8.	Profit and Loss	3	3	4	4	5	5	6	3	6	6	—	7	3	2	5	1	7
9.	Discount	2	2	2	2	3	—	4	1	4	4	4	5	1	1	4	1	**3**
10.	Simple Interest	1	1	3	2	1	2	1	1	1	1	1	1	—	—	2	1	—
11.	Compound Interest	1	2	1	1	2	—	3	1	3	3	—	3	1	1	3	—	4
12.	Time and Work	2	3	3	3	3	2	3	1	3	3	3	6	1	3	5	1	6
13.	Pipe and Cistern	1	—	1	1	—	1	2	1	2	2	—	1	—	—	2	—	—
14.	Time and Distance	2	3	2	2	1	1	3	1	3	2	2	2	2	3	4	1	4
15.	Boat and Stream	1	—	1	1	1	1	1	1	1	1	—	2	—	—	1	—	—
16.	Sequence and Series	1	2	2	3	—	—	1	—	2	2	—	—	—	—	—	—	—
17.	Algebra	4	3	—	—	—	5	9	5	8	10	4	8	5	8	10	4	**9**
18.	Trigonomentry	4	—	—	—	—	5	10	5	10	10	6	9	5	7	9	3	10
19.	Geometry	4	—	—	—	—	4	11	5	10	10	7	7	3	5	7	4	7
20.	Mensuration	6	3	—	1	5	6	15	5	15	15	5	20	8	5	16	1	19
21.	Statistics & Data Interpretation	4	3	3	3	4	5	5	5	6	5	7	5	9	7	5	4	5
22.	Miscellaneous	1	1	—	—	—	—	5	—	3	3	2	—	1	—	—	—	—
Total Number of Questions		**50**	**50**	**50**	**50**	**50**	**50**	**100**	**50**	**100**	**100**	**50**	**100**	**50**	**50**	**100**	**25**	**100**

* Average number of questions is based on the data available in the chart mentioned above (Considering 50 questions set)

ARE YOU AN ASPIRANT OF SSC TIER-I, TIER-II, FCI, 10+2 LDC & DATA ENTRY OPERATOR AND MATRIC LEVEL EXAMS ?

You do well know that in the recent exams conducted by SSC, 20–30 questions (out of 50) were asked from 1. ALGEBRA 2. TRIGONOMETRY 3. GEOMETRY 4. MENSURATION topics. The chart given below proves the importance of these topics.

	ALGEBRA	TRIGONOMETRY	GEOMETRY	MENSURATION
SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (1st Sitting)	10	5	4	6
SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (2nd Sitting)	6	6	5	4
SSC CGL Tier-II Exam, 25.10.2015	22	9	11	12
SSC CGL Tier-I Exam, 30.08.2015	11	7	8	3
SSC CGL Tier-I Exam, 19.08.2015 (2nd Sitting)	10	7	9	2
SSC Combined Graduate Level (CGL) Tier-I Exam, 21.04.2013	7	5	8	5
SSC FCI Assistant Grade-III Exam, 07.04.2013	5	5	5	6
SSC FCI Assistant Grade-III Exam, 11.11.2012	6	5	6	5
SSC 10+2 Higher Secondary Level Data Entry Operator & LDC Exam, 04.11.2012	4	6	4	4

CONTENTS

ALGEBRA

- **Chapter-01** : Indices and Surds
- **Chapter-02** : Polynomials
- **Chapter-03** : Factorisation of Quadratic Polynomials
- **Chapter-04** : Simplification of Fractions
- **Chapter-05** : Algebraic Identities
- **Chapter-06** : Solutions of Linear Equations
- **Chapter-07** : Graphic Representation of Straight Lines
- **Chapter-08** : Co-ordinate Geometry
- **Chapter-09** : Sequence and Series
- **IMPORTANT POINTS AT A GLANCE**

TRIGONOMETRY

- **Chapter-10** : Circular Measure of Angles
- **Chapter-11** : Trigonometric Ratios
- **Chapter-12** : Trigonometric Identities
- **Chapter-13** : Heights and Distances
- **IMPORTANT POINTS AT A GLANCE**

GEOMETRY

- **Chapter-14** : Lines and Angles
- **Chapter-15** : Triangles : Similarity and Congruence
- **Chapter-16** : Quadrilaterals
- **Chapter-17** : Circles : Chords and Tangents
- **IMPORTANT POINTS AT A GLANCE**

MENSURATION

- **Chapter-18** : Area and Perimeter (Triangles, Rectangles, Squares, Quadrilaterals, Rhombus, Circles)
- **Chapter-19** : Volume (Cubes, Spheres, Hemispheres, Cylinders, Cones, Frustums, Prism, Pyramids)
- **IMPORTANT POINTS AT A GLANCE**

Indispensable Book for the Preparation of

- **ALGEBRA**
- **TRIGONOMETRY**
- **GEOMETRY**
- **MENSURATION**

Useful for : **SSC CGL Tier-I Exam, SSC CGL Tier-II Exam, SSC CAPFs Exam, SSC 10+2 DEO/LDC/PA/SA Exam and other SSC and Competitive Exams**

You can also order the book by sending demand draft (D.D.) (Printed price of the book) + Rs. 25 in favour of **Kiran Prakashan**, payable at Delhi. Shop online at www.kiranprakashan.com

TOPICWISE DISTRIBUTION OF QUESTIONS SSC 10+2 DEO & LDC AND MATRIC LEVEL EXAMS HELD ON DURING 2010–2017

QUANTITATIVE APTITUDE

S. No.	TOPICS	* Average number of Questions	EXAMINATIONS															
			SSC DEO & LDC 27.11.2010	SSC DEO & LDC 20.02.2011	SSC Multi-Tasking 27.02.2011	SSC Constable (GD) 05.06.2011	SSC DEO & LDC 04.12.2011	SSC Cons. (GD) & Riflemen (GD) 22.04.2012 (Ist S)	SSC DEO & LDC 11.12.2012	SSC Multitasking Staff 17.03.2013	SSC DEO & LDC 10.11.2013 (IInd Sitting)	SSC CHSL DEO & LDC 16.11.2014	SSC Constable (GD) 04.10.2015 (Ist Sitting)	SSC CHSL DEO & LDC 15.11.2015 (Ist Sitting)	SSC CHSL DEO & LDC 06.12.2015 (Ist Sitting)	SSC CHSL DEO & LDC 20.12.2015 (Ist Sitting)	SSC CHSL (10+2) Tier-I (CBE) 08.09.2016 (Ist Sitting)	SSC CHSL (10+2) Tier-I (CBE) 16.01.2017 (IInd Sitting)
1.	Number System	1	4	2	3	6	2	3	3	2	3	—	2	3	—	1	—	2
2.	LCM and HCF	1	2	—	1	2	1	1	1	1	1	—	—	—	—	1	—	—
3.	Simplification	2	5	—	7	5	6	—	—	1	—	1	1	1	2	—	—	—
4.	Power, Indices and Surds	3	6	10	6	5	7	1	1	1	3	1	—	2	1	1	3	—
5.	Average	2	2	3	2	1	3	2	2	2	2	2	3	1	3	2	1	1
6.	Ratio and Proportion	3	3	5	4	2	4	2	2	2	—	2	1	1	2	2	1	1
7.	Percentage	3	2	4	5	2	4	2	2	2	1	2	2	2	1	2	1	1
8.	Profit and Loss	3	3	3	4	3	5	2	2	3	3	2	2	3	4	3	1	—
9.	Discount	2	2	3	2	3	2	2	2	2	2	2	4	2	2	2	1	2
10.	Simple Interest	1	1	2	3	1	2	—	—	1	1	—	2	—	1	2	1	—
11.	Compound Interest	1	2	1	1	1	1	1	1	1	1	1	—	2	1	—	—	1
12.	Time and Work	2	3	2	3	2	3	2	2	2	1	1	2	2	2	2	1	1
13.	Pipe and Cistern	1	—	1	1	1	1	—	—	1	—	1	—	—	—	—	—	—
14.	Time and Distance	2	3	3	2	4	2	—	—	1	1	1	2	2	1	2	1	1
15.	Boat and Stream	1	—	—	1	—	1	1	1	—	1	—	—	—	1	—	—	—
16.	Sequence and Series	1	2	—	2	1	3	—	—	—	—	3	—	—	1	—	—	—
17.	Algebra	3	3	—	—	1	—	5	5	—	5	5	—	5	3	5	2	5
18.	Trigonomentry	3	—	—	—	—	—	5	5	—	5	5	—	4	5	5	3	4
19.	Geometry	4	—	—	—	—	—	6	6	—	6	7	—	5	6	6	4	1
20.	Mensuration	5	3	5	—	4	1	6	6	1	8	5	2	6	5	5	1	1
21.	Statistics & Data Interpretation	5	3	5	3	3	3	9	9	2	4	9	2	9	9	9	4	4
22.	Miscellaneous	1	1	1	—	—	—	5	5	—	2	—	—	—	—	—	—	—
Total Number of Questions		**50**	**50**	**50**	**50**	**50**	**50**	**25**	**25**	**25**	**50**	**50**	**25**	**50**	**50**	**50**	**25**	**25**

* Average number of questions is based on the data available in the chart mentioned above (Considering 50 questions set)

6th REVISED AND ENLARGED EDITION

SALIENT HIGHLIGHTS:

- Comprehensive Coverage of Syllabi of almost all Competitive Exams.
- Revised Edition based on analysis of the trend of latest questions of various exams.
- Fundamental concepts dealt in detail with illustrative examples.
- Derivation of Short-cut methods and tricks from fundamentals and their applications.
- Problem-solving by Traditional as well as Tricky/short-cut methods.
- Wide variety of questions covered on each topic.
- Inclusion of questions based on the latest pattern of examinations.
- Exhaustive solved problems in each chapter.
- Caution notes on grey areas prone to common error.
- Wide coverage of previous years' solved problems.
- Frequently used Rules and Formulae marked in boxes.
- A unique approach to Data Sufficiency and Data Analysis & Data Interpretation.

CHAPTERS

1. Numbers 2. Binary Number System 3. Addition and Subtraction 4. Vedic Mathematics 5. Multiplication 6. Division 7. Divisibility 8. LCM and HCF 9. Decimal & Fraction 10. Power and Roots – Square, Cube - Indices, Surds 11. Algebra 12. Simplification 13. Percentage 14. Profit and Loss 15. Average 16. Ratio and Proportion 17. Alligation or Mixture 18. Partnership 19. Problems Based on Ages 20. Simple Interest 21. Compound Interest 22. Time and Work 23. Work and Wages 24. Pipes and Cistern 25. Time and Distance 26. Trains 27. Boats and Streams 28. Races and Games 29. Geometry : Lines, Angles 30. Triangles 31. Quadrilaterals 32. Circles 33. Area and Perimeter 34. Volume and Surface Areas (3-Dimensional Figures) 35. Trigonometry 36. Height and Distance 37. Series 38. Progression and Sequence 39. Permutation and Combination 40. Probability 41. Logarithms 42. Calendar 43. Clocks 44. Data Analysis 45. Data Sufficiency 46. Data Interpretation

---

A NEW INTRODUCTION ON HIGH DEMAND

Kiran's Quickest Mathematics Practice Work Book

- It is truly said, " Practice makes a man Perfect" and there can be no better example than Mathematics to suffice this golden rule.
- Keeping alive this spirit, we consciously and cautiously and cautiously decided to have a separate but synergised publication, "Kiran's Practice Work Book on Quickest Mathematics" that serves the very objective of readers elegantly.
- It provides ample opportunity to the Readers of Quickest Mathematics as well other aspirants to hone their skills and apply the Tricky methods.
- It can also work as a tool to review and rate your preparation.
- In this book Answers and Explanations have been provided separately - to make you feel the essence of real exam.
- It will certainly help you identify your Strength and Weaknesses and take remedial steps.

You can also order the book by sending demand draft (D.D.) (Printed price of the book) + Rs. 25 in favour of **Kiran Prakashan**, payable at Delhi. Shop online at www.kiranprakashan.com

CONTENTS

CHAPTERS ..... PAGES

1. Number System (No. of Questions 447) SME–21-72

TYPE–I : Questions based on Smallest and Largest fraction etc. SME–25

TYPE–II : Questions based on Division Multiplication, Addition and Subtraction SME–26

TYPE–III : Questions based on the Fraction of numbers SME–33

TYPE–IV : Questions based on finding the ascending & descending order of numbers etc. SME–39

TYPE–V : Questions based on finding the unit place of a number SME–39

TYPE–VI : Questions based on the sum of Consecutive numbers (Odd, even, etc.) SME–40

TYPE–VII : Miscellaneous Questions SME–41

EXPLANATIONS

TYPE–I SME–48

TYPE–II SME–49

TYPE–III SME–56

TYPE–IV SME–62

TYPE–V SME–62

TYPE–VI SME–63

TYPE–VII SME–65

TEST YOURSELF SME–71

2. LCM and HCF (No. of Questions 177) SME–73-94

TYPE–I : Questions based on the formula (LCM × HCF = First Number × Second Number) SME–74

TYPE–II : Questions based on only finding the LCM of the numbers .. SME–75

TYPE–III : Questions based on only finding the HCF of the numbers .. SME–77

CHAPTERS ..... PAGES

TYPE–IV : Questions based on ratio of the numbers SME–79

TYPE–V : Questions based on addition, subtraction, multiplication and division of the numbers SME–79

TYPE–VI : Miscellaneous Questions SME–81

EXPLANATIONS

TYPE–I SME–82

TYPE–II SME–83

TYPE–III SME–86

TYPE–IV SME–88

TYPE–V SME–89

TYPE–VI SME–91

TEST YOURSELF SME–92

3. Simplification (No. of Questions 334) SME–95-136

TYPE–I : Questions based on continued fraction SME–97

TYPE–II : Questions based on BODMAS SME–99

TYPE–III : Questions based on square and square root SME–104

TYPE–IV : Questions based on cube & cube root SME–111

TYPE–V : Miscellaneous Questions SME–113

EXPLANATIONS

TYPE–I SME–113

TYPE–II SME–116

TYPE–III SME–122

TYPE–IV SME–130

TYPE–V SME–132

TEST YOURSELF SME–133

4. Power, Indices and Surds (No. of Questions 353) SME–137-192

TYPE–I : Questions based on Simplification SME–138

CHAPTERS ..... PAGES

TYPE–II : Questions based on finding the largest and smallest value etc. ...SME–145

TYPE–III : Simplifying when root values are given If $\sqrt{x} = a$ is given (where $x = 1, 2, 3$ and 'a' is the correct value of $\sqrt{x}$) SME–147

TYPE–IV : Questions based on rationalising or prime factor SME–148

TYPE–V : Questions based on positive and negative exponent SME–148

TYPE–VI : Questions of type

$\sqrt{x+\sqrt{x+\sqrt{x+.....}}}$ and $\sqrt{x\sqrt{x\sqrt{x\sqrt{x}.....}}}$

.....SME–150

TYPE–VII : Miscellaneous Questions SME–151

EXPLANATIONS

TYPE–I SME–154

TYPE–II SME–167

TYPE–III SME–169

TYPE–IV SME–171

TYPE–V SME–171

TYPE–VI SME–174

TYPE–VII SME–175

TEST YOURSELF SME–179

5. Average (No. of Questions 388) SME–193-241

TYPE-I : Basic Average Questions SME–195

TYPE-II : To find n^{th} number when average of first 'p' and last 'q' numbers are given SME–198

TYPE-III : average of consecutive even, odd and prime numbers etc. SME–200

TYPE-IV : If the monthly income of factors (x, y or z) are given, then finding the monthly income of 'x' or 'y' or 'z' or 'x+y' or "x–y' etc. SME–201

TYPE-V : Questions based on twice, thrice, one-third etc. of numbers SME–202

CHAPTERS ..... PAGES

TYPE-VI : Question where correct average have to be find out as earlier some mistake was done. SME–203

TYPE-VII : Questions based on cricket SME–205

TYPE-VIII : Questions where missing number has to be find one as there has been some change in given average. SME–207

TYPE–IX : Questions based on determining the average age SME–208

TYPE-X : Miscellaneous Questions SME–213

EXPLANATIONS

TYPE–I SME–217

TYPE–II SME–220

TYPE–III SME–222

TYPE–IV SME–223

TYPE–V SME–224

TYPE–VI SME–227

TYPE–VII SME–230

TYPE–VIII SME–231

TYPE–IX SME–232

TYPE–X SME–236

TEST YOURSELF SME–240

6. Ratio and Proportion (No. of Questions 443) SME–242-312

TYPE–I : Questions based on the basic concept of Ratio & Proportion SME–247

TYPE–II : Questions based on Fractions SME–251

TYPE–III : Questions based on Percentage SME–252

TYPE–IV : Questions based on Age SME–252

TYPE–V : Questions based on addition, difference and product SME–254

TYPE–VI : Questions based on L.C.M. & H.C.F. SME–256

TYPE–VII : Finding the sum/difference/ product of numbers where some change has been done in given ratio. SME–256

CHAPTERS ..... PAGES

TYPE–VIII : Questions based on Allegation or Mixtures SME–257

TYPE–IX : Questions based on Income or Expenditure SME–263

TYPE–X : Questions based on Coins and Rupees SME–264

TYPE–XI : Questions based on Shares and Partners SME–265

TYPE–XII : Miscellaneous Questions SME–268

EXPLANATIONS

TYPE–I SME–272

TYPE–II SME–278

TYPE–III SME–279

TYPE–IV SME–279

TYPE–V SME–282

TYPE–VI SME–285

TYPE–VII SME–285

TYPE–VIII SME–288

TYPE–IX SME–296

TYPE–X SME–299

TYPE–XI SME–300

TYPE–XII SME–304

TEST YOURSELF SME–307

7. Percentage (No. of Questions 485) SME–313-376

TYPE–I : Questions based on the basic concept of percentage SME–315

TYPE–II : If 'x' is less/more than 'y' by 'm %' then 'y' exceed/less than 'x' SME–319

TYPE–III : Questions based on Income, expenditure, Salary and Wages ... SME–320

TYPE–IV : Questions based on Ratio SME–323

TYPE–V : Questions based on Alligation & Mixture SME–325

TYPE–VI : Questions based on consumption and expenditure SME–326

TYPE–VII : Questions based on examination and marks obtained SME–327

CHAPTERS ..... PAGES

TYPE–VIII : Questions based on tricks Net increase or Decrease %

$x + y + \frac{xy}{100}$ / $-x - y + \frac{xy}{100}$

$x - y - \frac{xy}{100}$ / $-x + y - \frac{xy}{100}$ SME–330

TYPE–IX : Questions based on Voters in an Election SME–332

TYPE–X : Questions based on Depreciation & Population increase SME–333

TYPE–XI : Questions based on reducing & exceeding prices SME–334

TYPE–XII ..... : Miscellaneous Questions SME–335

EXPLANATIONS

TYPE–I SME–340

TYPE–II SME–344

TYPE–III SME–345

TYPE–IV SME–350

TYPE–V SME–352

TYPE–VI SME–354

TYPE–VII SME–355

TYPE–VIII SME–360

TYPE–IX SME–362

TYPE–X SME–364

TYPE–XI SME–366

TYPE–XII SME–369

TEST YOURSELF SME–373

8. Profit and Loss (No. of Questions 541) SME–377-453

TYPE–I : Questions based on the basic concept of C.P. & S.P. and profit & loss SME–378

TYPE–II : Questions based on gain & loss percent SME–380

CHAPTERS ..... PAGES

TYPE–III : Questions based on sold & bought SME–383

TYPE–IV : Questions based on ratio & partnership SME–386

TYPE–V : Questions based on tricks

$x + y + \frac{xy}{100}$ $-x - y + \frac{xy}{100}$

$-x + y - \frac{xy}{100}$ $x - y - \frac{xy}{100}$ .. SME–389

TYPE–VI : Questions based On selling an article and interchanging its values SME–390

TYPE–VII : Questions based on marked price SME–391

TYPE–VIII : Loss/gain percent is equals to the C.P./S.P. SME–393

TYPE–IX : Finding the cost of article where a man sold an article at a loss of *x*%. If he had sold it for ₹ '*y*' more than he would have gained/loss m%.... SME–394

TYPE–X : Questions where articles are sold in a circular chain SME–396

TYPE–XI : A person bought two articles for ₹ *x*. He sold A at *m*% profit/loss and B at n% loss/profit. Then gain/loss p% on his outlay. Find the c.p. of A/B/A+B etc. SME–396

TYPE–XII : Difference between selling price and Cost Price SME–399

TYPE–XIII : Find the reduced/increased price of an article SME–399

TYPE–XIV : Miscellaneous Questions SME–400

EXPLANATIONS

TYPE–I SME–407

TYPE–II SME–410

TYPE–III SME–415

TYPE–IV SME–420

TYPE–V SME–424

TYPE–VI SME–425

TYPE–VII SME–427

CHAPTERS ..... PAGES

TYPE–VIII SME–429

TYPE–IX SME–430

TYPE–X SME–434

TYPE–XI SME–436

TYPE–XII SME–438

TYPE–XIII SME–439

TYPE–XIV SME–440

TEST YOURSELF SME–447

9. Discount (No. of Questions 346) SME–454-506

TYPE-I : Questions based on Successive Discount SME–455

TYPE-II : Questions where The Market Price is x% higher of cost price. A discount of y% is given on the market Price. Find the Loss/gain percent SME–459

TYPE-III : A shopkeeper earns a profit of x% after allowing a discount of y% on the printed price SME–463

TYPE-IV : Mixed problems of marked price SME–466

TYPE-V : Miscellaneous Questions SME–469

EXPLANATIONS

TYPE–I SME–474

TYPE–II SME–483

TYPE–III SME–490

TYPE–IV SME–495

TYPE–V SME–501

TEST YOURSELF SME–506

10. Simple Interest (No. of Questions 186) SME–507-538

TYPE–I : Questions based on the basic formula of Simple Interest $S.I. = \frac{P \times R \times T}{100}$ SME–508

TYPE–II : The sum of money becomes '*n*' times of itself in '*t*' years at a certain rate of Simple Interest SME–511

TYPE–III : If simple interest on a certain sum for '*n*' years if x/y of the sum find the rate SME–512

CHAPTERS ..... PAGES

TYPE–IV : Questions based on the difference and equality of Simple Interest rate and years SME–512

TYPE–V : Questions based on ratios SME–514

TYPE–VI : Questions based on Increase/ decrease in rate of Interest SME–515

TYPE–VII : Miscellaneous Questions SME–515

EXPLANATIONS

TYPE–I SME–518

TYPE–II SME–522

TYPE–III SME–525

TYPE–IV SME–527

TYPE–V SME–530

TYPE–VI SME–530

TYPE–VII SME–532

TEST YOURSELF SME–535

11. Compound Interest (No. of Questions 204) SME–539-577

TYPE–I : Questions based on the basic formula of compound Interest SME–540

TYPE–II : Questions based on both compound and simple interest ... SME–543

TYPE–III : Difference between compound and simple interest SME–544

TYPE–IV : If the amount becomes 'n' times of the sum after 't' years at compound interest SME–547

TYPE–V : A sum of money amounts to ₹ x_1 in t_1 years and to ₹ x_2 in t_2 years at compound interest SME–547

TYPE–VI : Questions based on Installments SME–548

TYPE–VII : Miscellaneous Questions SME–549

EXPLANATIONS

TYPE–I SME–550

TYPE–II SME–557

TYPE–III SME–562

TYPE–IV SME–566

TYPE–V SME–568

TYPE–VI SME–571

TYPE–VII SME–572

TEST YOURSELF SME–575

12. Time and Work (No. of Questions 383) SME–578-650

TYPE-I : Questions Based on the basic concept of time and work SME–580

TYPE-II : Questions where worker leaves or joins SME–585

TYPE-III : Questions based on 'M' man, 'W' women and 'B' boys SME–589

TYPE-IV : Questions based on fraction of the work SME–591

TYPE-V : Questions based on efficiency of worker SME–594

TYPE-VI : Questions based on the formulae $M_1D_1W_1 = M_2D_2W_2$ and its interchange SME–596

TYPE-VII : Questions based on Work and Wages SME–598

TYPE-VIII: Miscellaneous Questions SME–600

EXPLANATIONS

TYPE–I SME–603

TYPE–II SME–614

TYPE–III SME–622

TYPE–IV SME–627

TYPE–V SME–632

TYPE–VI SME–636

TYPE–VII SME–639

TYPE–VIII SME–641

TEST YOURSELF SME–645

13. Pipe and Cistern (No. of Questions 83) SME–651-665

TYPE–I : Questions based on the concept of pipe and cistern SME–652

TYPE–II : Questions based on fractions/ part of filled tank SME–653

CHAPTERS ..... PAGES

TYPE–III : Questions based on taps are opened alternatively or a leak in a tank SME–654

TYPE–IV : Miscellaneous Questions SME–655

EXPLANATIONS

TYPE–I SME–656

TYPE–II SME–659

TYPE–III SME–660

TYPE–IV SME–662

TEST YOURSELF SME–664

14. Time and Distance (No. of Questions 401) SME–666-736

TYPE–I : Questions based on the basic concept of time and distance SME–669

TYPE–II : Questions based on Rail and Platform/Bridge SME–672

TYPE–III : Questions based on Rail and a man/pole/signal SME–673

TYPE–IV : Questions based on two Rails cross each other in opposite direction SME–675

TYPE–V : Questions based on a car travels with $\frac{n}{y}$ of its usual speed SME–677

TYPE–VI : Questions based on average speed SME–678

TYPE–VII : Questions based on Ratios SME–680

TYPE–VIII : Questions based on two train travel in same direction at different speed or thief/ constable overtake. SME–681

TYPE–IX : Questions based on a train (transport system)/a man changes his speed, then he arrives at its destination before/later SME–683

TYPE–X : Questions based on any train crosses both platform and a man/a pole at same time SME–684

TYPE–XI : Question based on races SME–685

CHAPTERS ..... PAGES

TYPE–XII : Miscellaneous Questions SME–686

EXPLANATIONS

TYPE–I SME–690

TYPE–II SME–695

TYPE–III SME–698

TYPE–IV SME–700

TYPE–V SME–703

TYPE–VI SME–705

TYPE–VII SME–708

TYPE–VIII SME–709

TYPE–IX SME–712

TYPE–X SME–714

TYPE–XI SME–716

TYPE–XII SME–717

TEST YOURSELF SME–721

15. Boat and Stream (No. of Questions 61) SME–737-748

TYPE–I : Questions based on upstream and downstream SME–738

TYPE–II : Questions based on a boat/a man takes 'n' times as much time in going the same distance in opposite direction SME–740

TYPE–III : Miscellaneous Questions SME–740

EXPLANATIONS

TYPE–I SME–741

TYPE–II SME–745

TYPE–III SME–746

TEST YOURSELF SME–748

16. Sequence and Series (No. of Questions 143) SME–749-765

TYPE–I : Questions based on finding the next number/missing number/ wrong number SME–751

TYPE–II : Questions based on 'x^{th}' term & sum of 'n' terms SME–753

TYPE–III : Questions based on Simple calculation SME–755

CHAPTERS ..... PAGES

TYPE–IV : Questions based on square/ cube of natural/odd/even/prime numbers etc. SME–755

EXPLANATIONS

TYPE–I SME–756

TYPE–II SME–758

TYPE–III SME–762

TYPE–IV SME–763

TEST YOURSELF SME–764

17. Algebra (No. of Questions 759) SME–766-878

TYPE–I : Questions based on the basic algebraic concept/calculation SME–771

TYPE–II : Questions based on polynomial and algebraic identity SME–787

TYPE–III : Questions based on graphs of linear equations and co-ordinate Geometry SME–801

TYPE–IV : Questions based on ratios SME–804

TYPE–V : Questions based on Permutation and Combination and Binomial Therom SME–805

TYPE–VI : Miscellaneous Questions SME–805

EXPLANATIONS

TYPE–I SME–808

TYPE–II SME–834

TYPE–III SME–859

TYPE–IV SME–864

TYPE–V SME–866

TEST YOURSELF SME–868

18. Trigonometry (No. of Questions 626) SME–879-990

TYPE–I : Questions based on Circular Measure of angles (Radian & Degree Measure) SME–884

TYPE–II : Questions based on Trigonometric Ratios & Identities, Function, Projection, Law of Tangents etc. SME–884

CHAPTERS ..... PAGES

TYPE–III : Questions based on angle of elevation SME–907

TYPE–IV : Questions based on angle of depression SME–914

TYPE–V : Miscellaneous Questions SME–916

EXPLANATIONS

TYPE–I SME–918

TYPE–II SME–919

TYPE–III SME–955

TYPE–IV SME–973

TYPE–V SME–979

TEST YOURSELF SME–980

19. Geometry (No. of Questions 608) SME–991-1104

TYPE–I : Equilateral Triangles .SME–1008

TYPE–II : Isosceles Triangles SME–1009

TYPE–III : Scalene triangles, Acute & obtuse angles triangles and others triangles SME–1011

TYPE–IV : Right angle Triangles SME–1018

TYPE–V : Similar Triangles SME–1020

TYPE–VI : Rectangle SME–1021

TYPE–VII : Square SME–1021

TYPE–VIII : Polygon SME–1021

TYPE–IX : Parallelogram SME–1023

TYPE–X : Cyclic and others Quadrilateral SME–1023

TYPE–XI : Trapezium/Rhombus..SME–1024

TYPE–XII : Simple Circle SME–1025

TYPE–XIII : Tangents to Circle .SME–1030

TYPE–XIV : Incentre/Circumcentre and Incircle Circumcircle SME–1034

TYPE–XV : Miscellaneous Questions SME–1036

EXPLANATIONS

TYPE–I SME–1040

TYPE–II SME–1043

TYPE–III SME–1045

CHAPTERS ..... PAGES

TYPE–IV SME–1060
TYPE–V SME–1065
TYPE–VI SME–1068
TYPE–VII SME–1068
TYPE–VIII SME–1068
TYPE–IX SME–1071
TYPE–X SME–1071
TYPE–XI SME–1073
TYPE–XII SME–1075
TYPE–XIII SME–1086
TYPE–XIV SME–1092
TYPE–XV SME–1096
TEST YOURSELF SME–1101

20. Mensuration (No. of Questions 946) SME–1105-1256

TYPE–I : (2-D : Area) SME–1114
TYPE–II : (2-D : Perimeter) SME–1132
TYPE–III : (2-D : Percentage/Cost/ Quantity) SME–1137
TYPE–IV : (3-D : Volume) SME–1138
TYPE–V : (3-D : Area) SME–1153
TYPE–VI : (3-D : Percentage/Cost/ Quantity) SME–1160
TYPE–VII : Miscellaneous Questions SME–1162

EXPLANATIONS

TYPE–I SME–1168
TYPE–II SME–1202
TYPE–III SME–1211
TYPE–IV SME–1212
TYPE–V SME–1234
TYPE–VI SME–1243
TYPE–VII SME–1246
TEST YOURSELF SME–1253

21. Statistics and Data Interpretation (No. of Questions 968) SME–1257-1369

TYPE–I : Pie-Chart SME–1263
TYPE–II : Line graph SME–1282
TYPE–III : Simple Bar Diagram SME–1286

CHAPTERS ..... PAGES

TYPE–IV : Horizontal and Divide Bar Diagram SME–1296
TYPE–V : Multi Bar Diagram SME–1300
TYPE–VI : Histogram SME–1319
TYPE–VII : Table SME–1323
TYPE–VIII : Miscellaneous Questions SME–1331

EXPLANATIONS

TYPE–I SME–1333
TYPE–II SME–1344
TYPE–III SME–1346
TYPE–IV SME–1350
TYPE–V SME–1352
TYPE–VI SME–1361
TYPE–VII SME–1362
TYPE–VIII SME–1367
TEST YOURSELF SME–1368

22. Miscellaneous (No. of Questions 50) SME–1370-1376

TYPE–I : Questions based on Logarithm SME–1371
TYPE–II : Questions based on Set Theory SME–1371
TYPE–III : Questions based on Probability SME–1371
TYPE–IV : Questions based on Calendar SME–1371
TYPE–V : Questions based on clock SME–1371
TYPE–VI : Others SME–1372

EXPLANATIONS

TYPE–I SME–1373
TYPE–II SME–1373
TYPE–III SME–1373
TYPE–IV SME–1373
TYPE–V SME–1373
TYPE–VI SME–1374
TEST YOURSELF SME–1375

(Grand Total No. of Questions 8932)

1 NUMBER SYSTEM

Importance : Being a basic concept of mathematics : 1 and 2 questions on number system are regularly asked in different competitive exams. Its knowledge is also essential to solve other questions.

Scope of questions : Different type of questions like based on fractions, even/odd/whole/divisible/prime/coprime/rational/irrational/numbers and related to divisibility, order, ascending, descending, addition, multiplication, inverse numbers may be asked.

Way to success : These questions are solved by different methods. Maximum practice and rechecking is the way to success for this chapter.

Natural Numbers : Set of counting numbers is callled natural numbers. It is denoted by N. where,

N = {1, 2, 3, ...∞}

Even Numbers : The set of all natural numbers which are divisible by 2 are called even numbers. It is denoted by E.

Where, E = {2, 4, 6, 8, 10, ...∞}

Odd Numbers : The set of all natural numbers which are not divisible by 2 are called odd numbers. In other words, the natural numbers which are not even numbers, are odd numbers. i.e.,

O = {1, 3, 5, 7, ...∞}

Whole Numbers : When zero is included in the set of natural numbers, then it forms set of whole numbers. It is denoted by W. where,

W = {0, 1, 2, 3, ...∞}

Integers : When in the set of whole numbers, natural numbers with negative sign are included, then it becomes set of integers. It is denoted by I or Z.

I : [– ∞, ... –4, –3, –2, –1, 0, 1, 2, 3, 4, ...∞]

Integers can further be classified into negative or positive Integers. Negative Integers are denoted by Z^- and positive Integers are denoted by Z^+.

Z^- = {– ∞, ... –3, – 2, –1} and

Z^+ = {1, 2, 3, ... ∞}

Further 0 is neither negative nor positive integer.

Prime Numbers: The natural numbers which have no factors other than 1 and itself are called prime numbers.

Note that, (i) In other words they can be divided only by themselves or 1 only. As, 2, 3, 5, 7, 11 etc.

(ii) All prime numbers other than 2 are odd numbers but all odd numbers are not prime numbers.

2 is the only one even Prime number.

Co-Prime Numbers : Two numbers which have no common factor except 1, are called Co–Prime numbers. Such as, 9 and 16, 4 and 17, 80 and 81 etc.

It is not necessary that two co–prime numbers are prime always. They may or may not be prime numbers.

Divisible numbers/composite numbers : The whole numbers which are divisible by numbers other than itself and 1 are called divisible numbers or we can say the numbers which are not prime numbers are composite or divisible numbers. As, 4, 6, 9, 15, ...

Note : 1 is neither Prime number nor composite number. Composite numbers may be even or odd.

Rational Numbers : The numbers which can be expressed in the form of $\frac{p}{q}$ where p and q are integers and coprime and $q \neq 0$ are called rational numbers. It is denoted by Q. These may be positive, or negative.

e.g. $\frac{4}{5}, \frac{5}{1}, -\frac{1}{2}$ etc are rational numbers.

Irrational Numbers : The numbers which are not rational numbers, are called irrational numbers. Such as

$\sqrt{2}$ = 1.414213562.....

π = 3.141592653 .....

Real Numbers: Set of all rational numbers as well as irrational numbers is called Real numbers. The square of all of them is positive.

Cyclic Numbers : Cyclic numbers are those numbers of n digits which when multiplied by any other number upto n gives same digits in a different order. They are in the same line. As 142857

2 × 142857 = 285714 : 3 × 142857 = 428571

4 × 142857 = 571428 : 5 × 142857 = 714285

Perfect Numbers : If the sum of all divisors of a number N (except N) is equal to the number N itself then the number is called perfect number. Such as, 6, 28, 496. 8128 etc.

The factor of 6 are 1, 2 and 3

Since, 6 : 1 + 2 + 3 = 6

28 : 1 + 2 + 4 + 7 + 14 = 28

496 : 1 + 2 + 4 + 8 + 16 + 31 + 62 + 124 + 248 = 496

8128 : 1 + 2 + 4 + 8 + 16 + 32 + 64 + 127 + 254 + 508 + 1016 + 2032 + 4064 = 8128. etc.

Note : In a perfect number, the sum of inverse of all of its factors including itself is 2 always.

e.g. Factors of 28 are 1,2,4,7,14 are

$$= \frac{1}{1}+\frac{1}{2}+\frac{1}{4}+\frac{1}{7}+\frac{1}{14}+\frac{1}{28}=\frac{56}{28} = 2$$

Complex Numbers : Z = a + ib is called complex number, where a and b are real numbers, $b \neq 0$ and $i = \sqrt{-1}$.

Such as, $\sqrt{-2}$, $\sqrt{-3}$ etc.

So, a + ib or 4 + 5i are complex numbers.

Additive Identity : If a + 0 = a, then 0 (zero) is called additive identity.

Additive Inverse : If a + (–a) = 0, so 'a' and '–a' are called additive inverse to each other. As, 2 + (–2) = 0

Additive inverse of 2 is –2.

Multiplicative Identity : If a × 1 = a. then 1 is called multiplicative identity. e.g. 3 × 1 = 3 etc.

Multiplicative Inverse : If a × b = 1. then we can say that a and b are multiplicative invverse of each other. As

$$2 \times \frac{1}{2} = 1$$

So, multiplicative inverse of 2 is $\frac{1}{2}$

SOME IMPORTANT POINTS ON NUMBERS

(a) 2 is the only even prime number.

(b) Number 1 is neither divisible nor prime.

(c) Two consecutive odd prime numbers are called prime pair.

(d) All natural numbers are whole, rational, integer and real.

(e) All whole numbers are rational Integer and real.

(f) All whole numbers are rational and real.

(g) All whole numbers, rational and irrational numbers are real.

(h) Whole numbers and natural numbers can never be negative.

(i) Natural (including Prime, Composite, even or odd) numbers and whole numbers are never negative.

(j) Fractions are rational.

(k) All prime numbers except 2 are odd.

(l) 0 is neither negative nor positive number.

(m) If a is any number then, if a divides zero, result will be zero. If 0 divides a, then result will be infinite or not defined or undetermined i.e.

$$\frac{0}{a} = 0 \text{ but } \frac{a}{0} = \infty \text{ (infinite)}$$

where a is real number.

(n) Dividing 0 by any number gives zero e.g. $\frac{0}{a} = 0$

(o) The place or position of a digit in a number is called its place value such as
Place value of 2 in 5283 is 200.

(p) The real value of any digit in a certain number is called its face value. As, face value of 2 in 5283 is 2.

(q) The sum and the product of two rational numbers is always a rational number.

(r) The product or the sum of a rational number and irrational number is always an irrational number.

(s) π is an irrational number.

(t) There can be infinite number of rational or irrational numbers between two rational numbers or two irrational numbers.

(u) Decimal indication of an irrational number is infinite coming. as $-\sqrt{3}, \sqrt{2}$

(v) The square of an even number is even and the square of an odd number is odd.

DECIMAL

(w) The decimal representation of a rational number is either finite or infinite recurring e.g. = $\frac{3}{4}$ = 0.75 (finite), $\frac{11}{3}$ = 3.666 ..... (infinite recurring)

(x) If decimal number 0, x and 0. xy are given, then they can be expressed in the form of $\frac{p}{q}$

As, $0.x = \frac{x}{10}$ and $0.xy = \frac{xy}{100}$

(y) If decimal recurring numbers $0.\bar{x}$ and $0.\overline{xy}$ are given, then they can be expressed in the form of $\frac{p}{q}$ As $0.\bar{x}$ $= \frac{x}{9}$ and $0.\overline{xy} = \frac{xy}{99}$

(z) The recurring decimal numbers of type $0.\bar{x}$ or $0.x\overline{yz}$ may be converted to rational form as $\frac{p}{q}$ follows.

$0.x\bar{y} = \frac{xy - x}{90}$ and $0.x\overline{yz} = \frac{xyz - x}{990}$

DIVISIBILITY

Importance : Divisibility questions, if not asked directly, still its knowledge is very essential to solve different questions in simplications.

Scope of questions : The study of this concept is very useful to increase speed in simplication and number system.

Way to success : The knowledge of divisibility rules (of ,2, 3, 4, 5, 6, 8, 9) and of osculaters for 7, 11, 13 etc & mental calculations increase our (speed) time management and accuracy.

Basic Formulae of Divisibility from 2 to 19:

1. Divisibility by 2 : If the last digit of a number is 0 or an even number then that number is diviisible by 2. Such as, 242, 540 etc.

2. Divisibility by 3 : If the sum of all digits of a number is divisible by 3, then that number will be divisible by 3. Such as.

432 : 4 + 3 + 2 = 9 which is divisible by 3.

So, 432 is divisible by 3.

3. Divisibility by 4 : If in any number last two digits are divisible by 4, then whole number will be divisible by 4. Such as,

48424. In this number 24 is divisible by 4. So, 48424 will be divisible by 4.

4. Divisibility by 5 : If last digit of a number is 5 or 0, then that number is divisible by 5. Such as 200, 225 etc.

5. Divisibility by 6 : If a number is divisible by both 2 and 3, then that number is divisible by 6 also, such as 216, 25614 etc.

6. Divisibility by 7 : Here concept of osculator should be applied. The meaning of negative osculator is – there increases or decreases 1 from the factor of 10 of the number. As, 21 : 2 × 10 + 1 = 21

49 : 5 × 10 – 1 = 50 – 1 = 49

To check the divisibility of 7, we use osculator '2', as , 112 : 11 – 2 × 2 = 7 which is divisible by 7

Again,

343 : 34 – 2 × 3 = 28 which is divisible by 7. Then 343 will be divisible by 7.

7. Divisibility by 8 : If in any number last three digits are divisible by 8, then whole number is divisible by 8, such as,

247864 since 864 is divisible by 8.

So, 247864 is divisible by 8.

Similarly, 289000 is divisible by 8.

8. Divisibility by 9 : If the sum of all digits of a number is divisible by 9, then that whole number will be divisible by 9. As, 243243 : 2 + 4 + 3 + 2 + 4 + 3 = 18 is divisible by 9.

So, 243243 is divisible by 9.

9. Divisibility by 10 : The number whose last digit is '0', is divisible by 10, such as, 10, 20, 200, 300 etc.

10. Divisibility by 11 : If the difference between "Sum of digits at even place" and "Sum of digits at odd place" is divisible by 11, then the whole number is divisible by 11 such as,

9 1 7 4

+ +

16 5

∴ (9 + 7) – (4 + 1) = 16 – 5 = 11 is divisible by 11.

So, 9174 will be divisible by 11.

11. Divisibility by 12 : If a number is divisible by 3 and 4 both. Then the number is divisible by 12. Such as, 19044 etc.

12. Divisibility by 13 : For 13 we use osculator 4, but our osculator is not negative here. It is one-more osculator (4).

143 : 14 + 3 × 4 = 26

and 26 is divisible by 13, So, 143 is divisible by 13.

Similarly for 325 : 32 + 5 × 4 = 52

52 is divisible by 13

Hence, 325 will also be divisible by 13.

13. Divisibility by 14 : If a number is divisible by 2 and 7 both then that number is divisible by 14 i.e. number is even and osculator 2 is applicable.

14. Divisibility by 15 : If a number is divisible by 3 and 5 both, then that number is divisible by 15.

15. Divisibility by 16 : If last 4 digits of a number are divisible by 16, then whole number is divisible by 16. Such as 34**1920**.

16. Divisibility by 17 : For 17, there is a negative 'osculator 5'. This process is same as the process of 7. As.

1904 : 190 – 5 × 4 = 170.

$\because$ 170 is divisible by 17. So 1904 will be divisible by 17.

17. Divisibility by 18 : If a number is divisible by 2 and 9 both, then that number is divisible by 18.

18. Divisibility by 19 : For 19, there is one–more (positive) osculator 2, which is same processed as 13. As,

361 = 36 + 1 × 2 = 38

$\because$ 38 is divisible by 19. So 361 is also divisible by 19.

Few more Important Points:

1. Out of a group of n consecutive integers one and only one number is divisible by n.

2. The product of n consecutive numbers is always divisible by n! or = $\lfloor n$.

3. For any number n, (n^p–h) is always divisible by P where P is a prime number, for e.g.,

if n = 2 and P = 5 then,

$(2^5 - 2) = (32 - 2) = 30$ which is divisible by 5.

4. The square of an odd number when divided by 8 always leaves a remainder 1, as

If we divide $7^2 = 49$ or $5^2 = 25$ by 8 then remainder will be 1.

5. For any natural number n, n^5 or n^{4k+1} is having same unit digit as n has, where k is a whole number, such as,

$3^5 = 243$ has 3 at its unit place.

6. Square of any natural number can be written in the form of 3n or 3n + 1 or 4n or (4n + 1).

e.g. square of 11 = 121 = 3 × 40 + 1

or 4 × 30 + 1

If $N = a^p b^q c^r$ ..... where a, b and c are prime numbers and p, q and r are natural numbers, then

1. Number of factors of N is given by

F = (p + 1)(q + 1)(r + 1) .....

2. Number of ways to express the number as a product of two factors are $\frac{F}{2}$ F is even or $\frac{F+1}{2}$ if F is odd respectively.

3. Sum of all the factors of the number N.

$$S(F) = \frac{\left(a^{p+1}-1\right)}{(a-1)} \times \frac{\left(b^{q+1}-1\right)}{(b-1)} \times \frac{\left(c^{r+1}-1\right)}{(c-1)}$$

4. The number of ways in which a number N can be resolved into co–prime factors is 2^{k-1}, where k is the number of different Prime factors of the number N.

5. The number of co–primes to number N is given by

$$C(N) = n\left(1-\frac{1}{a}\right)\left(1-\frac{1}{b}\right)\left(1-\frac{1}{c}\right)$$

Special Rules :

Rule 1 : If the sum of digits of two digit number is 'a' and if the digits or the number are reversed, such that number reduces by 'b', then

$$\text{Original Number} = \frac{11a+b}{2}$$

For example : (For number 82) a = 8 + 2 = 10

and b = 82 – 28 = 54 is given then

$$\text{original number} = \frac{11\times10+54}{2} = \frac{164}{2} = 82$$

Rule 2 : If the sum of digits of two digit number is 'a' and if the digits of the number are reveresed, such that number increases by 'b', then,

$$\text{Original Number} = \frac{11a-b}{2}$$

e.g. (For number 47): a = 4 + 7 = 11

& b = 74 – 47 = 27 thus the

$$\text{original number} = \frac{11\times11-27}{2} = 47$$

Rule 3 : If the difference between a number and formed by number reversing digit is *x*, then the difference between both the digits of the number is $\frac{x}{9}$

eg. (for 63) $x = 63 - 36 = 27$

$$\Rightarrow \text{Required difference} = \frac{27}{9} = 3$$

Rule 4 : If the sum of a number and the number formed by reversing the digits is x, then the sum of digits of the number is $\frac{x}{11}$.

e.g. (For number 76) = x = 67 + 76 = 143 Required sum of numbers = 67 + 76 = 143

$$\text{Required sum} = \frac{143}{11} = 13$$

Dividend = (Divisor × Quotient) + Remainder

$$\text{Divisor} = \frac{\text{Dividend} - \text{Remainder}}{\text{Quotient}}$$

$$\text{Quotient} = \frac{\text{Dividend} - \text{Remainder}}{\text{Divisor}}$$

Remainder = Dividend – (Divisor × Quotient)

Special Rule for Remainder Calculation:

Rule 5 : If $\frac{a^n}{a-1}$ then remainder will always be 1, whether n is even or odd.

Rule 6 : If $\frac{a^{(\text{even number})}}{(a+1)}$, then remainder will be 1.

Rule 7 : If $\frac{a^{(\text{odd number})}}{(a+1)}$, then remainder will be a.

Rule 8 : If n is a single digit number, then in n^3, n will be at unit place. It is valid for the number 0, 1, 4, 5, 6 or 9 As, digit at unit place in (4^3) is 4.

Rule 9 : If n is a single digit number then in n^p, where p is any number (+ve), n will be at unit place. It is valid for 5 and 6.

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. Which of the following fraction is the smallest?

$\frac{7}{6}, \frac{7}{9}, \frac{4}{5}, \frac{5}{7}$

(1) $\frac{7}{6}$ (2) $\frac{7}{9}$

(3) $\frac{4}{5}$ (4) $\frac{5}{7}$

(SSC CGL Exam. 04.07.1999 (Ist Sitting)

2. Which of the following fraction is the smallest ?

$\frac{9}{13}, \frac{17}{26}, \frac{28}{29}, \frac{33}{52}$

(1) $\frac{33}{52}$ (2) $\frac{17}{26}$

(3) $\frac{9}{13}$ (4) $\frac{28}{29}$

(SSC CGL Exam. 04.07.1999 (IInd Sitting)

3. The smallest possible three-place decimal number is :

(1) 0.012 (2) 0.123

(3) 0.111

(4) None of the above

(SSC CGL Exam. 27.02.2000 (IInd Sitting)

4. Which of the following fraction is the smallest?

$\frac{8}{15}, \frac{14}{33}, \frac{7}{13}, \frac{11}{13}$

(1) $\frac{8}{15}$ (2) $\frac{7}{13}$

(3) $\frac{11}{13}$ (4) $\frac{14}{33}$

(SSC CGL Exam. 24.02.2002 (Ist Sitting)

5. Which of the following is the smallest fraction ?

$\frac{8}{25}, \frac{7}{23}, \frac{11}{23}, \frac{14}{53}$

(1) $\frac{8}{25}$ (2) $\frac{7}{23}$

(3) $\frac{11}{23}$ (4) $\frac{14}{53}$

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

6. Which of the following is the largest fraction ? $\frac{6}{7}, \frac{5}{6}, \frac{7}{8}, \frac{4}{5}$

(1) $\frac{6}{7}$ (2) $\frac{4}{5}$

(3) $\frac{5}{6}$ (4) $\frac{7}{8}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

7. The smallest number of five digits exactly divisible by 476 is

(1) 47600 (2) 10000

(3) 10476 (4) 10472

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

8. The least among the fractions $\frac{15}{16}, \frac{19}{20}, \frac{24}{25}, \frac{34}{35}$ is

(1) $\frac{34}{35}$ (2) $\frac{15}{16}$

(3) $\frac{19}{20}$ (4) $\frac{24}{25}$

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

9. The greatest fraction among $\frac{2}{3}, \frac{5}{6}, \frac{11}{15}$ and $\frac{7}{8}$ is

(1) $\frac{7}{8}$ (2) $\frac{11}{15}$

(3) $\frac{5}{6}$ (4) $\frac{2}{3}$

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

10. The least number among

$\frac{4}{9}, \sqrt{\frac{9}{49}}, 0.\dot{4}\dot{5}$ and $(0.8)^2$ is

(1) $\frac{4}{9}$ (2) $\sqrt{\frac{9}{49}}$

(3) $0.\dot{4}\dot{5}$ (4) $(0.8)^2$

(SSC CPO S.I. Exam. 06.09.2009)

11. Which of the following number is the greatest of all ?

$0.9, 0.\overline{9}, 0.0\overline{9}, 0.\overline{09}$

(1) 0.9 (2) $0.\overline{9}$

(3) $0.0\overline{9}$ (4) $0.\overline{09}$

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

12. The greatest value among the fractions $\frac{2}{7}, \frac{1}{3}, \frac{5}{6}, \frac{3}{4}$ is :

(1) $\frac{3}{4}$ (2) $\frac{5}{6}$

(3) $\frac{1}{3}$ (4) $\frac{2}{7}$

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

13. The least number of five digits which has 123 as a factor is

(1) 10037 (2) 10086

(3) 10081 (4) 10063

(SSC Delhi Police SI Exam. 19.08.2012)

14. The largest among the numbers $(0.1)^2$, $\sqrt{0.0121}$, 0.12 and $\sqrt{0.0004}$ is

(1) $(0.1)^2$ (2) $\sqrt{0.0121}$

(3) 0.12 (4) $\sqrt{0.0004}$

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

15. The greatest among the following numbers $(3)^{\frac{1}{3}}, (2)^{\frac{1}{2}}, 1, (6)^{\frac{1}{6}}$ is :

(1) $(2)^{\frac{1}{2}}$ (2) 1

(3) $(6)^{\frac{1}{6}}$ (4) $(3)^{\frac{1}{3}}$

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

16. When 335 is added to 5A7, the result is 8B2. 8B2 is divisible by 3. What is the largest possible value of A ?

(1) 8 (2) 2

(3) 1 (4) 4

(SSC CGL Tier-II Exam. 29.09.2013

17. If a number is as much greater than 31 as it is less than 75, then the number is

(1) 106 (2) 44

(3) 74 (4) 53

(SSC CHSL DEO & LDC Exam. 20.10.2013)

18. The greatest number among 0.7 + $\sqrt{0.16}$, $1.02 - \frac{0.6}{24}$, 1.2×0.83 and $\sqrt{1.44}$ is :

(1) $0.7 + \sqrt{0.16}$ (2) $\sqrt{1.44}$

(3) 1.2×0.83 (4) $1.02 - \frac{0.6}{24}$

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

19. Which is the largest of the following fractions ?

$\frac{2}{3}, \frac{3}{5}, \frac{8}{11}, \frac{11}{17}$

(1) $\frac{8}{11}$ (2) $\frac{3}{5}$

(3) $\frac{11}{17}$ (4) $\frac{2}{3}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

20. Sum of three fractions is $2\frac{11}{24}$. On dividing the largest fraction by the smallest fraction, $\frac{7}{6}$ is obtained which is $\frac{1}{3}$ greater than the middle fraction. The smallest fraction is

(1) $\frac{5}{8}$ (2) $\frac{3}{4}$

(3) $\frac{5}{6}$ (4) $\frac{3}{7}$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) (TF No. 789 TH 7)

21. Arrangement of the fractions $\frac{4}{3}$, $-\frac{2}{9}$, $-\frac{7}{8}$, $\frac{5}{12}$ into ascending order is

(1) $-\frac{7}{8}, -\frac{2}{9}, \frac{5}{12}, \frac{4}{3}$

(2) $-\frac{7}{8}, -\frac{2}{9}, \frac{4}{3}, \frac{5}{12}$

(3) $-\frac{2}{9}, -\frac{7}{8}, \frac{5}{12}, \frac{4}{3}$

(4) $-\frac{2}{9}, -\frac{7}{8}, \frac{4}{3}, \frac{5}{12}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

22. Which of the following is correct ?

(1) $\frac{2}{3} < \frac{3}{5} < \frac{11}{15}$

(2) $\frac{3}{5} < \frac{2}{3} < \frac{11}{15}$

(3) $\frac{11}{15} < \frac{3}{5} < \frac{2}{3}$

(4) $\frac{3}{5} < \frac{11}{15} < \frac{2}{3}$

(SSC CGL Tier-II Online Exam.01.12.2016)

TYPE–II

1. A number when divided by 899 gives a remainder 63. If the same number is divided by 29, the remainder will be :

(1) 10 (2) 5

(3) 4 (4) 2

(SSC CGL Exam. 04.07.1999 (IInd Sitting) & SSC CGL Exam. 27.07.2008 (IInd Sitting)

2. $\frac{1}{0.04}$ is equal to :

(1) $\frac{1}{40}$ (2) $\frac{2}{5}$

(3) $\frac{5}{2}$ (4) 25

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

3. A six digit number is formed by repeating a three digit number; for example, 256, 256 or 678, 678 etc. Any number of this form is always exactly divisible by :

(1) 7 only (2) 11 only

(3) 13 only (4) 1001

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

4. The smallest number to be added to 1000, so that 45 divides the sum exactly, is :

(1) 35 (2) 80

(3) 20 (4) 10

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

5. Which of the following numbers will always divide a six-digit number of the form *xyxyxy* (where $1 \le x \le 9$, $1 \le y \le 9$)?

(1) 1010 (2) 10101

(3) 11011 (4) 11010

(SSC CHSL DEO & LDC Exam. 04.12.2011(IInd Sitting (East Zone)

6. The divisor is 25 times the quotient and 5 times the remainder. If the quotient is 16, the dividend is :

(1) 6400 (2) 6480

(3) 400 (4) 480

(SSC CGL Exam. 24.02.2002 (Ist Sitting) & SSC CGL Prel. Exam. 13.11.2005 (IInd Sitting)

7. The product of two positive numbers is 11520 and their quotient is $\frac{9}{5}$. Find the difference of two numbers.

(1) 60 (2) 64

(3) 74 (4) 70

(SSC CGL Exam. 24.02.2002 (IInd Sitting)

8. When a number is divided by 56, the remainder obtained is 29. What will be the remainder when the number is divided by 8 ?

(1) 4 (2) 5

(3) 3 (4) 7

(SSC CGL Exam. 24.02.2002 (IInd Sitting) & SSC CGL Exam. 04.02.2007 (Ist Sitting)

9. A student was asked to multiply a number by $\frac{3}{2}$ but he divided that number by $\frac{3}{2}$. His result was 10 less than the correct answer. The number was :

(1) 10 (2) 12

(3) 15 (4) 20

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

10. A number being divided by 52 gives remainder 45. If the number is divided by 13, the remainder will be

(1) 5 (2) 6

(3) 12 (4) 7

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

11. If $\frac{3}{4}$ of the difference of $2\frac{1}{4}$ and $1\frac{2}{3}$ is subtracted from $\frac{2}{3}$ of $3\frac{1}{4}$ the result is

(1) $\frac{-48}{83}$ (2) $\frac{48}{83}$

(3) $\frac{-83}{48}$ (4) $\frac{83}{48}$

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

12. A number when divided by 296 gives a remainder 75. When the same number is divided by 37, the remainder will be

(1) 1 (2) 2
(3) 8 (4) 11

(SSC CPO S.I. Exam. 12.01.2003)

13. A number when divided successively by 4 and 5 leaves remainder 1 and 4 respectively. When it is successively divided by 5 and 4 the respective remainders will be

(1) 4, 1 (2) 3, 2
(3) 2, 3 (4) 1, 2

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

14. In a division problem, the divisor is 4 times the quotient and 3 times the remainder. If remainder is 4, the dividend is

(1) 36 (2) 40
(3) 12 (4) 30

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

15. Each member of a picnic party contributed twice as many rupees as the total number of members and the total collection was ₹ 3042. The number of members present in the party was

(1) 2 (2) 32
(3) 40 (4) 39

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

16. How many natural numbers divisible by 7 are there between 3 and 200 ?

(1) 27 (2) 28
(3) 29 (4) 36

(SSC CPO S.I. Exam. 07.09.2003)

17. The sum of first sixty numbers from one to sixty is divisible by

(1) 13 (2) 59
(3) 60 (4) 61

(SSC CPO S.I. Exam. 07.09.2003)

18. A number when divided by 3 leaves a remainder 1. When the quotient is divided by 2, it leaves a remainder 1. What will be the remainder when the number is divided by 6?

(1) 3 (2) 4
(3) 5 (4) 2

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

19. The product of two numbers is 9375 and the quotient, when the larger one is divided by the smaller, is 15. The sum of the numbers is :

(1) 395 (2) 380
(3) 400 (4) 425

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

20. A number, when divided by 119, leaves a remainder of 19. If it is divided by 17, it will leave a remainder of :

(1) 19 (2) 10
(3) 7 (4) 2

(SSC CPO S.I. Exam. 26.05.2005) & SSC CGL Prelim Exam. 27.07.2008)

21. $(7^{19} + 2)$ is divided by 6, the remainder is :

(1) 5 (2) 3
(3) 2 (4) 1

(SSC CPO S.I. Exam. 26.05.2005)

22. When a number is divided by 357 the remainder is 39. If that number is divided by 17, the remainder will be :

(1) 0 (2) 3
(3) 5 (4) 11

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

23. A number divided by 68 gives the quotient 269 and remainder zero. If the same number is divided by 67, the remainder is :

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

24. A number when divided by 6 leaves remainder 3. When the square of the same number is divided by 6, the remainder is :

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

25. When a number is divided by 893, the remainder is 193. What will be the remainder when it is divided by 47 ?

(1) 3 (2) 5
(3) 25 (4) 33

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

26. A number divided by 13 leaves a remainder 1 and if the quotient, thus obtained, is divided by 5, we get a remainder of 3. What will be the remainder if the number is divided by 65 ?

(1) 28 (2) 16
(3) 18 (4) 40

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

27. Which of the following number is NOT divisible by 18 ?

(1) 54036 (2) 50436
(3) 34056 (4) 65043

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

28. 64329 is divided by a certain number. While dividing, the numbers, 175, 114 and 213 appear as three successive remainders. The divisor is

(1) 184 (2) 224
(3) 234 (4) 296

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

29. In a question on division, the divisor is 7 times the quotient and 3 times the remainder. If the remainder is 28, then the dividend is

(1) 588 (2) 784
(3) 823 (4) 1036

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

30. If two numbers are each divided by the same divisor, the remainders are respectively 3 and 4. If the sum of the two numbers be divided by the same divisor, the remainder is 2. The divisor is

(1) 9 (2) 7
(3) 5 (4) 3

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

31. A number consists of two digits. If the number formed by interchanging the digits is added to the original number, the resulting number (i.e. the sum) must be divisible by

(1) 11 (2) 9
(3) 5 (4) 3

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

32. A number when divided by 5 leaves a remainder 3. What is the remainder when the square of the same number is divided by 5 ?

(1) 1 (2) 2
(3) 3 (4) 4

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

33. A number when divided by 192 gives a remainder of 54. What remainder would be obtained on dividing the same number by 16 ?

(1) 2 (2) 4
(3) 6 (4) 8

(SSC CPO S.I. Exam. 06.09.2009)

34. A number, when divided by 136, leaves remainder 36. If the same number is divided by 17, the remainder will be

(1) 9 (2) 7
(3) 3 (4) 2

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

35. Two numbers, when divided by 17, leave remainders 13 and 11 respectively. If the sum of those two numbers is divided by 17, the remainder will be

(1) 13 (2) 11
(3) 7 (4) 4

(SSC CISF ASI Exam 29.08.2010 (Paper-1)

36. A number, when divided by 221, leaves a remainder 64. What is the remainder if the same number is divided by 13 ?

(1) 0 (2) 1
(3) 11 (4) 12

(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

37. When 'n' is divisible by 5 the remainder is 2. What is the remainder when n^2 is divided by 5 ?

(1) 2 (2) 3
(3) 1 (4) 4

(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

38. The remainder when 3^{21} is divided by 5 is

(1) 1 (2) 2
(3) 3 (4) 4

(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

39. A number when divided by 49 leaves 32 as remainder. This number when divided by 7 will have the remainder as

(1) 4 (2) 3
(3) 2 (4) 5

(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

40. When a number is divided by 36, the remainder is 19. What will be the remainder when the number is divided by 12 ?

(1) 7 (2) 5
(3) 3 (4) 0

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

41. $9^6 - 11$ when divided by 8 would leave a remainder of :

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

42. If 17^{200} is divided by 18, the remainder is—

(1) 17 (2) 16
(3) 1 (4) 2

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

43. When 2^{31} is divided by 5 the remainder is

(1) 4 (2) 3
(3) 2 (4) 1

(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

44. A student was asked to divide a number by 6 and add 12 to the quotient. He, however, first added 12 to the number and then divided it by 6, getting 112 as the answer. The correct answer should have been

(1) 124 (2) 122
(3) 118 (4) 114

(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

45. When a number is divided by 387, the remainder obtained is 48. If the same number is divided by 43, then the remainder obtained will be–

(1) 0 (2) 3
(3) 5 (4) 35

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

46. When two numbers are separately divided by 33, the remainders are 21 and 28 respectively. If the sum of the two numbers is divided by 33, the remainder will be

(1) 10 (2) 12
(3) 14 (4) 16

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

47. In a division sum, the divisor is 10 times the quotient and 5 times the remainder. If the remainder is 46, then the dividend is

(1) 4236 (2) 4306
(3) 4336 (4) 5336

(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

48. When a number is divided by 24, the remainder is 16. The remainder when the same number is divided by 12 is

(1) 3 (2) 4
(3) 6 (4) 8

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

49. The expression $2^{6n} - 4^{2n}$, where n is a natural number is always divisible by

(1) 15 (2) 18
(3) 36 (4) 48

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

50. $(4^{61} + 4^{62} + 4^{63})$ is divisible by

(1) 3 (2) 11
(3) 13 (4) 17

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

51. 47 is added to the product of 71 and an unknown number. The new number is divisible by 7 giving the quotient 98. The unknown number is a multiple of

(1) 2 (2) 5
(3) 7 (4) 3

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

52. When an integer K is divided by 3, the remainder is 1, and when K + 1 is divided by 5, the remainder is 0. Of the following, a possible value of K is

(1) 62 (2) 63
(3) 64 (4) 65

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

53. A number when divided by 91 gives a remainder 17. When the same number is divided by 13, the remainder will be :
(1) 0 (2) 4
(3) 6 (4) 3
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

54. If the sum of the two numbers is 120 and their quotient is 5, then the difference of the two numbers is–
(1) 115 (2) 100
(3) 80 (4) 72
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

55. A number when divided by 280 leaves 115 as remainder. When the same number is divided by 35, the remainder is
(1) 15 (2) 10
(3) 20 (4) 17
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

56. A certain number when divided by 175 leaves a remainder 132. When the same number is divided by 25, the remainder is :
(1) 6 (2) 7
(3) 8 (4) 9
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

57. The number of integers in between 100 and 600, which are divisible by 4 and 6 both, is
(1) 40 (2) 42
(3) 41 (4) 50
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

58. The value of λ for which the expression $x^3 + x^2 - 5x + \lambda$ will be divisible by $(x - 2)$ is :
(1) 2 (2) –2
(3) –3 (4) 4
(SSC CHSL DEO & LDC Exam. 21.10.2012, IInd Sitting)

59. If the number formed by the last two digits of a three digit integer is an integral multiple of 6, the original integer itself will always be divisible by
(1) 6 (2) 3
(3) 2 (4) 12
(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

60. Divide 37 into two parts so that 5 times one part and 11 times the other are together 227.
(1) 15, 22 (2) 20, 17
(3) 25, 12 (4) 30, 7
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

61. The greatest common divisor of $3^{3^{333}}+1$ and $3^{3^{334}}+1$ is :
(1) 2 (2) 1
(3) $3^{3^{333}}+1$ (4) 20
(SSC CGL Tier-I Exam. 21.04.2013)

62. How many numbers between 400 and 800 are divisible by 4, 5 and 6 ?
(1) 7 (2) 8
(3) 9 (4) 10
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

63. A positive integer when divided by 425 gives a remainder 45. When the same number is divided by 17, the remainder will be
(1) 11 (2) 8
(3) 9 (4) 10
(SSC CGL Tier-I Exam. 19.05.2013 Ist Sitting)

64. A number x when divided by 289 leaves 18 as the remainder. The same number when divided by 17 leaves y as a remainder. The value of y is
(1) 5 (2) 2
(3) 3 (4) 1
(SSC CGL Tier-I Exam. 19.05.2013 Ist Sitting)

65. When n is divided by 6, the remainder is 4. When $2n$ is divided by 6, the remainder is
(1) 2 (2) 0
(3) 4 (4) 1
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

66. Two numbers 11284 and 7655, when divided by a certain number of three digits, leaves the same remainder. The sum of digits of such a three-digit number is
(1) 8 (2) 9
(3) 10 (4) 11
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

67. In a division sum, the divisor is 3 times the quotient and 6 times the remainder. If the remainder is 2, then the dividend is
(1) 50 (2) 48
(3) 36 (4) 28
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

68. $2^{16}-1$ is divisible by
(1) 11 (2) 13
(3) 17 (4) 19
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

69. The smallest number that must be added to 803642 in order to obtain a multiple of 11 is
(1) 1 (2) 4
(3) 7 (4) 9
(SSC CPO S.I. Exam. 12.01.2003)

70. Which one of the following will completely divide $5^{71} + 5^{72} + 5^{73}$?
(1) 150 (2) 160
(3) 155 (4) 30
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

71. If $[n]$ denotes the greatest integer $< n$ and (n) denotes the smallest integer $> n$, where n is any real number, then
$$\left(1\frac{1}{5}\right)\times\left[1\frac{1}{5}\right]-\left(1\frac{1}{5}\right)\div\left[1\frac{1}{5}\right]+(1.5)$$
is
(1) 1.5 (2) 2
(3) 2.5 (4) 3.5
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

72. The number which is to be added to 0.01 to get 1.1, is
(1) 1.11 (2) 1.09
(3) 1 (4) 0.10
(SSC Data Entry Operator Exam. 31.08.2008)

73. $999\frac{998}{999}\times 999$ is equal to :
(1) 998999 (2) 999899
(3) 989999 (4) 999989
(SSC CHSL DEO & LDC Exam. 27.11.2010)

74. $(2^{71} + 2^{72} + 2^{73} + 2^{74})$ is divisible by
(1) 9 (2) 10
(3) 11 (4) 13
(SSC (South Zone) Investigator Exam 12.09.2010)

75. By which number should 0.022 be multiplied so that product becomes 66 ?
(1) 3000 (2) 3200
(3) 4000 (4) 3600
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

76. $(3^{25} + 3^{26} + 3^{27} + 3^{28})$ is divisible by
(1) 11 (2) 16
(3) 25 (4) 30
(SSC CPO S.I. Exam. 05.09.2004)

77. The value of
$\left(0.34\overline{67} + 0.1\overline{333}\right)$ is :
(1) 0.48 (2) $0.48\overline{01}$
(3) $0.\overline{48}$ (4) $0.4\overline{8}$
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

78. The value of
$\frac{3.157 \times 4126 \times 3.198}{63.972 \times 2835.121}$ is closest to
(1) 0.002 (2) 0.02
(3) 0.2 (4) 2
(SSC CPO S.I. Exam. 12.01.2003)

79. $\frac{1}{7} + \left(999\frac{692}{693}\right) \times 99$ is equal to
(1) 1 (2) 99000
(3) 99800 (4) 99900
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

80. $(49)^{15} - 1$ is exactly divisible by :
(1) 50 (2) 51
(3) 29 (4) 8
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

81. If a and b are two odd positive integers, by which of the following integers is $(a^4 - b^4)$ always divisible ?
(1) 3 (2) 6
(3) 8 (4) 12
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

82. If m and n are positive integers and $(m - n)$ is an even number, then $(m^2 - n^2)$ will be always divisible by
(1) 4 (2) 6
(3) 8 (4) 12
(SSC CGL Tier-II Exam.16.09.2012)

83. If 5432*7 is divisible by 9, then the digit in place of * is :
(1) 0 (2) 1
(3) 6 (4) 9
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

84. The least number, which must be added to 6709 to make it exactly divisible by 9, is
(1) 5 (4) 4
(3) 7 (4) 2
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

85. The total number of integers between 100 and 200, which are divisible by both 9 and 6, is :
(1) 5 (2) 6
(3) 7 (4) 8
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

86. How many 3-digit numbers, in all, are divisible by 6 ?
(1) 140 (2) 150
(3) 160 (4) 170
(SSC CPO S.I. Exam.26.05.2005 & SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

87. If 'n' be any natural number, then by which largest number $(n^3 - n)$ is always divisible ?
(1) 3 (2) 6
(3) 12 (4) 18
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

88. If n is an integer, then $(n^3 - n)$ is always divisible by :
(1) 4 (2) 5
(3) 6 (4) 7
(SSC CGL Exam.13.11.2005 (Ist Sitting) & SSC CHSL DEO & LDC Exam. 27.11.2010)

89. If the sum of the digits of any integer lying between 100 and 1000 is subtracted from the number, the result always is
(1) divisible by 6
(2) divisible by 2
(3) divisible by 9
(4) divisible by 5
(SSC CHSL DEO & LDC Exam. 20.10.2013)

90. If a number is divisible by both 11 and 13, then it must be necessarily :
(1) divisible by (11 + 13)
(2) divisible by (13 – 11)
(3) divisible by (11 × 13)
(4) 429
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

91. If * is a digit such that 5824* is divisible by 11, then * equals :
(1) 2 (2) 3
(3) 5 (4) 6
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

92. If 78*3945 is divisible by 11, where * is a digit, then * is equal to
(1) 1 (2) 0
(3) 3 (4) 5
(SSC CPO S.I. Exam. 05.09.2004)

93. If the number 4 8 3 2 7 * 8 is divisible by 11, then the missing digit (*) is
(1) 5 (2) 3
(3) 2 (4) 1
(SSC CPO S.I. Exam. 09.11.2008)

94. Both the end digits of a 99 digit number N are 2. N is divisible by 11, then all the middle digits are :
(1) 1 (2) 2
(3) 3 (4) 4
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

95. If n is a whole number greater than 1, then $n^2(n^2 - 1)$ is always divisible by :
(1) 16 (2) 12
(3) 10 (4) 8
(SSC CPO S.I. Exam. 26.05.2005)

96. A 4-digit number is formed by repeating a 2-digit number such as 2525, 3232, etc. Any number of this form is always exactly divisible by :
(1) 7 (2) 11
(3) 13
(4) Smallest 3-digit prime number
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting) & SSC CGL Tier-I Exam.16.05.2010 (IInd Sitting)

97. What least number, of 5 digits is divisible by 41?
(1) 10045 (2) 10004
(3) 10041 (4) 41000
(SSC CPO S.I. Exam. 03.09.2006)

98. It is given that $(2^{32} + 1)$ is exactly divisible by a certain number. which one of the following is also definitely divisible by the same number ?
(1) $2^{96} + 1$ (2) 7×2^{33}
(3) $2^{16} - 1$ (4) $2^{16} + 1$
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

99. The greatest whole number, by which the expression $n^4 + 6n^3 + 11n^2 + 6n + 24$ is divisible for every natural number n, is

(1) 6 (2) 24
(3) 12 (4) 48

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

100. How many numbers between 1000 and 5000 are exactly divisible by 225 ?

(1) 16 (2) 18
(3) 19 (4) 12

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

101. Find the largest number, which exactly divides every number of the form $(n^3 - n)(n-2)$ where n is a natural number greater than 2.

(1) 6 (2) 12
(3) 24 (4) 48

(SSC CPO S.I. Exam. 09.11.2008)

102. The greatest number less than 1500, which is divisible by both 16 and 18, is

(1) 1440 (2) 1404
(3) 1386 (4) 1368

(SSC (South Zone) Investigator Exam 12.09.2010)

103. The least number, which is to be added to the greatest number of 4 digits so that the sum may be divisible by 345, is

(1) 50 (2) 6
(3) 60 (4) 5

(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

104. $4^{61} + 4^{62} + 4^{63} + 4^{64}$ is divisible by

(1) 3 (2) 10
(3) 11 (4) 13

(SSC CPO S.I. Exam. 12.01.2003)

105. The difference of a number consisting of two digits from the number formed by interchanging the digits is always divisible by

(1) 10 (2) 9
(3) 11 (4) 6

(SSC CGL Tier-I Exam. 21.04.2013 IInd Sitting)

106. Which one of the numbers is divisible by 25 ?

(1) 303310 (2) 373355
(3) 303375 (4) 22040

(SSC CGL Tier-II Exam. 29.09.2013)

107. The least number which must be added to the greatest number of 4 digits in order that the sum may be exactly divisible by 307 is

(1) 132 (2) 32
(3) 43 (4) 75

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

108. If $a = 4011$ and $b = 3989$ then value of $ab = ?$

(1) 15999879 (2) 15899879
(3) 15989979 (4) 15998879

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

109. For any integral value of n, $3^{2n} + 9n + 5$ when divided by 3 will leave the remainder

(1) 1 (2) 2
(3) 0 (4) 5

(SSC CGL Tier-I Exam. 19.10.2014

110. The solution to the inequality $12x - 61 \leq 6$ is

(1) $x \leq 6$ (2) $0 \leq x \leq 6$
(3) $-6 \leq x \leq 6$ (4) $-6 \leq x \leq 0$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014

111. 5349 is added to 3957. Then 7062 is subtracted from the sum. The result is not divisible by

(1) 4 (2) 3
(3) 7 (4) 11

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

112. The product of all the prime numbers between 80 and 90 is

(1) 83 (2) 89
(3) 7387 (4) 598347

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

113. If n is even, $(6^n - 1)$ is divisible by

(1) 37 (2) 35
(3) 30 (4) 6

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting (TF No. 545 QP 6)

114. I have x marbles. My elder brother has 3 more than mine, while my younger brother has 3 less than mine. If the total number of marbles is 15, the number of marbles that I have is

(1) 3 (2) 5
(3) 8 (4) 7

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting (TF No. 545 QP 6)

115. Weight of a bucket when filled fully with water is 17 kg. If the weight of the bucket when half filled with water is 13.5 kg, what is the weight of empty bucket ?

(1) 12 kg (2) 8 kg
(3) 10 kg (4) 7 kg

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting (TF No. 545 QP 6)

116. In a farm there are cows and hens. If heads are counted they are 180, if legs are counted they are 420. The number of cows in the farm is

(1) 130 (2) 150
(3) 50 (4) 30

(SSC CGL Tier-II Exam. 12.04.2015 (TF No. 567 TL 9)

117. The number which can be written in the form of n (n + 1) (n + 2), where n is a natural number, is

(1) 7 (2) 3
(3) 5 (4) 6

(SSC CGL Tier-II Exam. 12.04.2015 (TF No. 567 TL 9)

118. A number when divided by 2736 leaves the remainder 75. If the same number is divided by 24, then the remainder is

(1) 12 (2) 3
(3) 0 (4) 23

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) (TF No. 789 TH 7)

119. The maximum value of F in the following equation

5E9 + 2F8 + 3G7 = 1114 is

where E, F, G each stands for any digit.

(1) 8 (2) 9
(3) 7 (4) 5

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

120. The sum of four numbers is 48. When 5 and 1 are added to the first two; and 3 and 7 are subtracted from the 3rd and 4th, the numbers will be equal. The numbers are

(1) 9, 7, 15, 17 (2) 4, 12, 12, 20
(3) 5, 11, 13, 19 (4) 6, 10, 14, 18

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

121. The least number that should be added to 2055, so that the sum is exactly divisible by 27 is
(1) 28 (2) 24
(3) 27 (4) 31
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

122. What is the Arithmetic mean of the first 'n' natural numbers ?
(1) $\frac{n(n+1)}{2}$ (2) $\frac{n+1}{2}$
(3) $\frac{n^2(n+1)}{2}$ (4) $2(n+1)$
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

123. A number when divided by 361 gives a remainder 47. If the same number is divided by 19, the remainder obtained is
(1) 3 (2) 8
(3) 9 (4) 1
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

124. The difference between the greatest and the least four digit numbers that begin with 3 and ends with 5 is
(1) 999 (2) 900
(3) 990 (4) 909
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

125. The sum of two numbers is 75 and their difference is 25. The product of the two numbers is :
(1) 1350 (2) 1250
(3) 125 (4) 1000
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

126. The difference between the greatest and least prime numbers which are less than 100 is
(1) 96 (2) 97
(3) 94 (4) 95
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

127. Which one of the following is the minimum value of the sum of two integers whose product is 24?
(1) 25 (2) 11
(3) 8 (4) 10
(SSC CGL Tier-I (CBE) Exam.10.09.2016)

128. If the sum of the digits of a three digit number is subtracted from that number, then it will always be divisible by
(1) 3 only
(2) 9 only
(3) Both 3 and 9
(4) All of 3, 6 and 9
(SSC CGL Tier-II Online Exam.01.12.2016)

129. The greater of the two numbers whose product is 900 and sum exceeds their difference by 30 is
(1) 60 (2) 75
(3) 90 (4) 100
(SSC CGL Tier-II Online Exam.01.12.2016)

130. In a division sum, the divisor 'd' is 10 times the quotient 'q' and 5 times the remainder 'r'. If $r = 46$, the dividend will be
(1) 5042 (2) 5328
(3) 5336 (4) 4276
(SSC CGL Tier-II Online Exam.01.12.2016)

131. A number when divided by 44, gives 432 as quotient and 0 as remainder. What will be the remainder when dividing the same number by 31?
(1) 3 (2) 4
(3) 5 (4) 6
(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

132. A number when divided by 729 gives a remainder of 56. What will we get as remainder if the same number is divided by 27?
(1) 4 (2) 2
(3) 0 (4) 1
(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

133. What is the smallest 6-digit number that is completely divisible by 108 ?
(1) 100003 (2) 100004
(3) 100006 (4) 100008
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

134. If 25 is added to a number it becomes 3 less than thrice of the number. Then number is :
(1) 15 (2) 14
(3) 19 (4) 20
(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

145. The number 334 × 545 × 7p is dividible by 3340 if p is at least.
(1) 2 (2) 4
(3) 3 (4) 1
(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

136. If the sum of a number and its reciprocal be 2, then the number is
(1) 0 (2) 1
(3) –1 (4) 2
(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

137. When a number is divided by 56, the remainder will be 29. If the same number is divided by 8, then the remainder will be
(1) 6 (2) 7
(3) 5 (4) 3
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

138. A positive number when decreased by 4, is equal to 21 times the reciprocal of this number. The number is :
(1) 3 (2) 7
(3) 5 (4) 9
(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

139. When n is divided by 4, the remainder is 3. The remainder when $2n$ is divided by 4 is :
(1) 1 (2) 2
(3) 3 (4) 6
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

140. A number when divided by the sum of 555 and 445 gives two times their difference as quotient and 30 as the remainder. The number is
(1) 220030 (2) 22030
(3) 1220 (4) 1250
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

141. When a number x is divided by a divisor it is seen that the divisor = 4 times the quotient = double the remainder. If the remainder is 80 then the value of x is
(1) 6480 (2) 9680
(3) 8460 (4) 4680
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

142. On dividing a certain number by 342 we get 47 as remainder. If the same number is divided by 18, what will be the remainder ?
(1) 15 (2) 11
(3) 17 (4) 13
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

143. The sum of three numbers is 252. If the first number is thrice the second and third number is two–third of the first, then the second number is
(1) 41 (2) 21
(3) 42 (4) 84
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

144. The difference between the greatest and the least five-digit numbers formed by the digits 2, 5, 0, 6 and 8 is (repetition of digits is not allowed)
(1) 69552 (2) 65925
(3) 65952 (4) 63952
(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (IST Sitting)

145. A man has some hens and some cows. If the total number of heads of hens and cows together is 50 and the number of feet of hens and cows together is 142, then the number of cows is
(1) 21 (2) 25
(3) 27 (4) 29
(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

146. The least number, which when divided by 5, 6, 7 and 8 leaves a remainder 3 in each case, but when divided by 9 leaves no remainder, is :
(1) 1677 (2) 1683
(3) 2523 (4) 3363
(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

147. If the sum of the digits of any integer between 100 and 1000 is subtracted from the same integer, the resulting number is always divisible by
(1) 2 (2) 5
(3) 6 (4) 9
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

148. The least number that must be added to 8961 to make it exactly divisible by 84 is :
(1) 27 (2) 57
(3) 141 (4) 107
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

149. Number of composite numbers lying between 67 and 101 is :
(1) 27 (2) 24
(3) 26 (4) 23
(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

150. The least number that must be subtracted from 1294 so that the remainder when divided by 9, 11 and 13 will leave in each case the same remainder 6, is :
(1) 2 (2) 3
(3) 1 (4) 4
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

151. What least value must be assigned to '*' so that the number 63576*2 is divisible by 8 ?
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

152. The least number to be added to 13851 to get a number which is divisible by 87 is :
(1) 18 (2) 43
(3) 54 (4) 69
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

153. What least value must be assigned to '*' so that the number 451 * 603 is exactly divisible by 9?
(1) 7 (2) 8
(3) 5 (4) 9
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

154. The largest number of four digits exactly divisible by 88 is :
(1) 9988 (2) 9944
(3) 8888 (4) 9768
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

155. Which of the following numbers is completely divisible by 99?
(1) 57717 (2) 57627
(3) 55162 (4) 56982
(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

156. The sum of all prime numbers between 58 and 68 is
(1) 179 (2) 178
(3) 187 (4) 183
(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

157. The product of digits of a 2-digit number is 24. If we add 45 to the number, the new number obtained is a number formed by interchanging the digits.What is the original number?
(1) 54 (2) 83
(3) 38 (4) 45
(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

158. The smallest number, which should be added to 756896 so as to obtain a multiple of 11, is
(1) 1 (2) 2
(3) 3 (4) 5
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

159. The product of two numbers is 48. If one number equals "The number of wings of a bird plus 2 times the number of fingers on your hand divided by the number of wheels of a Tricycle". Then the other number is
(1) 9 (2) 10
(3) 12 (4) 18
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–III

1. One-fourth of a tank holds 135 litres of water. What part of the tank is full if it contains 180 litres of water?
(1) $\frac{2}{5}$ (2) $\frac{2}{3}$
(3) $\frac{1}{3}$ (4) $\frac{1}{6}$
(SSC CGL Exam. 04.07.1999 (Ist Sitting)

2. What is two-third of half of 369?
(1) 123 (2) 246
(3) $246\frac{3}{8}$ (4) $271\frac{3}{4}$
(SSC CGL Exam. 04.07.1999 (Ist Sitting)

3. $\frac{1}{5}$ of a number exceeds $\frac{1}{7}$ of the same number by 10. The number is :
(1) 125 (2) 150
(3) 175 (4) 200
(SSC CGL Exam. 04.07.1999 (Ist Sitting)

4. A boy was asked to find the value of $\frac{3}{8}$ of a sum of money. Instead of multiplying the sum by $\frac{3}{8}$ he divided it by $\frac{3}{8}$ and then his answer exceeded by ₹ 55. Find the correct answer ?
(1) ₹ 9 (2) ₹ 24
(3) ₹ 64 (4) ₹ 1,320
(SSC CGL Exam. 04.07.1999 (Ist Sitting)

5. In a class, $\frac{3}{5}$ of the students are girls and rest are boys. If $\frac{2}{9}$ of the girls and $\frac{1}{4}$ of the boys are absent. What part of the total number of students are present?
(1) $\frac{23}{30}$ (2) $\frac{23}{36}$
(3) $\frac{18}{49}$ (4) $\frac{17}{25}$
(SSC CGL Exam. 04.07.1999 (Ist Sitting)

6. An 85m long rod is divided into two parts. If one part is $\frac{2}{3}$ of the other part, then the longer part (in metres) is :

(1) 34 (2) $56\frac{2}{3}$

(3) 85 (4) 51

(SSC CGL Exam. 04.07.1999 (Ist Sitting)

7. Fraction between $\frac{2}{5}$ and $\frac{4}{9}$ is :

(1) $\frac{3}{7}$ (2) $\frac{2}{3}$

(3) $\frac{4}{5}$ (4) $\frac{1}{2}$

(SSC CGL Exam. 04.07.1999 (IInd Sitting)

8. $\frac{2}{3}$ of three-fourth of a number is :

(1) $\frac{1}{2}$ of the number

(2) $\frac{1}{3}$ of the number

(3) $\frac{8}{9}$ of the number

(4) $\frac{17}{12}$ of the number

(SSC CGL Exam. 04.07.1999 (IInd Sitting)

9. If 3 times a number exceeds its $\frac{3}{5}$ by 60, then what is the number ?

(1) 25 (2) 35

(3) 45 (4) 60

(SSC CGL Exam. 04.07.1999 (IInd Sitting)

10. Half of 1 per cent written as a decimal is—

(1) 0.2 (2) 0.02

(3) 0.05 (4) 0.005

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

11. A runner runs $1\frac{1}{4}$ laps of a 5 lap race. What fractional part of the race remains to be run?

(1) 15/4 (2) 4/5

(3) 5/6 (4) 2/3

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

12. The product of two fractions is $\frac{14}{15}$ and their quotient is $\frac{35}{24}$. The greater fraction is—

(1) $\frac{7}{4}$ (2) $\frac{7}{6}$

(3) $\frac{7}{3}$ (4) $\frac{4}{5}$

(SSC CGL Exam. 24.02.2002 (Ist Sitting)

13. What fraction of $\frac{4}{7}$ must be added to itself to make the sum $1\frac{1}{14}$?

(1) $\frac{7}{8}$ (2) $\frac{1}{2}$

(3) $\frac{4}{7}$ (4) $\frac{15}{14}$

(SSC CGL Exam. 24.02.2002 (Ist Sitting)

14. If $\frac{4}{5}$ of an estate be worth ₹ 16800, then the value of $\frac{3}{7}$ of it is—

(1) ₹ 90000 (2) ₹ 9000

(3) ₹ 72000 (4) ₹ 21000

(SSC CGL Exam. 24.02.2002 (Ist Sitting)

15. A boy on being asked what $\frac{6}{7}$ of a certain fraction was, made the mistake of dividing the fraction by $\frac{6}{7}$ and so got an answer which exceeded the correct answer by $\frac{13}{70}$. Find the fraction–

(1) $\frac{2}{3}$ (2) $\frac{3}{5}$

(3) $\frac{4}{5}$ (4) $\frac{7}{9}$

(SSC CGL Exam. 24.02.2002 (Ist Sitting)

16. $\frac{1}{2}$ of $\frac{3}{4}$ of a number is $2\frac{1}{2}$ of 10. What is the number?

(1) 50 (2) 60

(3) $66\frac{2}{3}$ (4) 56

(SSC CGL Exam. 24.02.2002 (Ist Sitting)

17. If one-third of one-fourth of a number is 15, then three-tenth of the number is

(1) 35 (2) 36

(3) 45 (4) 54

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

18. Express 45 minutes as the fraction of one day.

(1) $\frac{1}{40}$ (2) $\frac{1}{32}$

(3) $\frac{1}{60}$ (4) $\frac{1}{24}$

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

19. If 1 is added to the denominator of a fraction it becomes $\frac{1}{2}$. If 1 is added to the numerator it becomes 1. The product of numerator and denominator of the fraction is

(1) 6 (2) 10

(3) 12 (4) 14

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

20. A student was asked to find $\frac{5}{16}$ of a number. By mistake he found $\frac{5}{6}$ of that number. His answer was 250 more than the correct answer. Find the given number.

(1) 300 (2) 480

(3) 450 (4) 500

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

21. A number exceeds its one-fifth by 20. The number is

(1) 100 (2) 25

(3) 20 (4) 5

(SSC CPO S.I. Exam. 12.01.2003

22. Two-third of a positive number and $\frac{25}{216}$ of its reciprocal are equal. The number is

(1) $\frac{25}{144}$ (2) $\frac{5}{12}$

(3) $\frac{144}{25}$ (4) $\frac{12}{5}$

(SSC CPO S.I. Exam. 12.01.2003

23. 0.1 and $\frac{5}{8}$ of a bamboo are in mud and water respectively and the rest of length 2.75 m is above water. What is the length of the bamboo?

(1) 10 m (2) 30 m

(3) 27.5 m (4) 20 m

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

24. A man spends $\frac{1}{3}$ of his income on food, $\frac{2}{5}$ of his income on house rent and $\frac{1}{5}$ of his income on clothes. If he still has ₹ 400 left with him, his income is

(1) ₹ 4000 (2) ₹ 5000
(3) ₹ 6000 (4) ₹ 7000

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

25. When $0.\overline{47}$ is converted as a fraction, the result is

(1) $\frac{47}{90}$ (2) $\frac{46}{90}$
(3) $\frac{46}{99}$ (4) $\frac{47}{99}$

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

26. By how much does $\frac{6}{7/8}$ exceed $\frac{6/7}{8}$?

(1) $6\frac{1}{8}$ (2) $6\frac{3}{4}$
(3) $7\frac{3}{4}$ (4) $7\frac{5}{6}$

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003) & SSC CGL Exam. 27.07.2008 (Ist Sitting)

27. If one-nineth of a certain number exceeds its one-tenth by 4, the number is

(1) 320 (2) 360
(3) 400 (4) 440

(SSC CPO S.I. Exam. 05.09.2004)

28. $0.4\overline{23}$ is equivalent to the fraction :

(1) $\frac{491}{990}$ (2) $\frac{419}{990}$
(3) $\frac{49}{99}$ (4) $\frac{94}{99}$

(SSC CPO S.I. Exam. 26.05.2005)

29. Which of the following fraction is greater than $\frac{3}{4}$ but less than $\frac{5}{6}$?

(1) $\frac{2}{3}$ (2) $\frac{1}{2}$
(3) $\frac{4}{5}$ (4) $\frac{9}{10}$

(SSC CPO S.I. Exam. 26.05.2005)

30. A tin of oil was $\frac{4}{5}$ full. When 6 bottles of oil was taken out and 4 bottles of oil was poured into it, it was $\frac{3}{4}$ full. How many bottles of oil can the tin contain ?

(1) 10 (2) 20
(3) 30 (4) 40

(SSC CPO S.I. Exam. 26.05.2005)

31. A candidate in an examination was asked to find $\frac{5}{14}$ of a certain number. By mistake he found $\frac{5}{4}$ of it. Thus, his answer was 25 more than the correct answer. The number was :

(1) 28 (2) 56
(3) 84 (4) 140

(SSC CPO S.I. Exam. 26.05.2005)

32. In an examination, a student was asked to find $\frac{3}{14}$ of a certain number, By mistake, he found $\frac{3}{4}$ of it. His answer was 150 more than the correct answer. The given number is :

(1) 500 (2) 280
(3) 240 (4) 180

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

33. The product of two fractions is $\frac{14}{15}$ and their quotient is $\frac{35}{24}$. The greater of the fractions is

(1) $\frac{7}{4}$ (2) $\frac{7}{6}$
(3) $\frac{7}{3}$ (4) $\frac{4}{5}$

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

34. If the difference between the reciprocal of a positive proper fraction and the fraction itself be $\frac{9}{20}$, then the fraction is

(1) $\frac{3}{5}$ (2) $\frac{3}{10}$
(3) $\frac{4}{5}$ (4) $\frac{5}{4}$

(SSC CPO S.I. Exam. 03.09.2006)

35. A boy was asked to find $\frac{3}{5}$ of a fraction. Instead, he divided the fraction by $\frac{3}{5}$ and got an answer which exceeded the correct answer by $\frac{32}{75}$. The correct answer is

(1) $\frac{3}{25}$ (2) $\frac{6}{25}$
(3) $\frac{2}{25}$ (4) $\frac{2}{15}$

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

36. The rational number between $\frac{1}{2}$ and $\frac{3}{5}$ is

(1) $\frac{2}{5}$ (2) $\frac{4}{7}$
(3) $\frac{2}{3}$ (4) $\frac{1}{3}$

(SSC CPO S.I. Exam. 09.11.2008)

37. A man read $\frac{2}{5}$th of a book on the first day. He read $\frac{1}{3}$rd more on second day than he read on the first day. 15 pages were left for the third day. The number of pages in the book is

(1) 100 (2) 105
(3) 225 (4) 250

(SSC CPO S.I. Exam. 6.09.2009)

38. The number 0.121212.... in the form $\frac{p}{q}$ is equal to

(1) $\frac{4}{11}$ (2) $\frac{2}{11}$
(3) $\frac{4}{33}$ (4) $\frac{2}{33}$

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

39. $0.\overline{001}$ is equal to

(1) $\frac{1}{1000}$ (2) $\frac{1}{999}$

(3) $\frac{1}{99}$ (4) $\frac{1}{9}$

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

40. $1.\overline{27}$ in the form $\frac{p}{q}$ is equal to

(1) $\frac{127}{100}$ (2) $\frac{73}{100}$

(3) $\frac{14}{11}$ (4) $\frac{11}{14}$

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

41. Find a number, one-seventh of which exceeds its eleventh part by 100.

(1) 1925 (2) 1825

(3) 1540 (4) 1340

(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

42. The value of

$\frac{1}{15}+\frac{1}{35}+\frac{1}{63}+\frac{1}{99}+\frac{1}{143}$ is

(1) $\frac{5}{39}$ (2) $\frac{4}{39}$

(3) $\frac{2}{39}$ (4) $\frac{7}{39}$

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

43. The number $2.\dot{5}\dot{2}$, when written as a fraction and reduced to lowest terms, the sum of the numerator and denominator is

(1) 7 (2) 29

(3) 141 (4) 349

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

44. $\frac{1}{10}$ of a rod is coloured red, $\frac{1}{20}$ orange, $\frac{1}{30}$ yellow, $\frac{1}{40}$ green, $\frac{1}{50}$ blue, $\frac{1}{60}$ black and the rest is violet. If the length of the violet portion of the rod is 12.08 metres, then the length of the rod is

(1) 16 m (2) 18 m

(3) 20 m (4) 30 m

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

45. A tree increases annually by $\frac{1}{8}$ th of its height. By how much will it increase after 2 years, if it stands today 64 cm high?

(1) 72 cm (2) 74 cm

(3) 75 cm (4) 81 cm

FCI Assistant Grade-III Exam.25.02.2012 (Paper-I) North Zone (Ist Sitting)

46. A man spends $\frac{1}{4}$ th of his income on food $\frac{2}{3}$ rd of it on house rent and the remaining income which is ₹ 630 on other commodities. Find his house rent.

(1) ₹ 5040 (2) ₹ 3520

(3) ₹ 4890 (4) ₹ 4458

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

47. How many $\frac{1}{6}$ of together make $41\frac{2}{3}$?

(1) 125 (2) 150

(3) 250 (4) 350

(SSC CHSL DEO Entry Operator & LDC Exam. 28.11.2010 (Ist Sitting)

48. A fraction having denominator 30 and lying between $\frac{5}{8}$ and $\frac{7}{11}$ is–

(1) $\frac{18}{30}$ (2) $\frac{19}{30}$

(3) $\frac{20}{30}$ (4) $\frac{21}{30}$

(SSC CHSL DEO Entry Operator & LDC Exam. 28.11.2010 (Ist Sitting)

49. The sum of the numerator and denominator of a positive fraction is 11. If 2 is added to both numerator and denominator, the fraction is increased by $\frac{1}{24}$. The difference of numerator and denominator of the fraction is

(1) 5 (2) 3

(3) 1 (4) 9

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

50. The denominator of a fraction is 3 more than its numerator. If the numerator is increased by 7 and the denominator is decreased by 2, we obtain 2. The sum of numerator and denominator of the fraction is

(1) 5 (2) 13

(3) 17 (4) 19

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

51. A fraction becomes $\frac{1}{3}$ when 1 is subtracted from both the numerator and the denominator. The same fraction becomes $\frac{1}{2}$ when 1 is added to both the numerator and the denominator. The sum of numerator and denominator of the fraction is

(1) 10 (2) 18

(3) 7 (4) 16

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

52. A girl was asked to multiply a number by $\frac{7}{8}$, instead she divided the number by $\frac{7}{8}$ and got the result 15 more than the correct result. The sum of the digits of the number was :

(1) 4 (2) 8

(3) 6 (4) 11

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

53. A student was asked to multiply a given number by $\frac{8}{17}$. Instead, he divided the given number by $\frac{8}{17}$. His answer was 225 more than the correct answer. The given number was

(1) 64 (2) 289

(3) 136 (4) 225

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

54. If 1 is added to both the numerator and the denominator of a fraction, it becomes $\frac{1}{4}$. If 2 is added to both the numerator and the denominator of that fraction, it becomes $\frac{1}{3}$. The sum of numerator and denominator of the fraction is :

(1) 8 (2) 13
(3) 22 (4) 27

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

55. A number whose one-fifth part increased by 4 is equal to its one-fourth part diminished by 10, is :

(1) 260 (2) 280
(3) 240 (4) 270

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

56. A person gives $\frac{1}{4}$ of his property to his daughter, $\frac{1}{2}$ to his sons and $\frac{1}{5}$ for charity. How much has he given away ?

(1) $\frac{1}{20}$ (2) $\frac{19}{20}$
(3) $\frac{1}{10}$ (4) $\frac{9}{10}$

(SSC CGL Tier-I Exam. 11.11.2012, Ist Sitting)

57. In an office, there are 108 tables and 132 chairs. If $\frac{1}{6}$ of the tables and $\frac{1}{4}$ of the chairs are broken. How many people can work in the office if each person requires one table and one chair?

(1) 86 (2) 90
(3) 92 (4) 99

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

58. A, B, C and D purchase a gift worth ₹ 60. A pays $\frac{1}{2}$ of what others are paying, B pays $\frac{1}{3}$ of what others are paying and C pays $\frac{1}{4}$ of what others are paying. What is the amount paid by D ?

(1) ₹ 16 (2) ₹ 13
(3) ₹ 14 (4) ₹ 15

(SSC CGL Tier-I Exam. 21.04.2013)

59. In a school $\frac{1}{10}$ of the boys are same in number as $\frac{1}{4}$ of the girls and $\frac{5}{8}$ of the girls are same in number as $\frac{1}{4}$ of the boys. The ratio of the boys to girls in that school is

(1) 2 : 1 (2) 5 : 2
(3) 4 : 3 (4) 3 : 2

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

60. A fraction becomes $\frac{9}{11}$, if 2 is added to both the numerator and the denominator. If 3 is added to both the numerator and the denominator it becomes $\frac{5}{6}$. What is the fraction ?

(1) $\frac{7}{9}$ (2) $\frac{3}{7}$
(3) $\frac{5}{9}$ (4) $\frac{7}{10}$

(SSC CGL Tier-I Exam. 19.05.2013 Ist Sitting)

61. A rational number between $\frac{3}{4}$ and $\frac{3}{8}$ is

(1) $\frac{12}{7}$ (2) $\frac{7}{3}$
(3) $\frac{16}{9}$ (4) $\frac{9}{16}$

(SSC CGL Tier-I Exam. 19.05.2013 Ist Sitting)

62. The numerator of a fraction is 4 less than its denominator. If the numerator is decreased by 2 and the denominator is increased by 1, then the denominator becomes eight times the numerator. Find the fraction.

(1) $\frac{3}{8}$ (2) $\frac{3}{7}$
(3) $\frac{4}{8}$ (4) $\frac{2}{7}$

(SSC CGL Tier-I Exam. 19.05.2013 Ist Sitting)

63. In a class, there are 'z' students. Out of them 'x' are boys. What part of the class is composed of girls ?

(1) $\frac{x}{z}$ (2) $\frac{z}{x}$
(3) $1-\frac{x}{z}$ (4) $\frac{x}{z}-1$

(SSC CGL Tier-II Exam. 29.09.2013

64. Divide 50 into two parts so that the sum of their reciprocals is $\frac{1}{12}$.

(1) 35, 15 (2) 20, 30
(3) 24, 36 (4) 28, 22

(SSC CHSL DEO & LDC Exam. 20.10.2013)

65. A school group charters three identical buses and occupies $\frac{4}{5}$ of the seats. After $\frac{1}{4}$ of the passengers leave, the remaining passengers use only two of the buses. The fraction of the seats on the two buses that are now occupied is

(1) $\frac{8}{9}$ (2) $\frac{7}{10}$
(3) $\frac{7}{9}$ (4) $\frac{9}{10}$

(SSC CGL Tier-II Exam. 12.04.2015 (TF No. 567 TL 9)

66. $0.\overline{123}$ is equal to :

(1) $\frac{14}{333}$ (2) $\frac{41}{333}$
(3) $\frac{123}{1000}$ (4) $\frac{441}{333}$

(FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

67. 0.393939 ..... is equal to

(1) $\frac{39}{100}$ (2) $\frac{13}{33}$

(3) $\frac{93}{100}$ (4) $\frac{39}{990}$

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

68. $\frac{1}{11}$ is equal to

(1) 0.009 (2) $0.0\overline{9}$

(3) $0.\overline{09}$ (4) $0.0\overline{09}$

(SSC CPO S.I. Exam. 09.11.2008)

69. The decimal fraction $2.3\overline{49}$ is equal to

(1) 2326 /999 (2) 2326/990

(3) 2347/999 (4) 2347/990

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

70. The value of

$\frac{1}{20}+\frac{1}{30}+\frac{1}{42}+\frac{1}{56}+\frac{1}{72}+\frac{1}{90}$ is

(1) $\frac{1}{10}$ (2) $\frac{3}{5}$

(3) $\frac{3}{20}$ (4) $\frac{7}{20}$

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

71. $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{7}+\frac{1}{14}+\frac{1}{28}$ is equal to :

(1) 2 (2) 2.5

(3) 3 (4) 3.5

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

72. $\frac{1}{20}+\frac{1}{30}+\frac{1}{42}+\frac{1}{56}+\frac{1}{72}$

$+\frac{1}{90}+\frac{1}{110}+\frac{1}{132}$ is equal to:

(1) $\frac{1}{8}$ (2) $\frac{1}{7}$

(3) $\frac{1}{6}$ (4) $\frac{1}{10}$

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

73. Ram left $\frac{1}{3}$ of his property to his widow and $\frac{3}{5}$ of the remainder to his daughter. He gave the rest to his son who received Rs. 6,400. How much was his original property worth ?

(1) ₹ 16, 000 (2) ₹ 32, 000

(3) ₹ 24, 000 (4) ₹ 1, 600

(SSC CHSL DEO & LDC Exam. 9.11.2014)

74. A number exceeds its two fifth by 75. The number is

(1) 125 (2) 112

(3) 100 (4) 150

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

75. If the sum of two numbers, one of which is $\frac{2}{5}$ times the other, is 50, then the numbers are

(1) $\frac{115}{7}$ and $\frac{235}{7}$

(2) $\frac{150}{7}$ and $\frac{200}{7}$

(3) $\frac{240}{7}$ and $\frac{110}{7}$

(4) $\frac{250}{7}$ and $\frac{100}{7}$

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

76. If $\frac{3}{4}$ of a number is 7 more than $\frac{1}{6}$ of the number, then $\frac{5}{3}$ of the number is :

(1) 12 (2) 20

(3) 15 (4) 18

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

77. The vulgar fraction of $0.39\overline{39}$ is :

(1) $\frac{15}{33}$ (2) $\frac{11}{39}$

(3) $\frac{17}{39}$ (4) $\frac{13}{33}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

78. The smallest fraction, which should be added to the sum of $2\frac{1}{2}$, $3\frac{1}{3}$, $4\frac{1}{4}$ and $5\frac{1}{5}$ to make the result a whole number, is

(1) $\frac{13}{60}$ (2) $\frac{1}{4}$

(3) $\frac{17}{60}$ (4) $\frac{43}{60}$

(SSC CGL Tier-II Online Exam.01.12.2016)

79. Which of teh following fractions does not lie between $\frac{5}{6}$ and $\frac{8}{15}$?

(1) $\frac{2}{3}$ (2) $\frac{3}{4}$

(3) $\frac{4}{5}$ (4) $\frac{6}{7}$

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

80. The numerator of a fraction is multiple of two numbers. One of the numbers is greater than the other by 2. The greater number is smaller than the denominator by 4. If the denominator $7 + c$ ($c > -7$) is a constant, then the minimum value of the fraction is

(1) 5 (2) $\frac{1}{5}$

(3) –5 (4) $\frac{-1}{5}$

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

81. The sum of three numbers is 2, the 1st number is $\frac{1}{2}$ times the 2nd number and the 3rd number is $\frac{1}{4}$ times the 2nd number. The 2nd number is

(1) $\frac{7}{6}$ (2) $\frac{8}{7}$

(3) $\frac{9}{8}$ (4) $\frac{10}{9}$

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

82. If $\frac{1}{2}$ is added to a number and the sum is multiplied by 3, the result is 21. Then the number is :
(1) 6.5 (2) 5.5
(3) 4.5 (4) – 6.5
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

83. If $\frac{4}{5}$ th of a number exceeds its $\frac{3}{4}$ th by 8, then the number is :
(1) 130 (2) 120
(3) 160 (4) 150
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

84. A mason can build a wall in 70 hours. After 7 hours he takes a break. What fraction of the wall is yet to be built?
(1) 0.9 (2) 0.8
(3) 0.5 (4) 0.75
(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

85. Two baskets together have 640 oranges. If $\left(\frac{1}{5}\right)$th of the oranges in the first basket be taken to the second basket. The number of oranges in the first basket is
(1) 800 (2) 600
(3) 400 (4) 300
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–IV

1. Arrange $\frac{4}{5}, \frac{7}{8}, \frac{6}{7}, \frac{5}{6}$ in the ascending order :
(1) $\frac{4}{5}, \frac{7}{8}, \frac{6}{7}, \frac{5}{6}$ (2) $\frac{5}{6}, \frac{6}{7}, \frac{7}{8}, \frac{4}{5}$
(3) $\frac{4}{5}, \frac{5}{6}, \frac{6}{7}, \frac{7}{8}$ (4) $\frac{7}{8}, \frac{6}{7}, \frac{5}{6}, \frac{4}{5}$
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

2. Arrange the following fractions in decreasing order :
$\frac{3}{5}, \frac{7}{9}, \frac{11}{13}$
(1) $\frac{3}{5}, \frac{7}{9}, \frac{11}{13}$ (2) $\frac{7}{9}, \frac{3}{5}, \frac{11}{13}$
(3) $\frac{11}{13}, \frac{7}{9}, \frac{3}{5}$ (4) $\frac{11}{13}, \frac{3}{5}, \frac{7}{9}$
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

3. The fractions $\frac{1}{3}, \frac{4}{7}$ and $\frac{2}{5}$ written in ascending order given by:
(1) $\frac{4}{7} < \frac{1}{3} < \frac{2}{5}$ (2) $\frac{2}{5} < \frac{4}{7} < \frac{1}{3}$
(3) $\frac{1}{3} < \frac{2}{5} < \frac{4}{7}$ (4) $\frac{4}{7} > \frac{1}{3} > \frac{2}{5}$
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

4. Six numbers are arranged in decreasing order. The average of the first five numbers is 30 and the average of the last five numbers is 25. The difference of the first and the last numbers is :
(1) 20 (2) 25
(3) 5 (4) 30
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

5. The sum of three consecutive integers is 51. The middle one is :
(1) 14 (2) 15
(3) 16 (4) 17
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

TYPE–V

1. The digit in unit's place of the product 81 × 82 × 83 × ... × 89 is
(1) 0 (2) 2
(3) 6 (4) 8
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

2. The digit in unit's place of the product $(2153)^{167}$ is :
(1) 1 (2) 3
(3) 7 (4) 9
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

3. The digit in the unit's place of the product
$(2464)^{1793} \times (615)^{317} \times (131)^{491}$ is
(1) 0 (2) 2
(3) 3 (4) 5
(SSC CPO S.I. Exam. 05.09.2004)

4. Unit digit in $(264)^{102} + (264)^{103}$ is :
(1) 0 (2) 4
(3) 6 (4) 8
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

5. The digit in the unit's place of $[(251)^{98} + (21)^{29} - (106)^{100} + (705)^{35} - 16^4 + 259]$ is :
(1) 1 (2) 4
(3) 5 (4) 6
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

6. The last digit of 3^{40} is
(1) 1 (2) 3
(3) 7 (4) 9
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

7. What will be the unit digit in the product 7^{105} ?
(1) 5 (2) 7
(3) 9 (4) 1
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

8. The unit digit in the expansion of $(2137)^{754}$ is
(1) 1 (2) 3
(3) 7 (4) 9
(SSC CPO S.I. Exam. 07.09.2003 & SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

9. One's digit of the number $(22)^{23}$ is
(1) 4 (2) 6
(3) 8 (4) 2
(SSC CPO S.I. Exam. 09.11.2008)

10. The unit digit in the product $(122)^{173}$ is
(1) 2 (2) 4
(3) 6 (4) 8
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

11. The unit digit in the sum of $(124)^{372} + (124)^{373}$ is
(1) 5 (2) 4
(3) 2 (4) 0
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

12. The last digit of $(1001)^{2008} + 1002$ is
(1) 0 (2) 3
(2) 4 (4) 6
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

13. Find the unit digit in the product $(4387)^{245} \times (621)^{72}$.
(1) 1 (2) 2
(2) 5 (4) 7
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

14. The units digit of the expression $25^{6251} + 36^{528} + 73^{54}$ is
(1) 6 (2) 5
(3) 4 (4) 0
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

15. The unit's digit in the product $7^{71} \times 6^{63} \times 3^{65}$ is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

16. The digit in unit's place of the number $(1570)^2 + (1571)^2 + (1572)^2 + (1573)^2$ is :
(1) 4 (2) 1
(3) 2 (4) 3
(SSC CHSL DEO & LDC Exam. 21.10.2012, IInd Sitting)

17. The unit digit in $3 \times 38 \times 537 \times 1256$ is
(1) 4 (2) 2
(3) 6 (4) 8
(SSC CGL Tier-II Exam. 29.09.2013

18. In a two–digit number, the digit at the unit's place is 1 less than twice the digit at the ten's place. If the digits at unit's and ten's place are interchanged, the difference between the new and the original number is less than the original number by 20. The original number is
(1) 59 (2) 23
(3) 35 (4) 47
(SSC CHSL DEO & LDC Exam. 20.10.2013)

19. The digit in unit's place of the product $49237 \times 3995 \times 738 \times 83 \times 9$ is
(1) 0 (2) 7
(3) 5 (4) 6
(SSC CHSL DEO & LDC Exam. 16.11.2014

20. By interchanging the digits of a two digit number we get a number which is four times the original number minus 24. If the unit's digit of the original number exceeds its ten's digit by 7, then original number is
(1) 29 (2) 36
(3) 58 (4) 18
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) (TF No. 789 TH 7)

21. There is a number consisting of two digits, the digit in the units' place is twice that in the tens' place and if 2 be subtracted from the sum of the digits, the difference is equal to $\frac{1}{6}$th of the number. The number is
(1) 26 (2) 25
(3) 24 (4) 23
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

TYPE–VI

1. The sum of three consecutive odd natural numbers is 147. Then, the middle number is :
(1) 47 (2) 48
(3) 49 (4) 51
(SSC CGL Exam. 04.07.1999 (IInd Sitting)

2. The sum of first 20 odd natural numbers is equal to :
(1) 210 (2) 300
(3) 400 (4) 420
(SSC CGL Exam. 27.02.2000 (Ist Sitting)

3. The sum of all natural numbers from 75 to 97 is :
(1) 1598 (2) 1798
(3) 1958 (4) 1978
(SSC CGL Exam. 27.02.2000 (Ist Sitting)

4. The sum of all natural numbers between 100 and 200, which are multiples of 3 is :
(1) 5000 (2) 4950
(3) 4980 (4) 4900
(SSC CGL Exam. 27.02.2000 (Ist Sitting)

5. The sum of the squares of three consecutive natural numbers is 2030. Then, what is the middle number?
(1) 25 (2) 26
(3) 27 (4) 28
(SSC CGL Exam. 27.02.2000 (IInd Sitting)

6. The sum of three consecutive odd natural numbers is 87. The smallest of these numbers is :
(1) 29 (2) 31
(3) 23 (4) 27
(SSC CGL Exam. 24.02.2002 (Ist Sitting)

7. Sum of three consecutive even integers is 54. Find the least among them.
(1) 18 (2) 15
(3) 14 (4) 16
(SSC CGL Exam. 24.02.2002 (IInd Sitting)

8. The sum of three consecutive numbers is 87. The middle number is
(1) 27 (2) 29
(3) 30 (4) 28
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

9. What is the sum of two consecutive even numbers, the difference of whose square is 84?
(1) 38 (2) 34
(3) 42 (4) 46
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

10. The sum of all the natural numbers from 51 to 100 is
(1) 5050 (2) 4275
(3) 4025 (4) 3775
(SSC CPO S.I. Exam. 05.09.2004)

11. The sum of all the 2-digit numbers is :
(1) 4995 (2) 4950
(3) 4945 (4) 4905
(SSC CPO S.I. Exam. 26.05.2005)

12. The sum of first 50 odd natural numbers is
(1) 1000 (2) 1250
(3) 5200 (4) 2500
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

13. The sum of all the 3-digit numbers, each of which on division by 5 leaves remainder 3, is
(1) 180 (2) 1550
(3) 6995 (4) 99090
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

14. The sum of all the 3-digit numbers is
(1) 98901 (2) 494550
(3) 8991 (4) 899
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

15. Out of six consecutive natural numbers, if the sum of first three is 27, what is the sum of the other three ?
(1) 36 (2) 35
(3) 25 (4) 24
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

16. Which one of the following is a factor of the sum of first twenty-five natural numbers ?
(1) 26 (2) 24
(3) 13 (4) 12
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

17. The sum of all even numbers between 21 and 51 is
(1) 518 (2) 540
(3) 560 (4) 596
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

18. The sum of four consecutive even numbers is 748. The smallest among them is
(1) 188 (2) 186
(3) 184 (4) 174
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

19. If the sum of five consecutive integers is S, then the largest of those integers in terms of S is
(1) $\frac{S-10}{5}$ (2) $\frac{S+4}{4}$
(3) $\frac{S+5}{4}$ (4) $\frac{S+10}{5}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

20. The sum of all those prime numbers which are not greater than17 is
(1) 59 (2) 58
(3) 41 (4) 42
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

21. The sum of the squares of 3 consecutive positive numbers is 365. The sum of the numbers is
(1) 30 (2) 33
(3) 36 (4) 45
(SSC Multi-Tasking (Non-Technical) Staff Exam. 22.02.2011)

22. Find three consecutive numbers such that twice the first, three times the second and four times the third together make 191.
(1) 19, 20, 21 (2) 21, 22, 23
(3) 20, 21, 22 (4) 22, 23, 24
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

23. The sum of three consecutive odd natural numbers each divisible by 3 is 72. What is the largest among them?
(1) 21 (2) 24
(3) 27 (4) 36
(SSC CGL Exam. 04.07.1999 (Ist Sitting)

24. Find the sum of all positive multiples of 3 less than 50
(1) 400 (2) 404
(3) 408 (4) 412
(SSC CGL Tier-II Exam. 21.09.2014

25. What is the arithmetic mean of first 20 odd natural numbers ?
(1) 19 (2) 17
(3) 22 (4) 20
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

26. Two positive whole numbers are such that the sum of the first number and twice the second number is 8 and their difference is 2. The numbers are :
(1) 7,5 (2) 6,4
(3) 4,2 (4) 3,5
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

27. The sum of three consecutive natural numbers divisible by 3 is 45. The smallest number is :
(1) 18 (2) 3
(3) 12 (4) 9
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

28. The sum of three consecutive natural numbers each divisible by 5, is 225. The largest among them is
(1) 85 (2) 75
(3) 70 (4) 80
(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

TYPE–VII

1. If we write 45 as sum of four numbers so that when 2 is added to first number, 2 subtracted from second number, third multiplied by 2 and fourth divided by 2, we get the same result, then the four numbers are :
(1) 1, 8, 15, 21 (2) 8, 12, 5, 20
(3) 8, 12, 10, 15 (4)2, 12, 5, 26
(SSC CGL Exam. 04.07.1999 (IInd Sitting)

2. 12345679 × 72 is equal to :
(1) 88888888 (2) 999999998
(3) 888888888 (4) 898989898
(SSC CGL Exam. 27.02.2000 (Ist Sitting)

3. Given that $0.111 \ldots = \frac{1}{9}$; 0.444 is equal to :
(1) $\frac{1}{90}$ (2) $\frac{2}{45}$
(3) $\frac{1}{99}$ (4) $\frac{4}{9}$
(SSC CGL Exam. 27.02.2000 (Ist Sitting)

4. $8.3\dot{1} + 0.\dot{6} + 0.00\dot{2}$ is equal to:
(1) $8.9\dot{1}\dot{2}$ (2) $8.9\dot{1}\dot{2}$
(3) $8.97\dot{9}$ (4) $8.97\dot{9}$
(SSC CGL Exam. 24.02.2002 (Ist Sitting)

5. The value of $(0.\overline{63} + 0.\overline{37})$ is
(1) 1 (2) $\frac{100}{99}$
(3) $\frac{99}{100}$ (4) $\frac{100}{33}$
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

6. $(0.\overline{11} + 0.\overline{22}) \times 3$ is equal to
(1) 3 (2) $1.\overline{9}$
(3) 1 (4) $0.\overline{3}$
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

7 . Find the value of
$\frac{1}{5} + 999\frac{494}{495} \times 99$
(1) 90000 (2) 99000
(3) 90900 (4) 99990
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

8. If * means adding 6 times the second number to the first number then (1 * 2) * 3 equals :
(1) 121 (2) 31
(3) 93 (4) 91
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

9. The value of $999\frac{995}{999} \times 999$ is
(1) 990809 (2) 998996
(3) 999824 (4) 998999
(SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting) & (SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting)

10. $1.\overline{2} \times 0.\overline{03} =$

(1) $0.\overline{04}$ (2) $0.0\overline{36}$

(3) $1.\overline{13}$ (4) $0.\overline{037}$

(SSC CPO S.I. Exam. 06.09.2009)

11. Given that

$3.718 = \frac{1}{0.2689}$; then $\frac{1}{0.0003718}$ is equal to

(1) 2689 (2) 2.689

(3) 26890 (4) 0.2689

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

12. If a and b are two distinct natural numbers, which one of the following is true ?

(1) $\sqrt{a+b} > \sqrt{a} + \sqrt{b}$

(2) $\sqrt{a+b} = \sqrt{a} + \sqrt{b}$

(3) $\sqrt{a+b} < \sqrt{a} + \sqrt{b}$

(4) $ab = 1$

(SSC CPO S.I. Exam. 16.12.2007)

13. Which one of the following numbers is **not** a square of any natural number ?

(1) 17956 (2) 18225

(3) 63592 (4) 53361

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

14. $0.\overline{142857} \div 0.\overline{285714}$ is equal to

(1) 10 (2) 2

(3) $\frac{1}{2}$ (4) $\frac{1}{3}$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

15. The difference of $5.\overline{76}$ and $2.\overline{3}$ is

(1) $2.\overline{54}$ (2) $3.\overline{73}$

(3) $3.\overline{46}$ (4) $3.\overline{43}$

(SSC CISF ASI Exam 29.08.2010 (Paper-1)

16. When simplified the product

$\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\left(1-\frac{1}{5}\right).....\left(1-\frac{1}{n}\right)$, it becomes :

(1) $\frac{1}{n}$ (2) $\frac{2}{n}$

(3) $\frac{2(n-1)}{n}$ (4) $\frac{2}{n(n+1)}$

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

17. $2.8\overline{768}$ is equal to

(1) $2\frac{4394}{4995}$ (2) $2\frac{292}{333}$

(3) $2\frac{9}{10}$ (4) $2\frac{878}{999}$

(SSC CPO S.I. Exam. 03.09.2006)

18. Numbers 2, 4, 6, 8, 10, ..., 196, 198, 200 are multiplied together. The number of zeros at the end of the product on the right will be equal to —

(1) 21 (2) 22

(3) 24 (4) 25

(SSC Data Entry Operator Exam. 31.08.2008)

19. 7, 77, 77, 777 ÷ 77 equals

(1) 1111 (2) 101001

(3) 10101 (4) 1010101

(SSC Data Entry Operator Exam. 02.08.2009)

20. $8.3\overline{1} + 0.\overline{6} + 0.00\overline{2}$ is equal to

(1) $8.\overline{912}$ (2) $8.9\overline{12}$

(3) $8.97\overline{9}$ (4) $8.9\overline{79}$

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

21. The value of $0.\overline{2} + 0.\overline{3} + 0.\overline{32}$ is :

(1) $0.\overline{87}$ (2) $0.\overline{77}$

(3) $0.\overline{82}$ (4) $0.\overline{86}$

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

22. The value of $\left(0.\overline{63} + 0.\overline{37}\right)$ is

(1) 1 (2) $\frac{100}{99}$

(3) $\frac{99}{100}$ (4) $\frac{100}{33}$

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

23. If $\frac{51.84}{4.32} = 12$, then the value of $\frac{0.005184}{0.432}$ is

(1) 0.12 (2) 0.012

(3) 0.0012 (4) 1.2

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

24. The value of

$\left(1+\frac{1}{2}\right)\left(1+\frac{1}{3}\right)\left(1+\frac{1}{4}\right).....\left(1+\frac{1}{120}\right)$ is

(1) 30 (2) 40.5

(3) 60.5 (4) 121

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

25. Sum of two numbers is 40 and their product is 375. What will be the sum of their reciprocals?

(1) $\frac{8}{75}$ (2) $\frac{1}{40}$

(3) $\frac{75}{8}$ (4) $\frac{75}{4}$

(SSC CGL Exam. 04.07.1999 (Ist Sitting)

26. The sum and product of two numbers are 12 and 35 respectively. What will be the sum of their reciprocals?

(1) $\frac{1}{3}$ (2) $\frac{1}{5}$

(3) $\frac{12}{35}$ (4) $\frac{35}{12}$

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

27. If the sum of two numbers is 3 and the sum of their squares is 12,then their product is equal to :

(1) $\frac{3}{2}$ (2) $\frac{2}{3}$

(3) $-\frac{3}{2}$ (4) $-\frac{2}{3}$

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

28. 800 chocolates were distributed among the students of a class. East student got twice as many chocolates as the number of students in the class. The number of students in the class was :

(1) 25 (2) 30

(3) 35 (4) 20

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

29. The numbers 2, 4, 6, 8 ...., 98, 100 are multiplied together. The number of zeros at the end of the product must be :

(1) 13 (2) 12

(3) 11 (4) 10

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

30. How many digits in all are required to write numbers from 1 to 50?

(1) 100 (2) 92

(3) 91 (4) 50

(SSC CGL Exam. 27.02.2000 (IInd Sitting)

31. If doubling a number and adding 20 to the result gives the same answer as multiplying the number by 8 and taking away 4 from the product, the number is :
(1) 2 (2) 3
(3) 4 (4) 6
(SSC CGL Exam. 27.02.2000 (IInd Sitting)

32. A number of friends decided to go on a picnic and planned to spend ₹ 108 on eatables. Three of them however did not turn up. As a consequence each one of the remaining had to contribute ₹ 3 extra. The number of them who attended the picnic was :
(1) 15 (2) 12
(3) 9 (4) 6
(SSC CGL Exam. 27.02.2000 (IInd Sitting)

33. The numbers 1, 3, 5,7 .., 99 and128 are multiplied together. The number of zeros at the end of the product must be :
(1) 19 (2) 22
(3) 7 (4) Nil
(SSC CGL Exam. 27.02.2000 (IInd Sitting)

34. The sum of the squares of two positive numbers is 100 and difference of their squares is 28. Find the sum of the numbers :
(1) 12 (2) 13
(3) 14 (4) 15
(SSC CGL Exam. 24.02.2002 (Ist Sitting)

35. The simplified value of
$$\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\left(1-\frac{1}{5}\right)\ldots\left(1-\frac{1}{99}\right)\left(1-\frac{1}{100}\right)$$
is
(1) $\frac{2}{99}$ (2) $\frac{1}{25}$
(3) $\frac{1}{50}$ (4) $\frac{1}{100}$
(SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting) & (SSC CGL Prelim Exam. 13.11.2205 (Ist Sitting) & (SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting)

36. The product of two numbers is 120. The sum of their squares is 289. The difference of these two numbers is
(1) 9 (2) 7
(3) 8 (4) 6
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

37. The sum and product of two numbers are 10 and 24 respectively. The sum of their reciprocals is
(1) $\frac{1}{2}$ (2) $\frac{5}{12}$
(3) $\frac{7}{12}$ (4) $\frac{12}{5}$
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

38. $\left(99\frac{1}{7}+99\frac{2}{7}+99\frac{3}{7}+99\frac{4}{7}+99\frac{5}{7}+99\frac{6}{7}\right)$ is equal to
(1) 603 (2) 600
(3) 598 (4) 597
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

39. 380 mangoes are distributed among some boys and girls who are 85 in number. Each boy gets four mangoes and each girl gets five. The number of boys is
(1) 15 (2) 38
(3) 40 (4) 45
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

40. The product of two positive numbers is 2500. If one number is four times the other, then the sum of the two numbers is :
(1) 25 (2) 125
(3) 225 (4) 250
(SSC CGL Exam. 24.02.2002 (IInd Sitting)

41. In a two digit number if it is known that its units digit exceeds its tens digit by 2 and that the product of the given number and the sum of its digits is equal to 144, then the number is
(1) 46 (2) 42
(3) 26 (4) 24
(SSC CPO S.I. Exam. 12.01.2003)

42. In a test, 1 mark is awarded for each correct answer and one mark is deducted for each wrong answer. If a boy answers all 20 items of the test and gets 8 marks, the number of questions answered correct by him was
(1) 16 (2) 14
(3) 12 (4) 8
(SSC CPO S.I. Exam. 12.01.2003)

43. A number of boys raised ₹ 400 for a famine relief fund, each boy giving as many 25 paise coins as there were boys. The number of boys was :
(1) 40 (2) 16
(3) 20 (4) 100
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

44. Thrice the square of a natural number decreased by four times the number is equal to 50 more than the number. The number is:
(1) 4 (2) 5
(3) 10 (4) 6
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

45. The difference between two positive numbers is 3. If the sum of their squares is 369, then the sum of the numbers is :
(1) 81 (2) 33
(3) 27 (4) 25
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

46. A number consists of two digits such that the digit in the ten's place is less by 2 than the digit in the unit's place. Three times the number added to $\frac{6}{7}$ times the number obtained by reversing the digits equals 108. The sum of digits in the number is :
(1) 8 (2) 9
(3) 6 (4) 7
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

47. Of the three numbers, the second is twice the first and it is also thrice the third. If the average of three numbers is 44, the difference of the first number and the third number is :
(1) 24 (2) 18
(3) 12 (4) 6
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

48. A two digit number is five times the sum of its digits. If 9 is added to the number, the digits interchange their positions. The sum of digits of the number is :
(1) 11 (2) 9
(3) 7 (4) 6
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

49. How many numbers less than 1000 are multiples of both 10 and 13 ?
(1) 9 (2) 8
(3) 6 (4) 7
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

50. The number 1, 2, 3, 4, ..., 1000 are multiplied together. The number of zeros at the end (on the right) of the product must be :
(1) 30 (2) 200
(3) 211 (4) 249
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

51. If the difference of two numbers is 3 and the difference of their squares is 39, then the larger number is
(1) 8 (2) 9
(3) 12 (4) 13
(SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting) & SSC CHSL DEO & LDC Exam. 04.11.2012)

52. 7 is added to a certain number; the sum is multiplied by 5; the product is divided by 9 and 3 is subtracted from the quotient. Thus if the remainder left is 12, what was the original number ?
(1) 30 (2) 20
(3) 40 (4) 60
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

53. On multiplying a number by 7, all the digits in the product appear as 3's. the smallest such number is
(1) 47649 (2) 47719
(3) 47619 (4) 48619
(SSC CPO S.I. Exam. 03.09.2006)

54. A 2-digit number is 3 times the sum of its digits. If 45 is added to the number, its digits are interchanged. The sum of digits of the number is
(1) 11 (2) 9
(3) 7 (4) 5
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

55. The numbers 2272 and 875 are divided by a 3-digit number N, giving the same remainders. The sum of the digits of N is
(1) 10 (2) 11
(3) 12 (4) 13
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

56. The sum and product of two numbers are 12 and 35 respectively. The sum of their reciprocals will be
(1) $\frac{12}{35}$ (2) $\frac{1}{35}$
(3) $\frac{35}{8}$ (4) $\frac{7}{32}$
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

57. Of the three numbers, the second is twice the first and is also thrice the third. If the average of these three numbers is 44, the largest number is
(1) 24 (2) 36
(3) 72 (4) 108
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

58. The sum of the digits of a two digit number is 10. The number formed by reversing the digits is 18 less than the original number. Find the original number.
(1) 81 (2) 46
(3) 64 (4) 60
(SSC CPO S.I. Exam. 06.09.2009)

59. Five times of a positive integer is equal to 3 less than twice the square of that number. The number is
(1) 3 (2) 13
(3) 23 (4) 33
(SSC CPO S.I. Exam. 06.09.2009)

60. The product of two numbers is 24 times the difference of these two numbers. If the sum of these numbers is 14, the larger number is
(1) 9 (2) 8
(3) 7 (4) 10
(SSC CPO S.I. Exam. 06.09.2009)

61. The product of two numbers is 0.008. One of the number is $\frac{1}{5}$ of the other. The smaller number is
(1) 0.2 (2) 0.4
(3) 0.02 (4) 0.04
(SSC SAS Exam 26.06.2010 (Paper-1)

62. I multiplied a natural number by 18 and another by 21 and added the products. Which one of the following could be the sum?
(1) 2007 (2) 2008
(3) 2006 (4) 2002
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

63. If the sum of two numbers be multiplied by each number separately, the products so obtained are 247 and 114. The sum of the numbers is
(1) 19 (2) 20
(3) 21 (4) 23
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

64. If a and b are odd numbers, then which of the following is even ?
(1) $a + b + ab$ (2) $a + b - 1$
(3) $a + b + 1$ (4) $a + b + 2ab$
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

65. If two numbers x and y separately divided by a number d, remainders obtained are 4375 and 2986 respectively. If the sum of the numbers i.e $(x+y)$ is divided by the same number d remainder obtained is 2361. The value of number d is
(1) 7361 (2) 5000
(3) 4000 (4) 2542
(SSC CPO S.I. Exam.09.11.2008)

66. A farmer divides his herd of n cows among his four sons so that the first son gets one – half the herd, the second son gets one – fourth, the third son gets one – fifth and the fourth son gets 7 cows. The value of n is
(1) 80 (2) 100
(3) 140 (4) 180
(SSC CPO S.I. Exam. 09.11.2008)

67. In an examination, a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. A student attempted all the 200 questions and scored in all 200 marks. The number of questions, he answered correctly was
(1) 82 (2) 80
(3) 68 (4) 60
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

68. In an examination, a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. If he attempts all 75 questions and secures 125 marks, the number of questions he attemtpts correctly is
(1) 35 (2) 40
(3) 42 (4) 46
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

69. The product of two numbers is 120 and the sum of their squares is 289. The sum of the two numbers is
(1) 23 (2)7
(3) 13 (4) 169
(SSC Data Entry Operator Exam. 31.08.2008)

70. The sum and product of two numbers are 11 and 18 respectively. The sum of their reciprocals is

(1) $\frac{2}{11}$ (2) $\frac{11}{2}$

(3) $\frac{18}{11}$ (4) $\frac{11}{18}$

(SSC Data Entry Operator Exam. 02.08.2009)

71. A man ate 100 grapes in 5 days. Each day, he ate 6 more grapes than those he ate on the earlier day. How many grapes did he eat on the first day ?

(1) 8 (2) 12
(3) 54 (4) 76

(SSC Data Entry Operator Exam. 02.08.2009)

72. Instead of multiplying a number by 0.72, a student multiplied it by 7.2. If his answer was 2592 more than the correct answer, then the original number was

(1) 400 (2) 420
(3) 500 (4) 560

(SSC Data Entry Operator Exam. 02.08.2009)

73. Of the three numbers, the sum of the first two is 55, sum of the second and third is 65 and sum of third with thrice of the first is 110. The third number is

(1) 25 (2) 30
(3) 35 (4) 28

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

74. A number consists of two digits and the digit in the ten's place exceeds that in the unit's place by 5. If 5 times the sum of the digits be subtracted from the number, the digits of the number are reversed. Then the sum of digits of the number is

(1) 11 (2) 7
(3) 9 (4) 13

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

75. In a three-digit number, the digit at the hundred's place is two times the digit at the unit's place and the sum of the digits is 18. If the digits are reversed, the number is reduced by 396. The difference of hundred's and ten's digit of the number is

(1) 1 (2) 2
(3) 3 (4) 5

(SSCCHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

76. If the digits in the unit and the ten's places of a three digit number are interchanged, a new number is formed, which is greater than the original number by 63. Suppose the digit in the unit place of the original number be x. Then, all the possible values of x are

(1) 7, 8, 9 (2) 2, 7, 9
(3) 0, 1, 2 (4) 1, 2, 8

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

77. The sum of a natural number and its square equals the product of the first three prime numbers. The number is

(1) 2 (2) 3
(3) 5 (4) 6

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

78. A man has some hens and cows. If the number of heads : number of feet = 12 : 35, find out the number of hens, if the number of heads alone is 48.

(1) 28 (2) 26
(3) 24 (4) 22

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

79. The length of a road is one kilometre. The number of plants required for plantation at a gap of 20 metres in both sides of the road is

(1) 102 (2) 100
(3) 51 (4) 50

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

80. $999\frac{98}{99} \times 99$ is equal to :

(1) 98999 (2) 99899
(3) 99989 (4) 99998

(SSC CHSL DEO Entry Operator & LDC Exam. 28.11.2010 (Ist Sitting)

81. The sum of a two digit number and the number obtained by reversing its digits is a square number. How many such numbers are there ?

(1) 5 (2) 6
(3) 7 (4) 8

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

82. The value of $99\frac{95}{99} \times 99$ is

(1) 9798 (2) 9997
(3) 9898 (4) 9896

(SSC CPO S.I. Exam. 06.09.2009)

83. There are 50 boxes and 50 persons. Person 1 keeps 1 marble in every box. Person 2 keeps 2 marbles in every 2nd box, person 3 keeps 3 marbles in every third box. This process goes on till person 50 keeps 50 marbles in the 50th box. Find the total number of marbles kept in the 50th box.

(1) 43 (2) 78
(3) 6 (4) 93

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

84. 252 m of pant cloth and 141 m of shirt cloth are available in a cloth store. To stitch one pant and one shirt, $2\frac{1}{2}$ m and $1\frac{3}{4}$ m of cloth are needed respectively. Then the approximate number of pants and shirts that can be made out of it are

(1) (80,100) (2) (100,80)
(3) (100,90) (4) (90,80)

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

85. The number 323 has

(1) three prime factors
(2) five prime factors
(3) two prime factors
(4) no prime factor

(SSC CGL Tier-I Exam. 21.04.2013 IInd Sitting)

86. The product of two positive numbers is 2500. If one number is four times the other, the sum of the two numbers is :

(1) 25 (2) 125
(3) 225 (4) 250

(SSC CGL Exam. 24.02.2002 (IInd Sitting)

87. Mohan gets 3 marks for each correct sum and loses 2 marks for each wrong sum. He attempts 30 sums and obtains 40 marks. The number of sums solved correctly is :

(1) 15 (2) 20
(3) 25 (4) 10

(SSC CGL Tier-I Exam. 21.04.2013)

88. If $a * b = a + b + \frac{a}{b}$, then the value of 12 * 4 is :
(1) 20 (2) 21
(3) 48 (4) 19
(SSC CGL Tier-I Exam. 21.04.2013)

89. Find the maximum number of trees which can be planted, 20 metres apart, on the two sides of a straight road 1760 metres long
(1) 180 (2) 178
(3) 174 (4) 176
(SSC CGL Tier-I Exam. 21.04.2013)

90. A and B have together three times what B and C have, while A, B, C together have thirty rupees more than that of A. If B has 5 times that of C, then A has
(A) ₹ 60 (2) ₹ 65
(3) ₹ 75 (4) ₹ 45
(SSC CGL Tier-I Exam. 21.04.2013)

91. If sum of two numbers be a and their product be b, then the sum of their reciprocals is
(1) $\frac{1}{a}+\frac{1}{b}$ (2) $\frac{b}{a}$
(3) $\frac{a}{b}$ (4) $\frac{1}{ab}$
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

92. $\left(999\frac{999}{1000}\times 7\right)$ is equal to:
(1) $6993\frac{7}{1000}$ (2) $7000\frac{7}{1000}$
(3) $6633\frac{7}{1000}$ (4) $6999\frac{993}{1000}$
(SSC CPO S.I. Exam. 16.12.2007)

93. In a factory one out of every 9 is a female worker. If the number of female workers is 125, the total number of workers is
(1) 1250 (2) 1125
(3)1025 (4) 1000
(SSC Constable (GD) Exam. 12.05.2013)

94. $999\frac{1}{7}+999\frac{2}{7}+999\frac{3}{7}$
$+999\frac{4}{7}+999\frac{5}{7}+999\frac{6}{7}$
is simplified to :
(1) 5997 (2) 5979
(3) 5994 (4) 2997
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

95. 'a' divides 228 leaving a remainder 18. The biggest two–digit value of 'a' is
(1) 70 (2) 21
(3) 35 (4) 30
(SSC CHSL DEO & LDC Exam. 20.10.2013)

96. In a division sum, the divisor is 12 times the quotient and 5 times the remainder. If the remainder is 36, then the dividend is
(1) 2706 (2) 2796
(3) 2736 (4) 2826
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

97. The sum of two number is 8 and their product is 15. The sum of their reciprocals is
(1) $\frac{8}{15}$ (2) $\frac{15}{8}$
(3) 23 (4) 7
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

98. A number is doubled and 9 is added. If the resultant is trebled, it becomes 75. What is that number ?
(1) 6 (2) 3.5
(3) 8 (4) None of these
(SSC CGL Exam. 04.07.1999 (IInd Sitting)

99. If the operation ' * ' is defined by $a * b = a + b - ab$, then 5 * 7 equals
(1) 12 (2) –47
(3) –23 (4) 35
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014

100. A man engaged a servant on the condition that he would pay him ₹ 90 and a turban after service of one year. He served only for nine months and received the turban and an amount of ₹ 65. The price of turban is
(1) ₹ 25 (2) ₹ 18.75
(3) ₹ 10 (4) ₹ 2.50
(SSC CHSL DEO & LDC Exam. 16.11.2014

101. If a certain number of two digits is divided by the sum of its digits, the quotient is 6 and the remainder is 3. If the digits are reversed and the resulting number is divided by the sum of the digits, the quotient is 4 and the remainder is 9. The sum of the digits of the number is
(1) 6 (2) 9
(3) 12 (4) 4
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) (TF No. 789 TH 7)

102. Among the following statements, the statement which is **not correct** is :
(1) Every natural number is an integer.
(2) Every natural number is a real number.
(3) Every real number is a rational number.
(4) Every integer is a rational number.
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

103. If $p = -0.12$, $q = -0.01$ and $r = -0.015$, then the correct relationship among the three is :
(1) $q > p > r$ (2) $p > r > q$
(3) $p > q > r$ (3) $p < r < q$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

104. In an exam the sum of the scores of A and B is 120, that of B and C is 130 and that of C and A is 140. Then the score of C is :
(1) 65 (2) 75
(3) 70 (4) 60
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

105. What decimal of a week is an hour ?
(1) 0.0059 (2) 0.0062
(3) 0.062 (4) 0.059
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

106. The value of x in the following equation is :
$0.\dot{3}+0.\dot{6}+0.\dot{7}+0.\dot{8} = x$
(1) 5.3 (2) $2\frac{3}{10}$
(3) $2\frac{2}{3}$ (4) $2.\dot{3}\dot{5}$
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

7. Natu and Buchku each have certain number of oranges. Natu says to Buchku, "If you give me 10 of your oranges, I will have twice the number of oranges left with you". Buchku replies,"If you give me 10 of your oranges, I will have the same number of oranges as left with you". What is the number of oranges with Natu and Buchku, respectively ?
(1) 50, 20 (2) 70, 50
(3) 20, 50 (4) 50, 70
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

SHORT ANSWERS

TYPE-I

1. (4)	**2.** (1)	**3.** (4)	**4.** (4)
5. (4)	**6.** (4)	**7.** (4)	**8.** (2)
9. (1)	**10.** (2)	**11.** (2)	**12.** (2)
13. (2)	**14.** (3)	**15.** (4)	**16.** (4)
17. (4)	**18.** (2)	**19.** (1)	**20.** (2)
21. (1)	**22.** (2)		

TYPE-II

1. (2)	**2.** (4)	**3.** (4)	**4.** (1)
5. (2)	**6.** (2)	**7.** (2)	**8.** (2)
9. (2)	**10.** (2)	**11.** (4)	**12.** (1)
13. (3)	**14.** (2)	**15.** (4)	**16.** (2)
17. (4)	**18.** (2)	**19.** (3)	**20.** (4)
21. (2)	**22.** (3)	**23.** (2)	**24.** (4)
25. (2)	**26.** (4)	**27.** (4)	**28.** (3)
29. (4	**30.** (3)	**31**. (1)	**32.** (4)
33. (3)	**34.** (4	**35.** (3)	**36.** (4)
37. (4)	**38.** (3)	**39.** (1)	**40.** (1)
41. (*)	**42.** (3)	**43.** (2)	**44.** (2)
45. (3)	**46.** (4)	**47.** (4	**48.** (2)
49. (4)	**50.** (1)	**51.** (4)	**52.** (3)
53. (2)	**54.** (3)	**55.** (2)	**56.** (2)
57. (3)	**58.** (2)	**59.** (3)	**60.** (4)
61. (1)	**62.** (1)	**63.** (1)	**64.** (4
65. (1)	**66.** (4)	**67.** (1)	**68.** (3)
69. (3)	**70.** (3)	**71.** (2)	**72.** (2)
73. (1)	**74.** (2)	**75.** (1)	**76.** (4)
77. (2)	**78.** (3)	**79.** (2)	**80.** (4)
81. (3)	**82.** (1)	**83.** (3)	**84.** (1)
85. (2)	**86.** (2)	**87.** (2)	**88.** (3)
89. (3)	**90.** (3)	**91.** (3)	**92.** (4)
93. (4)	**94.** (4)	**95.** (2)	**96.** (4)
97. (2)	**98.** (1)	**99.** (4)	**100.** (2)
101. (3)	**102.** (1)	**103.** (2)	**104.** (2)
105. (2)	**106.** (3)	**107.** (1)	**108.** (1)
109. (2)	**110.** (1)	**111.** (3)	**112.** (3)
113. (2)	**114.** (2)	**115.** (3)	**116.** (4)
117. (4)	**118.** (2)	**119.** (2)	**120.** (4)
121. (2)	**122.** (2)	**123.** (3)	**124.** (3)
125. (2)	**126.** (4)	**127.** (4)	**128.** (3)
129. (1)	**130.** (3)	**131.** (3)	**132.** (2)
133. (4)	**134.** (2)	**135.** (1)	**136.** (2)
137. (3)	**138.** (2)	**139.** (2)	**140.** (1)
141. (1)	**142.** (2)	**143.** (3)	**144.** (3)
145. (1)	**146.** (2)	**147.** (4)	**148.** (1)
149. (1)	**150.** (3)	**151.** (3)	**152.** (4)
153. (2)	**154.** (2)	**155.** (1)	**156.** (3)
157. (3)	**158.** (3)	**159.** (3)	

TYPE-III

1. (3)	**2.** (1)	**3.** (3)	**4.** (2)
5. (1)	**6.** (4)	**7.** (1)	**8.** (1)
9. (1)	**10.** (4)	**11.** (1)	**12.** (2)
13. (1)	**14.** (2)	**15.** (2)	**16.** (3)
17. (4)	**18.** (2)	**19.** (1)	**20.** (2)
21. (2)	**22.** (2)	**23.** (1)	**24.** (3)
25. (4)	**26.** (2)	**27.** (2)	**28.** (2)
29. (3)	**30.** (4)	**31**. (1)	**32.** (2)
33. (2)	**34.** (3)	**35.** (2)	**36.** (2)
37. (3)	**38.** (3)	**39.** (2)	**40.** (3)
41. (1)	**42.** (1)	**43.** (4)	**44.** (1)
45. (4)	**46.** (1)	**47.** (3)	**48.** (2)
49. (3)	**50.** (2)	**51.** (1)	**52.** (4)
53. (3)	**54.** (1)	**55.** (2)	**56.** (2)
57. (2)	**58.** (2)	**59.** (2)	**60.** (1)
61. (4)	**62.** (2)	**63.** (3)	**64.** (2)
65. (4)	**66.** (2)	**67.** (2)	**68.** (3)
69. (2)	**70.** (3)	**71.** (1)	**72.** (3)
73. (3)	**74.** (1)	**75.** (4)	**76.** (2)
77. (4)	**78.** (4	**79.** (4)	**80.** (4)
81. (2)	**82.** (1)	**83.** (3)	**84.** (1)
85. (3)			

TYPE-IV

1. (3)	**2.** (3)	**3.** (3)	**4.** (2)
5. (4)			

TYPE-V

1. (1)	**2.** (3)	**3.** (1)	**4.** (1)
5. (2)	**6.** (1)	**7.** (2)	**8.** (4)
9. (3)	**10.** (1)	**11.** (4)	**12.** (2)
13. (4)	**14.** (4)	**15.** (4)	**16.** (1)
17. (4)	**18.** (4)	**19.** (1)	**20.** (1)
21. (3)			

TYPE-VI

1. (3)	**2.** (3)	**3.** (4)	**4.** (2)
5. (2)	**6.** (4)	**7.** (4)	**8.** (2)
9. (3)	**10.** (4)	**11.** (4)	**12.** (4)
13. (4)	**14.** (2)	**15.** (1)	**16.** (3)
17. (2)	**18.** (3)	**19.** (4)	**20.** (2)
21. (2)	**22.** (3)	**23.** (3)	**24.** (3)
25. (4)	**26.** (3)	**27.** (3)	**28.** (4)

TYPE-VII

1. (2)	**2.** (3)	**3.** (4)	**4.** (3)
5. (2)	**6.** (3)	**7.** (2)	**8.** (2)
9. (2)	**10.** (4)	**11.** (1)	**12.** (3)
13. (3)	**14.** (3)	**15.** (4)	**16.** (2)
17. (2)	**18.** (3)	**19.** (4)	**20.** (3)
21. (1)	**22.** (2)	**23.** (2)	**24.** (3)
25. (1)	**26.** (3)	**27.** (3)	**28.** (4)
29. (3)	**30.** (3)	**31**. (3)	**32.** (3)
33. (3)	**34.** (3)	**35.** (3)	**36.** (2)
37. (2)	**38.** (4)	**39.** (4)	**40.** (2)
41. (4)	**42.** (2)	**43.** (1)	**44.** (2)
45. (3)	**46.** (3)	**47.** (3)	**48.** (2)
49. (4)	**50.** (4)	**51.** (1)	**52.** (2)
53. (3)	**54.** (2)	**55.** (1)	**56.** (1)
57. (3)	**58.** (3)	**59.** (1)	**60.** (2)
61. (4)	**62.** (1)	**63.** (1)	**64.** (4)
65. (2)	**66.** (3)	**67.** (2)	**68.** (2)
69. (1)	**70.** (4)	**71.** (1)	**72.** (1)
73. (3)	**74.** (3)	**75.** (2)	**76.** (1)
77. (3)	**78.** (2)	**79.** (1)	**80.** (1)
81. (4)	**82.** (4)	**83.** (4)	**84.** (2)
85. (3)	**86.** (2)	**87.** (2)	**88.** (4)
89. (2)	**90.** (2)	**91.** (3)	**92.** (4)
93. (2)	**94.** (1)	**95.** (1)	**96.** (3)
97. (1)	**98.** (3)	**99.** (3)	**100.** (3)
101. (3)	**102.** (3)	**103.** (4)	**104.** (2)
105. (1)	**106.** (3)	**107.** (2)	

EXPLANATIONS

TYPE-I

1. (4) $\frac{7}{6} = 1.166$; $\frac{7}{9} = 0.777$

$\frac{4}{5} = 0.8$ and $\frac{5}{7} = 0.714$

Therefore, the smallest number is $\frac{5}{7}$

2. (1) $\frac{9}{13} = \frac{9 \times 4}{13 \times 4} = \frac{36}{52}$

$\frac{17}{26} = \frac{17 \times 2}{26 \times 2} = \frac{34}{52}$

$\frac{33}{52} = \frac{33}{52}$

Among these $\frac{33}{52}$ is the smallest

Again, $\frac{28}{29} = \frac{56}{58} > \frac{33}{52}$

3. (4) The smallest possible three-place decimal number = 0.001

4. (4) $\frac{8}{15}, \frac{14}{33}, \frac{7}{13}, \frac{11}{13}$

$\frac{8}{15} = 0.53\overline{3}$

$\frac{14}{33} = 0.\overline{42}$

$\frac{7}{13} = 0.538$

$\frac{11}{13} = 0.846$

$\therefore \frac{11}{13} > \frac{7}{13} > \frac{8}{15} > \frac{14}{33}$

5. (4) $\frac{8}{25} = 0.32$, $\frac{7}{23} = 0.30$

$\frac{11}{23} = 0.47$, $\frac{14}{53} = 0.26$

$\therefore \frac{14}{53}$ is the smallest fraction.

6. (4) The decimal equivalents of :

$\frac{6}{7} = 0.857$, $\frac{5}{6} = 0.833$,

$\frac{7}{8} = 0.875$, $\frac{4}{5} = 0.8$

Obviously, 0.875 is the greatest.

$\therefore \frac{7}{8}$ is the largest fraction.

7. (4) The smallest number of 5 digits = 10000

Now,

```
476)10000(21
    952
     480
     476
       4
```

$\therefore$ Required number = 10000 + (476 – 4)

= 10000 + 472 = 10472

8. (2) $\frac{15}{16} = 0.94$; $\frac{19}{20} = 0.95$

$\frac{24}{25} = 0.96$; $\frac{34}{35} = 0.97$

9. (1) $\frac{2}{3} = 0.67$; $\frac{5}{6} = 0.83$

$\frac{11}{15} = 0.73$; $\frac{7}{8} = 0.875$

10. (2) Decimal equivalents :

$\frac{4}{9} = 0.\dot{4}$; $\sqrt{\frac{9}{49}} = \frac{3}{7} = 0.43$

$0.\dot{4}\dot{5}$; $(0.8)^2 = 0.64$

$\therefore$ Least number = 0.43

$= \sqrt{\frac{9}{49}}$

11. (2) $0.9 = \frac{9}{10}$; $0.\overline{9} = \frac{9}{9} = 1$,

$0.0\overline{9} = \frac{9}{90} = \frac{1}{10}$;

$0.\overline{09} = \frac{9}{99} = \frac{1}{11}$

12. (2) $\frac{2}{7} = 0.286$; $\frac{1}{3} = 0.33$

$\frac{5}{6} = 0.833$; $\frac{3}{4} = 0.75$

13. (2) The smallest number of 5 digits = 10000

Remainder on dividing 10000 by 123 = 37

$\therefore$ Required number

= 10000 + (123 – 37) = 10086

14. (3) $(0.1)^2 = 0.01$

$\sqrt{0.0121} = \sqrt{0.11 \times 0.11} = 0.11$

$\sqrt{0.0004} = 0.02$

$\Rightarrow 0.01 < 0.02 < 0.11 < 0.12$

15. (4) LCM of 3, 2 and 6 = 6

$\therefore (3)^{\frac{1}{3}} = (3^2)^{\frac{1}{6}} = (9)^{\frac{1}{6}}$

$2^{\frac{1}{2}} = (2^3)^{\frac{1}{6}} = (8)^{\frac{1}{6}}$

$(1)^{\frac{1}{6}} = 1$; $(6)^{\frac{1}{6}} = (6)^{\frac{1}{6}}$

16. (4)
```
  5  A  7
  3  3  5
  8  B  2
```

$\Rightarrow$ A $\rightarrow$ 1, 2, 3, 4, 5 &

B $\rightarrow$ 5, 6, 7, 8,9

8B2 is exactly divisible by 3.

$\therefore$ 8 + B + 2 = multiple of 3

$\therefore$ B = 5 or 8 $\Rightarrow$ A = 1 or 4

17. (4) If the number be x, then

$x - 31 = 75 - x$

$\Rightarrow 2x = 75 + 31 = 106$

$\Rightarrow x = 53$

18. (2) $0.7 + \sqrt{0.16}$

= 0.7 + 0.4 = 1.1

$1.02 - \frac{0.6}{24}$

= 1.02 – 0.025

= 0.995

1.2 × 0.83 = 0.996

$\sqrt{1.44} = 1.2$

Hence, the greatest number

$= \sqrt{1.44}$

19. (1) $\frac{2}{3} = 0.66$

$\frac{3}{5} = 0.6$

$\frac{8}{11} = 0.73$

$\frac{11}{17} = 0.65$

20. (2) Let the three fractions be p, q and r, where $p < q < r$.

According to the question,

$$\frac{r}{p} = \frac{7}{6} \Rightarrow r = \frac{7}{6}p$$

Again, middle fraction

$$= q = \frac{7}{6} - \frac{1}{3} = \frac{7-2}{6} = \frac{5}{6}$$

$$\therefore p + q + r = 2\frac{11}{24}$$

$$\Rightarrow p + \frac{5}{6} + \frac{7}{6}p = \frac{59}{24}$$

$$\Rightarrow p + \frac{7p}{6} = \frac{59}{24} - \frac{5}{6}$$

$$\Rightarrow \frac{6p+7p}{6} = \frac{59-20}{24} = \frac{39}{24}$$

$$\Rightarrow 13p = \frac{39}{24} \times 6 = \frac{39}{4}$$

$$\Rightarrow p = \frac{39}{4 \times 13} = \frac{3}{4}$$

21. (1) Decimal equivalents of fractions :

$$\frac{4}{3} = 1.3$$

$$\frac{-2}{9} = -0.2$$

$$\frac{-7}{8} = -0.875$$

$$\frac{5}{12} = 0.42$$

$\therefore -0.875 < -0.2 < 0.42 < 1.3$

i.e., $\frac{-7}{8} < \frac{-2}{9} < \frac{5}{12} < \frac{4}{3}$

22. (2) On making denominators equal,

$$\frac{3}{5} = \frac{3 \times 3}{5 \times 3} = \frac{9}{15}$$

$$\frac{2}{3} = \frac{2 \times 5}{3 \times 5} = \frac{10}{15}$$

$$\frac{11}{15} = \frac{11}{15}$$

$$\therefore \frac{9}{15} < \frac{10}{15} < \frac{11}{15}$$

$$\Rightarrow \frac{3}{5} < \frac{2}{3} < \frac{11}{15}$$

TYPE-II

1. (2) Required remainder = remainder got when 63 is divided by 29 = 5

2. (4) $\frac{1}{0.04} = \frac{100}{4} = 25$

3. (4) The number (x y z x y z) can be written, after giving corresponding weightage of the places at which the digits occur, as

100000 x + 10000y + 1000z + 100x + 10y + z

= 100100x + 10010y + 1001z

= 1001 (100x + 10y + z)

Since 1001 is a factor, the number is divisible by 1001.

7 × 11 × 13 = 1001

As the number is divisible by 1001, it will also be divisible by all three namely, 7, 11 and 13 and not by only one of these because all three are factors of 1001.

So, the answer is 1001.

4. (1) 1000 = (45 × 22) + 10

∴ 45 – 10 = 35 to be added.

So, the smallest number to be added to 1000 to make the sum exactly divisible by 45 is 35.

5. (2) Number = $xy\ xy\ xy$

$= xy \times 10000 + xy \times 100 + xy$

$= xy\ (10000 + 100 + 1)$

$= xy \times 10101$

6. (2) Quotient = 16

Divisor = 25 × 16 = 400

and remainder = 80

Dividend = Divisor × quotient + Remainder

= 400 × 16 + 80

= 6400 + 80 = 6480

7. (2) Let the numbers be x and y.

∴ xy = 11520

and $\frac{x}{y} = \frac{9}{5}$

$$\therefore xy \times \frac{x}{y} = 11520 \times \frac{9}{5}$$

$$\Rightarrow x^2 = 2304 \times 9$$

$$\Rightarrow x = \sqrt{2304 \times 9}$$

$$\Rightarrow 48 \times 3 = 144$$

From $\frac{x}{y} = \frac{9}{5}$ we have

$$y = \frac{5 \times 144}{9} = 80$$

∴ Required difference

= 144 – 80 = 64

8. (2) **Rule :** When the second divisor is factor of first divisor, the second remainder is obtained by dividing the first remainder by the second divisor.

Hence, on dividing 29 by 8, the remainder is 5.

9. (2) Let the given number be x. Then,

$$\left(x \times \frac{3}{2}\right) - \left(x \div \frac{3}{2}\right) = 10$$

$$\Rightarrow \frac{3}{2}x - \frac{2}{3}x = 10$$

$$\Rightarrow \frac{9x - 4x}{6} = 10$$

$\Rightarrow 5x = 60 \Rightarrow x = 12$

10. (2) Here, 52 is a multiple of 13. Hence, the required remainder is obtained on dividing 45 by 13.

Required remainder = 6.

11. (4) $\frac{13}{4} \times \frac{2}{3} - \left(\frac{9}{4} - \frac{5}{3}\right) \times \frac{3}{4}$

$$= \frac{13}{6} - \left(\frac{27-20}{12}\right) \times \frac{3}{4}$$

$$= \frac{13}{6} - \frac{7}{12} \times \frac{3}{4} = \frac{13}{6} - \frac{7}{16}$$

$$= \frac{104-21}{48} = \frac{83}{48}$$

12. (1) Let number (dividend) be X.

∴ X = 296 × Q + 75 where Q is the quotient and can have the values 1, 2, 3 etc.

= 37 × 8 × Q + 37 × 2 + 1

= 37 (8Q + 2) + 1

Thus we see that the remainder is 1.

[Remark : When the second divisor is a factor of the first divisor, the second remainder is obtained by dividing the first remainder by the second divisor. Hence, divide 75 by 37, the remainder is 1**]**.

13. (3) The least number X in this case will be determined as follows:

4	X		
5	Y	–	1
	1	–	4

Y = 5 × 1 + 4 = 9

$X = 4 \times Y + 1 = 4 \times 9 + 1 = 37$

Now,

5	37		
4	7	–	2
	1	–	3

Hence, the respective remainders are 2, 3.

14. (2) Remainder = 4

$\Rightarrow$ Divisor = $3 \times 4 = 12$

Again, divisor = $4 \times$ quotient

$\Rightarrow$ $4 \times$ quotient = 12

$\Rightarrow$ Quotient $= \frac{12}{4} = 3$

$\Rightarrow$ Dividend = $3 \times 12 + 4 = 40$

15. (4) Let the required number of persons be x.

According to the question, $2x^2 = 3042$

or $x^2 = \frac{3042}{2} = 1521$

or $x = \sqrt{1521} = 39$

16. (2) Number just greater than 3 which is divisible by 7 = 7

Number just smaller than 200 which is divisible by 7 = 196

Here, $a = 7$, $a_n = 196$,

$d = 7$, $n = 8$

$\therefore a_n = a + (n-1)d$

$\Rightarrow 196 = 7 + (n-1) \times 7$

$\Rightarrow n - 1 = \frac{196-7}{7} = 27$

$\Rightarrow n = 27 + 1 = 28$

Note : We can find the answer after dividing 200 by 7. The quotient is our answer.

17. (4) Sum of first 60 numbers

$= \frac{60(60+1)}{2} = \frac{60 \times 61}{2} = 1830$

The number 1830 is divisible by 61.

18. (2) The least number (dividend) x is obtained as follows :

3	x
2	$y-1$
	$1-1$

$y = 2 \times 1 + 1 = 3$

$x = 3 \times 3 + 1 = 10$

When we divide 10 by 6, the remainder = 4

19. (3) Let the numbers be x and y and x is greater than y.

As given,

$xy = 9375$ ....(i)

Again,

$\frac{x}{y} = 15$

$\Rightarrow x = 15y$

$\therefore$ From equation (i),

$15y \times y = 9375$

$\Rightarrow y^2 = \frac{9375}{15} = 625$

$\Rightarrow y = \sqrt{625} = 25$

$\therefore x = 15y = 15 \times 25 = 375$

$\therefore x + y = 375 + 25 = 400$

20. (4) On dividing the given number by 119, let k be the quotient and 19 as remainder.

Then, number = $119k + 19$

$= 17 \times 7k + 17 \times 1 + 2$

$= 17(7k + 1) + 2$

Hence, the given number when divided by 17, gives $(7k + 1)$ as quotient and 2 as remainder.

21. (2) By the Binomial expansion we have

$(x+1)^n = x^n + {}^nc_1 x^{n-1} + {}^nc_2 x^{n-2} + \ldots + {}^nc_{n-1} x + 1$

Here, each term except the last term contains x. Obviously, each term except the last term is exactly divisible by x.

Following the same logic,

$7^{19} = (6+1)^{19}$ has each term except last term divisible by 6.

Hence, $7^{19} + 2$ when divided by 6 leaves remainder

$= 1 + 2 = 3$

22. (3) Here, 357 is exactly divisible by 17.

$\therefore$ Required remainder = Remainder obtained on dividing 39 by 17 = 5

23. (2) Number = 269×68

$= 269 \times (67 + 1)$

$= 269 \times 67 + 269$

Clearly, remainder is obtained on dividing 269 by 67 that is 1.

24. (4) The remainder will be same.

On dividing 9 by 6, remainder = 3

On dividing 81 by 6, remainder = 3

25. (2) Here, 893 is exactly divisible by 47.

Hence, the required remainder is obtained on dividing 193 by 47.

$\therefore$ Remainder = 5

26. (4) Let the least number be x.

13	x	Remainder
5	y	1
	1	3

$y = 5 \times 1 + 3 = 8$

$x = 13 \times 8 + 1 = 105$

On dividing 105 by 65, remainder = 40

27. (4) A number will be exactly divisible by 18 if it is divisible by 2 and 9 both. Clearly 65043 is not divisible by 2.

$\therefore$ Required number = 65043

28. (3) $\times\times\times)\,6\,4\,3\,2\,9\,(\times\times\times$

$\times\times\times$.....(i)

$1\,7\,5\,2$

$\times\times\times\times$.....(ii)

$\times 1\,1\,4\,9$

$\times\times\times\times$.....(iii)

$\times 2\,1\,3$

Number at (i) = 643 – 175 = 468

Number at (ii) = 1752 – 114

= 1638

Number at (iii) = 1149 – 213

= 936

Clearly, 468, 1638 and 936 are multiples of 234 and 234 > 213.

$\therefore$ Divisor = 234

29. (4) Let the quotient be Q and the remainder be R. Then

Divisor = 7 Q = 3 R

$\therefore$ Q $= \frac{3}{7}$R $= \frac{3}{7} \times 28 = 12$

$\therefore$ Divisor = 7 Q = $7 \times 12 = 84$

$\therefore$ Dividend = Divisor $\times$ Quotient + Remainder = $84 \times 12 + 28 = 1008 + 28 = 1036$

30. (3) Required divisor

$= 3 + 4 - 2 = 5$

31. (1) Let the number be $10x + y$

After interchanging the digits, the number obtained = $10y + x$

According to the question,

Resulting number

$= 10x + y + 10y + x$

$= 11x + 11y$

$= 11(x + y)$ which is exactly divisible by 11.

32. (4) If the quotient in the first case be x.
Then, number = $5x + 3$
On Squaring, the number
$= (5x + 3)^2$
$= 25x^2 + 30x + 9$
On dividing by 5, remainder
$= 9 - 5 = 4$

33. (3) Here, the first divisor 192 is a multiple of second divisor 16.
∴ Required remainder
= remainder obtained by dividing 54 by 16 = 6

34. (4) If the first divisor be a multiple of the second divisor, then required remainder = remainder obtained by dividing the first remainder (36) by the second divisor (17) = 2

35. (3) First number (X) = $17x + 13$
Second number (Y) = $17y + 11$

$$\therefore \frac{X+Y}{17} = \frac{17(x+y)}{17} + \frac{13+11}{17}$$

∴ Required remainder
= Remainder obtained on dividing
11 + 13 i.e. 24 by 17 = 7

36. (4) Here, the first divisor (221) is a multiple of second divisor (13) Hence, required remainder
= remainder obtained on dividing 64 by 13 = 12

37. (4) Required remainder = Remainder obtained by dividing 2^2 by 5.
Remainder = 4

38. (3) $3^1 = 3$; $3^2 = 9$; $3^3 = 27$; $3^4 = 81$; $3^5 = 243$
i.e. unit's digit is repeated after index 4.
Remainder after dividing 21 by 4 = 1
∴ Unit's digit in the expansion of $(3)^{21} = 3$
∴ Remainder after dividing by 5 = 3

39. (1) Here, the first divisor i.e. 49 is multiple of second divisor i.e. 7.
∴ Required remainder = Remainder obtained on dividing 32 by 7 = 4

40. (1) Here, the first divisor (36) is exactly divisible by the second divisor (12).
∴ Required remainder
= Remainder obtained after 19 is divided by 12 = 7

41. (*) If $(x \pm 1)^n$ is divided by x, the remainder is $(\pm 1)^n$,
Now, $9^6 - 11 == (8 + 1)^6 - 11$
When it is divided by 8,
remainder = + 1 – 11 = – 10
When – 10 is divided by 8, remainder = – 2 i.e. – 2 + 8 = 6

42. (3) $(17)^{200} = (18 - 1)^{200}$
We know that
$(x + a)^n$
$= x^n + nx^{n-1}.a +$

$$+\frac{n(n-1)}{1\times 2}x^{n-2}a^2$$

$$+\frac{n(n-1)(n-2)}{1\times 2\times 3}x^{n-3}a^3 + \ldots + a^n$$

We see that all the terms on the R.H.S. except a^n has x as one of its factor and hence are divisible by x. So, $(x + a)^n$ is divisible by x or not will be decided by a^n.
Let x = 18, a = – 1
and n = 200
∴ $(18 - 1)^{200}$ is divisible by 18 or not will depend on $(-1)^{200}$ as all other terms in its expansion will be divisible by 18 because each of them will have 18 as one of their factors.
$(-1)^{200} = 1$ (∵ 200 is even)
1 is not divisible by 18 and is also less than 18.
∴ 1 is the remainder.

43. (2) $2^{31} = \left(2^8\right)^4 \div 2 = (256)^4 \div 2$

$$= \frac{\ldots\ldots 6}{2} = \ldots\ldots 3$$

Clearly, the remainder will be 3 when divided by 5.
Illustration :
23 ÷ 5 gives remainder = 3
83 ÷ 5 gives remainder = 3

44. (2) Let the number be x.

$$\therefore \frac{x+12}{6} = 112$$

$\Rightarrow x + 12 = 672$
$\Rightarrow x = 672 - 12 = 660$

$$\therefore \text{Correct answer} = \frac{660}{6} + 12$$

= 110 + 12 = 122

45. (3) Here, 387 is a multiple of 43.
∴ Remainder obtained on dividing 48 by 43 i.e. 5 is the required remainder.

46. (4) If two numbers are separately divided by a certain divisor (d) leaving remainders r_1 and r_2, then remainder after their sum is divided by the same divisor.
$= r_1 + r_2 - d$
$= 21 + 28 - 33 = 16$

47. (4) Divisor = 5 × Remainder
= 5 × 46 = 230

$$\text{Quotient} = \frac{230}{10} = 23$$

∴ Dividend = Divisor × Quotient + Remainder
= 230 × 23 + 46
= 5290 + 46 = 5336

48. (2) Required remainder
= 16 – 12 = 4
(because 24 is a multiple of 12.)

49. (4) $2^{6n} - 4^{2n} = \left(2^6\right)^n - \left(4^2\right)^n$
$= 64^n - 16^n$
which is divisible by 64 – 16 = 48

50. (1) $4^{61} + 4^{62} + 4^{63}$
$= 4^{61}(1 + 4 + 4^2)$
$= 4^{61} \times 21$ which is divisible by 3.

51. (4) Let the unknown number be x.
$\therefore 71 \times x + 47 = 98 \times 7$
$\Rightarrow 71x = 686 - 47 = 639$

$$\Rightarrow x = \frac{639}{71} = 9 = 3 \times 3$$

52. (3) Of the given alternatives,
When 64 is divided by 3, remainder = 1
When 65 is divided by 5, remainder = 0

53. (2) Here, the first divisor (91) is a multiple of second divisor (13).
∴ Required remainder = Remainder obtained on dividing 17 by 13 = 4

54. (3) $x + y = 120$ ..... (i)

$$\frac{x}{y} = 5$$

$\Rightarrow x = 5y$
From, equation (i),
$5y + y = 120$
$\Rightarrow 6y = 120 \Rightarrow y = 20$
$\therefore x = 120 - 20 = 100$
∴ Difference = 100 – 20 = 80

55. (2) Here, 280 is a multiple of 35.
∴ Required remainder
= Remainder obtained on dividing 115 by 35 = 10

56. (2) Here, first divisor (175) is a multiple of second divisor (25).
$\therefore$ Required remainder = Remainder obtained on dividing 132 by 25 = 7

57. (3) We have to find such numbers which are divisible by 12 (LCM of 4 and 6).
Number of numbers divisible by 12 and lying between 1 to 600
$= \frac{600}{12} - 1 = 49$
Number of numbers divisible by 12 from 1 to 100 $= \frac{100}{12} = 8$
$\therefore$ Required answer
$= 49 - 8 = 41$

58. (2) $(x-2)$ is a factor of polynomial $P(x) = x^3 + x^2 - 5x + \lambda$.
$\therefore$ P(2) = 0 (i.e., on putting $x = 2$)
$\Rightarrow 2^3 + 2^2 - 5 \times 2 + \lambda = 0$
$\Rightarrow 8 + 4 - 10 + \lambda = 0$
$\Rightarrow \lambda + 2 = 0$
$\Rightarrow \lambda = -2$

59. (3) Required Number
$= 100x + 10y + z$
$\because 10y + z = 6m$
$\therefore$ Number $= 100x + 6m$, where m is a positive integer.
$= 2(50x + 3m)$

60. (4) If the first part be x, then second part $= 37 - x$.
$\therefore x \times 5 + (37 - x)\,11 = 227$
$\Rightarrow 5x + 407 - 11x = 227$
$\Rightarrow 6x = 407 - 227 = 180$
$\Rightarrow x = 30$
$\therefore$ Second part = 7

61. (1) $3^1 = 3$, $3^2 = 9$,
$3^3 = 27$, $3^4 = 81$
i.e. the unit's digit = odd number
$\therefore$ Hence, both numbers are divisible by 2.

62. (1) LCM of 4, 5 and 6 = 60
Quotient on dividing 800 by 60 = 13
Quotient on dividing 400 by 60 = 6
$\therefore$ Required answer = 13 – 6 = 7
Method 2 :
First number greater than 400 that is divisible by 60 = 420
Smaller number than 800 that is divisible by 60 = 780
It is an Arithmetic Progression with common difference = 60
By $t_n = a + (n-1)d$
$780 = 420 + (n-1) \times 60$
$\Rightarrow (n-1) \times 60 = 780 - 420$
$= 360$
$\Rightarrow (n-1) = 360 \div 60 = 6$
$\Rightarrow n = 6 + 1 = 7$

63. (1) The no. is of the form $(425x + 45)$ First divisor (425) is multiple of second divisor (17).
$\therefore$ Required remainder
= Remainder obtained on dividing 45 by 17 = 11

64. (4) Here, the first divisor (289) is a multiple of second divisor (17).
$\therefore$ Required remainder = Remainder obtained on dividing 18 by 17 = 1

65. (1) $n = 6q + 4$
$2n = 12q + 8$
Dividing 8 by 6 the remainder = 2

66. (4) If the remainder be x, then $(11284 - x)$ and $(7655 - x)$ are divisible by three digit number.
i.e. $(11284 - x) - (7655 - x)$
= 3629 is divisible by that number.
$3629 = 19 \times 191$
Hence, required number = 191
Sum of digits = 1 + 9 + 1 = 11

67. (1) Divisor $= 6 \times 2 = 12$
Again, Divisor = 3 × quotient
$\therefore$ Quotient $= \frac{12}{3} = 4$
Dividend $= 12 \times 4 + 2$
$= 48 + 2 = 50$

68. (3) $2^{16} - 1 = (2^8)^2 - 1$
$= (2^8+1)(2^8-1)$
$= (256 + 1)(256 - 1)$
$= 257 \times 255$ which is exactly divisible by 17.

69. (3)
```
11)803642(73058
   77
    33
    33
   × 64
     55
     92
     88
      4
```
$\therefore$ The required number
$= 11 - 4 = 7$

Method 2 :
Sum of digits at odd places = 2 + 6 + 0 = 8, sum of digits at even places = 4 + 3 + 8 = 15. For divisibility by 11, difference i.e., (15 – 8) = 0 or mutiple of 11.
$\therefore$ The required number = 7

70. (3) $5^{71} + 5^{72} + 5^{73}$
$= 5^{71}(1 + 5 + 5^2)$
$= 5^{71} \times 31$ which is exactly divisible by 155.

71. (2) $[n] < n$ (integer); $(n) > n$ (integer)
$\therefore$ Expression
$= 2 \times 1 - 2 \div 1 + 2 = 2$

72. (2) Required number
$= 1.1 - 0.01 = 1.09$

73. (1) $999\frac{998}{999} \times 999$
$= \left(999 + \frac{998}{999}\right) \times 999$
$= 999^2 + 998$
$= (1000 - 1)^2 + 998$
$= 1000000 - 2000 + 1 + 998$
$= 998999$

74. (2) Expression
$= 2^{71}(1 + 2 + 4 + 8)$
$= 2^{71} \times 15 = 2^{71} \times 3 \times 5$
Which is exactly divisible by 10.

75. (1) Let required number be x.
$\therefore 0.022 \times x = 66$
$\Rightarrow x = \frac{66}{0.022} = 3000$

76. (4) $3^{25} + 3^{26} + 3^{27} + 3^{28}$
$= 3^{25}(1 + 3 + 3^2 + 3^3)$
$= 3^{25}(1 + 3 + 9 + 27)$
$= 3^{25} \times 40$, which is clearly divisible by 30.

77. (2) $\therefore$ Required sum
$= 0.34\overline{67} + 0.13\overline{33} = 0.48\overline{01}$

Illustration =		
0.34	67	67
0.13	33	33
0.48	01	00

78. (3) **Tricky Approach**
Taking approximate values, we have
$\frac{3 \times 4126 \times 3}{64 \times 2835} = 0.2046 \approx 0.2$

79. (2) Expression
$= \frac{1}{7} + \left(999 + \frac{692}{693}\right) \times 99$
$= \frac{1}{7} + 999 \times 99 + \frac{692}{693} \times 99$

$= \frac{1}{7} + (1000 - 1)\ 99 + \frac{692}{7}$

$= \frac{1}{7} + \frac{692}{7} + 99000 - 99$

$= \frac{693}{7} + 99000 - 99$

$= 99 + 99000 - 99 = 99000$

80. (4) $x^n - a^n$ is exactly divisible by $(x-a)$ if n is odd.

$\therefore (49)^{15} - (1)^{15}$ is exactly divisible by 49–1 = 48, that is a multiple of 8.

81. (3) $a^4 - b^4 = (a^2)^2 - (b^2)^2 = (a^2 + b^2)(a^2 - b^2) = (a^2 + b^2)(a + b)(a - b)$

Let $a = 3$, $b = 1$

$\therefore$ Required number

$= (3 + 1)(3 - 1) = 8$

82. (1) Let $m = n = p$ and $m - n = 2p$

$m + n = 2p$

$\therefore (m - n)(m + n) = 4p^2$

$\Rightarrow m^2 - n^2 = 4p^2$

83. (3) A number is divisible by 9, if sum of its digits is divisible by 9. Let the number be x.

$\Rightarrow 5 + 4 + 3 + 2 + x + 7$

$= 21 + x$

$\therefore x = 6$

84. (1) A number is divisible by 9 if the sum of its digits is divisible by 9.

Here, 6 + 7 + 0 + 9 = 22

Now, 22 + 5 = 27, which is divisible by 9. Hence 5 must be added to 6709.

85. (2) A number is divisible by 9 and 6 both, if it is divisible by LCM of 9 and 6 i.e., 18. Hence, the numbers are 108, 126, 144, 162, 180, 198.

86. (2) First 3–digit number divisible by 6 = 102

Last such 3-digit number =996

$\therefore 996 = 102 + (n - 1)\ 6$

$\Rightarrow (n - 1)6 = 996 - 102 = 894$

$\Rightarrow n - 1 = \frac{894}{6} = 149$

$\Rightarrow n = 150$

87. (2) $n^3 - n = n(n^2 - 1)$

$= n(n + 1)(n - 1)$

For $n = 2$, $n^3 - n = 6$

88. (3) $n^3 - n = n(n + 1)(n - 1)$

$n = 1$, $n^3 - n = 0$

$n = 2$, $n^3 - n = 2 \times 3 = 6$

$n = 3$, $n^3 - n = 3 \times 4 \times 2 = 24$

$n = 4$, $n^3 - n = 4 \times 5 \times 3 = 60$

$60 \div 6 = 10$

89. (3) Number $= 100x + 10y + z$

Sum of digits $= x + y + z$

Difference $= 100x + 10y + z - x - y - z$

$= 99x + 9y = 9(11x + y)$

90. (3) divisible by (11×13)

91. (3) Any number is divisible by 11 when the differences of alternative digits is 0 or multiple of 0, 11 etc. Here,

5 8 2 4 ★

$5 + 2 + ★ = 7 + ★$

$8 + 4 = 12$

$\therefore ★ = 12 - 7 = 5$

92. (4) A number is divisible by 11, if the difference of the sum of its digits at odd places and the sum of its digits of even places, is either 0 or a number divisible by 11.

$\therefore (5 + 9 + * + 7) - (4 + 3 + 8) = 0$ or multiple of 11

$\Rightarrow 21 + * - 15$

$\therefore * + 6$ = a multiple of 11

$\therefore * = 5$

93. (4) A number is divisible by 11, if the difference of sum of its digits at odd places and the sum of its digits at even places is either 0 or a number divisible by 11.

Difference

$= (4 + 3 + 7 + 8) - (2 + 8 + ★)$

$= 22 - 10 - ★$

$= 12 - ★$

Clearly, ★ = 1

94. (4) A number is divisible by 11 if the difference of the sum of digits at odd and even places be either zero or multiple of 11.

If the middle digit be 4, then 24442 or 244442 etc are divisible by 11.

95. (2) $n^2(n^2 - 1) = n^2(n + 1)(n - 1)$

Now, we put values $n = 2, 3.....$

When $n = 2$

$\therefore n^2(n^2 - 1) = 4 \times 3 \times 1 = 12$, which is a multiple of 12

When n = 3.

$n^2(n^2 - 1) = 9 \times 4 \times 2 = 72$,

which is also a multiple of 12. etc.

96. (4) Let the unit digit be x and ten's digit be y.

$\therefore$ Number

$= 1000y + 100x + 10y + x$

$= 1010y + 101x = 101(10y + x)$

Clearly, this number is divisible by 101, which is the smallest three-digit prime number.

97. (2) The least number of 5 digits = 10000

```
41)10000(243
   82
   180
   164
    160
    123
     37
```

$\therefore$ Required number

$= 10000 + (41 - 37)$

$= 10004$

98. (1) $2^{96} + 1 = (2^{32})^3 + 1^3$

$= (2^{32} + 1)(2^{64} - 2^{32} + 1)$

Clearly, $2^{32} + 1$ is a factor of $2^{96} + 1$

99. (4) For $n = 1$

$n^4 + 6n^3 + 11n^2 + 6n + 24$

$= 1 + 6 + 11 + 6 + 24 = 48$

For $n = 2$

$n^4 + 6n^3 + 11n^2 + 6n + 24$

$= 16 + 48 + 44 + 12 + 24$

$= 144$ which is divisible by 48.

Clearly, 48 is the required number.

100. (2) When we divide 1000 by 225, quotient = 4

When we divide 5000 by 225, quotient = 22

$\therefore$ Required answer = 22 – 4 = 18

101. (3) $(n^3 - n)(n - 2)$

$= n(n - 1)(n + 1)(n - 2)$

When $n = 3$,

Number $= 3 \times 2 \times 4 = 24$

102. (1) LCM of 16 and 18 = 144

Multiple of 144 that is less than 1500 = 1440

103. (2) The largest 4-digit number = 9999

```
345)9999(28
    690
    3099
    2760
     339
```

$\therefore$ Required number = 345 – 339 = 6

104. (2) $4^{61} + 4^{62} + 4^{63} + 4^{64}$

$= 4^{61}(1 + 4 + 4^2 + 4^3)$

$= 4^{61}(1 + 4 + 16 + 64)$

$= 4^{61} \times 85$

Which is a multiple of 10.

105. (2) Let the number be $10x + y$

where $y < x$.

Number obtained by interchanging the digits = $10y + x$

$\therefore$ Difference $= 10x + y - 10y - x$

$= 9x - 9y = 9(x - y)$

Hence, the difference is always exactly divisible by 9.

106. (3) Check through option

$$\frac{303375}{25} = \frac{303375 \times 4}{25 \times 4}$$

$$= \frac{1213500}{100} = 12135$$

A number is divisible by 25 if the last two digits are divisible by 25 or zero.

107. (1) $307 \times 32 = 9824$

$307 \times 33 = 10131$

$\therefore$ Required number

$= 10131 - 9999 = 132$

108. (1) $a = 4011$, $b = 3989$

$\therefore ab = 4011 \times 3989$

$= (4000 + 11)(4000 - 11)$

$= (4000)^2 - (11)^2$

$= 16000000 - 121$

$= 15999879$

109. (2) Expression $= 3^{2n} + 9n + 5$

$= (3^{2n} + 9n + 3) + 2$

$= 3(3^{2n-1} + 3n + 1) + 2$

Clearly, remainder = 2

110. (1) $12x - 61 \le 6 \Rightarrow 12x \le 61 + 6$

$$\Rightarrow 12x < 67 \Rightarrow x \le \frac{67}{12}$$

$\Rightarrow x < 6$ (Approx.)

111. (3) Resulting number = 3957 + 5349 – 7062 = 2244 which is divisible by 4, 3 and 11.

$2244 \div 4 = 561$

$2244 \div 3 = 748$

$2244 \div 11 = 204$

112. (3) Prime numbers between 80 and 90.

= 83 and 89

$\therefore$ Required product $= 83 \times 89$

$= 7387$

113. (2) When $n = 2$,

$6^n - 1 = 6^2 - 1 = 36 - 1 = 35$

When, n = an even number,

$a^n - b^n$ is always divisible by $(a^2 - b^2)$.

114. (2) Total number of marbles $= x + x + 3 + x - 3 = 3x$

$\therefore 3x = 15 \Rightarrow x = 5$

115. (3)

Bucket + full water = 17 kg.

Bucket + $\frac{1}{2}$ water = 13.5 kg.

– – –

$\frac{1}{2}$ water = 3.5 kg.

$\therefore$ Water $= 2 \times 3.5 = 7$ kg.

$\therefore$ Weight of empty bucket

$= 17 - 7 = 10$ kg.

116. (4) A cow and a hen each has a head.

If the total number of cows be x, then

Number of hens $= 180 - x$

A cow has four legs and a hen has two legs.

$\therefore (180 - x) \times 2 + 4x = 420$

$\Rightarrow 360 - 2x + 4x = 420$

$\Rightarrow 2x = 420 - 360 = 60$

$$\Rightarrow x = \frac{60}{2} = 30$$

117. (4) On putting $n = 1$

$n(n+1)(n+2) = 1 \times 2 \times 3 = 6$

118. (2) $2736 \div 24 = 114$

Hence, first divisor (2736) is a multiple of second divisor (24).

$\therefore$ Required remainder

= Remainder obtained on dividing 75 by 24 = 3

119. (2) 5 E9 + 2 F8 + 3 G7 = 1114

Value of 'F' will be maximum if the values of E and G are minimum.

$\therefore$ 509 + 2 F8 + 307 = 1114

$\Rightarrow$ 2 F8 = 1114 – 509 – 307 = 298

$\Rightarrow$ F = 9

120. (4) Let four numbers be a, b, c and d respectively.

$\therefore a + b + c + d = 48$ .....(i)

and,

$a + 5 = b + 1 = c - 3 = d - 7 = x$ (let)

$\therefore a = x - 5$; $b = x - 1$,

$c = x + 3$, $d = x + 7$

From equation (i),

$x - 5 + x - 1 + x + 3 + x + 7 = 48$

$\Rightarrow 4x + 4 = 48$

$\Rightarrow 4x = 48 - 4 = 44$

$$\Rightarrow x = \frac{44}{4} = 11$$

$\therefore a = x - 5 = 11 - 5 = 6$

$b = x - 1 = 11 - 1 = 10$

$c = x + 3 = 11 + 3 = 14$

$d = x + 7 = 11 + 7 = 18$

121. (2) 27) 2055 (76

189

165

162

3

$\therefore$ Required number = 27 – 3 = 24

122. (2) Sum of first n natural numbers

$$= \frac{n(n+1)}{2}$$

$\therefore$ Required average

$$= \frac{n(n+1)}{2 \times n} = \frac{n+1}{2}$$

123. (3) Here, the first divisor (361) is a multiple of second divisor (19).

$\therefore$ Required remainder = Remainder obtained on dividing 47 by 19 = 9

124. (3) Largest number = 3995

Smallest number = 3005

Difference = 3995 – 3005 = 990

125. (2) Let the numbers be x and y.

According to the question,

$x + y = 75$

$x - y = 25$

$\because (x + y)^2 - (x - y)^2 = 4xy$

$\Rightarrow 75^2 - 25^2 = 4xy$

$\Rightarrow 4xy = (75 + 25)(75 - 25)$

$$\left[\because a^2 - b^2 = (a+b)(a-b)\right]$$

$\Rightarrow 4xy = 100 \times 50$

$$\Rightarrow xy = \frac{100 \times 50}{4} = 1250$$

126. (4) Required difference

$= 97 - 2 = 95$

127. (4) $xy = 24$

$\therefore (x, y)$

$= (1 \times 24), (2 \times 12), (3 \times 8), (4 \times 6)$

$\therefore$ Minimum value of $(x + y)$

$= 4 + 6 = 10$.

128. (3) Let the 3–digit number be $100x + 10y + z$.

Sum of the digits $= x + y + z$

According to the question,

Difference

$= 100x + 10y + z - (x + y + z)$

$= 99x + 9y$

$= 9(11x + y)$

Clearly, it is a multiple of 3 and 9.

129. (1) Let the numbers be x and y where $x > y$.

According to the question,

$(x + y) - (x - y) = 30$

$\Rightarrow x + y - x + y = 30$
$\Rightarrow 2y = 30$
$\Rightarrow y = \frac{30}{2} = 15$
$\therefore xy = 900$
$\Rightarrow 15x = 900$
$\Rightarrow x = \frac{900}{15} = 60$

130. (3) According to the question,
Divisor (d) = 5r = 5 × 46 = 230
Again, Divisor (d) = 10 × Quotient (q)
$\Rightarrow 230 = q \times 10$
$\Rightarrow q = \frac{230}{10} = 23$
∴ Dividend = Divisor × Quotient + Remainder
= 230 × 23 + 46
= 5290 + 46 = 5336

131. (3) Divided = 44 × 432 = 19008

```
31) 19008 (613
    186
     40
     31
      98
      93
       5
```

∴ Remainder = 5

132. (2) Here, first divisor (729) is a multiple of second divisor (27).
∴ Required remainder = Remainder got on dividing 56 by 27 = 2.

133. (4) Smallest number of six digits
= 100000

```
108) 100000 (925
     972
     280
     216
      640
      540
      100
```

∴ Required number
= 100000 + (108 – 100)
= 100008

134. (2) Let the number be x.
According to the question,
$x + 25 = 3x - 3$
$\Rightarrow 3x - x = 25 + 3$
$\Rightarrow 2x = 28 \Rightarrow x = 14$

135. (1) 334 × 545 × 7p is divisible by 3340.
$\Rightarrow$ 334 × 5 × 109 × 7 × p, is divisible by 334 × 2 × 5
Clearly, $p = 2$

136. (2) Let the number be a.
According to the question,
$a + \frac{1}{a} = 2$
$\Rightarrow a^2 + 1 = 2a \Rightarrow a^2 - 2a + 1 = 0$
$\Rightarrow (a - 1)^2 = 0 \Rightarrow a - 1 = 0$
$\Rightarrow a = 1$

137. (3) ∵ First divisor (56) is a multiple of second divisor (8).
∴ Required remainder
= Remainder obtained after dividing 29 by 8 = 5

138. (2) Let the number be x.
According to the question,
$x - 4 = \frac{21}{x}$
$\Rightarrow x^2 - 4x = 21$
$\Rightarrow x^2 - 4x - 21 = 0$
$\Rightarrow x^2 - 7x + 3x - 21 = 0$
$\Rightarrow x(x - 7) + 3(x - 7) = 0$
$\Rightarrow (x + 3)(x - 7) = 0$
$\Rightarrow x = 7$ because $x \neq -3$.

139. (2) Let quotient be 1.
∴ $n = 4 \times 1 + 3 = 7$
∴ $2n = 2 \times 7 = 14$,
On dividing 14 by 4, remainder = 2

140. (1) Divisor = 555 + 445 = 1000
Quotient = (555 – 445) × 2
= 110 × 2 = 220
Remainder = 30
∴ Dividend = Divisor × Quotient + Remainder
= 1000 × 220 + 30 = 220030

141. (1) According to the question,
Divisor = 2 × remainder
= 2 × 80 = 160
Again, 4 × quotient = 160
$\Rightarrow$ Quotient = $\frac{160}{4} = 40$
∴ x = Divisor × Quotient + remainder
= 160 × 40 + 80 = 6480

142. (2) Here, first divisor (342) is a multiple of second divisor (18).
i.e. 342 ÷ 18 = 19
∴ Required remainder
= Remainder on dividing 47 by 18 = 11

143. (3) Let second number = x.
∴ First number = $3x$
Third number = $\frac{2}{3} \times 3x$
$= 2x$
According to the question,
$3x + x + 2x = 252$
$\Rightarrow 6x = 252$
$\Rightarrow x = \frac{252}{6} = 42$

144. (3) Five-digit numbers formed by 2, 5, 0, 6 and 8 :
Largest number = 86520
Smallest number = 20568
Required difference
= 86520 – 20568 = 65952

145. (1) Let the number of cows be x.
∵ A hen or a cow has only one head.
∴ Number of hens = 50 – x
A hen has two feet.
A cow has four feet.
According to the question,
$4x + 2(50 - x) = 142$
$\Rightarrow 4x + 100 - 2x = 142$
$\Rightarrow 2x = 142 - 100 = 42$
$\Rightarrow x = \frac{42}{2} = 21$

146. (2) Firstly, we find LCM of 5, 6, 7 and 8.

2	5,	6,	7,	8
	5,	3,	7,	4

$\Rightarrow$ LCM = 2 × 5 × 4 × 3 × 7= 840
Required number
= 840x + 3 which is exactly divisible by 9.
Now, 840x + 3
= 93x × 9 + 3x + 3
When x = 2 then 840x + 3, is divisible by 9.
∴ Required number
= 840 × 2 + 3 = 1683

147. (4) A 3–digit number
= 100x + 10y + z
Sum of digits = $x + y + z$
Difference
= 100x + 10y + z – x – y – z
= 99x + 9y = 9 (11x + y) i.e., multiple of 9.

148. (1)

```
84 ) 8961 (106
     84
      561
      504
      ×57 ⇒ Remainder
```

∴ Required number = 84 – 57
= 27

149. (1) Number of numbers lying between 67 and 101
$\Rightarrow 101 - 67 - 1 = 33$
Prime numbers $\Rightarrow$ 71, 73, 79, 83, 89 and 97 = 6
$\therefore$ Composite numbers
$= 33 - 6 = 27$

150. (3) LCM of 9, 11 and 13
$= 9 \times 11 \times 13 = 1287$
$\therefore$ Required lowest number that leaves 6 as remainder
$= 1287 + 6 = 1293$
$\therefore$ Required answer
$= 1294 - 1293 = 1$

151. (3) A number is divisible by 8 if number formed by the last three digits is divisible by 8.
$\therefore$ If $*$ is replaced by 3, then $632 \div 8 = 79$

152. (4) 87) 13851 (159

```
  87
 ----
 515
 435
 ----
  801
  783
 ----
   18
```

$\therefore$ Required number
$= 87 - 18 = 69$

153. (2) If the sum of the digits of a number be divisible by 9, the number is divisible by 9.
Sum of the digits of 451 * 603
$= 4 + 5 + 1 + * + 6 + 0 + 3$
$= 19 + *$
If $* = 8$, then $19 + 8 = 27$ which is divisible by 9.

154. (2) The largest 4-digit number = 9999

```
88 ) 9999 ( 113
     88
     ---
     119
      88
      ---
      319
      264
      ---
       55 ⇒ Remainder
```

$\therefore$ Required number
$= 9999 - 55 = 9944$

155. (1) A number is divisible by 99 if it is divisible by 9 and 11 both.
Sum of the digits of the number 57717
$= 5 + 7 + 7 + 1 + 7 = 27$ which is divisible by 9.
Difference between the sum of digits at odd and even places = $(7 + 7 + 5) - (7 + 1)$
$= 19 - 8 = 11$ which is a multiple of 11.
$\therefore$ Required number = 57717

156. (3) Prime numbers between 58 and 68 $\Rightarrow$ 59, 61 and 67
$\therefore$ Required sum $= 59 + 61 + 67$
$= 187$

157. (3) Let the two digit number be $10x + y$.
According to the question,
$xy = 24$ .... (i)
and, $10x + y + 45 = 10y + x$
$\Rightarrow 10y + x - 10x - y = 45$
$\Rightarrow 9y - 9x = 45$
$\Rightarrow 9(y - x) = 45$
$\Rightarrow y - x = \frac{45}{9} = 5$ ... (ii)
$\therefore (x + y)^2 = (y - x)^2 + 4xy$
$= 5^2 + 4 \times 24$
$= 25 + 96 = 121$
$\Rightarrow x + y = \sqrt{121} = 11$ ... (iii)
On adding equations (ii) and (iii),
$y - x + x + y = 5 + 11$
$\Rightarrow 2y = 16 \Rightarrow y = 8$
$\therefore xy = 24 \Rightarrow 8x = 24$
$\Rightarrow x = \frac{24}{8} = 3$
$\therefore$ Required number $= 10x + y = 10 \times 3 + 8 = 38$

4. (3) A number is divisible by 11 if the difference between the sum of digits at odd places and that at even places is either zero or a multiple of 11.
Sum of the digits at odd places = $6 + 8 + 5 = 19$
Sum of the digits at even places $= 9 + 6 + 7 = 22$
$\therefore$ Required number=22–19 = 3

6. (3) According to the question,
First number $= \frac{2 + 2 \times 5}{3}$
$= \frac{12}{3}$
$= 4$
$\therefore$ Second number $= \frac{48}{4} = 12$

TYPE-III

1. (3) $\because$ 135 Litres $= \frac{1}{4}th$ part
180 Litres $= \frac{1}{4} \times \frac{180}{135} = \frac{1}{3}$

2. (1) $? = 369 \times \frac{1}{2} \times \frac{2}{3} = 123$

3. (3) Let the number be x.
$\therefore$ According to question,
$\frac{x}{5} - \frac{x}{7} = 10 \Rightarrow \frac{7x - 5x}{35} = 10$
$\Rightarrow \frac{2x}{35} = 10$
$\Rightarrow x = \frac{10 \times 35}{2} = 175$

4. (2) Let the amount be ₹ x
$\therefore$ According to question,
$\frac{8}{3}x - \frac{3}{8}x = 55$
$\Rightarrow \frac{64x - 9x}{24} = 55$
$\Rightarrow \frac{55x}{24} = 55$ or, $x =$ ₹ 24

5. (1) Let the total number of students in a class be x
$\therefore$ According to question,
Number of girls $= \frac{3}{5}x$
and number of boys $= x - \frac{3x}{5}$
$= \frac{2}{5}x$
Number of girls who are absent
$= \frac{3}{5} \times \frac{2}{9}x = \frac{6x}{45}$
and number of boys who are absent
$= \frac{2}{5} \times \frac{1}{4} \times x = \frac{x}{10}$
$\therefore$ Total number of students who are present
$= x - \frac{6x}{45} - \frac{x}{10}$
$= \frac{(90 - 12 - 9)x}{90}$
$= \frac{69x}{90} = \frac{23x}{30}$
Therefore, the $\frac{23}{30}$ part of the students are present in the class.

6. (4) Let the longer part be x
$\therefore$ According to question,
Shortest part $= \frac{2x}{3}$
$\therefore x + \frac{2}{3}x = 85m$
$\Rightarrow \frac{3x + 2x}{3} = 85$
$\Rightarrow \frac{5x}{3} = 85$
$\therefore x = 51m$

7. (1) $\frac{2}{5}$ and $\frac{4}{9} = 0.40$ and 0.44
Fraction between these two
$= \frac{3}{7} = 0.42$

8. (1) $\frac{2}{3} \times \frac{3}{4} = \frac{1}{2}$

9. (1) Suppose required number is x Then,

$$3x - \frac{3x}{5} = 60 \Rightarrow \frac{12x}{5} = 60$$

$$\Rightarrow x = \frac{60 \times 5}{12} = 25$$

10. (4) $\frac{1}{2}$ of 1%

$$= \frac{1}{2} \times \frac{1}{100} = \frac{0.01}{2} = 0.005$$

11. (1) Remaining race

$$= 5 - 1\frac{1}{4} \text{ laps}$$

$$= 5 - \frac{5}{4} \text{laps} = \frac{15}{4} \text{laps}$$

12. (2) Given

$$\frac{a}{b} \times \frac{c}{d} = \frac{14}{15} \quad \text{...(i)}$$

$$\frac{a}{b} \times \frac{d}{c} = \frac{35}{24} \quad \text{...(ii)}$$

Now multiplying both the equations

$$\frac{ac}{bd} \times \frac{ad}{bc} = \frac{14}{15} \times \frac{35}{24}$$

$$\Rightarrow \frac{a^2}{b^2} = \frac{49}{36} \Rightarrow \frac{a}{b} = \frac{7}{6}$$

$$\therefore \frac{c}{d} = \frac{\frac{14}{15}}{\frac{7}{6}} = \frac{4}{5}$$

But the greater fraction is $\frac{7}{6}$.

13. (1) Let the fraction be x.

$$\therefore \frac{4x}{7} + \frac{4}{7} = \frac{15}{14}$$

$$\Rightarrow \frac{4x}{7} = \frac{15}{14} - \frac{4}{7} = \frac{15-8}{14} = \frac{1}{2}$$

$$\Rightarrow x = \frac{1}{2} \times \frac{7}{4} = \frac{7}{8}$$

14. (2) Let the value of estate be ₹ x
According to the question

$$\frac{4}{5} \text{ of } x = 16800$$

$$\therefore x = \frac{16800 \times 5}{4} = ₹\ 21000$$

$$\therefore \frac{3}{7} \text{ of the value } = 21000 \times \frac{3}{7}$$

$$= 3000 \times 3 = ₹\ 9000$$

15. (2) Let the fraction = x
According to the question;

$$\frac{6}{7} \text{of } x = \frac{x}{\frac{6}{7}} - \frac{13}{70}$$

$$\Rightarrow \frac{6x}{7} = \frac{7x}{6} - \frac{13}{70}$$

$$\Rightarrow \frac{7x}{6} - \frac{6x}{7} = \frac{13}{70}$$

$$\Rightarrow \frac{49x - 36x}{42} = \frac{13}{70}$$

$$\Rightarrow \frac{13x}{42} = \frac{13}{70}$$

$$\therefore x = \frac{13 \times 42}{70 \times 13} = \frac{3}{5}$$

16. (3) Let the number is x.
According to the question

$$\frac{1}{2} \text{of} \frac{3}{4} \text{of } x = 2\frac{1}{2} \text{ of } 10$$

$$\Rightarrow \frac{3x}{8} = \frac{5}{2} \times 10$$

$$\Rightarrow x = \frac{5 \times 10 \times 8}{3 \times 2} = \frac{200}{3} = 66\frac{2}{3}$$

17. (4) Let the number be x.

$$\therefore \frac{x}{3 \times 4} = 15$$

$$\Rightarrow x = 15 \times 3 \times 4 = 180$$

Now, required number

$$= \frac{3}{10} x = \frac{3}{10} \times 180 = 54$$

18. (2) 1 day = 24 × 60 minutes
∴ Required fraction

$$= \frac{45}{24 \times 60} = \frac{1}{32}$$

19. (1) Let the numerator = x and denominator = y
∴ Fraction

$$= \frac{x}{y} \text{ and } \frac{x}{y+1} = \frac{1}{2}$$

$$\Rightarrow 2x = y + 1 \Rightarrow x = \frac{y+1}{2}$$

$$\frac{x+1}{y} = 1 \Rightarrow x + 1 = y$$

$$\Rightarrow \frac{y+1}{2} + 1 = y$$

$$\Rightarrow \frac{y+1+2}{2} = y$$

$$\Rightarrow y + 3 = 2y \Rightarrow y = 3$$

$$x + 1 = 3 \Rightarrow x = 2$$

$$\therefore xy = 2 \times 3 = 6$$

20. (2) Let the number = x

$$\therefore x \times \frac{5}{6} - x \times \frac{5}{16} = 250$$

$$\Rightarrow \frac{40x - 15x}{48} = 250$$

$$\Rightarrow \frac{25x}{48} = 250$$

$$\Rightarrow x = \frac{250 \times 48}{25} = 480$$

21. (2) Let the number be x.
According to the question,

$$x = \frac{x}{5} + 20 \Rightarrow x - \frac{x}{5} = 20$$

$$\Rightarrow \frac{4x}{5} = 20$$

$$\Rightarrow x = \frac{20 \times 5}{4} = 25$$

22. (2) Let the number be x.

$$\therefore \frac{2}{3}x = \frac{25}{216x} \Rightarrow x^2 = \frac{25 \times 3}{2 \times 216}$$

$$\therefore x = \sqrt{\frac{25 \times 3}{2 \times 216}} = \sqrt{\frac{25}{144}} = \frac{5}{12}$$

23. (1) Let the length of bamboo be x metres.
∴ Length of bamboo above water

$$= x - \frac{x}{10} - \frac{5x}{8}$$

$$= \frac{40x - 4x - 25x}{40} = \frac{11x}{40}$$

According to the question,

$$\frac{11x}{40} = 2.75$$

$$\Rightarrow x = \frac{2.75 \times 40}{11} = 10 \text{ metres.}$$

24. (3) Let the man's income be ₹ x
According to the question,

$$x - \frac{x}{3} - \frac{2x}{5} - \frac{1x}{5} = 400$$

$$\text{or } x\left(1 - \frac{1}{3} - \frac{2}{5} - \frac{1}{5}\right) = 400$$

or $x\left(\frac{15-5-6-3}{15}\right)=400$

or $x\times\frac{1}{15}=400$

or $x = 15 \times 400 =$ ₹ 6000

25. (4) $0.\overline{47}=\frac{47}{99}$

26. (2) $\frac{6}{\frac{7}{8}}=\frac{6\times 8}{7}=\frac{48}{7}$

$\frac{\frac{6}{7}}{8}=\frac{6}{7\times 8}=\frac{3}{28}$

$\therefore$ Required difference

$=\frac{48}{7}-\frac{3}{28}$

$=\frac{192-3}{28}=\frac{189}{28}=\frac{27}{4}=6\frac{3}{4}$

27. (2) Let the number be x.
According to the question

$\frac{x}{9}-\frac{x}{10}=4$

$\Rightarrow \frac{10x-9x}{90}=4$

$\Rightarrow x = 90 \times 4 = 360$

28. (2) $0.4\overline{23}=\frac{423-4}{990}=\frac{419}{990}$

29. (3) Decimal equivalent of :

$\frac{3}{4}=0.75$ and $\frac{5}{6}=0.833$

Now, $\frac{2}{3}=0.66$, $\frac{1}{2}=0.5$,

$\frac{4}{5}=0.8$ and $\frac{9}{10}=0.9$

Clearly, $\frac{4}{5}$ lies between $\frac{3}{4}$ and $\frac{5}{6}$.

30. (4) Let the tin contain x bottles of oil.
As given,

$\frac{4}{5}x-6+4=\frac{3}{4}x$

$\Rightarrow \frac{4}{5}x-\frac{3}{4}x=2$

$\Rightarrow \left(\frac{16-15}{20}\right)x=2$

$\Rightarrow \frac{x}{20}=2$

$\Rightarrow x = 2 \times 20 = 40$

$\therefore$ The tin can contain 40 bottles.

31. (1) Let the required number be x.
As given,

$\Rightarrow x\times\frac{5}{4}-x\times\frac{5}{14}=25$

$\Rightarrow 5x\left(\frac{1}{4}-\frac{1}{14}\right)=25$

$\Rightarrow 5x\left(\frac{7-2}{28}\right)=25 \Rightarrow 5x\times\frac{5}{28}=25$

$\Rightarrow x=\frac{25\times 28}{5\times 5}=28$

32. (2) Let the number be x.
Then,

$\frac{3}{4}x-\frac{3}{14}x=150$

$\Rightarrow \frac{21x-6x}{28}=150$

$\Rightarrow 15x = 28 \times 150$

$\Rightarrow x=\frac{28\times 150}{15}=280$

33. (2) Let the fractions be x and y, where $x > y$

$\therefore xy=\frac{14}{15}$ and $\frac{x}{y}=\frac{35}{24}$

$\therefore xy\times\frac{x}{y}=\frac{14}{15}\times\frac{35}{24}$

$\Rightarrow x^2=\frac{49}{36}$

$\Rightarrow x=\frac{7}{6}$

34. (3) The required fraction is $\frac{4}{5}$,

because $\frac{5}{4}-\frac{4}{5}=\frac{25-16}{20}=\frac{9}{20}$

35. (2) Let the fraction be x,
According to the question,

$\frac{x}{\frac{3}{5}}-x\times\frac{3}{5}=\frac{32}{75}$

$\Rightarrow \frac{5x}{3}-\frac{3x}{5}=\frac{32}{75}$

$\Rightarrow \frac{25x-9x}{15}=\frac{32}{75}$

$\Rightarrow \frac{16x}{15}=\frac{32}{75}$

$\Rightarrow x=\frac{32}{75}\times\frac{15}{16}=\frac{2}{5}$

Correct answer $=\frac{2}{5}\times\frac{3}{5}=\frac{6}{25}$

36. (2) Required number

$=\frac{3+1}{2+5}=\frac{4}{7}$ or

$\frac{1}{2}=0.5;\ \frac{3}{5}=0.6$

$\frac{4}{7}=0.57$

Clearly, $0.5 < 0.57 < 0.6$

37. (3) Let the number of pages in the book be x.
According to the question,

$\frac{2x}{5}+\frac{2x}{5}+\frac{x}{3}\times\frac{2}{5}+15=x$

$\Rightarrow \frac{4x}{5}+\frac{2x}{15}+15=x$

$\Rightarrow \frac{12x+2x+225}{15}=x$

$\Rightarrow 15x = 14x + 225$

$\Rightarrow 15x - 14x = 225$

$\Rightarrow x = 225$

38. (3) 0.121212 ....

$=0.\overline{12}=\frac{12}{99}=\frac{4}{33}$

39. (2) $0.\overline{001}=\frac{1}{999}$

40. (3) $1.\overline{27}=1\frac{27}{99}=1\frac{3}{11}=\frac{14}{11}$

41. (1) Let the number be x.

$\therefore \frac{x}{7}-\frac{x}{11}=100$

$\Rightarrow \frac{11x-7x}{11\times 7}=100$

$\Rightarrow 4x = 77 \times 100$

$\Rightarrow x=\frac{77\times 100}{4}=1925$

42. (1) $\frac{1}{15}+\frac{1}{35}+\frac{1}{63}+\frac{1}{99}+\frac{1}{143}$

$=\frac{1}{3\times5}\times\frac{1}{5\times7}+\frac{1}{7\times9}$

$+\frac{1}{9\times11}+\frac{1}{11\times13}$

$=\frac{1}{2}\left(\frac{1}{3}-\frac{1}{5}+\frac{1}{5}-\frac{1}{7}+\frac{1}{7}-\frac{1}{9}+\frac{1}{9}-\frac{1}{11}+\frac{1}{11}-\frac{1}{13}\right)$

$=\frac{1}{2}\left(\frac{1}{3}-\frac{1}{13}\right)=\frac{1}{2}\left(\frac{13-3}{39}\right)=\frac{5}{39}$

43. (4) $2.\dot{5}\dot{2}=2\frac{52}{99}=\frac{250}{99}$

$\therefore$ Required sum

$= 250 + 99 = 349$

44. (1) Let the length of the rod be x metres. According to the question,

$x-\left(\frac{x}{10}+\frac{x}{20}+\frac{x}{30}+\frac{x}{40}+\frac{x}{50}+\frac{x}{60}\right)$

$=12.08$

$\Rightarrow x\left[1-\left(\frac{60+30+20+15+12+10}{600}\right)\right]$

$= 12.08$

$\Rightarrow x\left(1-\frac{147}{600}\right)=12.08$

$\Rightarrow x\left(\frac{600-147}{600}\right)=12.08$

$\Rightarrow x\times\frac{453}{600}=12.08$

$\Rightarrow x=\frac{12.08\times600}{453}=16$ m.

45. (4) Height of tree after 1 year

$=64+64\times\frac{1}{8}=72$ cm

Height of tree after 2 years

$=72+72\times\frac{1}{8}$

$= 72 + 9 = 81$ cm

46. (1) Suppose total income

= ₹ x

$\therefore\ x-\frac{x}{4}-\frac{2x}{3}=630$

$\frac{x}{12}=630\quad\therefore x=7560$

$\therefore$ House rent $=\frac{2}{3}\times7560$

= ₹ 5040

47. (3) Required answer

$=\frac{\frac{125}{3}}{\frac{1}{6}}=\frac{125}{3}\times6=250$

48. (2) $\frac{5}{8}=0.625$; $\frac{7}{11}=0.636$

$\frac{20}{30}=0.666\ldots$; $\frac{19}{30}=0.633\ldots$

49. (3) Let numerator be x, then denominator = $11 - x$.

$\therefore$ Fraction $=\frac{x}{11-x}$

Again, $\frac{x+2}{11-x+2}$

$=\frac{x}{11-x}+\frac{1}{24}$

$\Rightarrow\frac{x+2}{13-x}-\frac{x}{11-x}=\frac{1}{24}$

$\Rightarrow\frac{11x-x^2+22-2x-13x+x^2}{(13-x)(11-x)}$

$=\frac{1}{24}$

$\Rightarrow\frac{22-4x}{(13-x)(11-x)}=\frac{1}{24}$

$\Rightarrow 528-96x=143-24x+x^2$

$\Rightarrow x^2+72x-385=0$

$\Rightarrow x^2+77x-5x-385=0$

$\Rightarrow x(x+77)-5(x+77)=0$

$\Rightarrow (x-5)(x+77)=0\Rightarrow x=5$

$\therefore$ Denominator = 11 – 5 = 6

$\therefore$ Difference = 6 – 5 = 1

50. (2) Let the original fraction be $\frac{x}{x+3}$.

$\therefore\frac{x+7}{x+3-2}=2$

$\Rightarrow x+7=2x+2$

$\Rightarrow x=7-2=5$

$\therefore$ Required sum $= x + x + 3$

$= 2x + 3 = 10 + 3 = 13$

51. (1) Let the original fraction be $\frac{x}{y}$.

$\therefore\frac{x-1}{y-1}=\frac{1}{3}\Rightarrow 3x-3=y-1$

$\Rightarrow 3x-y=2$ .....(i)

Again, $\frac{x+1}{y+1}=\frac{1}{2}\Rightarrow 2x+2=y+1$

$\Rightarrow 2x-y=-1$ ....(ii)

From equation (i) – (ii)

$3x-y-2x+y=2+1$

$\Rightarrow x=3$

From equation (i)

$3\times3-y=2\Rightarrow y=9-2=7$

$\Rightarrow x+y=3+7=10$

52. (4) Let the number be x.

$\frac{x}{\frac{7}{8}}-\frac{7x}{8}=15$

$\Rightarrow\frac{8x}{7}-\frac{7x}{8}=15$

$\Rightarrow\frac{64x-49x}{56}=15$

$\Rightarrow\frac{15x}{56}=15$

$\Rightarrow x=56$

$\therefore$ Sum of the digit = 5 + 6 = 11

53. (3) Let the given number be x.

$\therefore\frac{x}{\frac{8}{17}}-\frac{8x}{17}=225$

$\Rightarrow\frac{17x}{8}-\frac{8x}{17}=225$

$\Rightarrow\frac{289x-64x}{136}=225$

$\Rightarrow\frac{225x}{136}=225\Rightarrow x=136$

54. (1) Let the original fraction be $\frac{x}{y}$.

$\therefore\frac{x+1}{y+1}=\frac{1}{4}$

$\Rightarrow 4x+4=y+1$

$\Rightarrow 4x-y=-3$ ...(i)

In case II,

$\frac{x+2}{y+2}=\frac{1}{3}$

$\Rightarrow 3x+6=y+2$

$\Rightarrow 3x-y=-4$ ...(ii)

By (i) – (ii),

$4x-y-3x+y=-3+4$

$\Rightarrow x=1$

From (i),

$4\times1-y=-3\Rightarrow y=7$

$\therefore x+y=1+7=8$

55. (2) Let the number be x.

$\therefore \frac{x}{5}+4=\frac{x}{4}-10$

$\Rightarrow \frac{x}{4}-\frac{x}{5}=10+4=14$

$\Rightarrow \frac{5x-4x}{20}=14$

$\Rightarrow x = 20 \times 14 = 280$

56. (2) Part of the property given away

$=\frac{1}{4}+\frac{1}{2}+\frac{1}{5}$

$=\frac{5+10+4}{20}=\frac{19}{20}$

57. (2) Unbroken tables

$=\frac{5}{6}\times 108=90$

Unbroken chairs $=\frac{3}{4}\times 132=99$

Unbroken pairs = 90

58. (2) A + B + C + D = 60

$A=\frac{B+C+D}{2}$

$\Rightarrow 3A = 60 \Rightarrow A =$ ₹ 20

$B=\frac{A+C+D}{3}$

$\Rightarrow 4B = 60 \Rightarrow B =$ ₹ 15

$C=\frac{A+B+D}{4}$

$\Rightarrow 5C = 60 \Rightarrow B =$ ₹ 12

D = 60 – (20 + 15 + 12) = ₹ 13

59. (2) If the number of boys be x, and that of girls be y, then

$\frac{x}{10}=\frac{y}{4}\Rightarrow \frac{x}{y}=\frac{10}{4}=\frac{5}{2}=5:2$

60. (1) Solve this question by options.

Original fraction $=\frac{7}{9}$

Adding 2 to numerator and denominator, fraction $=\frac{9}{11}$

Adding 3 to numerator and denominator, fraction $=\frac{10}{12}$

$=\frac{5}{6}$, which is correct.

61. (4) $\frac{3}{4}=\frac{3\times 4}{4\times 4}=\frac{12}{16}$

$\frac{3}{8}=\frac{6}{16}$

$\therefore \frac{6}{16},\frac{7}{16},\frac{8}{16},\frac{9}{16},\frac{10}{16},\frac{11}{16},\frac{12}{16}$

$\therefore$ Required rational number

$=\frac{9}{16}$

$\frac{12}{9},\frac{7}{3},\frac{16}{9}$ are all greater than 1, only $\frac{9}{16}<1$, hence it is the obvious choice)

62. (2) Original fraction $=\frac{x-4}{x}$

In case II,

$8(x-4-2)=x+1$

$\Rightarrow 8x-48=x+1$

$\Rightarrow 7x=49 \quad \Rightarrow x=7$

$\therefore$ Original fraction

$=\frac{7-4}{7}=\frac{3}{7}$

63. (3) Boys = x

Girls = $z-x$

$\therefore$ Part of girls $=\frac{z-x}{z}=1-\frac{x}{z}$

64. (2) First part = x,

Second part = $50-x$

$\therefore \frac{1}{x}+\frac{1}{50-x}=\frac{1}{12}$

Put values of x from the given options. Otherwise

$\Rightarrow \frac{50-x+x}{x(50-x)}=\frac{1}{12}$

$\Rightarrow x(50-x)=600$

$\Rightarrow x^2-50x+600=0$

$\Rightarrow x^2-30x-20x+600=0$

$\Rightarrow x(x-30)-20(x-30)=0$

$\Rightarrow (x-20)(x-30)=0$

$\Rightarrow x = 20$ or 30

65. (4) Number of seats in each bus = 10 (let)

Total passengers $=\frac{30\times 4}{5}=24$

$\frac{1}{4}$ of the passengers leave the bus.

Remaining passengers

$=24\times\frac{3}{4}=18$

$\therefore$ Required answer

$=\frac{18}{20}=\frac{9}{10}$

66. (2) $0.\overline{123}=\frac{123}{999}=\frac{41}{333}$

67. (2) 0.393939 .....

$=0.\dot{3}\dot{9}=\frac{39}{99}=\frac{13}{33}$

68. (3) $\frac{1}{11}=0.0909.....=0.\overline{09}$

69. (2) $2.3\overline{49}=\frac{2349-23}{990}$

$=\frac{2326}{990}$

70. (3) Expression

$=\frac{1}{20}+\frac{1}{30}+\frac{1}{42}+\frac{1}{56}+\frac{1}{72}+\frac{1}{90}$

$=\frac{1}{4\times 5}+\frac{1}{5\times 6}+\frac{1}{6\times 7}+\frac{1}{7\times 8}+\frac{1}{8\times 9}+\frac{1}{9\times 10}$

$=\left(\frac{1}{4}-\frac{1}{5}\right)+\left(\frac{1}{5}-\frac{1}{6}\right)....+\left(\frac{1}{9}-\frac{1}{10}\right)$

$=\frac{1}{4}-\frac{1}{10}=\frac{5-2}{20}=\frac{3}{20}$

71. (1) $?=1+\frac{1}{2}+\frac{1}{4}+\frac{1}{7}+\frac{1}{14}+\frac{1}{28}$

$=\frac{28+14+7+4+2+1}{28}$

$=\frac{28+28}{28}=2$

72. (3) Expression

$=\frac{1}{20}+\frac{1}{30}+\frac{1}{42}+....+\frac{1}{132}$

$=\frac{1}{4\times 5}+\frac{1}{5\times 6}+\frac{1}{6\times 7}+....+\frac{1}{11\times 12}$

$=\frac{1}{4}-\frac{1}{5}+\frac{1}{5}-\frac{1}{6}+\frac{1}{6}-\frac{1}{7}+.....+\frac{1}{11}-\frac{1}{12}$

$=\frac{1}{4}-\frac{1}{12}=\frac{3-1}{12}=\frac{2}{12}=\frac{1}{6}$

73. (3) The original property with Ram = ₹ x (let)

$\therefore$ Wife's share = Rs. $\frac{x}{3}$

Remaining property

$= x - \frac{x}{3} =$ ₹ $\frac{2x}{3}$

Daughter's share $= \frac{2x}{3} \times \frac{3}{5}$

$=$ ₹ $\frac{2x}{5}$

Son's share $= \frac{2x}{3} - \frac{2x}{5}$

$= \frac{10x - 6x}{15} =$ ₹ $\frac{4x}{15}$

$\therefore \frac{4x}{15} = 6400$

$\Rightarrow 4x = 6400 \times 15$

$\Rightarrow x = \frac{6400 \times 15}{4} =$ ₹ 24000

74. (1) Let the number be x.
According to the question,

$x - \frac{2x}{5} = 75$

$\Rightarrow \frac{5x - 2x}{5} = 75$

$\Rightarrow \frac{3x}{5} = 75$

$\Rightarrow x = \frac{75 \times 5}{3} = 125$

75. (4) First number = x (let)

$\therefore$ Second number $= \frac{2x}{5}$

$\therefore x + \frac{2x}{5} = 50$

$\Rightarrow \frac{5x + 2x}{5} = 50$

$\Rightarrow 5x + 2x = 50 \times 5$

$\Rightarrow 7x = 250$

$\Rightarrow x = \frac{250}{7}$

$\therefore$ Second number

$= \frac{2}{5} \times \frac{250}{7} = \frac{100}{7}$

76. (2) Let the number be x.
According to the question,

$\frac{3x}{4} - \frac{x}{6} = 7$

$\Rightarrow \frac{9x - 2x}{12} = 7$

$\Rightarrow 7x = 12 \times 7$

$\Rightarrow x = \frac{12 \times 7}{7} = 12$

$\therefore \frac{5x}{3} = \frac{5}{3} \times 12 = 20$

77. (4) $0.39\overline{39} = 0.\overline{39}$

$= \frac{39}{99} = \frac{13}{33}$.

78. (4) $2\frac{1}{2} + 3\frac{1}{3} + 4\frac{1}{4} + 5\frac{1}{5}$

$= (2 + 3 + 4 + 5) + \left(\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}\right)$

$= 14 + \left(\frac{30 + 20 + 15 + 12}{60}\right)$

$= 14 + \frac{77}{60} = 14 + 1\frac{17}{60}$

$= 15\frac{17}{60}$

$\therefore$ Required answer $= 1 - \frac{17}{60} =$

$\frac{60 - 17}{60} = \frac{43}{60}$

79. (4) $\frac{5}{6} = 0.83$

$\frac{8}{15} = 0.53$

$\frac{6}{7} = 0.86$

Clearly, $0.53 < 0.83 < 0.86$

80. (4) Let the first number be x.
$\therefore$ Second number $= x + 2$
According to the question,
$x + 2 = 7 + c - 4 = 3 + c$
$\Rightarrow x = 1 + c$
$\therefore$ Fraction

$= \frac{x(x+2)}{7+c} = \frac{(1+c)(3+c)}{7+c}$

For the minimum value,
$-3 < c < -1$
$\therefore c = -2$
$\therefore$ Required value of fraction $= -\frac{1}{5}$

81. (2) Let second number be x.

$\therefore$ First number $= \frac{x}{2}$

Third number $= \frac{x}{4}$

$\therefore x + \frac{x}{2} + \frac{x}{4} = 2$

$\Rightarrow \frac{4x + 2x + x}{4} = 2$

$\Rightarrow 7x = 8 \Rightarrow x = \frac{8}{7}$

82. (1) Let the number be x.
According to the question,

$\left(x + \frac{1}{2}\right) \times 3 = 21$

$\Rightarrow x + \frac{1}{2} = \frac{21}{3} = 7$

$\Rightarrow x = 7 - \frac{1}{2} = \frac{13}{2} = 6.5$

83. (3) Let the number be x.
According to the question,

$\frac{4x}{5} - \frac{3x}{4} = 8$

$\Rightarrow \frac{16x - 15x}{20} = 8$

$\Rightarrow \frac{x}{20} = 8$

$\Rightarrow x = 20 \times 8 = 160$

84. (1) $\because$ A mason makes a wall in 70 hours.
$\therefore$ Part of wall built by the mason in 7 hours $= \frac{7}{70}$

$= \frac{1}{10}$

$\therefore$ Remaining part $= 1 - \frac{1}{10}$

$= \frac{9}{10} = 0.9$

85. (3) Let the number of oranges in the first basket be x.
$\therefore$ Number of oranges in the second basket $= 640 - x$
According to the question,

$x - \frac{x}{5} = 640 - x + \frac{x}{5}$

$= 640 - \left(x - \frac{x}{5}\right)$

$\Rightarrow \frac{4x}{5} = 640 - \frac{4x}{5}$

$\Rightarrow \frac{4x}{5} + \frac{4x}{5} = 640$

$\Rightarrow \frac{8x}{5} = 640 \Rightarrow 8x = 640 \times 5$

$\Rightarrow x = \frac{640 \times 5}{8} = 400$

TYPE-IV

1. (3) Firstly, we express every fraction in decimal form.

$\frac{4}{5} = 0.8$; $\frac{7}{8} = 0.875$

$\frac{6}{7} = 0.857$

$\frac{5}{6} = 0.833 = 0.8\dot{3}$

So, $\frac{4}{5} < \frac{5}{6} < \frac{6}{7} < \frac{7}{8}$

2. (3) The decimal equivalent of

$\frac{3}{5} = 0.6, \frac{7}{9} = 0.777..,....$

$\frac{11}{13} = 0.846$

Obviously, $0.846 > 0.\dot{7} > 0.6$

$\therefore$ The required decreasing order

$= \frac{11}{13}, \frac{7}{9}, \frac{3}{5}$

3. (3) $\frac{1}{3} = 0.333....$,

$\frac{4}{7} = 0.5714$, $\frac{2}{5} = 0.4$

Clearly,

$0.\overline{33} < 0.4 < 0.5714$

$\therefore \frac{1}{3} < \frac{2}{5} < \frac{4}{7}$

4. (2) Numbers are :

$a > b > c > d > e > f$

According to the question,

$a + b + c + d + e = 5 \times 30$

$= 150$ --- (i)

$b + c + d + e + f = 5 \times 25$

$= 125$ --- (ii)

By equation (i) – (ii)

$a - f = 150 - 125 = 25$

5. (4) Let the numbers be x, $x + 1$ and $x + 2$.

$\therefore x + x + 1 + x + 2 = 51$

$\Rightarrow 3x + 3 = 51$

$\Rightarrow 3x = 51 - 3 = 48$

$\Rightarrow x = \frac{48}{3} = 16$

$\therefore$ Middle number = 16 + 1= 17

TYPE-V

1. (1) The digit in unit's place = unit's digit in the product $1 \times 2 \times 3 \times .... \times 9 = 0$.

2. (3) Unit's digit in $3^4 = 1$

So, unit digit in $3^{164} = 1$

Now, unit's digit in $(2153)^{167}$

= unit digit in 3^{167}

= unit digit in $3^3 = 7$

3. (1) $(4)^{2m}$ gives 6 at unit digit.

$(4)^{2m+1}$ gives 4 at unit digit.

$(5)^n$ gives 5.

The same is the case with 1.

$\therefore$ Required digit = Unit's digit in the product of $4 \times 5 \times 1 = 0$

4. (1) Unit digit in $(264)^4$ i.e.

$4 \times 4 \times 4 \times 4$ is 6

$\therefore$ Unit digit in

$(264)^{100}$ is also 6.

Now, $(264)^{102} = (264)^{100} \times (264)^2$

= (Unit digit 6) × (Unit digit 6)=36

$\therefore$ Unit digit is 6

Similarly,

$(264)^{103} + (264)^{100} \times (264)^3$

Therefore, the unit digit in $(264)^{102} + (264)^{103}$ is 6 + 4 = 10 i.e. 0.

5. (2) $(251)^{98} = ...1$

$(21)^{29} = ...1$

$(106)^{100} = ...6$

$(705)^{35} = ...5$

$(16)^4 = ...6$

$259 = ...9$

$\therefore$ Required answer = 1 + 1 – 6 + 5 – 6 + 9 = 16 – 12 = 4

6. (1) $3^1 = 3$; $3^2 = 9$; $3^3 = 27$;

$3^4 = 81$; $3^5 = 343$; .....

$\therefore$ Remainder on dividing 40 by 4 = 0

$\therefore$ Unit's digit in $3^{40} = 1$

7. (2)

Unit digit

$7^{\boxed{1}} \Rightarrow \boxed{7}$

$7^2 \Rightarrow 9$

$7^3 \Rightarrow 3$

$7^4 \Rightarrow 1$

$7^5 \Rightarrow 7$

4

4) 105 (26

8

25

24

1

$7^1 \Rightarrow \boxed{7}$

8. (4) Expression = $(2137)^{754}$

Unit's digit in 2137 = 7

Now, $7^1 = 7$, $7^2 = 49$, $7^3 = 343$, $7^4 = 2401$, $7^5 = 16807$, ...

Clearly, after index 4, the unit's digit follow the same order.

Dividing index 754 by 4 we get remainder = 2

$\therefore$ Unit's digit in the expansion of $(2137)^{754}$ = Unit's digit in the expansion of $(2137)^2 = 9$

9. (3) Unit's digit in the expansion of $(22)^{23}$

= Unit's digit in the expansion of $(2)^{23}$

Now,

$2^1 = 2$

$2^2 = 4$

$2^3 = 8$

$2^4 = 16$

$2^5 = 32$

i.e. 2 repeats itself after the index 4.

On dividing 23 by 4, remainder = 3

$\therefore$ Unit's digit in $(2)^{23}$

= Unit's digit in $(2)^3 = 8$

10. (1) $2^1 = 2$; $2^2 = 4$;

$2^3 = 8$; $2^4 = 16$; $2^5 = 32$

$\therefore$ Unit digit in the product of $(122)^{173}$

= Unit digit in $(122)^1 = 2$

(1 = remainder when 173 is divided by 4).

11. (4) $4^1 = 4$; $4^2 = 16$; $4^3 = 64$; $4^4 = 256$; $4^5 = 1024$

Remainder on dividing 372 by 4 = 0

Remainder on dividing 373 by 4 = 1

$\therefore$ Required unit digit

= Unit digit of the sum of 6 + 4 = 0

12. (2) Last digit of $(1001)^{2008} + 1002$

= 1 + 2 = 3

13. (4) $7^1 = 7$; $7^2 = 49$; $7^3 = 343$;

$7^4 = 2401$; $7^5 = 16807$

i.e. The unit's digit repeats itself after power 4.

Remainder after we divide 245 by 4 = 1

$\therefore$ Unit's digit in the product of $(4387)^{245} \times (621)^{72}$ = Unit's digit in the product of $(4387)^1 \times (621)^{72}$

$= 7 \times 1 = 7$

14. (4) Unit digit in the expansion of 25^{6251}

= Unit digit in the expansion of $5^{6251} = 5$

$36^{528} \equiv$ Unit digit in $6^{528} = 6$

Now, $3^1 = 3$, $3^2 = 9$, $3^3 = 27$; $3^4 = 81$, $3^5 = 243$....

$\therefore 73^{54} = 73^{52} \times 73^2$

$\equiv 3^2 = 9$

$\therefore$ Required digit = Unit's digit of the sum 5 + 6 + 9 = 0

15. (4) $7^1 = 7$, $7^2 = 49$, $7^3 = 343$, $7^4 = 2401$

$3^1 = 3$, $3^2 = 9$, $3^3 = 27$, $3^4 = 81$

i.e. the digit at unit's place gets repeated after power 4. Unit 6 remains same for any power.

$\therefore$ Required unit's digit

= Unit's digit in the product of $7^3 \times 6 \times 3^1 = 4$

16. (1) Unit's digit in $(1570)^2 = 0$

Unit's digit in $(1571)^2 = 1$

Unit's digit in $(1572)^2 = 4$

Unit's digit in $(1573)^2 = 9$

$\therefore$ Required unit's digit

= Unit's digit (0 +1+4 + 9) = 4

17. (4) Unit's digit in 3 × 38 × 537 × 1256

= Unit's digit in 3 × 8 × 7 × 6

= 4 × 2 = 8

18. (4) Ten's digit $= x$

Unit's digit $= 2x - 1$

$\therefore$ Original number

$= 10x + (2x - 1)$

$= 12x - 1$

New number $= 10(2x - 1) + x$

$= 20x - 10 + x = 21x - 10$

$\therefore (21x - 10) - (12x + 1)$

$= 12x - 1 - 20$

$\Rightarrow 9x - 9 = 12x - 21$

$\Rightarrow 3x = 12 \Rightarrow x = 4$

$\Rightarrow$ Original number $= 12x - 1$

$= 12 \times 4 - 1 = 47$

[check through options].

19. (1) Required unit's digit

= Unit's digit in the product of 7 × 5 × 8 × 3 × 9 = 0

20. (1) Let the two–digit number be $10x + y$ where $x < y$.

Number obtained on reversing the digits $= 10y + x$

According to the question,

$10y + x = 4(10x + y) - 24$

$\Rightarrow 40x + 4y - 10y - x = 24$

$\Rightarrow 39x - 6y = 24$

$\Rightarrow 13x - 2y = 8$ ....(i)

Again, $y - x = 7$

$\Rightarrow y = x + 7$ ....(ii)

$\therefore 13x - 2(x + 7) = 8$

$\Rightarrow 13x - 2x - 14 = 8$

$\Rightarrow 11x = 14 + 8 = 22$

$\Rightarrow x = \frac{22}{11} = 2$

From equation (ii),

$y - 2 = 7 \Rightarrow y = 2 + 7 = 9$

$\therefore$ Number $= 10x + y = 10 \times 2 + 9 = 29$

21. (3) Ten's digit of original number $= x$

$\therefore$ Unit's digit $= 2x$

$\therefore$ Number $= 10x + 2x = 12x$

According to the question,

$3x - 2 = \frac{1}{6} \times 12x$

$\Rightarrow 3x - 2 = 2x$

$\Rightarrow 3x - 2x = 2$

$\Rightarrow x = 2$

$\therefore$ Number $= 12x = 12 \times 2 = 2 = 24$

TYPE-VI

1. (3) $\therefore x + x + 2 + x + 4 = 147$

$\Rightarrow 3x + 6 = 147$

$\Rightarrow 3x = 147 - 6 = 141$

$\Rightarrow x = \frac{141}{3} = 47$

$\therefore$ Middle Number

$= x + 2 = 47 + 2 = 49$

2. (3) Series of first 20 odd natural numbers is an arithmetic progression with 1 as the first term and the common difference 2.

Sum of n terms in arithmetic progression is given by.

$$S_n = \frac{1}{2}n[2a + (n-1)d]$$

Where a : First term

d : common difference

$$\therefore S_{20} = \frac{1}{2} \times 20[(2 \times 1) + (20 - 1) \times 2]$$

$= 10[2 + 38] = 10 \times 40 = 400$

Note : Sum of first n consecutive odd numbers $= n^2$

3. (4) Series of all natural numbers from 75 to 97 is in A.P. whose first term,

a = 75, last term, $l = 97$

If number of terms be n, then

$a_n = a + (n-1)d$

$\Rightarrow 97 = 75 + (n - 1)$

$\Rightarrow n = 97 - 74 = 23$

$$S_n = \frac{n}{2}(a + l)$$

$$S_{23} = \frac{23}{2}(75 + 97)$$

$$= \frac{23}{2} \times 172 = 1978$$

4. (2) Numbers divisible by 3 and lying between 100 and 200 are : 102, 105,..... 198

Let number of terms = n

$\therefore 198 = 102 + (n-1)3$

$\Rightarrow n - 1 = \frac{198 - 102}{3} = 32$

$\Rightarrow n = 33$

$\therefore S = \frac{n}{2} = (a + l)$

$= \frac{32}{2}(102 + 198) = 4950$

5. (2) Let the three consecutive natural numbers be x, x + 1 and x + 2.

$\therefore$ According to question,

$x^2 + (x + 1)^2 + (x + 2)^2 = 2030$

or $x^2 + x^2 + 2x + 1 + x^2 + 4x + 4 = 2030$

or $3x^2 + 6x + 5 = 2030$

or $3x^2 + 6x - 2025 = 0$

or $x^2 + 2x - 675 = 0$

or $x^2 + 27x - 25x - 675 = 0$

$x(x + 27) - 25(x + 27) = 0$

or $(x - 25)(x + 27) = 0$

$\therefore x = 25$ and -27

$\therefore$ Required number = x + 1

= 25 + 1 = 26

6. (4) Let the three odd consecutive natural numbers be x, x + 2 and x + 4.

$\therefore$ According to the question

$x + x + 2 + x + 4 = 87$

or $3x + 6 = 87$

or $3x = 81$ $\therefore x = 27$

$\therefore$ Smallest number = 27

7. (4) Let three consecutive even integers be 2x, 2x + 2 and 2x + 4 respectively.

$\therefore 2x + 2x + 2 + 2x + 4 = 54$

$\Rightarrow 6x + 6 = 54$

$\Rightarrow 6x = 54 - 6 = 48$

$\Rightarrow x = 8$

$\therefore$ The least even number

$= 2 \times 8 = 16$

8. (2) Let three consecutive natural numbers be x, $x+1$, $x+2$.
According to the question,
$x + x + 1 + x + 2 = 87$
$\Rightarrow 3x + 3 = 87$
$\Rightarrow 3x = 84 \Rightarrow x = \frac{84}{3} = 28$
$\therefore$ Middle number = 28 + 1 = 29
OR, $\frac{87}{3} = 29$

9. (3) $(x + 2)^2 - x^2 = 84$
or $x^2 + 4x + 4 - x^2 = 84$
or $4x = 84 - 4 = 80$
or $x = \frac{80}{4} = 20$
$\Rightarrow x + 2 = 20 + 2 = 22$
$\therefore$ The required sum
= 20 + 22 = 42

10. (4) We have,
$1 + 2 + 3 \ldots\ldots + n$
$= \frac{n(n+1)}{2}$
$\therefore 51 + 52 + \ldots\ldots + 100$
$= (1 + 2 + \ldots\ldots 100) - (1 + 2 + \ldots + 50)$
$= \frac{100 \times 101}{2} - \frac{50 \times 51}{2}$
= 5050 – 1275 = 3775

11. (4) The two-digit numbers are :
10, 11, 12, ... 97, 98, 99
We know that,
$1 + 2 + 3 + 4 + \ldots\ldots + n$
$= \frac{n(n+1)}{2}$
$\therefore$ Required sum = $(1 + 2 + 3 + \ldots\ldots + 99) - (1 + 2 + \ldots\ldots + 9)$
$= \frac{99(99+1)}{2} - \frac{9(9+1)}{2}$
= 4950 – 45 = 4905

12. (4) S = 1 + 3 + 5 + ... to 50 terms
Here, $a = 1$
$d = 3 - 1 = 2$
$n = 50$
$\therefore S = \frac{n}{2}[2a + (n-1)d]$
$= \frac{50}{2}[2 \times 1 + (50-1) \times 2]$
= 25 (2 + 98) = 25 × 100
= 2500

13. (4) According to the question,
First number = a = 103
Last number = l = 998
$\therefore$ If the number of such numbers be n, then,
$998 = 103 + (n - 1) \times 5$
$\Rightarrow (n - 1) \times 5 = 998 - 103 = 895$
$\Rightarrow n - 1 = \frac{895}{5} = 179$
$\Rightarrow n = 180$
$\therefore S = \frac{n}{2}(a + l)$
$= \frac{180}{2}(103 + 998)$
= 90 × 1101 = 99090

14. (2) First 3 – digit number = 100
Last 3 – digit number = 999
Number of terms = 900
$\therefore S = \frac{n}{2}[a + l]$
$= \frac{900}{2}[100 + 999]$
= 450 × 1099 = 494550

15. (1) $x + x + 1 + x + 2 = 27$
$3x + 3 = 27$
$3x = 24$
$x = 8$
$\therefore$ Three consecutive no's whose sum is 27 are 8, 9,10. Hence, next 3 consecutive no's having 36 as sum are 11, 12 and 13

16. (3) $\because 1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$
$\therefore 1 + 2 + 3 + \ldots + 25$
$= \frac{25(25+1)}{2} = 25 \times 13$
Hence, 13 is a factor of required sum.

17. (2) 22 + 24 + 26 + ... + 50
= 2 (11 + 12 + 13 + ... + 25)
= 2 [(1 + 2 + 3 + ... + 25) – (1 + 2 + 3 ... + 10)]
$= 2\left(\frac{25 \times 26}{2} - \frac{10 \times 11}{2}\right)$
= 2 (325 – 55) = 2 × 270 = 540
Method 2 :
Tricky Approach
Sum of first n even numbers
$= n(n + 1)$
$\therefore$ Required sum = Sum of 25 even numbers from 1 to 50 – sum of 10 even numbers from 1 to 20
= 25×26 – 10 × 11 = 650 – 110
= 540

18. (3) $x + x + 2 + x + 4 + x + 6 = 748$
$\Rightarrow 4x + 12 = 748$
$\Rightarrow 4x = 748 - 12 = 736$
$\Rightarrow x = \frac{736}{4} = 184$

19. (4) Sum of five consecutive integers = S
$\therefore$ Third integer = $\frac{S}{5}$
$\therefore$ Largest integer = $\frac{S}{5} + 2$
$= \frac{S+10}{5}$

20. (2) Prime numbers upto 17
$\Rightarrow$ 2, 3, 5, 7, 11, 13, 17
$\therefore$ Required sum = 2 + 3 + 5 + 7 + 11 + 13 + 17 = 58

21. (2) $10^2 + 11^2 + 12^2$
= 100 + 121 + 144 = 365
$\therefore$ Required sum =10 + 11 + 12
= 33

22. (3) Numbers = x, $x+1$ and $x+2$
$\therefore 2x + 3x + 3 + 4x + 8 = 191$
$\Rightarrow 9x = 191 - 11 = 180$
$\Rightarrow x = 20$
$\therefore$ Numbers = 20, 21 and 22

23. (3) Let the numbers be 3x, 3x + 3 and 3x + 6
$\therefore$ 3x + 3x + 3 + 3x + 6 = 72
$\Rightarrow$ 9x + 9 = 72
$\Rightarrow$ 9x = 72 – 9 = 63
$\Rightarrow x = \frac{63}{9} = 7$
$\therefore$ Largest number
= 3x + 6 = 3 × 7 + 6 = 27

24. (3) Sum of all multiples of 3 upto 50
= 3 + 6 + ... + 48
= 3 (1 + 2 + 3 + ... + 16)
$= \frac{3 \times 16(16+1)}{2} = 3 \times 8 \times 17$
= 408
$\left[\because 1 + 2 + 3 + \ldots\ldots + n = \frac{n(n+1)}{2}\right]$

25. (4) Sum of first n odd natural numbers = $n^2 = (20)^2 = 400$
$\therefore$ Required average = $\frac{400}{20} = 20$

26. (3) Let the numbers be x and y.
According to the question,
$x + 2y = 8$ .... (i)
$x - y = 2$ ..... (ii)
By equation (i) – (ii),
$2y + y = 8 - 2$
$\Rightarrow 3y = 6 \Rightarrow y = 2$
From equation (ii),
$x - 2 = 2 \Rightarrow x = 4$

27. (3) Let the numbers be : $3x$, $3x+3$ and $3x+6$

According to the question,

$3x + 3x + 3 + 3x + 6 = 45$

$\Rightarrow 9x + 9 = 45$

$\Rightarrow 9x = 45 - 9 = 36$

$\Rightarrow x = \frac{36}{9} = 4$

$\therefore$ The smallest number

$= 3x = 3 \times 4 = 12$

28. (4) Let the required largest number be x.

According to the question,

$x + x - 5 + x - 10 = 225$

$\Rightarrow 3x - 15 = 225$

$\Rightarrow 3x = 225 + 15 = 240$

$\therefore x = \frac{240}{3} = 80$

TYPE-VII

1. (2) Check through options

The numbers are : 8, 12, 5, 20

2. (3) $12345679 \times 72 = 888888888$

3. (4) Given : $0.111.....= \frac{1}{9}$

$0.444.....= 4 \times 0.111....$

$= 4 \times \frac{1}{9} = \frac{4}{9}$

4. (3) $8.3\dot{1} = 8\frac{31-3}{90}$

$= 8\frac{28}{90} = \frac{748}{90}$

$0.\dot{6} = \frac{6}{9}$

$0.00\dot{2} = \frac{2}{900}$

$\therefore 8.3\dot{1} + 0.\dot{6} + 0.00\dot{2}$

$= \frac{748}{90} + \frac{6}{9} + \frac{2}{900}$

$= \frac{7480 + 600 + 2}{900} = \frac{8082}{900}$

$= 8 = \frac{8082}{900} = 8\ \frac{979-97}{900}$

$= 8.97\dot{9}$

5. (2) Expression $= 0.\overline{63} + 0.\overline{37}$

$= \frac{63}{99} + \frac{37}{99} = \frac{100}{99}$

6. (3) Expression

$= \left(0.\overline{11} + 0.\overline{22}\right) \times 3$

$= \left(\frac{11}{99} + \frac{22}{99}\right) \times 3$

$= \frac{33}{99} \times 3 = \frac{99}{99} = 1$

7. (2) $\frac{1}{5} + \left(999 + \frac{494}{495}\right) \times 99$

$= \frac{1}{5} + \left(999 + 1 - \frac{1}{495}\right) \times 99$

$= \frac{1}{5} + 999 \times 99 + 99 - \frac{99}{495}$

$= \frac{1}{5} + 98901 + 99 - \frac{1}{5} = 99000$

8. (2) $(1 * 2) * 3 = (1 + 2 \times 6) * 3$

$= 13 * 3 = (13 + 3 \times 6)$

$= 13 + 18 = 31$

9. (2) The given expression

$= 999\frac{995}{999} \times 999$

$= \left(999 + \frac{995}{999}\right)999$

$= 999 \times 999 + \frac{995}{999} \times 999$

$= (1000 - 1)\ 999 + 995$

$= 999000 - 999 + 995$

$= 999000 - 4 = 998996$

10. (4) Expression $= 1.\overline{2} \times 0.\overline{03}$

$= 1\frac{2}{9} \times \frac{3}{99} = \frac{11}{9} \times \frac{3}{99} = \frac{1}{27}$

$= 0.\overline{037}$

11. (1) $3.718 = \frac{1}{0.2689}$ (Given)

$\therefore \frac{1}{0.0003718} = \frac{10000}{3.718}$

$= 0.2689 \times 10000 = 2689$

12. (3) $\left(\sqrt{a+b}\right)^2 = a + b$

$\left(\sqrt{a} + \sqrt{b}\right)^2 = a + b + 2\sqrt{ab}$

Here, $a + b < a + b + 2\sqrt{ab}$

Clearly, $\sqrt{a+b} < \sqrt{a} + \sqrt{b}$

13. (3) $\sqrt{18225} = 135$,

$\sqrt{17956} = 134$

$\sqrt{63592} = 252.17$

In a perfect square number 2 never comes at the unit's place.

14. (3) $0.\overline{142857} \div 0.\overline{285714}$

$= \frac{142857}{999999} \div \frac{285714}{999999}$

$= \frac{142857}{285714} = \frac{1}{2}$

15. (4) $5.\overline{76} - 2.\overline{3}$

$= 5 + \frac{76}{99} - 2 - \frac{3}{9} = 3 + \frac{76}{99} - \frac{3}{9}$

$= 3 + \frac{76-33}{99} = 3 + \frac{43}{99} = 3.\overline{43}$

16. (2) $\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\left(1-\frac{1}{5}\right).....\left(1-\frac{1}{n}\right)$

$= \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} \times ..... \times \frac{n-1}{n} = \frac{2}{n}$

We observe that denominator of a term cancels with the numerator of the succeeding term

17. (2) $2.8\overline{768} = 2\frac{8768-8}{9990}$

$= 2\frac{8760}{9990} = 2\frac{292}{333}$

18. (3) When we multiply 2 and 5 (at unit place) we get a zero

$\therefore$ Number of zeros = The number of zeros in the end in the product of 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190 and 200 = 24

19. (4) $77777777 \div 77 = 1010101$

20. (3) Expression

$= 8.3\overline{1} + 0.\overline{6} + 0.00\overline{2}$

$$\begin{array}{l} = \ 8.31\overline{1} \\ \quad +0.66\overline{6} \\ \quad \underline{+0.00\overline{2}} \\ \quad \underline{8.97\overline{9}} \end{array}$$

21. (1) $0.\overline{2}+0.\overline{3}+0.\overline{32}$

$= \frac{2}{9}+\frac{3}{9}+\frac{32}{99}$

$= \frac{22+33+32}{99} = \frac{87}{99} = 0.\overline{87}$

22. (2) Expression = $0.\overline{63}+0.\overline{37}$

$= \frac{63}{99}+\frac{37}{99} = \frac{100}{99}$

23. (2) $\frac{51.84}{4.32} = \frac{5184}{432} = 12$

$\therefore \frac{0.005184}{0.432} = \frac{5184}{432}\times\frac{1}{1000}$

$= \frac{12}{1000} = 0.012$

24. (3)

$\left(\frac{2+1}{2}\right)\left(\frac{3+1}{3}\right)\left(\frac{4+1}{4}\right)....\left(\frac{120+1}{120}\right)$

$= \frac{3}{2}\times\frac{4}{3}\times\frac{5}{4}\times.....\times\frac{121}{120}$

$= \frac{121}{2} = 60.5$

25. (1) Let x and y be the two numbers. Then,

xy = 375 and x + y = 40

$\therefore$ Sum of reciprocals $= \frac{x+y}{xy}$

$= \frac{40}{375} = \frac{8}{75}$

26. (3) Let the two numbers be x and y.

$\therefore$ x + y = 12 and xy = 35

$\frac{1}{x}+\frac{1}{y} = \frac{y+x}{xy} = \frac{12}{35}$

27. (3) Let two numbers be x and y.

x + y = 3

$x^2 + y^2 = 12$

$\Rightarrow (x + y)^2 = (3)^2$

$\Rightarrow x^2 + y^2 + 2xy = 9$

$\Rightarrow 12 + 2xy = 9$

$\Rightarrow 2xy = -3$

$\Rightarrow xy = -\frac{3}{2}$

28. (4) Let the number of students be n.

So, each of n students got 2n chocolates

Total no. of chocolates

= (2n) × n = 800

$\Rightarrow 2n^2 = 800$

$\Rightarrow n^2 = 400 \Rightarrow n = 20$

29. (3) A product gets 0 at its end when

(i) a multiple of 5 is multiplied by an even number or

(ii) a multiple of 10 is multiplied by any number.

All the given numbers are even and do not contain any multiple of 5. So, zeros at the end of the product will come only on multiplications by multiples of 10.

Multiples of 10 that lie in the given range from 2 to 100 are 10, 20, 30, 40,50, 60, 70, 80, 90 and 100. Each of these multiples will yield one zero except 100 which will yield two zeros at the end of the product.

$\therefore$ Total no. of zeros at the product = 9 + 2 = 11

30. (3) Number of digits from 1 to 9 = 9

Number of digits used in writing from 10 to 50

= 41 × 2 = 82

$\therefore$ Total digits = 82 + 9 = 91

31. (3) Let the number be x.

$\therefore$ According to question,

2x + 20 = 8x – 4

or 8x – 2x = 20 + 4

or 6x = 24

$\therefore$ x = 4

32. (3) Let the original number of friends be *x*.

$\therefore \frac{108}{x-3} - \frac{108}{x} = 3$

$\Rightarrow 108\left(\frac{x-x+3}{x(x-3)}\right) = 3$

$\Rightarrow x(x-3) = 108$

$\Rightarrow x^2 - 3x - 108 = 0$

$\Rightarrow x^2 - 12x + 9x - 108 = 0$

$\Rightarrow (x-12) + 9(x-12) = 0$

$\Rightarrow (x-12)(x+9) = 0$

$\Rightarrow x = 12$ as $x \neq -9$

$\therefore$ The number of friends who attended the picnic

= 12 – 3 = 9

33. (3) In 2m × 5n, the number of zeros

= n when m ≥ n

= m when m < n

Here, $128 = 2^7$

In 1 × 3 × 5 × 7 × ... × 99

multiples of 5 are 5, 15, 25, 35, 45, 55, 65, 75, 85, 95 (= 5^{10})

Clearly, 7 zeros will be found in the product.

34. (3) According to question

$x^2 + y^2 = 100$ ...(i)

$x^2 - y^2 = 28$ ...(ii)

Adding both the equations

$x^2 + y^2 = 100$

$x^2 - y^2 = 28$

$2x^2 = 128$

$\Rightarrow x^2 = 64 \quad \therefore x = 8$

From the equation (i)

$y^2 = 100 - 64 \quad \therefore y = 6$

So, x + y = 8 + 6 = 14

35. (3) $\frac{2}{3}\times\frac{3}{4}\times\frac{4}{5}\times...\times\frac{98}{99}\times\frac{99}{100}$

$= \frac{2}{100} = \frac{1}{50}$

36. (2) Let the numbers be *x* and *y*.

$xy = 120$

$x^2 + y^2 = 289$

$(x-y)^2 = x^2 + y^2 - 2xy$

$= 289 - 2\times 120 = 289 - 240 = 49$

$\therefore x - y = 7$

37. (2) Let the numbers be x and *y*.

$\therefore x + y = 10$ and $xy = 24$

$\therefore \frac{x+y}{xy} = \frac{1}{y}+\frac{1}{x} = \frac{10}{24} = \frac{5}{12}$

38. (4) Expression $= 99+\frac{1}{7}+99+\frac{2}{7}$

$+ 99+\frac{3}{7}+ ..... + 99 + \frac{6}{7}$

$= (99\times 6) + \left(\frac{1}{7}+\frac{2}{7}+\frac{3}{7}+\frac{4}{7}+\frac{5}{7}+\frac{6}{7}\right)$

$= 594 + \left(\frac{1+2+3+4+5+6}{7}\right)$

$= 594 + \frac{21}{7} = 594 + 3 = 597$

39. (4) Let number of boys = *x*

and number of girls = 85 – *x*

According to the question,

$x\times 4 + (85 - x)\times 5 = 380$

$\Rightarrow 4x + 425 - 5x = 380$

$\Rightarrow x = 45$

40. (2) Let one of the positive numbers be x.
$\therefore$ The other will be 4x
Now, $4x \times x = 2500$
$\Rightarrow x^2 = 2500 \div 4 = 625$
$\therefore x = \sqrt{625} = 25$
$\therefore$ Sum of the two numbers
$= 5x = 5 \times 25 = 125$

41. (4) Let the ten's digit be x
$\therefore$ Unit's digit = x + 2
Therefore, the two digit number
$= 10x + x + 2$
$= 11x + 2$ ...(i)
Again,
$(11x + 2)(x + x + 2)$
$= 144$
$\Rightarrow (11x + 2)(2x + 2) = 144$
$(11x + 2)(x + 1) = 72$
$\Rightarrow 11x^2 + 2x + 11x + 2 = 72$
$\Rightarrow 11x^2 + 13x - 70 = 0$
$\Rightarrow 11x^2 - 22x + 35x - 70 = 0$
$\Rightarrow 11x(x - 2) + 35(x - 2) = 0$
$\Rightarrow (x - 2)(11x + 35) = 0$
$\Rightarrow x = 2, -\frac{35}{11}$
But $x = -\frac{35}{11}$
is not admissible.
$\therefore$ The number $= 11x + 2$
$= 11 \times 2 + 2 = 24$

42. (2) Let the number of correct answers be x
$\therefore$ The no. of incorrect answers
$= 20 - x$
According to the question,
$x - (20 - x) = 8$
$\Rightarrow x - 20 + x = 8$
$\Rightarrow 2x = 28 \Rightarrow x = 14$

43. (1) Let the number of boys = x
$\therefore$ Number of 25 paise coins= x^2
According to question,
$\frac{25}{100} \times x^2 = 400$
$\Rightarrow \frac{x^2}{4} = 400 \Rightarrow x^2 = 1600$
$\Rightarrow x = \sqrt{1600} = 40$

44. (2) Let the number be x.
According to the question,
$3 \times x^2 - 4 \times x = x + 50$
$\Rightarrow 3x^2 - 5x - 50 = 0$
$\Rightarrow 3x^2 - 15x + 10x - 50 = 0$
$\Rightarrow 3x(x - 5) + 10(x - 5) = 0$
$\Rightarrow (x - 5)(3x - 10) = 0$
$\Rightarrow x = 5$ or $\frac{-10}{3}$
But the number is natural.
$\therefore x \neq \frac{-10}{3}$
Hence, the required number = 5.

45. (3) Let the number be x and y and $x > y$.
$x - y = 3$ ...(i)
$x^2 + y^2 = 369$ ...(ii)
From equation (i)
$x - y = 3$
$\Rightarrow (x - y)^2 = 3^2$
$\Rightarrow x^2 + y^2 - 2xy = 9$
$\Rightarrow 2xy = (x^2 + y^2) - 9$
$= 369 - 9 = 360$
From equation (ii)
Now, $(x + y)^2 = x^2 + y^2 + 2xy$
$= 369 + 360 = 729$
$\therefore x + y = \sqrt{729} = 27$
$\therefore$ Required sum = 27

46. (3) Let the unit's digit be x.
$\therefore$ Ten's digit $= x - 2$
$\therefore$ Number $= 10(x - 2) + x$
$= 10x - 20 + x = 11x - 20$
New number obtained after reversing the digits
$= 10x + x - 2 = 11x - 2$
According to the question,
$3(11x - 20) + \frac{6}{7}(11x - 2) = 108$
$\Rightarrow (11x - 20) + \frac{2}{7}(11x - 2) = 36$
$\Rightarrow 77x - 140 + 22x - 4 = 252$
$\Rightarrow 99x = 252 + 144$
$\Rightarrow x = \frac{396}{99} = 4$
$\therefore$ Number $= 11x - 20$
$= 11 \times 4 - 20 = 24$
$\therefore$ Sum of digits $= 2 + 4 = 6$

47. (3) Let the first number be x.
$\therefore$ Second number $= 2x$,
and third number $= \frac{2x}{3}$
Now, $x + 2x + \frac{2x}{3} = 44 \times 3$
$\Rightarrow \frac{3x + 6x + 2x}{3} = 132$
$\Rightarrow 11x = 132 \times 3$
$\Rightarrow x = \frac{132 \times 3}{11} = 36$
$\therefore$ Required difference
$= x - \frac{2x}{3} = \frac{x}{3} = \frac{36}{3} = 12$

48. (2) Let the two digit number be $10y + x$.
According to the question,
$10y + x = 5(x + y)$
$\Rightarrow 10y + x - 5x - 5y = 0$
$\Rightarrow 5y - 4x = 0$ ....(i)
And,
$10y + x + 9 = 10x + y$
$\Rightarrow 9x - 9y = 9$
$\Rightarrow x - y = 1$ ... (ii)
From equation (i),
$\Rightarrow 5y - 4(1 + y) = 0$
[From (ii)]
$\Rightarrow 5y - 4 - 4y = 0$
$\Rightarrow y = 4$
$\therefore$ From equation (ii),
$x = 4 + 1 = 5$
$\therefore$ Number $= 10 \times 4 + 5 = 45$
$\therefore$ Sum of digits $= 4 + 5 = 9$

49. (4) The number of multiples of 130 are obtained by dividing 1000 by 130. The quotient i.e. 7 gives the result.

50. (4) Zeros are obtained if there is any zero at the end of any multiplicand and if 5 or multiple of 5 are multiplied by any even number. i.e. $(5)^n (2)^m$ has n zeros if $n < m$ or m zeros if $m < n$
Now, we obtain the index of 5 as follows :
$$\text{Index} = \left[\frac{1000}{5}\right] + \left[\frac{1000}{5^2}\right] + \left[\frac{1000}{5^3}\right] + \left[\frac{1000}{5^4}\right]$$
$= 200 + 40 + 8 + 1 = 249.$
Certainly, n will be less than m.
$\therefore$ Number of zeros = 249

51. (1) Let the numbers be a and b, where $a > b$
According to the question,
$a - b = 3$ ...(i)
$a^2 - b^2 = 39$
$\Rightarrow (a + b)(a - b) = 39$
$\Rightarrow a + b = \frac{39}{a - b} = \frac{39}{3} = 13$
$\Rightarrow a + b = 13$ ...(ii)
Adding equations (i) and (ii)
$2a = 16 \Rightarrow a = 8$

52. (2) Check through options
$20 \rightarrow 20 + 7 = 27 \rightarrow 27 \times 5$
$= 135 \rightarrow 135 \div 9$
$= 15 \rightarrow 15 - 3 = 12$
OR, We will solve the problem from the opposite side.
Here the remainder is 12.
$12 + 3 = 15$
$15 \times 9 = 135$
$135 \div 5 = 27$
$27 - 7 = 20$
$\therefore$ The original number was 20.

53. (3) Let the smallest number be x.
$\therefore x \times 7 = 33333....$
$\Rightarrow x = \frac{33333....}{7} = 47619$

54. (2) Let the two digit number be = $10x + y$.
According to the question,
$10x + y = 3(x + y)$
$\Rightarrow 10x + y = 3x + 3y$
$\Rightarrow 10x + y - 3x - 3y = 0$
$\Rightarrow 7x - 2y = 0$ ...(i)
and,
$10x + y + 45 = 10y + x$
$\Rightarrow 10y + x - 10x - y = 45$
$\Rightarrow 9y - 9x = 45$
$\Rightarrow 9(y - x) = 45$
$\Rightarrow y - x = 5$ ...(ii)
$2 \times$ (ii) + (i) we have
$2y - 2x + 7x - 2y = 10$
$\Rightarrow 5x = 10 \Rightarrow x = \frac{10}{5} = 2$
From equation (ii),
$y - 2 = 5 \Rightarrow y = 2 + 5 = 7$
$\therefore$ Number $= 10x + y$
$= 2 \times 10 + 7 = 27$
$\therefore$ Sum of digits $= 2 + 7 = 9$

55. (1) Let the remainder in each case be x.
Then, $(2272 - x)$ and $(875 - x)$ are exactly divisible by that three digit number.
Hence, their difference $[(2272 - x) - (875 - x)] = 1397$ will also be exactly divisible by the said divisor (N).
Now, $1397 = 11 \times 127$
Since both 11 and 127 are prime numbers, N is 127.
$\therefore$ Sum of digits $= 1 + 2 + 7 = 10$

56. (1) Let the numbers be x and y respectively.
$\therefore x + y = 12$ and $xy = 35$
$\therefore \frac{1}{x} + \frac{1}{y} = \frac{x+y}{xy} = \frac{12}{35}$

57. (3) Let the third number be x.
$\therefore$ Second number $= 3x$
First number $= \frac{3}{2}x$
According to the question,
$\frac{3x}{2} + 3x + x = 44 \times 3$
$\Rightarrow \frac{3x + 6x + 2x}{2} = 44 \times 3$
$\Rightarrow 11x = 88 \times 3$
$\Rightarrow x = \frac{88 \times 3}{11} = 24$
$\therefore$ The largest number
$= 3x = 3 \times 24 = 72$

58. (3) Let the two digit number be $10x + y$ where $x > y$.
Here, $x + y = 10$ ...(i)
and, $10x + y - 10y - x = 18$
$\Rightarrow 9x - 9y = 18$
$\Rightarrow 9(x - y) = 18$
$\Rightarrow x - y = 2$ ...(ii)
Solving equations (i) and (ii),
$x = 6$ and $y = 4$
$\therefore$ Number $= 10 \times 6 + 4 = 64$

59. (1) Let the positive integer be x.
$\therefore 2x^2 - 5x = 3$
$\Rightarrow 2x^2 - 5x - 3 = 0$
$\Rightarrow 2x^2 - 6x + x - 3 = 0$
$\Rightarrow 2x(x - 3) + 1(x - 3) = 0$
$\Rightarrow (x - 3)(2x + 1) = 0$
$\therefore x = 3$ and $x = -\frac{1}{2}$ is not admissible.

60. (2) Let the first number be x.
$\therefore$ Second number $= 14 - x$
$\therefore x(14 - x) = 24(x - 14 + x)$
$\Rightarrow x(14 - x) = 24(2x - 14)$
$\Rightarrow 14x - x^2 = 48x - 336$
$\Rightarrow x^2 + 34x - 336 = 0$
$\Rightarrow x^2 + 42x - 8x - 336 = 0$
$\Rightarrow x(x + 42) - 8(x + 42) = 0$
$\Rightarrow (x + 42)(x - 8) = 0$
$\therefore x = 8$ as $x \neq -42$
$\therefore$ Second number $= 14 - 8 = 6$
$\therefore$ Larger number $= 8$
Note : It is preferable to solve it by oral calculation with the help of given alternatives.

61. (4) If the first number be x, then
Second number $= \frac{x}{5}$
$\therefore x \times \frac{x}{5} = 0.008$
$\Rightarrow x^2 = 0.008 \times 5 = 0.04$
$\therefore x = \sqrt{0.04} = 0.2$
$\therefore$ Smaller number
$= \frac{0.2}{5} = 0.04$

62. (1) Let the natural numbers be x and y.
$\therefore$ Required sum $= 18x + 21y$
$= 3(6x + 7y)$
Hence, the sum is divisible by 3.
$\therefore$ Required answer = 2007

63. (1) Let the numbers be x and y.
$\therefore x(x + y) = 247$
and $y(x + y) = 114$
$\Rightarrow x^2 + xy = 247$ and $xy + y^2 = 114$
On adding;
$x^2 + xy + xy + y^2 = 247 + 114$
$\Rightarrow x^2 + 2xy + y^2 = 361$
$\Rightarrow (x + y)^2 = 19^2 \Rightarrow x + y = 19$

64. (4) The sum of two odd numbers is even. The same is the case with their product.
$\therefore a + b + 2ab$ = Even number

65. (2) $d = 4375 + 2986 - 2361$
$= 5000$

66. (3) According to the question,
$\left(\frac{n}{2} + \frac{n}{4} + \frac{n}{5}\right) + 7 = n$
$\Rightarrow \left(\frac{10n + 5n + 4n}{20}\right) + 7 = n$
$\Rightarrow \frac{19n}{20} + 7 = n$
$\Rightarrow n - \frac{19n}{20} = 7 \Rightarrow \frac{n}{20} = 7$
$\Rightarrow n = 20 \times 7 = 140$

67. (2) If the number of correct answers be x, then
$x \times 4 - 1.(200 - x) = 200$
$\Rightarrow 4x - 200 + x = 200$
$\Rightarrow 5x = 400$
$\Rightarrow x = \frac{400}{5} = 80$

68. (2) Let the number of correct answers be x.
$\therefore x \times 4 - (75 - x) \times 1 = 125$
$\Rightarrow 4x - 75 + x = 125$
$\Rightarrow 5x = 125 + 75 = 200$
$\therefore x = \frac{200}{5} = 40$

69. (1) Let the numbers be a and b.
According to the question,
$ab = 120$ ... (i)
and $a^2 + b^2 = 289$ ... (ii)
$\therefore (a + b)^2 = a^2 + b^2 + 2ab$
$= 289 + 2 \times 120$
$= 289 + 240 = 529$
$\therefore a + b = \sqrt{529} = 23$

70. (4) Let the numbers be x and y.
According to the question,
$x + y = 11$ ....(i)
$xy = 18$ ...(ii)
Dividing equation (i) by equation (ii)
$$\frac{x+y}{xy} = \frac{1}{y} + \frac{1}{x} = \frac{11}{18}$$

71. (1) Let number of grapes eaten on the first day be x.
$\therefore x + x + 6 + x + 12 + x + 18 + x + 24 = 100$
$\Rightarrow 5x + 60 = 100$
$\Rightarrow 5x = 100 - 60 = 40$
$$\Rightarrow x = \frac{40}{5} = 8$$

72. (1) Let the original number be x.
According to the question
$7.2 \times x - 0.72 \times x = 2592$
$\Rightarrow x(7.2 - 0.72) = 2592$
$\Rightarrow x \times 6.48 = 2592$
$$\Rightarrow x = \frac{2592}{6.48}$$
$$= \frac{2592 \times 100}{648} = 400$$

73. (3) Let the numbers be x, y and z.
$\therefore x + y = 55$ ....(i)
$y + z = 65$ ....(ii)
$3x + z = 110$ ....(iii)
By equation (iii) – (ii),
$3x - y = 110 - 65 = 45$ ....(iv)
By equation (i) + (iv),
$4x = 45 + 55 = 100$
$\Rightarrow x = 25$
From equation (iii),
$75 + z = 110$
$\Rightarrow z = 110 - 75 = 35$

74. (3) Let unit's digit be x.
Ten's digit $= x + 5$
Number $= 10(x + 5) + x$
$= 11x + 50$
Again,
$11x + 50 - 5(2x + 5)$
$= 10x + x + 5$
$\Rightarrow 11x + 50 - 10x - 25 = 11x + 5$
$\Rightarrow 10x = 20 \Rightarrow x = 2$
$\therefore$ Required sum
$= 2x + 5 = 2 \times 2 + 5 = 9$

75. (2) Let the number be $100(2x) + 10y + x = 201x + 10y$ .....(i)
$\therefore 2x + y + x = 18$
$\Rightarrow 3x + y = 18$ .....(ii)
When the digits are reversed, number
$= 100(x) + 10y + 2x$
$= 102x + 10y$ .....(iii)
$\therefore 201x + 10y - 102x - 10y = 396$
$\Rightarrow 99x = 396 \Rightarrow x = 4$
$\therefore$ From equation (i)
$3 \times 4 + y = 18$
$\Rightarrow y = 18 - 12 = 6$
$\therefore$ Required difference $= 2x - y = 2 \times 4 - 6 = 2$

76. (1) Let the two digit number be $10y + x$ where $x > y$
$\therefore 10x + y - 10y - x = 63$
$\Rightarrow 9x - 9y = 63$
$\Rightarrow x - y = 7$
$\therefore x = 7, 8, 9$ and $y = 0, 1, 2$

77. (3) Let the required number be x.
$\therefore x^2 + x = 2 \times 3 \times 5$
$\Rightarrow x^2 + x - 30 = 0$
$\Rightarrow x^2 + 6x - 5x - 30 = 0$
$\Rightarrow x(x + 6) - 5(x + 6) = 0$
$\Rightarrow (x - 5)(x + 6) = 0$
$\Rightarrow x = 5$

78. (2) Number of hens $= x$
$\therefore$ Number of cows $= 48 - x$
$\therefore 2x + (48 - x) \times 4 = 35 \times 4$
$\Rightarrow 2x + 192 - 4x = 140$
$\Rightarrow 2x = 192 - 140 = 52$
$\Rightarrow x = 26$

79. (1) Length of the road = 1000 metre
Number of plants on one side of the road $= \frac{1000}{20} + 1 = 51$
$\therefore$ Total number of plants
$= 2 \times 51 = 102$

80. (1) $\left(999 + \frac{98}{99}\right) \times 99$
$= 999 \times 99 + 98$
$= (1000 - 1)\,99 + 98$
$= 99000 - 99 + 98 = 98999$

81. (4) If the number be $10x + y$ then number obtained by reversing the digits $= 10y + x$.
$\therefore 10x + y + 10y + x = 11(x + y)$
If $x + y = 11$ the possible pairs are = (2, 9), (3, 8), (4, 7) and (5, 6)
$\therefore$ Required answer = 8

82. (4) Expression
$$= \left(99 + \frac{95}{99}\right) \times 99$$
$= 99 \times 99 + 95$
$= 99(100 - 1) + 95$
$= 9900 - 99 + 95 = 9896$

83. (4) Marbles in the 50th box will be kept by 1st, 2nd, 5th, 10th, 25th and 50th persons.
[There are the factors of 50].
$\therefore$ Number of marbles
$= 1 + 2 + 5 + 10 + 25 + 50 = 93$

84. (2) Number of pants
$$= \frac{252}{2\frac{1}{2}} = \frac{252 \times 2}{5} = 100$$
Number of shirts
$$= \frac{141 \times 4}{7} \approx 80$$

85. (3) $323 = 17 \times 19$

86. (2) Let one of the positive number be x.
$\therefore$ The other will be 4x
Now, $4x \times x = 2500$
$\Rightarrow x^2 = 2500 \div 4 = 625$
$\therefore x = \sqrt{625} = 25$
$\therefore$ Sum of the two numbers
$4x + x = 5x = 5 \times 25 = 125$

87. (2) If the number of correct sums be x, then,
$x \times 3 - (30 - x) \times 2 = 40$
$\Rightarrow 3x - 60 + 2x = 40$
$\Rightarrow 5x = 60 + 40 = 100$
$\Rightarrow x = 20$

88. (4) $a * b = a + b + \frac{a}{b}$
$$\therefore 12 * 4 = 12 + 4 + \frac{12}{4}$$
$= 16 + 3 = 19$

89. (2) Number of trees on each side of the road
[+1 because we would start with a tree]
$$= \frac{1760}{20} + 1 = 88 + 1 = 89$$
$\therefore$ Required answer
$= 89 \times 2 = 178$

90. (2) A + B= 3 (B + C)
A + B + C = A + 30
B = 5 C
∴ A + B = 3 (B + C)
⇒ A + 5C = 18C ⇒ A = 13C
∴ A + B + C = A + 30
13C + 5C + C = 13C + 30
⇒ 6C = 30
⇒ C = 5
⇒ A = 13 × 5 = ₹ 65

91. (3) If the numbers be x and y, then
$x + y = a$ and $xy = b$

$$\therefore \frac{1}{y}+\frac{1}{x}=\frac{x+y}{xy}=\frac{a}{b}$$

92. (4) $999\frac{999}{1000}\times 7$

$$=\left(999+\frac{999}{1000}\right)\times 7$$

$$=6993+\frac{6993}{1000}$$

$$=6993+6\frac{993}{1000}$$

$$=6993+6+\frac{993}{1000}$$

$$=6999\frac{993}{1000}$$

93. (2) Total number of workers
= 125 × 9 = 1125

94. (1) Expression

$$=999\frac{1}{7}+999\frac{2}{7}+\ldots+999\frac{6}{7}$$

$$=\left(999+\frac{1}{7}\right)+\left(999+\frac{2}{7}\right)+\ldots\ldots$$

$$+\left(999+\frac{6}{7}\right)$$

$$=(6\times 999)+\left(\frac{1}{7}+\frac{2}{7}+\frac{3}{7}+\ldots+\frac{6}{7}\right)$$

$$=5994+\left(\frac{1+2+3+4+5+6}{7}\right)$$

$$=5994+\frac{21}{7}=5994+3=5997$$

95. (1) 228 = 70 × 3 + 18

96. (3) Divisor = 5 × remainder
= 5 × 36 = 180
Again, Divisor = 12 × quotient
∴ 180 = 12 × quotient

$$\therefore \text{Quotient}=\frac{180}{12}=15$$

∴ Dividend = Divisor × Quotient + Remainder
= 180 × 15 + 36
= 2700 + 36 = 2736

97. (1) If the numbers be x and y, then
$x + y = 8$ ..... (i)
$xy = 15$ ..... (ii)
Dividing equation (i) by (ii)

$$\frac{x+y}{xy}=\frac{8}{15}\Rightarrow\frac{x}{xy}+\frac{y}{xy}=\frac{8}{15}$$

$$\Rightarrow\frac{1}{y}+\frac{1}{x}=\frac{8}{15}$$

98. (3) Suppose number is x.
∴ 3 (2x + 9) = 75
⇒ 6x + 27 = 75
⇒ 6x = 48 ⇒ x = 8

99. (3) ∵ $a * b = a + b - ab$
∴ 5 * 7 = 5 + 7 – 5 × 7 = 12 – 35
= – 23

100. (3) 12 months' salary
= ₹ 90 + turban
∴ 9 months' salary

$$=(₹\ 90+\text{turban})\times\frac{9}{12}$$

$$=₹\ 90\times\frac{3}{4}+\frac{3}{4}\text{ turban}$$

$$=₹\ \frac{135}{2}+\frac{3}{4}\text{ turban}$$

$$\therefore ₹\ \frac{135}{2}+\frac{3}{4}\text{ turban}$$

= ₹ 65 + turban

$$\therefore \frac{1}{4}\text{ turban}=\frac{135}{2}-65=₹\ \frac{5}{2}$$

$$\therefore \text{Turban}\Rightarrow\frac{5}{2}\times 4=₹\ 10$$

101. (3) Let the number be $10x + y$.
Dividend = Divisor × quotient + remainder
∴ $10x + y = 6(x + y) + 3$
⇒ $10x + y = 6x + 6y + 3$
⇒ $10x - 6x + y - 6y = 3$
⇒ $4x - 5y = 3$ ....(i)
Again, $10y + x = 4(x + y) + 9$
⇒ $10y + x = 4x + 4y + 9$
⇒ $6y - 3x = 9$
⇒ $2y - x = 3$ ....(ii)
∴ By equation (i) + 4 × (ii),
$4x - 5y = 3$
$8y - 4x = 12$
$3y = 15$
⇒ $y = 5$
From equation (ii),
$2 \times 5 - x = 3 \Rightarrow$
$x = 10 - 3 = 7$
∴ Sum of digits = $x + y = 7 + 5 = 12$

102. (3) Every rational number is a real number.

103. (4) 0.01 < 0.015 < 0.12
⇒ – 0.01 > – 0.015 > – 0.12
⇒ $p < r < q$

104. (2) A + B = 120
B + C = 130
C + A = 140
On adding,
2 (A + B + C) = 120 + 130 + 140
= 390

$$\Rightarrow A+B+C=\frac{390}{2}=195$$

∴ Marks obtained by C = Marks obtained by (A + B + C) – Marks obtained by (A + B)
= 195 – 120 = 75

105. (1) Required answer

$$=\frac{1}{7\times 24}=\frac{1}{168}=0.0059$$

106. (3) $x=0.\dot{3}+0.\dot{6}+0.\dot{7}+0.\dot{8}$

$$=\frac{3}{9}+\frac{6}{9}+\frac{7}{9}+\frac{8}{9}$$

$$=\frac{3+6+7+8}{9}=\frac{24}{9}=\frac{8}{3}=2\frac{2}{3}$$

107. (2) Let the number of oranges with Natu be x.
Number of oranges with Buchku = y
Case I,
$x + 10 = 2(y - 10)$
⇒ $x + 10 = 2y - 20$
⇒ $2y - x = 20 + 10 = 30$ ..(i)
Case II,
$y + 10 = x - 10$
⇒ $x - y = 10 + 10 = 20$ ... (ii)
On adding equations (i) and (ii),
$2y - x + x - y = 30 + 20$
⇒ $y = 50$
From equation (ii),
$x - 50 = 20$
⇒ $x = 50 + 20 = 70$

TEST YOURSELF

1. 64329 is divided by a certain number, the successive remainders being 175, 114 and 213 respectively. What are the divisor and the quotient respectively ?
(1) 234 and 274 (2) 224 and 268
(3) 468 and 232 (4) 218 and 274

2. The sum of the first two of three consecutive odd numbers is 33 more than the third number. What is the second number ?
(1) 35 (2) 37
(3) 39 (4) 33

3. A rational number between $\frac{1}{2}$ and $\frac{3}{5}$ is :
(1) $\frac{2}{5}$ (2) $\frac{3}{5}$
(3) $\frac{11}{20}$ (4) None of these

4. How many numbers are there between 99 and 1000 such that the digit 8, occupies the unit's place?
(1) 64 (2) 74
(3) 82 (4) None of these

5. One third of the boys and one half of the girls of a college participate in a social work project. If the number of participating students is 300 out of which 100 are boys, what is the total number of students in the college?
(1) 500 (2) 700
(3) 800 (4) None of these

6. Find the unit's digit in the product of 437, 82, 28, 45 and 47.
(1) 0 (2) 1
(3) 2 (4) 3

7. What will be the digit at unit's place in the value of $(2467)^{153}$?
(1) 9 (2) 7
(3) 3 (4) 1

8. What will be the unit's digit in the value of $(3127)^{173}$?
(1) 9 (2) 1
(3) 3 (4) 7

9. What will be the unit's digit in the product of $(2467)^{153} \times (341)^{72}$?
(1) 3 (2) 1
(3) 7 (4) 9

10. Find the number of prime factors in $30^7 \times 22^5 \times 34^{12} \times 12^5$.
(1) 70 (2) 65
(3) 29 (4) 69

11. Find the number of prime factors in the product of $25^{12} \times 10^7 \times 14^7$.
(1) 50 (2) 52
(3) 51 (4) 54

12. A certain number when successively divided by 8 and 11 leaves remainder 3 and 7 respectively. Find the remainder if the same number is divided by 88.
(1) 57 (2) 51
(3) 59 (4) 61

13. A certain number on being divided successively by 9, 11 and 13 leaves remainder 8, 9 and 8 respectively. What are the remainders when the same number be divided by reversing the order of divisors?
(1) 10, 1, 6 (2) 10, 6, 2
(3) 10, 3, 3 (4) 9, 3, 2

14. A certain number when successively divided by 3, 5 and 8 leaves remainder 1, 2, 3 respectively. Find the remainders when the same number is divided by reversing the divisors.
(1) 3, 2, 1 (2) 4, 1, 1
(3) 4, 2, 2 (4) 1, 4, 1

15. If the sum of the digits of any number, lying between 100 and 1000 is subtracted from the number, then the difference is always divisible by
(1) 7 (2) 9
(3) 11 (4) 6

16. Find the least number of five digits which is divisible by 666.
(1) 10656 (2) 10665
(3) 10566 (4) 15066

17. Find the nearest number to 56586 which is exactly divisible by 552.
(1) 58666 (2) 56856
(3) 58656 (4) 85656

18. Find the number nearest to 77685 which is exactly divisible by 720.
(1) 78680 (2) 77700
(3) 77760 (4) 78960

19. Find the number nearest to 12199 which is exactly divisible by the product of the first four prime numbers.
(1) 12229 (2) 122208
(3) 12280 (4) 12180

20. Find the greatest number of 4 digits and the least number of 5 digits which when divided by 789 leave a remainder 5 in each case.
(1) 9473, 10262 (2) 9573, 10362
(3) 9673, 10462 (4) 9676, 10465

SHORT ANSWERS

1. (1)	**2.** (2)	**3.** (3)	**4.** (4)
5. (2)	**6.** (1)	**7.** (2)	**8.** (4)
9. (3)	**10.** (1)	**11.** (2)	**12.** (3)
13. (1)	**14.** (2)	**15.** (2)	**16.** (1)
17. (2)	**18.** (3)	**19.** (4)	**20.** (1)

EXPLANATIONS

1. (1) × × ×) 64329 (× × ×
× × ×
175
Here, 643 – 175 = 468
∴ Divisor = 468 or 234

234) 64329 (274
468
1752
1638
1149
936
213

Divisor = 234
Quotient = 274

2. (2) $x + x + 2 = x + 4 + 33$
$\Rightarrow x + 2 = 37$

3. (3) Required number
$$= \frac{\frac{1}{2} + \frac{3}{5}}{2} = \frac{5+6}{20} = \frac{11}{20}$$

4. (4) Such numbers between 99 and 200 = 10
Total numbers = 90

5. (2) Total number of students
= 100 × 3 + 400 = 700

6. (1) The unit's digits in 437, 82, 28, 45 and 47 are 7, 2, 8, 5 and 7 respectively.
The product of 7, 2, 8, 5 and 7 = 7 × 2 × 8 × 5 × 7 = 3920
Since the unit's digit in 3920 is 0, hence, the unit digit of 437 × 82 × 28 × 45 × 47 will also be zero.

7. (2) The given number = $(2467)^{153}$
Here, the unit's digit in 2467 is 7 that repeats itself after 4 times

Now, we divide index by 4.

```
4 ) 153 ( 38
    12
     33
     32
      1
```

Here the remainder is 1.
The unit's digit in the value of $(2467)^{153}$ will be same as $(7)^1 = 7$

8. (4) Here the unit's digit of 3127 is 7 and the index is 173
So, if we divide 173 by 4, the remainder is 1.
$\therefore$ The required unit's digit
$= (7)^1 = 7$

9. (3) The unit's digit in $(2467)^{153}$
= The unit's digit in $(7)^{153}$ = The unit's digit in $(7)^1 = 7$
and the unit's digit in $(341)^{72} = 1$
Because for any index to 1, the value of unit's digit will be 1.
$\therefore$ The unit's digit in the product of $(2467)^{153} \times (341)^{72} = 7 \times 1 = 7$

10. (1) We break each base number into prime factors.
Now, $30^7 = (2 \times 3 \times 5)^7 = 2^7 \times 3^7 \times 5^7$
$22^5 = (2 \times 11)^5 = 2^5 \times 11^5$
$34^{12} = (2 \times 17)^{12} = 2^{12} \times 17^{12}$
$12^5 = (3 \times 2 \times 2)^5 = 3^5 \times 2^5 \times 2^5$
$\therefore 30^7 \times 2^2 \times 34^{12} \times 12^5 = 2^7 \times 3^7 \times 5^7 \times 2^5 \times 11^5 \times 2^{12} \times 17^{12} \times 3^5 \times 2^5 \times 2^5$
$= 2^{7+5+12+5+5} \times 3^{7+5} \times 5^7 \times 11^5 \times 17^{12}$
$= 2^{34} \times 3^{12} \times 5^7 \times 11^5 \times 17^{12}$
$\therefore$ The required number of prime factors
$= 34 + 12 + 7 + 5 + 12 = 70$

11. (2) We break each base number into prime factors.
Now, 25^{12}
$= (5 \times 5)^{12} = 5^{12} \times 5^{12}$
$10^7 = (2 \times 5)^7 = 2^7 \times 5^7$
and , $14^7 = (2 \times 7)^7 = 2^7 \times 7^7$
$\therefore 25^{12} \times 10^7 \times 14^7 = 5^{12} \times 5^{12} \times 2^7 \times 5^7 \times 2^7 \times 7^7$
$= 5^{12+12+7} \times 2^{7+7} \times 7^7 = 5^{31} \times 2^{14} \times 7^7$
$\therefore$ Number of prime factors= 31 + 14 + 7 = 52

12. (3) It is to be noted that $88 = 8 \times 11$
Here, $d_1 = 8$, $d_2 = 11$, $r_1 = 3$, $r_2 = 7$.
Where d_1, d_2 are divisors and r_1 and r_2 are respective remainders.
$\therefore$ Required remainder $= d_1 r_2 + r_1$
$= 8 \times 7 + 3 = 56 + 3 = 59$

13. (1) We proceed to find the number that is least as mentioned below.

9	z		
11	y	–	8
13	x	–	9
	1	–	8

$x = 13 \times 1 + 8 = 21$
$y = 11x + 9 = 11 \times 21 + 9 = 231 + 9 = 240$
$z = 9y + 8 = 9 \times 240 = 8 = 2160 + 8 = 2168.$
Now, divide 2168 by 13, 11 and 9.

13	2168		
11	166	–	10
9	15	–	1
	1	–	6

Hence, the remainders are 10, 1 and 6 respectively.
Remark : To determine the least number, we have taken the last quotient as 1.

14. (2) This problem can be solved by determining true or complete remainder and dividing it by reversing the order of divisors.
True remainder $= d_1 d_2 r_3 + d_1 r_2 + r_1$
Here, $d_1 = 3$, $d_2 = 5$, $r_1 = 1$, $r_2 = 2$, $r_3 = 3$
$\therefore$ **True** remainder $= 3 \times 5 \times 3 + 3 \times 2 + 1 = 45 + 6 + 1 = 52$
Now, we divide 52 by 8, 5 and 3

8	52		
5	6	–	4
3	1	–	1
	0		1

Hence, the remainders are 4, 1 and 1.

15. (2) Any number between 100 and 1000 may be written as $100m + 10n + K$ where $0 < m < 9$, $0 < n < 9$ and $0 < K < 9$.
$\therefore (100m + 10n + K) - (m + n + K)$
$= 99m + 9n$
$= 9(11m + n)$ = multiplie of 9.
Hence divisible by 9.

16. (1) The least number of five digits = 10000
Now, we divide 10000 by 666

```
666) 10000 (15
     666
     3340
     3330
       10
```

Here, we have 10 as remainder. Therefore, the least number to be added to the least number of 5 digits, i.e., 10000 to get the least number of 5 digits which is exactly divisible by 666 is 666–10 or 656.
Hence, the required number
= 10000 + 656 = 10656.

17. (2) We divide 56586 by 552

```
552) 56586 (102
     552
     1386
     1104
      282
```

$\therefore R = 282$
$D = 552$
$\therefore D - R = 552 - 282 = 270$
Here, $(D - R) < R$
So, we get the required number by adding $(D - R)$ to the dividend.
Therefore, the number nearest to 56586 that is exactly divisible by 552 is
56586 + 270 = 56856

18. (3) We divide 77685 by 720

```
720 ) 77685 (107
      720
       5685
       5040
        645
```

Here, $D - R = 720 - 645 = 75 < R$.
$\therefore$ The required number
= 77685 + 75 = 77760

19. (4) As we know, the first four prime numbers are 2, 3, 5, 7
Their product $= 2 \times 3 \times 5 \times 7$
$= 210$
Now, we divide 12199 by 210

```
210) 12199 (58
     1050
      1699
      1680
        19
```

Here, $D - R = 210 - 19 = 191$
So, $(D - R) > R$.
Hence, the required number
$= 12199 - R = 12199 - 19$
$= 12180$

20. (1) The greatest number of 4 digits = 9999
Now, we divide 9999 by 789

```
789) 9999 (12
     789
      2109
      1578
       531
```

Thus, when 9999 – 531= 9468 is divided by 789, no remainder is left.
The required greatest number of 4 digits = 9468 + 5 = 9473
The least number of 5 digits
= 10000

```
789) 10000 (12
     789
      2110
      1578
       532
```

Remainder = 532
$\therefore$ The least number of 5 digits exactly divisible by 789
= 10000 + (789 – 532)
= 10000 + 257 = 10257
$\therefore$ The required number
= 10257 + 5 = 10262
Remark : If 532 is subtracted from 10000 the number obtained 9468 is exactly divisible by 789 but in that case, the number will not be of 5 digits but of 4 digits. ☐☐☐

2 LCM AND HCF

Importance : Questions based on L.C.M and H.C.F concepts (in addition involved in other questions) are independently asked in certain competitive exams. A little practice with full 'concentration' will enable you to learn how to solve these questions.

Scope of questions : Most asked questions are related to finding out L.C.M. or H.C.F. for numbers special questions are based on remainder on dividing. difference ratio of L.C.M./H.C.F. to make complete square/cube of different number etc.

Way to success : TRICKS in addition to formulae help in most of L.C.M. & H.C.F. questions.

IMPORTANT DEFINITIONS :

Highest Common Factor (H.C.F) : It is also called Greatest common Diviser (G.C.D). When a greatest number divides perfectly the two or more given numbers then that number is called the H.C.F. of two or more given numbers. e.g.

The H.C.F of 10, 20, 30 is 10 as they are perfectly divided by 10,5 and 2 and 10 is highest or greatest of them.

Least common Multiple (L.C.M.) : The least number which is divisible by two or more given numbers, that least number is called L.C.M. of the numbers.

L.C.M. of 3,5,6 is 30, because all 3 numbers divide 30, 60, 90, ... and so on perfectly and 30 is minimum of them.

Factor and Multiple : If a number m, divides perfectly second number n, then m is called the factor of n and n is called the multiple of m.

Rule 1 : 1st number × 2nd number = L.C. M. × H.C.F.

- **There are two methods for calculating the H.C.F and L.C.M.**

  (i) Factor Method

  (ii) Division Method

- **If the ratio of two numbers is a:b, (lowest form i.e. indivisible to each other) then**

Numbers are ak and bk, where k is a constant and hence,

H.C.F. is K and L.C.M. is abk.

Rule 2 : L.C.M of fractions

$$= \frac{\text{L.C.M. of numerators}}{\text{H.C.F. of denominators}}$$

Rule 3 : H.C.F. of fractions

$$= \frac{\text{H.C.F of numerators}}{\text{L.C.M. of denominators}}$$

IMPORTANT POINTS

- If there is no common factor between two numbers, then L.C.M. will be the product of both numbers.
- If there are 'n' numbers in a set and H.C.F. of any two numbers is H and L.C.M. of all 'n' numbers is L, then product of all 'n' numbers is $\left[(H)^{n-1} \times L\right]$

Rule 4 : When a number is divided by a, b or c leaving same remainder 'r' in each case then that number must be k + r where k is LCM of a, b and c.

Rule 5 : When a number is divided by a, b or c leaving remainders p, q or r respectively such that the difference between divisor and remainder in each case is same i.e., (a – P) = (b – q) = (c – r) = t (say) then that (least) number must be in the form of (k – t), where k is LCM of a, b and c

Rule 6 : The largest number which when divide the numbers a, b and c the remainders are same then that largest number is given by H.C.F. of (a – b), (b – c) and (c – a).

Rule 7 : The largest number which when divide the numbers a, b and c give remainders as p, q, r respectively is given by H.C.F. of (a – p), (b – q) and (c – r).

Rule 8 : Greatest n digit number which when divided by three numbers p,q,r leaves no remainder will be

Required Number = (n – digit greatest number) – R

R is the remainder obtained on dividing greatest n digit number by L.C.M of p.q,r.

Rule 9 : The n digit largest number which when divided by p, q, r leaves remainder 'a' will be

Required number = [n – digit largest number – R] + a

where, R is the remainder obtained when

n – digit largest number is divided by the L.C.M of p, q, r.

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. The LCM of two numbers is 864 and their HCF is 144. If one of the number is 288, the other number is :
(1) 576 (2) 1296
(3) 432 (4) 144
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. LCM of two numbers is 225 and their HCF is 5. If one number is 25, the other number will be:
(1) 5 (2) 25
(3) 45 (4) 225
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. The L.C.M. of two numbers is 1820 and their H.C.F. is 26. If one number is 130 then the other number is :
(1) 70 (2) 1690
(3) 364 (4) 1264
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. The LCM of two numbers is 1920 and their HCF is 16. If one of the number is 128, find the other number.
(1) 204 (2) 240
(3) 260 (4) 320
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. The HCF of two numbers 12906 and 14818 is 478. Their LCM is
(1) 400086 (2) 200043
(3) 600129 (4) 800172
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

6. The H.C.F. and L.C.M. of two 2-digit numbers are 16 and 480 respectively. The numbers are :
(1) 40, 48 (2) 60, 72
(3) 64, 80 (4) 80, 96
(SSC CPO S.I. Exam. 26.05.2005)

7. The HCF of two numbers is 16 and their LCM is 160. If one of the number is 32, then the other number is
(1) 48 (2) 80
(3) 96 (4) 112
(SSC CPO Sub Inspector Exam. 12.01.2003

8. The product of two numbers is 4107. If the H.C.F. of the numbers is 37, the greater number is
(1) 185 (2) 111
(3) 107 (4) 101
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting) & SSC CGL Exam. 27.07.08 (Second Sitting)

9. The HCF of two numbers is 15 and their LCM is 300. If one of the number is 60, the other is :
(1) 50 (2) 75
(3) 65 (4) 100
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

10. The HCF and LCM of two numbers are 12 and 924 respectively. Then the number of such pairs is
(1) 0 (2) 1
(3) 2 (4) 3
(SSC CGLTier-1 Exam 26.06.2011 (Second Sitting)

11. The LCM of two numbers is 30 and their HCF is 5. One of the number is 10. The other is
(1) 20 (2) 25
(3) 15 (4) 5
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

12. The product of two numbers is 1280 and their H.C.F. is 8. The L.C.M. of the number will be :
(1) 160 (2) 150
(3) 120 (4) 140
(SSC CPO SI Exam. 16.12.2007)

13. The H.C.F. and L.C.M. of two numbers are 8 and 48 respectively. If one of the number is 24, then the other number is
(1) 48 (2) 36
(3) 24 (4) 16
(SSC CGLTier-I Exam. 16.05.2010 (First Sitting)

14. The H.C.F and L.C.M of two numbers are 12 and 336 respectively. If one of the number is 84, the other is
(1) 36 (2) 48
(3) 72 (4) 96
(SSC CGLTier-I Exam. 16.05.2010 (Second Sitting)

15. The product of two numbers is 216. If the HCF is 6, then their LCM is
(1) 72 (2) 60
(3) 48 (4) 36
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

16. The HCF and LCM of two numbers are 18 and 378 respectively. If one of the number is 54, then the other number is
(1) 126 (2) 144
(3) 198 (4) 238
(SSC (South Zone) Investigator Exam 12.09.2010)

17. The HCF and product of two numbers are 15 and 6300 respectively. The number of possible pairs of the numbers is
(1) 4 (2) 3
(3) 2 (4) 1
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

18. The HCF of two numbers is 15 and their LCM is 225. If one of the number is 75, then the other number is :
(1) 105 (2) 90
(3) 60 (4) 45
(SSC CHSL DEO & LDC Exam. 27.11.2010)

19. The LCM of two numbers is 520 and their HCF is 4. If one of the number is 52, then the other number is
(1) 40 (2) 42
(3) 50 (4) 52
(SSC CISF Constable (GD) Exam. 05.06.2011)

20. The H.C.F. of two numbers is 96 and their L.C.M. is 1296. If one of the number is 864, the other is
(1) 132 (2) 135
(3) 140 (4) 144
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

21. The LCM of two numbers is 4 times their HCF. The sum of LCM and HCF is 125. If one of the number is 100, then the other number is
(1) 5 (2) 25
(3) 100 (4) 125
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

22. Product of two co-prime numbers is 117. Then their L.C.M. is
(1) 117 (2) 9
(3) 13 (4) 39
(SSC CGL Tier-I Exam. 19.05.2013 Ist Sitting)

23. The product of two numbers is 2160 and their HCF is 12. Number of such possible pairs is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

24. LCM of two numbers is 2079 and their HCF is 27. If one of the number is 189, the other number is
(1) 297 (2) 584
(3) 189 (4) 216
(SSC (10+2) Level Data Entry Operator & LDC Exam. 10.11.2013, IInd Sitting)

25. The product of two numbers is 2028 and their HCF is 13. The number of such pairs is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CPO S.I. Exam. 12.01.2003 & SSC CGL Tier-I Exam. 19.06.11 (First Sitting)

26. The HCF and LCM of two numbers are 13 and 455 respectively. If one of the number lies between 75 and 125, then, that number is :
(1) 78 (2) 91
(3) 104 (4) 117
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

27. The H.C.F. of two numbers is 8. Which one of the following can never be their L.C.M.?
(1) 24 (2) 48
(3) 56 (4) 60
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

28. The HCF of two numbers is 23 and the other two factors of their LCM are 13 and 14. The larger of the two numbers is :
(1) 276 (2) 299
(3) 345 (4) 322
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

29. The L.C.M. of three different numbers is 120. Which of the following cannot be their H.C.F.?
(1) 8 (2) 12
(3) 24 (4) 35
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

30. The H.C.F. and L.C.M. of two numbers are 44 and 264 respectively. If the first number is divided by 2, the quotient is 44. The other number is
(1) 147 (2) 528
(3) 132 (4) 264
(SSC CHSL DEO & LDC Exam. 9.11.2014

TYPE–II

1. The least number which when divided by 4, 6, 8, 12 and 16 leaves a remainder of 2 in each case is :
(1) 46 (2) 48
(3) 50 (4) 56
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The least number, which when divided by 12, 15, 20 or 54 leaves a remainder of 4 in each case, is :
(1) 450 (2) 454
(3) 540 (4) 544
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. Find the greatest number of five digits which when divided by 3, 5, 8, 12 have 2 as remainder :
(1) 99999 (2) 99958
(3) 99960 (4) 99962
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. The least multiple of 13, which on dividing by 4, 5, 6, 7 and 8 leaves remainder 2 in each case is:
(1) 2520 (2) 842
(3) 2522 (4) 840
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone, SSC CGL Prelim Exam. 24.02.2002 (Second Sitting) & SSC CGL Prelim Exam. 13.11.2005)

5. A, B, C start running at the same time and at the same point in the same direction in a circular stadium. A completes a round in 252 seconds, B in 308 seconds and C in 198 seconds. After what time will they meet again at the starting point ?
(1) 26 minutes 18 seconds
(2) 42 minutes 36 seconds
(3) 45 minutes
(4) 46 minutes 12 seconds
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

6. Find the largest number of four digits such that on dividing by 15, 18, 21 and 24 the remainders are 11, 14, 17 and 20 respectively.
(1) 6557 (2) 7556
(3) 5675 (4) 7664
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

7. The least perfect square, which is divisible by each of 21, 36 and 66 is
(1) 214344 (2) 214434
(3) 213444 (4) 231444
(SSC CPO S.I. Exam. 12.01.2003)

8. The least number, which when divided by 4, 5 and 6 leaves remainder 1, 2 and 3 respectively, is
(1) 57 (2) 59
(3) 61 (4) 63
(SSC CPO S.I. Exam. 12.01.2003)

9. Let the least number of six digits which when divided by 4, 6, 10, 15 leaves in each case same remainder 2 be N. The sum of digits in N is :
(1) 3 (2) 5
(3) 4 (4) 6
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

10. Which is the least number which when doubled will be exactly divisible by 12, 18, 21 and 30 ?
(1) 2520 (2) 1260
(3) 630 (4) 196
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

11. The smallest square number divisible by 10, 16 and 24 is
(1) 900 (2) 1600
(3) 2500 (4) 3600
(SSC CPO S.I. Exam. 07.09.2003)

12. If the students of a class can be grouped exactly into 6 or 8 or 10, then the minimum number of students in the class must be
(1) 60 (2) 120
(3) 180 (4) 240
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

13. The least number which when divided by 4, 6, 8 and 9 leave zero remainder in each case and when divided by 13 leaves a remainder of 7 is :
(1) 144 (2) 72
(3) 36 (4) 85
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

14. The smallest number, which when divided by 12 and 16 leaves remainder 5 and 9 respectively, is :
(1) 55 (2) 41
(3) 39 (4) 29
(SSC CPO S.I. Exam. 26.05.2005)

15. A number which when divided by 10 leaves a remainder of 9, when divided by 9 leaves a remainder of 8, and when divided by 8 leaves a remainder of 7, is :
(1) 1539 (2) 539
(3) 359 (4) 1359
(SSC CPO S.I. Exam. 26.05.2005)

16. What is the smallest number which leaves remainder 3 when divided by any of the numbers 5, 6 or 8 but leaves no remainder when it is divided by 9 ?
(1) 123 (2) 603
(3) 723 (4) 243
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

17. The least number which when divided by 16, 18, 20 and 25 leaves 4 as remainder in each case but when divided by 7 leaves no remainder is
(1) 17004 (2) 18000
(3) 18002 (4) 18004
(SSC CGL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

18. What is the least number which when divided by the numbers 3, 5, 6, 8, 10 and 12 leaves in each case a remainder 2 but when divided by 13 leaves no remainder ?
(1) 312 (2) 962
(3) 1562 (4) 1586
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

19. The least multiple of 7, which leaves the remainder 4, when divided by any of 6, 9, 15 and 18, is
(1) 76 (2) 94
(3) 184 (4) 364
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

20. The largest number of five digits which, when divided by 16, 24, 30, or 36 leaves the same remainder 10 in each case, is :
(1) 99279 (2) 99370
(3) 99269 (4) 99350
(SSC CPO S.I. Exam. 16.12.2007)

21. The smallest number, which when divided by 5, 10, 12 and 15, leaves remainder 2 in each case; but when divided by 7 leaves no remainder, is
(1) 189 (2) 182
(3) 175 (3) 91
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

22. What least number must be subtracted from 1936 so that the resulting number when divided by 9, 10 and 15 will leave in each case the same remainder 7 ?
(1) 37 (2) 36
(3) 39 (4) 30
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

23. The least number, which when divided by 18, 27 and 36 separately leaves remainders 5,14, and 23 respectively, is
(1) 95 (2) 113
(3) 149 (4) 77
(SSC CPO S.I. Exam. 09.11.2008)

24. The least number which when divided by 5, 6, 7 and 8 leaves a remainder 3, but when divided by 9 leaves no remainder is
(1) 1677 (2) 1683
(3) 2523 (4) 3363
(SSC CPO S.I. Exam. 06.09.2009) & SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

25. The greatest number of four digits which when divided by 12, 16 and 24 leave remainders 2, 6 and 14 respectively is
(1) 9974 (2) 9970
(3) 9807 (4) 9998
(SSC CPO S.I. Exam. 06.09.2009)

26. When a number is divided by 15, 20 or 35, each time the remainder is 8. Then the smallest number is
(1) 428 (2) 427
(3) 328 (4) 338
(SSC CPO S.I. Exam. 06.09.2009)

27. The smallest number, which, when divided by 12 or 10 or 8, leaves remainder 6 in each case, is
(1) 246 (2) 186
(3) 126 (4) 66
(SSC (South Zone) Investigator Exam. 12.09.2010)

28. The traffic lights at three different road crossings change after 24 seconds, 36 seconds and 54 seconds respectively. If they all change simultaneously at 10 : 15 : 00 AM, then at what time will they again change simultaneously?
(1) 10 : 16 : 54 AM
(2) 10 : 18 : 36 AM
(3) 10 : 17 : 02 AM
(4) 10 : 22 : 12 AM
(SSC CGLTier-1 Exam. 26.06.2011 (First Sitting)

29. From a point on a circular track 5 km long A, B and C started running in the same direction at the same time with speed of $2\frac{1}{2}$ km per hour, 3 km per hour and 2 km per hour respectively. Then on the starting point all three will meet again after
(1) 30 hours (2) 6 hours
(3) 10 hours (4) 15 hours
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

30. Four runners started running simultaneously from a point on a circular track. They took 200 seconds, 300 seconds, 360 seconds and 450 seconds to complete one round. After how much time do they meet at the starting point for the first time ?
(1) 1800 seconds
(2) 3600 seconds
(3) 2400 seconds
(4) 4800 seconds
(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

31. Four bells ring at intervals of 4, 6, 8 and 14 seconds. They start ringing simultaneously at 12.00 O'clock. At what time will they again ring simultaneously ?
(1) 12 hrs. 2 min. 48 sec.
(2) 12 hrs. 3 min.
(3) 12 hrs. 3 min. 20 sec.
(4) 12 hrs. 3 min. 44 sec.
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

32. 4 bells ring at intervals of 30 minutes, 1 hour, $1\frac{1}{2}$ hour and 1 hour 45 minutes respectively. All the bells ring simultaneously at 12 noon. They will again ring simultaneously at :
(1) 12 mid night (2) 3 a.m.
(3) 6 a.m. (4) 9 a.m.
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

33. Four bells ring at the intervals of 5, 6, 8 and 9 seconds. All the bells ring simulataneously at some time. They will again ring simultaneously after
(1) 6 minutes (2) 12 minutes
(3) 18 minutes (4) 24 minutes
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

34. Three bells ring simultaneously at 11a.m. They ring at regular intervals of 20 minutes, 30 minutes, 40 minutes respectively. The time when all the three ring together next is
(1) 2 p.m. (2) 1 p.m.
(3) 1.15 p.m. (4) 1.30 p.m.
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

35. The greatest number of four digits which when divided by 3, 5, 7, 9 leave remainders 1, 3, 5, 7 respectively is :
(1) 9763 (2) 9764
(3) 9766 (4) 9765
(SSC CGL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

36. Five bells begin to toll together and toll respectively at intervals of 6, 7, 8, 9 and 12 seconds. After how many seconds will they toll together again ?
(1) 72 Sec. (2) 612 Sec.
(3) 504 Sec. (4) 318 Sec.
(SSC Constable (GD) Exam. 12.05.2013)

37. L.C.M. of $\frac{2}{3}, \frac{4}{9}, \frac{5}{6}$ is
(1) $\frac{8}{27}$ (2) $\frac{20}{3}$
(3) $\frac{10}{3}$ (4) $\frac{20}{27}$
(SSCCGL DEO & LDC Exam. 20.10.2013)

38. The number nearest to 10000, which is exactly divisible by each of 3, 4, 5, 6, 7 and 8, is :
(1) 9240 (2) 10080
(3) 9996 (4) 10000
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

39. The largest 4-digit number exactly divisible by each of 12, 15, 18 and 27 is
(1) 9690 (2) 9720
(3) 9930 (4) 9960
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

40. The least number, which is a perfect square and is divisible by each of the numbers 16, 20 and 24, is
(1) 1600 (2) 3600
(3) 6400 (4) 14400
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

41. The number nearest to 43582 divisible by each of 25, 50 and 75 is :
(1) 43500 (2) 43650
(3) 43600 (4) 43550
(SSC CPO S.I. Exam. 16.12.2007)

42. The smallest number, which when increased by 5 is divisible by each of 24,32, 36 and 564, is
(1) 869 (2) 859
(3) 4320 (4) 427
(SSC CPO S.I. Exam. 09.11.2008)

43. The greatest number, which when subtracted from 5834, gives a number exactly divisible by each of 20, 28, 32 and 35, is
(1) 1120 (2) 4714
(3) 5200 (4) 5600
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

44. The smallest perfect square divisible by each of 6, 12 and 18 is
(1) 196 (2) 144
(3) 108 (4) 36
(SSC (South Zone) Investigator Exam. 12.09.2010)

45. The greatest 4-digit number exactly divisible by 10, 15, 20 is
(1) 9990 (2) 9960
(3) 9980 (4) 9995
(SSC Graduate Level Tier-II Exam. 29.09.2013)

46. Find the least number which when divided separately by 15, 20, 36 and 48 leaves 3 as remainder in each case.
(1) 183 (2) 243
(3) 483 (4) 723
(SSC CGL Tier-II Exam. 21.09.2014)

47. Three men step off together from the same spot. Their steps measure 63 cm, 70 cm and 77 cm respectively. The minimum distance each should cover so that all can cover the distance in complete steps is
(1) 9630 cm (2) 9360 cm
(3) 6930 cm (4) 6950 cm
(SSC CGL Tier-II Exam. 21.09.2014)

48. Three bells ring at intervals of 36 seconds, 40 seconds and 48 seconds respectively. They start ringing together at a particular time. They will ring together after every
(1) 6 minutes (2) 12 minutes
(3) 18 minutes (4) 24 minutes
(SSC CGL Tier-II Online Exam.01.12.2016)

49. The LCM of four consecutive numbers is 60. The sum of the first two numbers is equal to the fourth number. What is the sum of four numbers?
(1) 17 (2) 14
(3) 21 (4) 24
(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

50. The LCM fo two prime numbers x and y, $(x > y)$ is 161. The value of $(3y - x)$:
(1) –2 (2) –1
(3) 1 (4) 2
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

51. Three electronic devices make a beep after every 48 seconds, 72 seconds and 108 seconds respectively. They beeped together at 10 a.m. The time when they will next make a beep together at the earliest is
(1) 10 : 07 : 12 hours
(2) 10 : 07 : 24 hours
(3) 10 : 07 : 36 hours
(4) 10 : 07 : 48 hours
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–III

1. The maximum number of students among whom 1001 pens and 910 pencils can be distributed in such a way that each student gets same number of pens and same number of pencils, is :
(1) 91 (2) 910
(3) 1001 (4) 1911
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The greatest number, which when divide 989 and 1327 leave remainders 5 and 7 respectively, is :
(1) 8 (2) 16
(3) 24 (4) 32
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

3. H.C.F of $\frac{2}{3}, \frac{4}{5}$ and $\frac{6}{7}$ is
(1) $\frac{48}{105}$ (2) $\frac{2}{105}$
(3) $\frac{1}{105}$ (4) $\frac{24}{105}$
(SSC Graduate Level Tier-II Exam. 16.09.2012)

4. Let N be the greatest number that will divide 1305, 4665 and 6905 leaving the same remainder in each case. Then, sum of the digits in N is :
(1) 4 (2) 5
(3) 6 (4) 8
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

5. What is the greatest number that will divide 307 and 330 leaving remainders 3 and 7 respectively ?
(1) 19 (2) 16
(3) 17 (4) 23
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

6. Which greatest number will divide 3026 and 5053 leaving remainders 11 and 13 respectively?
(1) 18 (2) 30
(3) 45 (4) 60
(SSC CPO S.I. Exam. 03.09.2006)

7. The greatest number, by which 1657 and 2037 are divided to give remainders 6 and 5 respectively, is
(1) 127 (2) 133
(3) 235 (4) 305
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

8. The largest number, which divides 25, 73 and 97 to leave the same remainder in each case, is
(1) 24 (2) 23
(3) 21 (4) 6
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

9. What is the greatest number which will divide 110 and 128 leaving a remainder 2 in each case ?
(1) 8 (2) 18
(3) 28 (4) 38
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

10. A milkman has 75 litres milk in one can and 45 litres in another. The maximum capacity of container which can measure milk of either container exact number of times is :
(1) 1 litre (2) 5 litres
(3) 15 litres (4) 25 litres
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

11. What is the least number of square tiles required to pave the floor of a room 15 m 17 cm long and 9 m 2 cm broad?
(1) 840 (2) 841
(3) 820 (4) 814
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

12. Three sets of English, Mathematics and Science books containing 336, 240, 96 books respectively have to be stacked in such a way that all the books are stored subject-wise and the height of each stack is the same. Total number of stacks will be
(1) 14 (2) 21
(3) 22 (4) 48
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

13. A farmer has 945 cows and 2475 sheep. He farms them into flocks, keeping cows and sheep separate and having the same number of animals in each flock. If these flocks are as large as possible, then the maximum number of animals in each flock and total number of flocks required for the purpose are respectively
(1) 15 and 228 (2) 9 and 380
(3) 45 and 76 (4) 46 and 75
(SSC (10+2) Level Data Entry Operator & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

14. A milk vendor has 21 litres of cow milk, 42 litres of toned milk and 63 litres of double toned milk. If he wants to pack them in cans so that each can contains same litres of milk and does not want to mix any two kinds of milk in a can, then the least number of cans required is
(1) 3 (2) 6
(3) 9 (4) 12
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

15. The greatest number that divides 411, 684, 821 and leaves 3, 4 and 5 as remainders, respectively, is
(1) 254 (2) 146
(3) 136 (4) 204
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

16. Find the greatest number which will exactly divide 200 and 320.
(1) 10 (2) 20
(3) 16 (4) 40
(SSC CGL Tier-II Exam. 21.09.2014

17. 84 Maths books, 90 Physics books and 120 Chemistry books have to be stacked topicwise. How many books will be there in each stack so that each stack will have the same height too ?
(1) 12 (2) 18
(3) 6 (4) 21
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014

18. The greatest number that will divide 729 and 901 leaving remainders 9 and 5 respectively, is
(1) 15 (2) 16
(3) 19 (4) 20
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

19. Three tankers contain 403 litres, 434 litres, 465 litres of diesel respectively. Then the maximum capacity of a container that can measure the diesel of the three containers exact number of times is
(1) 31 litres (2) 62 litres
(3) 41 litres (4) 84 litres
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

20. There are 24 peaches, 36 apricots and 60 bananas and they have to be arranged in several rows in such a way that every row contains the same number of fruits of only one type. What is the minimum number of rows required for this to happen ?
(1) 12 (2) 9
(3) 10 (4) 6
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

21. The greatest number by which 2300 and 3500 are divided leaving the remainders of 32 and 56 respectively, is
(1) 136 (2) 168
(3) 42 (4) 84
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

22. The product of two 2–digit numbers is 2160 and their H.C.F. is 12. The numbers are
(1) (12, 60) (2) (72, 30)
(3) (36, 60) (4) (60, 72)
(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

23. Find the greatest number that will divide 390, 495 and 300 without leaving a remainder.
(1) 5 (2) 15
(3) 25 (4) 35
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

24. In a school, 391 boys and 323 girls have been divided into the largest possible equal classes, so that each class of boys numbers the same as each class of girls. What is the number of classes ?
(1) 23 (2) 19
(3) 44 (4) 17
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

25. Two pipes of length 1.5 m and 1.2 m are to be cut into equal pieces without leaving any extra length of pipes. The greatest length of the pipe pieces of same size which can be cut from these two lengths will be
(1) 0.13 metre (2) 0.4 metre
(3) 0.3 metre (4) 0.41 metre
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–IV

1. The LCM and the HCF of the numbers 28 and 42 are in the ratio :
(1) 6 : 1 (2) 2 : 3
(3) 3 : 2 (4) 7 : 2
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. If the ratio of two numbers is 2 : 3 and their L.C.M. is 54, then the sum of the two numbers is
(1) 5 (2) 15
(3) 45 (4) 270
(SSC CPO S.I. Exam. 07.09.2003)

3. The ratio of two numbers is 4 : 5 and their L.C.M. is 120. The numbers are
(1) 30, 40 (2) 40, 32
(3) 24, 30 (4) 36, 20
(SSC CPO S.I. Exam. 07.09.2003)

4. Three numbers are in the ratio 2 : 3 : 4 and their H.C.F. is 12. The L.C.M. of the numbers is
(1) 144 (2) 192
(3) 96 (4) 72
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

5. Two numbers are in the ratio 3 : 4. If their LCM is 240, the smaller of the two number is
(1) 100 (2) 80
(3) 60 (4) 50
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

6. Two numbers are in the ratio 3 : 4. Their L.C.M. is 84. The greater number is
(1) 21 (2) 24
(3) 28 (4) 84
(SSC CGLTier-I Exam. 16.05.2010 (First Sitting)

7. Two numbers are in the ratio 3 : 4. If their HCF is 4, then their LCM is
(1) 48 (2) 42
(3) 36 (4) 24
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting) & SSC (South Zone) Investigator Exam. 12.09.2010 & SSC MTS Exam. 10.03.2013)

8. The ratio of the sum to the LCM of two natural numbers is 7 : 12. If their HCF is 4, then the smaller number is :
(1) 20 (2) 16
(3) 12 (4) 8
(SSC CGL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

9. Two numbers are in the ratio 3 : 4. The product of their H.C.F. and L.C.M. is 2028. The sum of the numbers is
(1) 68 (2) 72
(3) 86 (4) 91
(SSC DEO Exam. 02.08.2009)

10. The LCM of two numbers is 48. The numbers are in the ratio 2 : 3. The sum of the numbers is
(1) 28 (2) 32
(3) 40 (4) 64
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

11. The ratio of two numbers is 4 : 5 and their H.C.F. is 8. Then their L.C.M. is
(1) 130 (2) 140
(3) 150 (4) 160
(SSC CGL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

12. The ratio of two numbers is 3 : 4 and their HCF is 5. Their LCM is :
(1) 10 (2) 60
(3) 15 (4) 12
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

13. Three numbers are in the ratio 1 : 2 : 3 and their HCF is 12. The numbers are
(1) 12, 24, 36 (2) 5, 10, 15
(3) 4, 8, 12 (4) 10, 20, 30
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

14. If $x : y$ be the ratio of two whole numbers and z be their HCF, then the LCM of those two numbers is
(1) yz (2) $\frac{xz}{y}$
(3) $\frac{xy}{z}$ (4) xyz
(SSC CHSL DEO & LDC Exam. 16.11.2014

15. The H.C.F. and L.C.M. of two numbers are 21 and 84 respectively. If the ratio the two numbers is 1 : 4, then the larger of the two numbers is
(1) 12 (2) 108
(3) 48 (4) 84
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

TYPE–V

1. The product of the LCM and HCF of two numbers is 24. The difference of the two numbers is 2. Find the numbers ?
(1) 8 and 6 (2) 8 and 10
(3) 2 and 4 (4) 6 and 4
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The LCM of two numbers is 495 and their HCF is 5. If the sum of the numbers is 100, then their difference is :
(1) 10 (2) 46
(3) 70 (4) 90
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. Two numbers, both greater than 29, have HCF 29 and LCM 4147. The sum of the numbers is :
(1) 966 (2) 696
(3) 669 (4) 666
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting), & SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. The sum of the H.C.F. and L.C.M of two numbers is 680 and the L.C.M. is 84 times the H.C.F. If one of the number is 56, the other is :
(1) 84 (2) 12
(3) 8 (4) 96
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

5. The sum of two numbers is 84 and their HCF is 12. Total number of such pairs of number is
(1) 2 (2) 3
(3) 4 (4) 5
(SSC HSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

6. The sum of a pair of positive integer is 336 and their H.C.F. is 21. The number of such possible pairs is
(1) 2 (2) 3
(3) 4 (4) 5
(SSC CGL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

7. The sum of two numbers is 45. Their difference is $\frac{1}{9}$ of their sum. Their L.C.M. is
(1) 200 (2) 250
(3) 100 (4) 150
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

8. The H.C.F. of two numbers, each having three digits , is 17 and their L.C.M. is 714. The sum of the numbers will be :
(1) 289 (2) 391
(3) 221 (4) 731
(SSC CPO S.I. Exam. 16.12.2007)

9. The product of the LCM and the HCF of two numbers is 24. If the difference of the numbers is 2, then the greater of the number is
(1) 3 (2) 4
(3) 6 (4) 8
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

10. The sum of two numbers is 216 and their HCF is 27. How many pairs of such numbers are there?
(1) 1 (2) 2
(3) 3 (4) 0
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

11. The LCM of two numbers is 12 times their HCF. The sum of the HCF and the LCM is 403. If one of the number is 93, then the other number is
(1) 124 (2) 128
(3) 134 (4) 138
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

12. Sum of two numbers is 384. H.C.F. of the numbers is 48. The difference of the numbers is
(1) 100 (2) 192
(3) 288 (4) 336
(SSC CPO S.I. Exam. 06.09.2009)

13. The sum of two numbers is 36 and their H.C.F and L.C.M. are 3 and 105 respectively. The sum of the reciprocals of two numbers is
(1) $\frac{2}{35}$ (2) $\frac{3}{25}$
(3) $\frac{4}{35}$ (4) $\frac{2}{25}$
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting) & SSC HSL DEO & LDC Exam. 28.11.2010)

14. L.C.M. of two numbers is 120 and their H.C.F. is 10. Which of the following can be the sum of those two numbers ?
(1) 140 (2) 80
(3) 60 (4) 70
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

15. Three numbers which are co-prime to one another are such that the product of the first two is 551 and that of the last two is 1073. The sum of the three numbers is :
(1) 75 (2) 81
(3) 85 (4) 89
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

16. The sum of two numbers is 36 and their H.C.F. is 4. How many pairs of such numbers are possible ?
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

17. If the HCF and LCM of two consecutive (positive) even numbers be 2 and 84 respectively, then the sum of the numbers is
(1) 30 (2) 26
(3) 14 (4) 34
(SSC CGL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

18. The LCM of two positive integers is twice the larger number. The difference of the smaller number and the GCD of the two numbers is 4. The smaller number is :
(1) 12 (2) 6
(3) 8 (4) 10
(SSC CGL DEO & LDC Exam. 21.10.2012, IInd Sitting)

19. The L.C.M. of two numbers is 20 times their H.C.F. The sum of H.C.F. and L.C.M. is 2520. If one of the number is 480, the other number is :
(1) 400 (2) 480
(3) 520 (4) 600
(SSC CPO S.I. Exam. 26.05.2005)

20. The LCM of two numbers is 44 times of their HCF. The sum of the LCM and HCF is 1125. If one number is 25, then the other number is
(1) 1100 (2) 975
(3) 900 (4) 800
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

21. If A and B are the H.C.F. and L.C.M. respectively of two algebraic expressions x and y, and A + B = x + y, then the value of $A^3 + B^3$ is
(1) $x^3 - y^3$ (2) x^3
(3) y^3 (4) $x^3 + y^3$
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

22. HCF and LCM of two numbers are 7 and 140 respectively. If the numbers are between 20 and 45, the sum of the numbers is :
(1) 70 (2) 77
(3) 63 (4) 56
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

23. The number between 3000 and 4000 which is exactly divisible by 30, 36 and 80 is
(1) 3625 (2) 3250
(3) 3500 (4) 3600
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

24. Let x be the least number, which when divided by 5, 6, 7 and 8 leaves a remainder 3 in each case but when divided by 9 leaves no remainder. The sum of digits of x is
(1) 21 (2) 22
(3) 18 (4) 24
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

25. The greatest four digit number which is exactly divisible by each one of the numbers 12, 18, 21 and 28 is
(1) 9828 (2) 9288
(3) 9882 (4) 9928
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

26. A number x is divisible by 7. When this number is divided by 8, 12 and 16. It leaves a remainder 3 in each case. The least value of x is:
(1) 148 (2) 149
(3) 150 (4) 147
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

27. Let x be the smallest number, which when added to 2000 makes the resulting number divisible by 12, 16, 18 and 21. The sum of the digits of x is
(1) 7 (2) 5
(3) 6 (4) 4
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

28. The smallest five digit number which is divisible by 12,18 and 21 is :

(1) 10224 (2) 30256
(3) 10080 (4) 50321

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

29. A number between 1000 and 2000 which when divided by 30, 36 and 80 gives a remainder 11 in each case is

(1) 1451 (2) 1641
(3) 1712 (4) 1523

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

30. The number between 4000 and 5000 that is divisible by each of 12, 18, 21 and 32 is

(1) 4023 (2) 4032
(3) 4302 (4) 4203

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

31. If the product of three consecutive numbers is 210 then sum of the smaller number is :

(1) 3 (2) 4
(3) 5 (4) 11

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

TYPE–VI

1. The LCM of two multiples of 12 is 1056. If one of the number is 132, the other number is

(1) 12 (2) 72
(3) 96 (4) 132

(SSC CPO S.I. Exam. 06.09.2009)

2. The least number to be subtracted from 36798 to get a number which is exactly divisible by 78 is

(1) 18 (2) 60
(3) 38 (4) 68

(SSC CPO S.I. Exam. 06.09.2009)

3. Find the least multiple of 23, which when divided by 18, 21 and 24 leaves the remainder 7, 10 and 13 respectively.

(1) 3013 (2) 3024
(3) 3002 (4) 3036

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. The greatest number, that divides 122 and 243 leaving respectively 2 and 3 as remainders, is

(1) 12 (2) 24
(3) 30 (4) 120

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

5. If $P = 2^3.3^{10}.5$; $Q = 2^5.3.7$, then HCF of P and Q is :

(1) 2.3.5.7 (2) 3.2^3
(3) $2^2.3^7$ (4) $2^5.3^{10}.5.7$

(SSC CGL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

6. A fraction becomes $\frac{1}{6}$ when 4 is subtracted from its numerator and 1 is added to its denominator. If 2 and 1 are respectively added to its numerator and the denominator, it becomes $\frac{1}{3}$. Then, the LCM of the numerator and denominator of the said fraction, must be

(1) 14 (2) 350
(3) 5 (4) 70

(SSC CGL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

7. The HCF (GCD) of a, b is 12, a, b are positive integers and $a > b > 12$. The smallest values of (a, b) are respectively

(1) 12, 24 (2) 24, 12
(3) 24, 36 (4) 36, 24

(SSC CGL Tier-I Exam. 11.11.2012, Ist Sitting)

8. The number of pair of positive integers whose sum is 99 and HCF is 9 is

(1) 2 (2) 3
(3) 4 (4) 5

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

SHORT ANSWERS

TYPE-I

1. (3)	**2.** (3)	**3.** (3)	**4.** (2)
5. (1)	**6.** (4)	**7.** (2)	**8.** (2)
9. (2)	**10.** (3)	**11.** (3)	**12.** (1)
13. (4)	**14.** (2)	**15.** (4)	**16.** (1)
17. (3)	**18.** (4)	**19.** (1)	**20.** (4)
21. (2)	**22.** (1)	**23.** (2)	**24.** (1)
25. (2)	**26.** (2)	**27.** (4)	**28.** (4)
29. (4)	**30.** (3)		

TYPE-II

1. (3)	**2.** (4)	**3.** (4)	**4.** (3)
5. (4)	**6.** (2)	**7.** (3)	**8.** (1)
9. (2)	**10.** (3)	**11.** (4)	**12.** (2)
13. (2)	**14.** (2)	**15.** (3)	**16.** (4)
17. (4)	**18.** (2)	**19.** (4)	**20.** (2)
21. (2)	**22.** (3)	**23.** (1)	**24.** (2)
25. (1)	**26.** (1)	**27.** (3)	**28.** (2)
29. (3)	**30.** (1)	**31.** (1)	**32.** (4)
33. (1)	**34.** (2)	**35.** (1)	**36.** (3)
37. (2)	**38.** (2)	**39.** (2)	**40.** (2)
41. (2)	**42.** (2)	**43.** (2)	**44.** (4)
45. (2)	**46.** (4)	**47.** (3)	**48.** (2)
49. (2)	**50.** (1)	**51.** (1)	

TYPE-III

1. (1)	**2.** (3)	**3.** (2)	**4.** (1)
5. (1)	**6.** (3)	**7.** (1)	**8.** (1)
9. (2)	**10.** (3)	**11.** (4)	**12.** (1)
13. (3)	**14.** (2)	**15.** (3)	**16.** (4)
17. (3)	**18.** (2)	**19.** (1)	**20.** (3)
21. (4)	**22.** (3)	**23.** (2	**24.** (4)
25. (3)			

TYPE-IV

1. (1)	**2.** (3)	**3.** (3)	**4.** (1)
5. (3)	**6.** (3)	**7.** (1)	**8.** (3)
9. (4)	**10.** (3)	**11.** (4)	**12.** (2)
13. (1)	**14.** (4)	**15.** (4)	

TYPE-V

1. (4)	**2.** (1)	**3.** (2)	**4.** (4)
5. (2)	**6.** (3)	**7.** (3)	**8.** (3)
9. (3)	**10.** (2)	**11.** (1)	**12.** (3)
13. (3)	**14.** (4)	**15.** (3)	**16.** (3)
17. (2)	**18.** (3)	**19.** (4)	**20.** (1)
21. (4)	**22.** (3)	**23.** (4)	**24.** (3)
25. (1)	**26.** (4)	**27.** (1)	**28.** (3)
29. (1)	**30.** (2)	**31.** (4)	

TYPE-VI

1. (3)	**2.** (2)	**3.** (1)	**4.** (4)
5. (2)	**6.** (4)	**7.** (4)	**8.** (4)

EXPLANATIONS

TYPE-I

1. (3) Using Rule 1,
Required number

$$= \frac{\text{LCM} \times \text{HCF}}{\text{First number}}$$

$$= \frac{864 \times 144}{288} = 432$$

2. (3) Using Rule 1,
LCM × HCF = 1st Number× 2nd Number
⇒ 225 × 5 = 25 × x

$$\therefore x = \frac{225 \times 5}{25} = 45$$

3. (3) Using Rule 1,
Given that
L.C.M. of two numbers = 1820
H.C.F. of those numbers = 26
One of the number is 130
∴ Another number

$$= \frac{1820 \times 26}{130} = 364$$

4. (2) Using Rule 1,
We have,
First number × second number = LCM × HCF
∴ Second number

$$= \frac{1920 \times 16}{128} = 240$$

5. (1) Using Rule 1,
Product of two numbers
= HCF × LCM
⇒ 12906 × 14818
= LCM × 478

$$\Rightarrow \text{LCM} = \frac{12906 \times 14818}{478}$$

= 400086

6. (4) Using Rule 1,
H.C.F. of the two 2-digit numbers = 16
Hence, the numbers can be expressed as $16x$ and $16y$, where x and y are prime to each other.
Now,
First number × second number = H.C.F. × L.C.M.
⇒ $16x \times 16y = 16 \times 480$

$$\Rightarrow xy = \frac{16 \times 480}{16 \times 16} = 30$$

The possible pairs of x and y, satisfying the condition $xy = 30$ are : (3, 10), (5, 6), (1, 30), (2, 15)
Since the numbers are of 2-digits each.
Hence, admissible pair is (5, 6)
∴ Numbers are : 16 × 5 = 80 and 16 × 6 = 96

7. (2) Using Rule 1,
We know that,
First number × Second number = LCM × HCF
⇒ Second number

$$= \frac{16 \times 160}{32} = 80$$

8. (2) Using Rule 1,

$$\text{LCM} = \frac{\text{Product of two numbers}}{\text{HCF}}$$

$$= \frac{4107}{37} = 111$$

Obviously, numbers are 111 and 37 which satisfy the given condition.
Hence, the greater number = 111

9. (2) Using Rule 1,
First number × Second number = HCF × LCM
∴ Second number

$$= \frac{15 \times 300}{60} = 75$$

10. (3) Let the numbers be $12x$ and $12y$ where x and y are prime to each other.
∴ LCM = $12xy$
∴ $12xy = 924$
⇒ $xy = 77$
∴ Possible pairs = (1,77) and (7,11)

11. (3) Using Rule 1,
First number × second number = LCM × HCF
Let the second number be x.
∴ $10x = 30 \times 5$

$$\Rightarrow x = \frac{30 \times 5}{10} = 15$$

12. (1) Using Rule 1,
HCF × LCM = Product of two numbers
⇒ 8 × LCM = 1280

$$\Rightarrow \text{LCM} = \frac{1280}{8} = 160$$

13. (4) Using Rule 1,
First number × second number = HCF × LCM
⇒ 24 × second number = 8 × 48

$$\therefore \text{Second number} = \frac{8 \times 48}{24} = 16$$

14. (2) Using Rule 1,
First number × second number = HCF × LCM
⇒ 84 × second number
= 12 × 336
∴ Second number

$$= \frac{12 \times 336}{84} = 48$$

15. (4) Let the numbers be $6x$ and $6y$ where x and y are prime to each other.
∴ $6x \times 6y = 216$

$$\Rightarrow xy = \frac{216}{6 \times 6} = 6$$

∴ LCM = $6xy = 6 \times 6 = 36$

16. (1) Using Rule 1,
Second number

$$= \frac{\text{HCF} \times \text{LCM}}{\text{First number}}$$

$$= \frac{18 \times 378}{54} = 126$$

17. (3) Let the number be $15x$ and $15y$, where x and y are co –prime.
∴ $15x \times 15y = 6300$

$$\Rightarrow xy = \frac{6300}{15 \times 15} = 28$$

So, two pairs are
(7, 4) and (14, 2)

18. (4) Using Rule 1,
First number × Second number = HCF × LCM
⇒ 75 × Second number
= 15 × 225
∴ Second number

$$= \frac{15 \times 225}{75} = 45$$

19. (1) Using Rule 1,
First number × second number = HCF × LCM
⇒ 52 × second number
= 4 × 520
⇒ Second number

$$= \frac{4 \times 520}{52} = 40$$

20. (4) Using Rule 1,
First number × Second number = HCF × LCM
⇒ 864 × Second number
= 96 × 1296 ⇒ Second number

$$= \frac{96 \times 1296}{864} = 144$$

21. (2) Using Rule 1,
Let LCM be L and HCF be H, then
L = 4H
∴ H + 4H = 125
⇒ 5H = 125
$\Rightarrow H = \frac{125}{5} = 25$
∴ L = 4 × 25 = 100
∴ Second number
$= \frac{L \times H}{\text{First number}}$
$= \frac{100 \times 25}{100} = 25$

22. (1) HCF of two-prime numbers = 1
∴ Product of numbers = their LCM = 117
117 = 13 × 9 where 13 & 9 are co-prime. L.C.M (13,9) = 117.

23. (2) HCF = 12
Numbers = $12x$ and $12y$
where x and y are prime to each other.
∴ $12x \times 12y = 2160$
$\Rightarrow xy = \frac{2160}{12 \times 12}$
= 15 = 3 × 5, 1 × 15
Possible pairs = (36, 60) and (12, 180)

24. (1) Using Rule 1,
Second number
$= \frac{\text{H.C.F.} \times \text{L.C.M.}}{\text{First Number}}$
$= \frac{27 \times 2079}{189} = 297$

25. (2) Here, HCF = 13
Let the numbers be 13x and 13y where x and y are Prime to each other.
Now, 13x × 13y = 2028
$\Rightarrow xy = \frac{2028}{13 \times 13} = 12$
The possible pairs are : (1, 12), (3, 4), (2, 6)
But the 2 and 6 are not co-prime.
∴ The required no. of pairs = 2

26. (2) HCF = 13
Let the numbers be $13x$ and $13y$. Where x and y are co-prime.
∴ LCM = $13\,xy$
∴ $13\,xy$ = 455
$\therefore xy = \frac{455}{13} = 35 = 5 \times 7$
∴ Numbers are 13 × 5 = 65 and 13 × 7 = 91

27. (4) HCF of two numbers is 8.
This means 8 is a factor common to both the numbers. LCM is common multiple for the two numbers, it is divisible by the two numbers. So, the required answer = 60

28. (4) Let the numbers be $23x$ and $23y$ where x and y are co-prime.
∴ LCM = $23\,xy$
As given,
$23xy = 23 \times 13 \times 14$
∴ $x = 13$, $y = 14$
∴ The larger number = $23y$
= 23 × 14 = 322

29. (4) LCM = 2 × 2 × 2 × 3 × 5
Hence, HCF = 4, 8, 12 or 24
According to question
35 cannot be H.C.F. of 120.

30. (3) Using Rule 1,
First number = 2 × 44 = 88
∴ First number × Second number
= H.C.F. × L.C.M.
⇒ 88 × Second numebr
= 44 × 264
⇒ Second number
$= \frac{44 \times 264}{88} = 132$

TYPE-II

1. (3) Using Rule 4,
L.C.M. of 4, 6, 8, 12 and 16 = 48
∴ Required number
= 48 + 2 = 50

2. (4) Using Rule 4,
LCM of 15, 12, 20, 54 = 540
Then number = 540 + 4 = 544
[4 being remainder]

3. (4) Using Rule 4,
The greatest number of five digits is 99999.
LCM of 3, 5, 8 and 12

2	3,	5,	8,	12
2	3,	5,	4,	6
3	3,	5,	2,	3
	1,	5,	2,	1

∴ LCM = 2 × 2 × 3 × 5 × 2 = 120
After dividing 99999 by 120, we get 39 as remainder
99999 – 39 = 99960
= (833 × 120)
99960 is the greatest five digit number divisible by the given divisors.
In order to get 2 as remainder in each case we will simply add 2 to 99960.
∴ Greatest number
= 99960 + 2 = 99962

4. (3) Using Rule 4,
LCM of 4, 5, 6, 7 and 8

= 2	4,	5,	6,	7,	8
2	2,	5,	3,	7,	4
	1,	5,	3,	7,	2

= 2 × 2 × 2 × 3 × 5 × 7 = 840.
let required number be 840 K + 2 which is multiple of 13.
Least value of K for which (840 K + 2) is divisible by 13 is K = 3
∴ Required number
= 840 × 3 + 2
= 2520 + 2 = 2522

5. (4) Required time = LCM of 252, 308 and 198 seconds

2	252,	308	198
2	126,	154,	99
7	63,	77,	99
9	9,	11,	99
11	1,	11,	11
	1,	1,	1

∴ LCM = 2 × 2 × 7 × 9 × 11
= 2772 seconds
= 46 minutes 12 seconds

6. (2) 15 = 3 × 5
$18 = 3^2 \times 2$
21 = 3 × 7
$24 = 2^3 \times 3$
LCM = 8 × 9 × 5 × 7 = 2520
The largest number of four digits = 9999

2520)9999(3
7560
2439

Required number
= 9999 – 2439 – 4 = 7556
(Because 15 – 11 = 4
18 – 14 = 4
21 – 17 = 4
24 – 20 = 4)

7. (3) LCM of 21, 36 and 66
∴ LCM = 3 × 2 × 7 × 6 × 11
= 3 × 3 × 2 × 2 × 7 × 11
∴ Required number
$= 3^2 \times 2^2 \times 7^2 \times 11^2$
= 213444

8. (1) Using Rule 5,
Here 4 – 1 = 3, 5 – 2 = 3, 6 – 3 = 3
∴ The required number
= LCM of (4, 5, 6) – 3
= 60 – 3 = 57

9. (2) LCM of 4, 6, 10, 15 = 60
Least number of 6 digits
= 100000
The least number of 6 digits which is exactly divisible by 60 = 100000 + (60 – 40)
= 100020
∴ Required number (N)
= 100020 + 2 = 100022
Hence, the sum of digits = 1 + 0 + 0 + 0 + 2 + 2 = 5

10. (3) The LCM of 12, 18, 21, 30

2	12,	18,	21,	30
3	6,	9,	21,	15
	2,	3,	7,	5

∴ LCM = 2 × 3 × 2 × 3 × 7 × 5
= 1260
∴ The required number

$= \frac{1260}{2} = 630$

11. (4) We find LCM of = 10, 16, 24

2	10,	16,	24
2	5,	8,	12
2	5,	4,	6
2	5,	2,	3,
3	5,	1,	3
5	5,	1,	1
	1,	1,	1

∴ LCM = $2^2 \times 2^2 \times 3 \times 5$
∴ Required number
= 2 × 2 × 2 × 2 × 3 × 3 × 5 × 5
= 3600

12. (2) Required number of students = LCM of 6, 8, 10 = 120

13. (2) LCM of 4, 6, 8, 9

2	4,6,8,9
2	2,3,4,9
3	1,3,2,9
	1,1,2,3

∴ LCM = 2 × 2 × 3 × 2 × 3 = 72
∴ Required number = 72, because it is exactly divisible by 4, 6, 8 and 9 and it leaves remainder 7 when divided by 13.

14. (2) Using Rule 5,
Here, 12 – 5 = 7,
16 – 9 = 7
∴ Required number
= (L.C.M. of 12 and 16) – 7
= 48 – 7 = 41

15. (3) Using Rule 5,
Here, Divisor – remainder = 1
e.g., 10 – 9 = 1, 9 – 8 = 1,
8 – 7 = 1
∴ Required number
= (L.C.M. of 10, 9, 8) –1
= 360 – 1 = 359

16. (4) We find LCM of 5, 6 and 8
5 = 5
6 = 3 × 2
8 = 2^3
= $2^3 \times 3 \times 5 = 8 \times 15 = 120$
Required number = 120K + 3
∴ when K = 2, 120 × 2 + 3 = 243 required no.
It is completely divisible by 9

17. (4) LCM of 16, 18, 20 and 25 = 3600
∴ Required number = 3600K + 4 which is exactly divisible by 7 for certain value of K.
When K = 5,
number = 3600 × 5 + 4
= 18004 which is exactly divisible by 7.

18. (2) LCM of 3, 5, 6, 8, 10 and 12 = 120
∴ Required number
= $120x + 2$, which is exactly divisible by 13.
$120x + 2 = 13 \times 9x + 3x + 2$
Clearly $3x + 2$ should be divisible by 13.
For x=8,$3x + 2$ is divisible by 13.
∴ Required number
= $120x + 2 = 120 \times 8 + 2$
= 960 + 2 = 962

19. (4) LCM of 6, 9, 15 and 18

= 2	6,	9,	15,	18
3	3,	9,	15,	9
3	1,	3,	5,	3
	1,	1,	5,	1

∴ LCM = 2 × 3 × 3 × 5 = 90
∴ Required number = $90k + 4$, which must be a multiple of 7 for some value of k.
For $k = 4$,
Number = 90 × 4 + 4 = 364, which is exactly divisible by 7.

20. (2) Using Rule 9,
We will find the LCM of 16, 24, 30 and 36.

2	16,	24,	30,	36
2	8,	12,	15,	18
2	4,	6,	15,	9
3	2,	3,	15,	9
	2,	1,	5,	3

∴ LCM = 2 × 2 × 2 × 3 × 2 × 5 × 3 = 720
The largest number of five digits = 99999
On dividing 99999 by 720, the remainder = 639
∴ The largest five-digit number divisible by 720
= 99999 – 639 = 99360
∴ Required number = 99360 + 10
= 99370

21. (2) LCM of 5, 10, 12, 15

2	5,	10,	12,	15
3	5,	5,	6,	15
= 5	5,	5,	2,	5
	1,	1,	2,	1

∴ LCM = 2 × 3 × 5 × 2 = 60
∴ Number = $60k + 2$
Now, the required number should be divisible by 7.
Now, $60k + 2 = 7 \times 8k + 4k + 2$
If we put $k = 3$, $(4k + 2)$ is equal to 14 which is exactly divisible by 7.
∴ Required number = 60 × 3 + 2
= 182

22. (3) LCM of 9, 10 and 15 = 90
⇒ The multiple of 90 are also divisible by 9, 10 or 15.
∴ 21 × 90 = 1890 will be divisible by them.
∴ Now, 1897 will be the number that will give remainder 7.
1936 – 1897
Required number
= 1936 – 1897 = 39

23. (1) The difference between the divisor and the corresponding remainder is same in each case ie. 18 – 5 = 13, 27 – 14 = 13, 36 – 23 = 13
∴ Required number
= (LCM of 18, 27, and 36) – 13
= 108 – 13 = 95

24. (2) The LCM of 5, 6, 7 and 8 = 840
∴ Required number = 840 k + 3 which is exactly divisible by 9 for some value of k.
Now, 840 k + 3 = 93 × 9 k + (3k + 3)
When k = 2, 3k + 3 = 9, which is divisible by 9.
∴ Required number
= 840 × 2 + 3 = 1683

25. (1) Using Rule 5,
Here, 12 – 2 = 10; 16 – 6 = 10; 24 – 14 = 10
Now, LCM of 12, 16 and 24 = 48
∴ The greatest 4–digit number exactly divisible by 48 = 9984
∴ Required number
= 9984 – 10 = 9974

26. (1) Using Rule 5,
LCM of 15, 20 and 35 = 420
∴ Required least number
= 420 + 8 = 428

27. (3) Using Rule 5,
The smallest number divisible by 12 or 10 or 8
= LCM of 12, 10 and 8 = 120
⇒ Required number =120 + 6
= 126

28. (2) LCM of 24, 36 and 54 seconds
= 216 seconds
= 3 minutes 36 seconds
∴ Required time = 10 : 15 : 00 + 3 minutes 36 seconds
= 10 : 18 : 36 a.m.

29. (3) A makes one complete round of the circular track in $\frac{5}{\frac{5}{2}}$ = 2 hours, B in $\frac{5}{3}$ hours and C in $\frac{5}{2}$ hours.
That is after 2 hours A is at the starting point, B after $\frac{5}{3}$ hours and C after $\frac{5}{2}$ hours.
Hence the required time
= LCM of 2, $\frac{5}{3}$ and $\frac{5}{2}$ hours
$= \frac{\text{LCM of } 2, 5, 5}{\text{HCF of } 3, 2}$
$= \frac{10}{1}$ = 10 hours.

30. (1) Required time = LCM of 200, 300, 360 and 450 seconds
= 1800 seconds

31. (1) LCM of 4, 6, 8, 14
= 168 seconds
= 2 minutes 48 seconds
They ring again at 12 + 2 min. 48 sec.
= 12 hrs. 2 min. 48 sec.

32. (4) $1\frac{1}{2}$ hours = 90 minutes
1 hour and 45 minutes
= 105 minutes
1 hour = 60 minutes
∴ LCM of 30 minutes, 60 minutes, 90 minutes and 105 minutes

3	30,	60,	90,	105
5	10,	20,	30,	35
2	2,	4,	6,	7
	1,	2,	3,	7

∴ LCM = 3 × 5 × 2 × 2 × 3 × 7
= 1260 minutes
1260 minutes $= \frac{1260}{60}$ = 21 hours
∴ The bell will again ring simultaneously after 21 hours.
∴ Time will be
= 12 noon + 21 hours
= 9 a.m.

33. (1) The LCM of 5, 6, 8 and 9
= 360 seconds = 6 minutes

34. (2) LCM of 20, 30 and 40 minutes = 120 minutes
Hence, the bells will toll together again after 2 hours i.e. at 1 p.m.

35. (1) The difference between divisor and the corresponding remainder is equal.
LCM of 3, 5, 7 and 9 = 315
Largest 4-digit number = 9999

```
315)9999(31
    945
     549
     315
     234
```

∴ Number divisible by 315
= 9999 – 234 = 9765
Required number
= 9765 – 2 = 9763

36. (3) Required time = LCM of 6, 7, 8, 9 and 12 seconds
= 504 seconds

37. (2) Using Rule 2,
$\text{LCM} = \frac{\text{LCM of } 2, 4, 5}{\text{HCF of } 3, 9, 6}$
$= \frac{20}{3}$

38. (2) LCM of 3, 4, 5, 6, 7, 8 = 840

```
840)10000(11
    840
    1600
     840
     760
```

Since, the remainder 760 is more than half of the divisor 840.
∴ The nearest number
= 10000 + (840 – 760) = 10080

39. (2) Using Rule 8,
The largest number of 4-digits is 9999. L.C.M. of divisors

2	12,	15,	18,	27
3	6,	15,	9,	27
3	2,	5,	3,	9
	2,	5,	1,	3

LCM = 2 × 2 × 3 × 3 × 3 × 5
= 540
Divide 9999 by 540, now we get 279 as remainder.
9999 – 279 = 9720
Hence, 9720 is the largest 4-digit number exactly divisible by each of 12, 15, 18 and 27.

40. (2) The smallest number divisible by 16, 20 and 24
= LCM of 16, 20 and 24

2	16,	20,	24
2	8,	10,	12
2	4,	5,	6
	2,	5,	3

∴ LCM = 2×2×2×2×5×3
= $2^2 \times 2^2 \times 5 \times 3$
∴ Required complete square number = $2^2 \times 2^2 \times 5^2 \times 3^2$ = 3600

41. (2) LCM of 25, 50 and 75 = 150
On dividing 43582 by 150, remainder = 82

```
150) 43582(290
     300
     1358
     1350
       82
```

∴ Required number
= 43582 + (150 – 82) = 43650

42. (2) Required number = (LCM of 24, 32, 36 and 54) – 5
Now,

2	24,	32,	36,	54
2	12,	16,	18,	27
2	6,	8,	9,	27
3	3,	4,	9,	27
3	1,	4,	3,	9
	1,	4,	1,	3

LCM = 2 × 2 × 2 × 3 × 3 × 3 × 4
= 864
∴ Required number = 864 – 5
= 859

43. (2)

2	20,	28,	32,	35
2	10,	14,	16,	35
5	5,	7,	8,	35
7	1,	7,	8,	7
	1,	1,	8,	1

∴ LCM = 2 × 2 × 5 × 7 × 8
= 1120
∴ Required number
= 5834 – 1120 = 4714

44. (4) The LCM of 6, 12 and 18
= 36 = 6^2

45. (2) Using Rule 8,
LCM of 10, 15 and 20 = 60
Largest 4-digit number = 9999

∴ 60)9999(166
60
399
360
399
360
39

∴ Required number
= 9999 – 39 = 9960

46. (4) Using Rule 4,
Required number = (LCM of 15, 20, 36 and 48) + 3

2	15,	20,	36,	48
2	15,	10,	18,	24
3	15,	5,	9,	12
5	5,	5,	3,	4
	1,	1,	3,	4

∴ LCM = 2 × 2 × 3 × 5 × 3 × 4
= 720
∴ Required number
= 720 + 3 = 723

47. (3) Required distance = LCM of 63, 70 and 77 cm.
= 6930 cm.

Illustration :

7	63,	70,	77
	9,	10,	11

∴ LCM = 7 × 9 × 10 × 11
= 6930

48. (2) Required answer = LCM of 36, 40 and 48 seconds
= 720 seconds

$= \left(\frac{720}{60}\right)$ minutes = 12 minutes

Illustration :

2	36,	40,	48
2	18,	20,	24
2	9,	10,	12
3	9,	5,	6
	3,	5,	2

∴ LCM = 2 × 2 × 2 × 2 × 3 × 3 × 5
= 720

49. (2)

2	60
2	30
3	15
	5

∴ 60 = 2 × 2 × 3 × 5
i.e., Numbers = 2, 3, 4 and 5
∴ Required sum
= 2 + 3 + 4 + 5 = 14

50. (1) LCM of x and y = 161
∴ $xy = 23 \times 7$
∴ $x = 23$; $y = 7$
∴ $3y - x = 3 \times 7 - 23$
= 21 – 23 = – 2

51. (1) Required time = LCM of 48, 72 and 108 seconds

2	48,	72,	108
2	24,	36,	54
2	12,	18,	54
3	6,	9,	27
3	2,	3,	9
	2,	1,	3

∴ LCM = 2 × 2 × 2 × 2 × 3 × 3 × 3
= 432 seconds
= 7 minutes 12 second
∴ Required time
= 10 : 07 : 12 hours

TYPE-III

1. (1) Maximum number of students
= The greatest common divisor
= HCF of 1001 and 910 = 91

2. (3) Using Rule 7,
Required number
= HCF of (989 – 5) and (1327 – 7)
= HCF of 984 and 1320 = 24
∴ HCF = 24

3. (2) Using Rule 3,

HCF of $\frac{2}{3}, \frac{4}{5}$ and $\frac{6}{7}$

$= \frac{\text{HCF of 2, 4 and 6}}{\text{LCM of 3, 5 and 7}}$

$= \frac{2}{105}$

4. (1) Using Rule 7,
The greatest number N = HCF of (1305 – x), (4665 – x) and (6905 – x), where x is the remainder
= HCF of (4665 – 1305), (6905–4665) and
(6905 – 1305)
= HCF of 3360, 2240 and 5600

2240)3360(1
2240
1120)2240(2
2240
×

Again,

1120)5600(5
5600
×

∴ N = 1120
Sum of digits
= 1 + 1 + 2 + 0 = 4

5. (1) Using Rule 7,
The number will be HCF of 307 – 3 = 304 and
330 – 7 = 323.

304)323(1
304
19)304(16
19
114
114
×

∴ Required number = 19

6. (3) Using Rule 7,
3026 –11 = 3015 and
5053 –13 = 5040
Required number = HCF of 3015 and 5040

3015) 5040 (1
3015
2025) 3015 (1
2025
990) 2025 (2
1980
45) 990 (22
90
90
90
×

∴ Required number = 45

7. (1) Using Rule 7,
We have to find HCF of
(1657 – 6 = 1651) and
(2037 – 5 = 2032)
1651 = 13 × 127
2032 = 16 × 127
∴ HCF = 127
So, required number will be 127.

8. (1) Using Rule 7,
Let x be the remainder.
Then, $(25 - x)$, $(73 - x)$, and $(97 - x)$ Will be exactly divisible by the required number.
$\therefore$ Required number
= HCF of $(73 - x) - (25 - x)$, $(97 - x) - (73 - x)$
and $(97 - x) - (25 - x)$
= HCF of (73 –25), (97 –73), and
(97 –25) = HCF of 48, 24 and 72 = 24

9. (2) Using Rule 7,
Required number
= HCF of (110 – 2) and (128 – 2)
= HCF of 108 and 126 = 18

10. (3) Required maximum capacity of container
= HCF of 75 l and 45 l
Now, 75 = 5 × 5 × 3
45 = 5 × 3 × 3
$\therefore$ HCF = 15 litres

11. (4) Length of the floor
= 15 m 17 cm = 1517 cm
Breadth of the floor
= 9m 2 cm = 902 cm.
Area of the floor
= 1517 × 902 cm^2
The number of square tiles will be least, when the size of each tile is maximum.
$\therefore$ Size of each tile = HCF of 1517 and 902 = 41
$\therefore$ Required number of tiles
$= \frac{1517 \times 902}{41 \times 41} = 814$

12. (1) Number of books in each stack
= HCF of 336, 240, 96 = 48

```
240) 336 (1
     240
      96) 240 (2
          192
           48) 96(2
               96
                ×

48) 96 (2
    96
     ×
```

$\therefore$Total number of stacks
$= \frac{336}{48} + \frac{240}{48} + \frac{96}{48}$
=7 + 5 + 2 = 14

13. (3) First of all we find the HCF of 945 and 2475. HCF = 45
Illustration :

```
945)2475(2
    1890
     585)945(1
         585
          360)585(1
              360
               225)360(1
                   225
                    135)225(1
                        135
                         90)135(1
                            90
                            45)90(2
                               90
                                ×
```

$\therefore$ Maximum number of animals in each flock = 45
Required total number of flocks
$= \frac{945}{45} + \frac{2475}{45} = 21 + 55 = 76$

14. (2) Maximum quantity in each can
= HCF of 21, 42 and 63 litres
= 21 litres
Required least number of cans
$= \frac{21}{21} + \frac{42}{21} + \frac{63}{21}$
= 1 + 2 + 3 = 6

15. (3) Using Rule 7,
Required number = HCF of 411 – 3 = 408; 684 – 4 = 680 and 821 – 5 = 816
HCF of 408 and 816 = 408
HCF of 408 and 680

```
408)  680 (1
      408
       272)408(1
           272
            136) 272(2
                 272
                  ×
```

$\therefore$ Required number = 136

16. (4) Required number = HCF of 200 and 320 = 40

Illustration :

```
200) 320 (1
     200
      120) 200 (1
           120
            80) 120 (1
                80
                40) 80 (2
                    80
                     ×
```

17. (3) As the height of each stack is same, the required number of books in each stack
= HCF of 84, 90 and 120
84 = 2 × 2 × 3 × 7
90 = 2 × 3 × 3 × 5
120 = 2 × 2 × 2 × 3 × 5
$\therefore$ HCF = 2 × 3 = 6

18. (2) Using Rule 7,
Required number
= HCF of (729 – 9)
= 720 and (901 – 5)
= 896

```
720) 896 (1
     720
      176) 720 (4
           704
            16) 176 (11
                16
                 16
                 16
                  ×
```

H.C.F = 16

19. (1) Greatest capacity of measuring vessel
= HCF of 403 litres, 434 litres and 465 litres
= 31 litres

Illustration :

HCF of 403 and 434

```
403) 434 (1
     403
      31) 403 (13
          31
           93
           93
            ×
```

HCF of 31 and 465

```
31) 465 (15
    31
    155
    155
     ×
```

$\Rightarrow$ 31 litres

20. (3) Minimum number of rows = Maximum number of fruits in each row
$\therefore$ HCF of 24, 36 and 60 = 12
$\therefore$ Minimum number of rows
$= \frac{24}{12} + \frac{36}{12} + \frac{60}{12}$
= 2 + 3 + 5 = 10

21. (4) Using Rule 7,
Required number
= HCF of 2300 – 32 = 2268 and 3500 – 56 = 3444

```
2268)3444(1
     2268
     1176)2268(1
          1176
          1092)1176(1
               1092
                 84)1092(13
                    84
                    252
                    252
                     ×
```

∴ HCF = 84

22. (3) HCF of numbers = 12
Let the numbers be $12x$ and $12y$ where x and y are co–prime.
According to the question,
$12x \times 12y = 2160$

$\Rightarrow xy = \frac{2160}{12 \times 12} = 15$

= 3 × 5 or 1 × 15
∴ Required numbers
= 12 × 3 = 36 and 12 × 5 = 60

23. (2) Required number = HCF of 390, 495 and 300 = 15
Illustration :

```
390) 495 (1
     390
     105) 390 (3
          315
           75) 105 (1
               75
               30) 75 (1
                   60
                   15) 30 (2
                       30
                        ×
```

HCF of 15 and 300 = 15

24. (4) First of all we find HCF of 391 and 323.

```
323) 391 (1
     323
      68) 323 (4
          272
           51) 68 (1
               51
               17) 51 (3
                   51
                    ×
```

∴ Number of classes = 17

25. (3) Maximum length of each piece = HCF of 1.5 metre and 1.2 metre = 0.3 metre
Illustration :

```
12 ) 15 ( 1
     12
      3) 12 (4
         12
          ×
```

∴ HCF of 1.5 and 1.2 metre = 0.3 metre

TYPE-IV

1. (1) L.C.M. of 28 and 42

2	28,	42
2	14,	21
7	7,	21
	1,	3

= 2 × 2 × 7 × 3 = 84
H.C. F. of 28 and 42

```
28)42(1
   28
   14)28(2
      28
      00
```

∴ H.C. F = 14

Required ratio $= \frac{84}{14} = 6:1$

2. (3) Let the two numbers are 2x and 3x respectively.
According to question,
LCM = 54

$x(3 \times 2) = 54$

⇒ x = 9
Numbers = 2x = 2 × 9 = 18
and, 3x = 3 × 9 = 27
Sum of the two numbers
= 18 + 27 = 45

3. (3) Suppose the numbers are 4x and 5x respectively
According to question
x × 4 × 5 = 120
⇒ x = 6
∴ Required numbers
= 4 × 6 = 24
and = 5 × 6 = 30

4. (1) Let the numbers be $2x$, $3x$ and $4x$ respectively.
∴ HCF = x = 12
∴ Numbers are : 2 ×12 = 24
3 ×12 = 36, 4 ×12 = 48
LCM of 24, 36, 48
= 2 × 2 × 2 × 3 × 3 × 2 = 144

5. (3) Let the number be $3x$ and $4x$.
Their LCM = $12x$
According to the question,
$12x = 240$

$\Rightarrow x = \frac{240}{12} = 20$

∴ Smaller number = $3x$ = 3 × 20
= 60

6. (3) Let the numbers be $3x$ and $4x$.
∴ Their LCM = $12x$
∴ $12x = 84$

$\Rightarrow x = \frac{84}{12} = 7$

∴ Larger number
= $4x$ = 4 × 7 = 28

7. (1) Numbers = $3x$ and $4x$
HCF = x = 4
∴ LCM = $12x$ = 12 × 4 = 48

8. (3) Let the numbers be $4x$ and $4y$ where x and y are prime to each other.
LCM = $4xy$

$\therefore \frac{(4x+4y)}{4xy} = \frac{7}{12}$

⇒ $12(x + y) = 7xy$
⇒ $x = 3$, $y = 4$
∴ Smaller number
= 4 × 3 = 12

9. (4) Using Rule 1,
Let the numbers be $3x$ and $4x$ respectively
First number × second number
= HCF × LCM
⇒ $3x \times 4x = 2028$

$\Rightarrow x^2 = \frac{2028}{3 \times 4} = 169$

$\therefore x = \sqrt{169} = 13$

∴ Sum of the numbers
= $3x + 4x = 7x$ = 7 × 13 = 91

10. (3) If the numbers be $2x$ and $3x$, then LCM = $6x$
∴ $6x = 48 \Rightarrow x = 8$
∴ Required sum = $2x + 3x = 5x$
= 5 × 8 = 40

11. (4) Let the numbers be $4x$ and $5x$.
∴ H.C.F. = x = 8
∴ Numbers = 32 and 40
∴ Their LCM = 160

12. (2) If the numbers be $3x$ and $4x$, then
HCF = x = 5
∴ Numbers = 15 and 20
∴ LCM = 60

13. (1) Numbers = x, $2x$ and $3x$ (let)
Their H.C.F. = x = 12
∴ Numbers = 12, 24 and 36

14. (4) Using Rule 1,

Product of two numbers

= HCF × LCM

⇒ Numbers = zx and zy

∴ $zx \times zy = z \times$ LCM

⇒ LCM = xyz

15. (4) HCF of numbers = 21

∴ Numbers = $21x$ and $21y$ Where x and y are prime to each other.

Ratio of numbers = 1 : 4

∴ Larger number = 21 × 4 = 84

TYPE-V

1. (4) Using Rule 1,

Let the numbers be x and $(x+2)$.

∴ Product of numbers

= HCF × LCM

⇒ $x(x+2) = 24$

⇒ $x^2 + 2x - 24 = 0$

⇒ $x^2 + 6x - 4x - 24 = 0$

⇒ $x(x+6) - 4(x+6) = 0$

⇒ $(x-4)(x+6) = 0$

⇒ $x = 4$, as $x \neq -6 = 0$

∴ Numbers are 4 and 6.

2. (1) Using Rule 1,

Suppose 1st number is x then, 2nd number

= $100 - x$

∴ LCM × HCF = 1st number × 2nd number

⇒ $495 \times 5 = x \times (100 - x)$

⇒ $495 \times 5 = 100x - x^2$

⇒ $x^2 - 55x - 45x - 2475 = 0$

⇒ $(x - 45)(x - 55) = 0$

⇒ $x = 45$ or $x = 55$

Then, difference = 55 – 45 = 10

3. (2) Let the number be 29x and 29y respectively

where x and y are prime to each other.

∴ LCM of 29x and 29y = 29xy

Now, 29xy = 4147

$\therefore xy = \frac{4147}{29} = 143$

Thus xy = 11 × 13

∴ Numbers are 29 × 11

= 319 and 29 × 13 = 377

∴ Required sum

= 377 + 319 = 696

4. (4) Let HCF be h and LCM be l.

Then, $l = 84h$ and $l + h$

= 680

⇒ $84h + h = 680$

$\Rightarrow h = \frac{680}{85} = 8$

∴ $l = 680 - 8 = 672$

∴ Other number

$= \frac{672 \times 8}{56} = 96$

5. (2) HCF = 12

∴ Numbers = $12x$ and $12y$ where x and y are prime to each other.

∴ $12x + 12y = 84$

⇒ $12(x + y) = 84$

$\Rightarrow x + y = \frac{84}{12} = 7$

∴ Possible pairs of numbers satisfying this condition

= (1,6), (2,5) and (3,4). Hence three pairs are of required numbers.

6. (3) Let the numbers be $21x$ and $21y$ where x and y are prime to each other.

∴ $21x + 21y = 336$

⇒ $21(x + y) = 336$

$\Rightarrow x + y = \frac{336}{21} = 16$

∴ Possible pairs

= (1, 15), (5, 11), (7, 9), (3, 13)

7. (3) Let the number be x and y.

According to the question,

∴ $x + y = 45$ ..... (i)

Again, $x - y = \frac{1}{9}(x + y)$

or $x - y = \frac{1}{9} \times 45$

or $x - y = 5$ ..... (ii)

By (i) + (ii) we have,

$x + y = 45$

$x - y = 5$

$2x = 50$

or, $x = 25$

∴ $y = 45 - 25 = 20$.

Now, LCM of 25 and 20 = 100.

8. (3) Let the numbers be $17x$ and $17y$ where x and y are co-prime.

LCM of $17x$ and $17y = 17xy$

According to the question,

$17xy = 714$

$\Rightarrow xy = \frac{714}{17} = 42 = 6 \times 7$

⇒ $x = 6$ and $y = 7$

or, $x = 7$ and $y = 6$.

∴ First number = $17x$

= 17 × 6 = 102

Second number = $17y$

= 17 × 7 = 119

∴ Sum of the numbers

= 102 + 119 = 221

9. (3) Using Rule 1,

Let the larger number be x.

∴ Smaller number = $x - 2$

∴ First number × Second number = HCF × LCM

⇒ $x(x - 2) = 24$

⇒ $x^2 - 2x - 24 = 0$

⇒ $x^2 - 6x + 4x - 24 = 0$

⇒ $x(x - 6) + 4(x - 6) = 0$

⇒ $(x - 6)(x + 4) = 0$

⇒ $x = 6$ because $x \neq -4$

10. (2) HCF of two numbers = 27

∴ Let the numbers be $27x$ and $27y$ where x and y are prime to each other.

According to the question,

$27x + 27y = 216$

⇒ $27(x + y) = 216$

$\Rightarrow x + y = \frac{216}{27} = 8$

∴ Possible pairs of x and y = (1, 7) and (3, 5)

∴ Numbers =(27, 189) and (81, 135)

11. (1) Using Rule 1,

Let the HCF of numbers = H

∴ Their LCM = 12H

According to the question,

12H +H = 403

⇒13H = 403

$\Rightarrow H = \frac{403}{13} = 31$

⇒ LCM = 12 × 31

Now,

First number × second number = HCF × LCM

= 93 × Second Number

= 31 × 31 × 12

Second number = $\frac{31 \times 31 \times 12}{93}$

= 124

12. (3) Let the numbers be $48x$ and $48y$ where x and y are co-primes.

$\therefore\ 48x + 48y = 384$

$\Rightarrow 48(x + y) = 384$

$\Rightarrow x + y = \frac{384}{48} = 8$ ..... (i)

Possible and acceptable pairs of x and y satisfying this condition are : (1, 7) and (3, 5).

$\therefore$ Numbers are : $48 \times 1 = 48$ and $48 \times 7 = 336$

and $48 \times 3 = 144$ and $48 \times 5 = 240$

$\therefore$ Required difference

$= 336 - 48 = 288$

13. (3) Let the numbers be $3x$ and $3y$.

$\therefore 3x + 3y = 36$

$\Rightarrow x + y = 12$ ... (i)

and $3xy = 105$ ... (ii)

Dividing equation (i) by (ii), we have

$$\frac{x}{3xy} + \frac{y}{3xy} = \frac{12}{105}$$

$$\Rightarrow \frac{1}{3y} + \frac{1}{3x} = \frac{4}{35}$$

14. (4) Let the numbers be $10x$ and $10y$ where x and y are prime to each other.

$\therefore$ LCM $= 10\,xy$

$\Rightarrow 10xy = 120$

$\Rightarrow xy = 12$

Possible pairs = (3, 4) or (1, 12)

$\therefore$ Sum of the numbers $= 30 + 40 = 70$

15. (3) Let the numbers be x, y and z which are prime to one another.

Now, $xy = 551$

$yz = 1073$

$\therefore\ y$ = HCF of 551 and 1073

$\therefore\ y = 29$

$$\therefore\ x = \frac{551}{29} = 19$$

$$\text{and } z = \frac{1073}{29} = 37$$

$\therefore$ Sum $= 19 + 29 + 37 = 85$

16. (3) HCF of two numbers = 4.

Hence, the numbers can be given by $4x$ and $4y$ where x and y are co-prime. Then,

$4x + 4y = 36 \Rightarrow 4(x + y) = 36$

$\Rightarrow x + y = 9$

Possible pairs satisfying this condition are : (1, 8), (4, 5), (2, 7)

17. (2) Let the numbers be $2x$ and $2y$ where x and y are prime to each other.

$\therefore$ LCM $= 2xy$

$\Rightarrow 2xy = 84$

$\Rightarrow xy = 42 = 6 \times 7$

$\therefore$ Numbers are 12 and 14.

Hence Sum $= 12 + 14 = 26$

18. (3) Let the numbers be xH and yH where H is the HCF and yH $> x$H.

$\therefore$ LCM $= xy$ H

$\therefore xy\text{H} = 2y\text{H} \Rightarrow x = 2$

Again, xH $-$ H $= 4$

$\Rightarrow 2\text{H} - \text{H} = 4 \Rightarrow \text{H} = 4$

$\therefore$ Smaller number $= x\text{H} = 8$

19. (4) Using Rule 1,

Let the H.C.F. be H.

$\therefore$ L.C.M. = 20H

Then, H + 20H = 2520

$\Rightarrow 21\text{ H} = 2520$

$$\Rightarrow \text{H} = \frac{2520}{21} = 120$$

$\therefore$ L.C.M. = 20H = 20×120= 2400

As,

First number × Second number = L.C.M. × H.C.F.

$\Rightarrow$ 480 × Second number = 2400 × 120

$\Rightarrow$ Second number

$$= \frac{2400 \times 120}{480} = 600$$

20. (1) Using Rule 1,

If the HCF = H, then

LCM = 44 H

$\therefore$ 44 H + H = 1125

$\Rightarrow$ 45 H = 1125

$$\therefore\ \text{H} = \frac{1125}{45} = 25$$

$\therefore$ LCM = 44 × 25 = 1100

Now

First number × Second number = LCM × HCF

$\Rightarrow$ 25 × Second number = 1100 × 25

$\therefore$ Second number

$$= \frac{1100 \times 25}{25} = 1100$$

21. (4) Let no. are x and y and HCF = A, LCM = B

Using Rule, we have

$xy = \text{AB}$

$\Rightarrow x + y = \text{A} + \text{B}$ (given) ...(i)

$(x-y)^2 = (x + y)^2 - 4xy$

or, $(x-y)^2 = (\text{A} + \text{B})^2 - 4\text{ AB}$

or, $(x-y)^2 = (\text{A} - \text{B})^2$

or, $(x-y) = \text{A} - \text{B}$ ...(ii)

Using (i) and (ii), we get

$x = \text{A}$ and $y = \text{B}$

$\therefore \text{A}^3 + \text{B}^3 = x^3 + y^3$

22. (3) Let the numbers be $7x$ and $7y$ where x and y are co-prime.

Now, LCM of $7x$ and $7y = 7xy$

$\therefore\ 7xy = 140$

$$\Rightarrow xy = \frac{140}{7} = 20$$

Now, required values of x and y whose product is 50 and are co-prime, will be 4 and 5.

$\therefore$ Numbers are 28 and 35 which lie between 20 and 45.

$\therefore$ Required sum = 28 + 35 = 63.

23. (4) Firstly, we find the LCM of 30, 36 and 80.

2	30, 36, 80
2	15, 18, 40
3	15, 9, 20
5	5, 3, 20
	1, 3, 4

$\therefore$ LCM $= 2 \times 2 \times 3 \times 5 \times 3 \times 4$

$= 720$

$\therefore$ Required number = Multiple of $720 = 720 \times 5 = 3600$;

because $3000 < 3600 < 4000$

24. (3) LCM of 5, 6, 7 and 8 = 840

2	5, 6, 7, 8
	5, 3, 7, 4

$\therefore$ LCM $= 2 \times 5 \times 3 \times 7 \times 4 = 840$

$\therefore$ Required number $= 840x + 3$ which is divisible by 9 for a certain least value of x.

Now,

$840x + 3 = 93x \times 9 + 3x + 3$

$3x + 3$, is divisible by 9 for $x = 2$

$\therefore$ Required number $= 840 \times 2 + 3$

$= 1680 + 3 = 1683$

$\therefore$ Sum of digits $= 1 + 6 + 8 + 3$

$= 18$

25. (1) Using Rule 1,

2	12, 18, 21, 28
2	6, 9, 21, 14
3	3, 9, 21, 7
7	1, 3, 7, 7
	1, 3, 1, 1

$\therefore$ LCM = 2 × 2 × 3 × 3 × 7= 252
The largest 4-digit number
= 9999

252) 9999 (39
756
2439
2268
171

$\therefore$ Required number
= 9999 – 171 = 9828

26. (4) LCM of 8, 12 and 16 = 48
$\therefore$ Required number
= $48a + 3$ which is divisible by 7.
$\therefore$ $x = 48a + 3$
= $(7 \times 6a) + (6a + 3)$ which is divisible by 7.
i.e. $6a + 3$ is divisible by 7.
When $a = 3$, $6a + 3 = 18 + 3$
= 21 which is divisible by 7.
$\therefore$ $x = 48 \times 3 + 3 = 144 + 3 = 147$

27. (1)

2	12,	16,	18,	21
2	6,	8,	9,	21
3	3,	4,	9,	21
	1,	4,	3,	7

$\therefore$ LCM = 2 × 2 × 3 × 4 × 3 × 7
= 1008
Multiple of 1008 = 2016
$\therefore$ Required number
= 2016 – 2000 = 16 = x
$\therefore$ Sum of digits of x = 1 + 6 = 7

28. (3)

2	12,	18,	21
3	6,	9,	21
	2,	3,	7

$\therefore$ LCM of 12, 18 and 21
= 2 × 3 × 2 × 3 × 7 = 252
Of the options,
10080 ÷ 252 = 40

29. (1)We find LCM of 30, 36 and 80.

2	30,	36,	80
2	15,	18,	40
3	15,	9,	20
5	5,	3,	20
	1,	3,	4

$\therefore$ LCM = 2 × 2 × 3 × 3 × 4 × 5
= 720
$\therefore$ Required number
= 2 × 720 + 11
= 1440 + 11 = 1451

30. (2)

2	12,	18,	21,	32
2	6,	9,	21,	16
3	3,	9,	21,	8
	1,	3,	7,	8

$\therefore$ LCM = 2 × 2 × 3 × 3 × 7 × 8
= 2016
$\therefore$ Required number
= 2016 × 2 = 4032

31. (4)

2	210
3	105
5	35
	7

$\therefore$ 210 = 2 × 3 × 5 × 7 = 5 × 6 × 7
$\therefore$ Required answer = 5 + 6 = 11

TYPE-VI

1. (3) Let the numbers be $12x$ and $12y$.
$\therefore$ Their LCM = $12xy$ when x and y are prime to each other.
$\therefore$ $y = \frac{1056}{132} = 8$ [$\because$ $12x = 132$]
$\therefore$ Other number = $12y$
= 12 × 8 = 96

2. (2) When 36798 is divided by 78, remainder = 60
$\therefore$ The least number to be subtracted = 60

3. (1) LCM of 18, 21 and 24

2	18,	21,	24
3	9,	21,	12
	3,	7,	4

LCM = 2 × 3 × 3 × 7 × 4 = 504
Now compare the divisors with their respective remainders. We observe that in all the cases the remainder is just 11 less than their respective divisor. So the number can be given by 504 K – 11. Where K is a positive integer
Since 23 × 21 = 483
We can write 504 K – 11
= (483 + 21) K – 11
= 483 K + (21K – 11)
483 K is multiple of 23, since 483 is divisible by 23.
So, for (504K – 11) to be multiple of 23, the remainder (21K – 11) must be divisible by 23.
Put the value of K = 1, 2, 3, 4, 5, 6, ... and so on successively. We find that the minimum value of K for which (21K – 11) is divisible by 23. is 6, (21 × 6 – 11) = 115 which is divisible by 23.
Therefore, the required least number
= 504 × 6 – 11 = 3013

4. (4) Using Rule 7,
Clearly, 122 – 2 = 120 and 243 – 3 = 240 are exactly divisible by the required number.
$\therefore$ Required number
= HCF of 120 and 240 = 120

5. (2) P = $2^3 \times 3^{10} \times 5$
Q = $2^5 \times 3 \times 7$
HCF = $2^3 \times 3$

6. (4) Let the original fraction be $\frac{x}{y}$.

$\therefore$ $\frac{x-4}{y+1} = \frac{1}{6}$

$\Rightarrow$ $6x - 24 = y + 1$
$\Rightarrow$ $6x - y = 25$ .....(i)
Again,

$\frac{x+2}{y+1} = \frac{1}{3}$

$\Rightarrow$ $3x + 6 = y + 1$
$\Rightarrow$ $3x - y = -5$ .....(ii)
By equation (i) – (ii),
$6x - y - 3x + y = 25 + 5$
$\Rightarrow$ $3x = 30$ $\Rightarrow$ $x = 10$
From equation (i),
$60 - y = 25 \Rightarrow y = 35$
LCM of 10 and 35 = 70

7. (4) HCF of a and b = 12
$\therefore$ Numbers = $12x$ and $12y$
where x and y are prime to each other.
$\because$ $a > b > 12$
$\therefore$ $a = 36$; $b = 24$

8. (4) Let the numbers be $9x$ and $9y$ where x and y are prime to each other.
According to the question,
$9x + 9y = 99$
$\Rightarrow 9(x + y) = 99$
$\Rightarrow x + y = 11$
Possible pairs = (1, 10) (2, 9), (3, 8), (4, 7), (5, 6)

TEST YOURSELF

1. The sum of two numbers is 1215 and their HCF is 81. How many such pairs of numbers can be formed?
(1) 3 (2) 4
(3) 6 (4) None of these

2. Three plots having an area of 132, 204 and 228 square metres respectively are to be sub-divided into equal vegetable beds. If the breadth of a bed is 3 metres, find the maximum length that a bed can have.
(1) 14 metres (2) 4 metres
(3) 24 metres (4) 6 metres

3. Three plots having an area of 165, 195 and 285 square metres respectively are to be sub-divided into equalised flower beds. If the breadth of a bed is 3 metres, what will the maximum length of a bed?
(1) 5.5 metres (2) 6 metres
(3) 5 metres (4) 6.5 metres

4. A room is 26 metres long and 10 metres broad. Its floor is to be paved by square tiles. What will be the least number of tiles required to cover the floor completely ?
(1) 50 (2) 55
(3) 60 (4) 65

5. Find the least number of square tiles by which the floor of a room of dimensions 16.58 × 8.32 m can be covered completely?
(1) 348644 (2) 344864
(3) 384644 (4) None of these

6. A wine seller had three types of wine, 403 litres of 1st kind, 434 litres of 2nd kind and 465 litres of 3rd kind. Find the least possible number of casks of equal size in which different types of wine can be filled without mixing.
(1) 46 (2) 44
(3) 42 (4) 48

7. Find the greatest number which will divide 478 and 719 leaving remainders 2 and 5 respectively.
(1) 242 (2) 240
(3) 236 (4) 238

8. Find the greatest number which will divide 42, 49 and 56 and leave remainders 6, 7 and 8 respectively.
(1) 6 (2) 8
(3) 12 (4) 24

9. Find the greatest number which divides 99, 123 and 183 leaving the same remainder in each case.
(1) 11 (2) 12
(3) 13 (4) 14

10. On dividing the numbers 7654, 8506 and 9997 by a certain largest number, in each case the remainder is the same. Find the number and the remainder.
(1) 213 and 199
(2) 223 and 189
(3) 233 and 179
(4) None of these

11. The numbers 2270, 3739 and 6677 on being divided by a certain number of three digits, leave the same remainder. Find the number and the remainder respectively.
(1) 123, 20 (2) 113, 10
(3) 116, 20 (4) 118, 15

12. On being divided by a three digit number, the numbers 95336 and 91545 leave the same remainder. Find the number and the remainder.
(1) 234 and 109
(2) 233 and 105
(3) 223 and 115
(4) None of these

13. The numbers 11284 and 7655 when divided by a number of three digit, leave the same remainder. Find the number of three digits.
(1) 292 (2) 219
(3) 119 (4) 191

14. What is the greatest number that will divide 2930 and 3246 that will leave 7 as remainder in each case.
(1) 79 (2) 89
(3) 69 (4) 97

15. In finding the HCF of two numbers by division method, the last divisor is 49 and the quotients are 17, 3, 2. Find the two numbers.
(1) 243 and 4929
(2) 343 and 5929
(3) 334 and 5992
(4) None of these

16. In finding the HCF of two numbers by division method, the last divisor is 18 and quotients are 2, 7 and 3. Find the numbers.
(1) 639 and 846
(2) 369 and 864
(3) 396 and 846
(4) None of these

17. Find the HCF of 513, 1134 and 1215.
(1) 27 (2) 9
(3) 18 (4) 54

SHORT ANSWERS

1. (2)	**2.** (2)	**3.** (3)	**4.** (4)
5. (2)	**6.** (3)	**7.** (4)	**8.** (1)
9. (3)	**10.** (1)	**11.** (2)	**12.** (3)
13. (4)	**14.** (1)	**15.** (2)	**16.** (3)
17. (1)			

EXPLANATIONS

1. (2) Let the numbers be $81x$ and $81y$ where x and y are co-prime.

$\therefore 81x + 81y = 1215$

$\Rightarrow x + y = \dfrac{1215}{81} = 15$

Possible pairs

= (1, 14), (2, 13), (4, 11), (7, 8)

2. (2) The maximum area a bed can have will be the greatest divisor of three plots.

Now, HCF of 132, 204 and 228 = ?

HCF of 132 and 204

```
132)204(1
    132
     72)132(1
        72
         60)72(1
            60
             12)60(5
                60
                 ×
```

The HCF of 132 and 204 = 12

The required HCF = HCF of 12 and 228.

12) 228 (19
12
108
108
×

Hence, the greatest area of the equalised bed = 12 sq.metres

∴ Maximum length of the bed

$= \frac{\text{Area}}{\text{Breadth}} = \frac{12}{3} = 4$ metres

3. (3) Maximum area of a bed = HCF of 165, 195 and 285.

165) 195 (1
165
30) 165 (5
150
15) 30 (2
30
×

15) 285 (19
15
135
135
×

∴ HCF = Maximum area = 15 sq. metres

Breadth = 3 metres

∴ Length $= \frac{15}{3}$ = 5 metres

4. (4) For the least number of tiles, each tile must be of maximum area.

Side of the largest tile = HCF of 26m and 10m

= HCF of 2 × 13m and 2 × 5 m = 2 metres

∴ Area of a tile = 2 × 2 = 4 sq. metres

∴ The least number of tiles

$= \frac{\text{Area of the floor}}{\text{Area of a tile}} = \frac{26 \times 10}{2 \times 2} = 65$

5. (2) We require the least number of square tiles, hence each tile must be of maximum dimensions.

Hence, the maximum dimensions of a tile

= HCF of 16.58 m and 8.32 m

Now, 16.58 m= 16.58 × 100 cm = 1658 cm

8.32 m = 8.32 ×100 cm = 832 cm

832) 1658 (1
832
826) 832 (1
826
6) 826 (137
6
22
18
46
42
4) 6 (1
4
2) 4 (2
4
×

Hence, the side of a square tile = 2 cm

∴ Required number of tiles

$= \frac{\text{Area of floor}}{\text{Area of a square tile}}$

$= \frac{1658 \times 832}{2 \times 2} = 344864$

6. (3) For the least possible number of casks of equal size, the size of each cask must be of the greatest capacity. Hence, the capacity of the cask will be equal to the HCF of 403*l*, 434*l* and 465*l*.

Now, HCF of 403 and 434.

403) 434 (1
403
31) 403 (13
31
93
93
×

Required HCF= HCF of 31 and 465

31) 465 (15
31
155
155
×

∴ Required HCF = 31 litres = Capacity of a cask.

So, required number of casks

$= \frac{403}{31} + \frac{434}{31} + \frac{465}{31}$

= 13 + 14 + 15 = 42

7. (4) We can understand the problem in better way in this form, i.e., (478 – 2) = 476 and (719 – 5) = 714 will be completely divisible by that number to be found. For this to happen we take the HCF Of 476 and 714.

476) 714 (1
476
238) 476 (2
476
×

∴ Required number = HCF of 476 and 714 = 238

8. (1) Take the HCF of (42 – 6) = 36, (49 – 7) = 42 and (56 – 8) = 48

36) 42 (1
36
6) 36 (6
36
×

And, HCF of 6 and 48 is also 6.

So, the required greatest number will be 6.

9. (3) Let x be the remainder. Then (99 – x), (123 – x) and (183 – x) will be exactly divisible by the required number. As discussed under division method of HCF, any number which divides the given number, also divides their difference. In other words, HCF of given numbers is same as the HCF of their difference.

∴ Required number

= HCF of (123 – x) – (99 – x), (183– x) – (123 – x) and (183 – x) – (99 – x)

= HCF of (123 – 99), (183 – 123) and (183 – 99)

= HCF of 24, 60 and 84

Now, 24 = 2 × 2 × 2 × 3

60 = 2 × 2 × 3 × 5

84 = 2 × 2 × 3 × 7

∴ Required HCF = 2 × 2 × 3 = 12

∴ Required number = 13

10. (1) Let the remainder be x.

Then (7654 – x), (8506 – x) and (9997 – x) are exactly divisible by that number.

Hence the required number

= HCF of (7654 – x),(8506 – x) and (9997 – x)

= HCF of (8506 – x) – (7654 – x), (9997 – x) – (8506 – x) and (9997 – x) – (7654 – x) = HCF of 852, 1491 and 2343

852) 1491 (1
852
639) 852 (1
639
213) 639 (3
639
×

Now, HCF of 213 and 2343

```
213) 2343 (11
     213
      213
      213
       ×
```

Hence required number = 213

Required remainder = 7654 ÷ 213

```
213) 7654 (35
     639
      1264
      1065
       199
```

Hence required remainder = 199

11. (2) As done in the previous question, the greatest common divisor

= HCF of (3739 – 2270), (6677 – 3739) and (6677 – 2270)

= HCF of 1469, 2938 and 4407

Now, 1469 = 1469 × 1

2938 = 1469 × 2

4407 = 1469 × 3

∴HCF = 1469

Now, 1469 = 113 × 13

Since, (2270 – R), (3739 – R) and (6677 – R), where R is the remainder, are exactly divisible by 1469, hence these are also exactly divisible by its factors 13 and 113. The three digit number is 113. Now the above mentioned numbers can be written as

2270 = (113 × 20) + 10

3739 = (113 × 33) + 10

6677 = (113 × 59) + 10

Hence, the required number is 113 and the remainder is 10.

12. (3) Let the remainder in each case be x.

Then, the numbers (95336 – x) and (91545 – x) will be exactly divisible by that three digit number.

As discussed earlier, the difference of the two numbers, i.e.,

[(95336 – x) – (91545 – x)] or, 3791 is exactly divisible by the three digit number. In other words, that three digit number will be a factor of 3791.

Now, 3791= 17 × 223

Since, the factors of 3791 have only 223 as three digit factor.

So, Required number = 223

Now, we divide 95336 by 223 to get remainder.

```
223) 95336 (427
     892
      613
      446
       1676
       1561
Remainder →  115
```

13. (4) Let the remainder in each case be x.

Then, (11284 – x) and (7655 – x) are exactly divisible by that three digit number.

Hence, their difference is [(11284 – x) – (7655 – x] = 3629 will also be exactly divisible by that three digit number. In other words that divisor will be a factor of 3629.

Now, 3629 = 19 ×191

Since both 19 and 191 are prime numbers, the three digit number is 191.

Hence, the required number = 191

14. (1) Obviously, the greatest number will divide completely the numbers (2930 – 7) and (3246 – 7), i.e., 2923 and 3239.

Hence, the greatest number will be the HCF of 2923 and 3239.

```
2923) 3239 (1
      2923
       316) 2923 (9
            2844
              79) 316 (4
                  316
                   ×
```

∴HCF = 79

Hence, the required number = 79

15. (2) Here, the last divisor = 49 and quotient = 2

or, Symbolically the process of finding the HCF by division method can be shown in this way.

```
a) b (17
   17a
    c) a (3
       3c
        49) c (2
            c
            x
```

the dividend (c) = 49 × 2 = 98

Now, divisor = 98,

quotient = 3

and remainder = 49

∴ Dividend (a) = 98 × 3 + 49 = 294 + 49 = 343

Again, divisor = 343,

quotient = 17

and remainder = 98

∴ Dividend (b) = 343 × 17 + 98 = 5831+ 98 = 5929

Thus, two numbers are 343 and 5929.

Short-cut method :

	a	b	c	49
Remainders →		17	3	2

Let two numbers are a and b.

c = 2 × 49 = 98

b = 3c + 49 = 3 × 98 + 49 = 343

a = 17b+c = 17×343 + 98 = 5929

16. (3) Last divisor = 18 and quotient = 3

∴ Dividend = 18 × 3 = 54

Now, divisor = 54, quotient = 7 and remainder = 18

∴ Dividend = 7 × 54 + 18 = 378 + 18 = 396

Now, divisor = 396, quotient = 2 and remainder = 54

∴ Dividend = 2 × 396 + 54 = 792 + 54 = 846

Hence, the required numbers are 396 and 846.

17. (1) At first, we find out the HCF of 1134 and 1215

```
1134)1215(1
     1134
       81)1134(14
          81
           324
           324
            ×
```

∴ HCF of 1134 and 1215 is 81.

∴ Required HCF = HCF of 513 and 81.

```
81)513(6
   486
    27)81(3
       81
        ×
```

∴ HCF of given numbers = 27

3 SIMPLIFICATION

Importance : 1 or 2 questions based on simplication are essential part of almost every competitive exams. The difficulty level varies based on examinataion level.

Scope of questions : The mostly asked questions are based on complex, fractions, decimal, squares, cubes, square roots and cuberoots. Questions are completely numerical kind with no alongways.

Way to success: Note that BODMAS rule and other simplification TRICKS & RULES are completely followed. Your concentration and 'Mental calculation' will help most in these questions.

Rule 1 : An expression must be simplified by following defined order/sequence known as VBODMAS, which is given by:

1st step, V – Vineculum (line brackets)/Bar
B – Brackets
O – Of
D – Division
M – Multiplication
A – Addition
Last step, S – Subtraction

There are four types of brackets given below.

(i) – → Line/Bar

(ii) ( ) → Simple or Small Bracket/open brackets

(iii) { } → Curly Brackets/Braces

(iv) [ ] → Square Brackets/Closed brackets

These brackets must be solved in given order only.

Rule 2 :

$$\frac{1}{n(n+1)}+\frac{1}{(n+1)(n+2)}+\frac{1}{(n+2)(n+3)}\cdots\cdots\frac{1}{(n+r-1)(n+r)}$$

$$=\left(\frac{1}{n}-\frac{1}{n+1}\right)+\left(\frac{1}{n+1}-\frac{1}{n+2}\right)+\left(\frac{1}{n+2}-\frac{1}{n+3}\right)$$

$$+\ \cdots\cdots\ +\left(\frac{1}{n+r-1}-\frac{1}{n+r}\right)=\left(\frac{1}{n}-\frac{1}{n+r}\right)$$

Rule 3 : $\frac{1}{n(n+2)}+\frac{1}{(n+2)(n+4)}+\frac{1}{(n+4)(n+6)}$

$$+\ \cdots\cdots\ +\frac{1}{(n+2r-2)(n+2r)}=\frac{1}{2}\left(\frac{1}{n}-\frac{1}{n+2r}\right)$$

Rule 4 : FORMULA → $\frac{a^3+b^3}{a^2-ab+b^2}=(a+b)$

Rule 5 : FORMULA → $\frac{a^3-b^3}{a^2+ab+b^2}=(a-b)$

Rule 6 : FORMULA → $\frac{(a+b)^2+(a-b)^2}{(a^2+b^2)}=2$

Rule 7 : FORMULA → $a^2+2ab+b^2=(a+b)^2$

Rule 8 : $\frac{a^2-b^2}{a-b}=a+b$ or, $\frac{a^2-b^2}{a+b}=a-b$

Basic formulae

(i) $(a+b)^2=a^2+2ab+b^2$

(ii) $(a-b)^2=a^2-2ab+b^2$

(iii) $(a^2-b^2)=(a+b)(a-b)$

(iv) $(a+b)^2+(a-b)^2=2(a^2+b^2)$

(v) $(a+b)^2-(a-b)^2=4ab$

(vi) $(a+b)^3=a^3+b^3+3ab(a+b)$

(vii) $(a-b)^3=a^3-b^3-3ab(a-b)$

(viii) $a^3+b^3=(a+b)(a^2-ab+b^2)$

(ix) $a^3-b^3=(a-b)(a^2+ab+b^2)$

(x) $a^3+b^3+c^3-3abc=(a+b+c)(a^2+b^2+c^2-ab-bc-ca)$

If $a+b+c=0$

$\Rightarrow a^3+b^3+c^3=3abc$

(xi) $a^2+\frac{1}{a^2}=\left(a+\frac{1}{a}\right)^2-2=\left(a-\frac{1}{a}\right)^2+2$

(xii) $\left(a+\frac{1}{a}\right)^3=a^3+\frac{1}{a^3}+3\times\left(a+\frac{1}{a}\right)$

(xiii) $\left(a-\frac{1}{a}\right)^3=a^3-\frac{1}{a^3}-3\times\left(a-\frac{1}{a}\right)$

SQUARE ROOTS AND CUBE ROOTS

Importance : Questions based on square roots and cube roots are mainly asked with the questions of simplication and number system.

Scope of questions : Questions may be basic (totally numeric) or applied.

Way to success : Learning Formulae and squares/square roots/cube/cube roots of different numbers is very useful.

Some important Points (On Square Roots):

If a number n is multiplied with itself, then product n^2 is called the Square of n and here n is called the Square root of n^2.

If a number has x digits, then its square has (2x – 1) digits.

Number is 12 square is 144

$\therefore$ Number of digit in144 is $2 \times 2 - 1 = 3$

If we square any number, then 2, 3, 7 and 8 will never come at unit place of square.

The square root of a negative number is always imaginary.

Square of a two–digit number whose unit place digit is 5 can be obtained as.

$(25)^2 = 2 \times 3$ (Hundred) $+ 5^2 = 2 \times 300 + 25 = 625$

or,

$(35)^2 = 3 \times 4$ (Hundred) $+ 5^2 = 3 \times 400 + 25 = 1225$

There are two methods of calculating square root.

(i) Factor method (ii) Division method

(i) **Factor method :** Square root of 44100

$\therefore$ $44100 = 2\times2\times3\times3\times5\times5\times7\times7$

$\therefore$ $\sqrt{44100} = \sqrt{2^2\times3^2\times5^2\times7^2}$

$= 2\times3\times5\times7 = 210$

(ii) **Division method :** Square root of 455625

```
     6 | 45 56 25 (675
     6 | 36
   127 | 0956
     7 | -889
  1345 |    6725
     5 |  - 6725
         -------
             0
```

$= \sqrt{455625} = 675.$

Special Rules :

(i) $(ab)^{\frac{1}{2}} = \sqrt{ab} = \sqrt{a}\times\sqrt{b} = (a)^{\frac{1}{2}} \times (b)^{\frac{1}{2}}$

(ii) $\left(\frac{a}{b}\right)^{\frac{1}{2}} = \frac{(a)^{\frac{1}{2}}}{(b)^{\frac{1}{2}}} = \frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$

If the unit digit of a number is 1, then unit digit of its square root is 1 or 9 such as

$\sqrt{81} = 9$ or, $\sqrt{441} = 21$

If the unit digit of any number is 4, then the unit digit of its square root is 2 or 8. Such as, $\sqrt{64} = 8$ or, $\sqrt{144} = 12$

If the unit digit of any number is 5 or 00 (double zero) then the unit digit of its square root is 5 or 0.

As, $\sqrt{625} = 25$, $\sqrt{100} = 10$

Square roots of some numbers :

$\sqrt{0} = 0$	$\sqrt{1} = 1$
$\sqrt{2} = 1.414$	$\sqrt{3} = 1.732$
$\sqrt{4} = 2$	$\sqrt{25} = 5$
$\sqrt{9} = 3$	$\sqrt{49} = 7$
$\sqrt{16} = 4$	$\sqrt{81} = 9$
$\sqrt{36} = 6$	$\sqrt{121} = 11$
$\sqrt{64} = 8$	$\sqrt{169} = 13$
$\sqrt{100} = 10$	$\sqrt{225} = 15$
$\sqrt{144} = 12$	$\sqrt{289} = 17$
$\sqrt{196} = 14$	$\sqrt{361} = 19$
$\sqrt{256} = 16$	$\sqrt{441} = 21$
$\sqrt{324} = 18$	
$\sqrt{400} = 20$	

Some Important Points (On Cube Roots) :

If a number n is multiplied by itself 3 times then n^3 is called the cube of n and here n is called the cube root of n^3.

Cube roots can be calculated only by factor method.

If in any number 0, 1, 2, 3, 4, 5, 6, 7, 8 or 9 are at unit place, then 0, 1, 8, 7, 4, 5, 6, 3,2 or 9 respectively will be the unit place of their cube root.

Note that if unit place of any number is 0, 1, 4, 5, 6 or 9 then unit place of the cube or cube root of this number will be same as in original number.

To calculate cubic root of 3375.

$3375 = 3 \times 3 \times 3 \times 5 \times 5 \times 5$

$\therefore$ $\sqrt[3]{3375} = \sqrt[3]{3^3\times5^3} = 3 \times 5 = 15$

If $\sqrt[3]{x} = b$ then $x^{\frac{1}{3}} = b \Rightarrow \log x^{\frac{1}{3}} = \log b$

$\Rightarrow \frac{1}{3}\log x = \log b$

$\therefore$ $b = \text{antilog}\left(\frac{1}{3}\log x\right)$.

Some Cube Roots :

$\sqrt[3]{1} = 1$	$\sqrt[3]{8} = 2$
$\sqrt[3]{27} = 3$	$\sqrt[3]{64} = 4$
$\sqrt[3]{125} = 5$	$\sqrt[3]{216} = 6$
$\sqrt[3]{343} = 7$	$\sqrt[3]{512} = 8$
$\sqrt[3]{729} = 9$	$\sqrt[3]{1000} = 10$
$\sqrt[3]{1331} = 11$	$\sqrt[3]{1728} = 12$
$\sqrt[3]{2197} = 13$	$\sqrt[3]{2744} = 14$
$\sqrt[3]{3375} = 15$	$\sqrt[3]{4096} = 16$
$\sqrt[3]{4913} = 17$	$\sqrt[3]{5832} = 18$
$\sqrt[3]{6859} = 19$	$= 20$

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. Simplify : $1+\cfrac{1}{1+\cfrac{2}{2+\cfrac{3}{1+\cfrac{4}{5}}}}$

(1) $1\frac{11}{17}$ (2) $1\frac{5}{7}$

(3) $1\frac{6}{17}$ (4) $1\frac{21}{17}$

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. Simplify : $1+\cfrac{2}{1+\cfrac{3}{1+\cfrac{4}{5}}}$

(1) $\frac{7}{4}$ (2) $\frac{4}{7}$

(3) $\frac{7}{5}$ (4) $\frac{3}{7}$

(SSC CGLPrelim Exam. 04.07.1999 (First Sitting)

3. The value of

$\cfrac{1}{3+\cfrac{1}{2-\cfrac{1}{\cfrac{7}{9}}}}+\frac{17}{22}$ is :

(1) $\frac{12}{22}$ (2) $\frac{22}{5}$

(3) $\frac{5}{22}$ (4) 1

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. If $x=1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2}}}}$

then, the value of $2x+\frac{7}{4}$ is :

(1) 3 (2) 4

(3) 5 (4) 6

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. Simplify :

$\frac{19}{43}\div\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{4}}}}$

(1) 1 (2) $\frac{19}{43}$

(3) $\frac{43}{19}$ (4) $\frac{38}{43}$

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

6. The simplification of $\cfrac{5}{3+\cfrac{3}{1-\cfrac{2}{3}}}$

gives

(1) 5 (2) $\frac{5}{3}$

(3) $\frac{5}{12}$ (4) $\frac{3}{5}$

(SSC CPO S.I. Exam. 2.01.2003)

7. If $2=x+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{4}}}$, then the value of x is :

(1) $\frac{18}{17}$ (2) $\frac{21}{17}$

(3) $\frac{13}{17}$ (4) $\frac{12}{17}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. Find the value of

$\cfrac{2}{1+\cfrac{1}{1-\cfrac{1}{2}}}\times\cfrac{3}{\frac{5}{6}\text{ of }\frac{3}{2}\div1\frac{1}{4}}$

(1) 6 (2) 8

(3) 4 (4) 2

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

9. Simplify :

$1+\cfrac{4}{2+\cfrac{3}{5-\cfrac{1}{2}}}-\frac{1}{2}(10\div2)$

(1) 1 (2) 0

(3) $-\frac{15}{2}$ (4) $-\frac{1}{2}$

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

10.

$$\left[\left(1+\frac{1}{10+\frac{1}{10}}\right)\times\left(1+\frac{1}{10+\frac{1}{10}}\right)-\left(1-\frac{1}{10+\frac{1}{10}}\right)\times\left(1-\frac{1}{10+\frac{1}{10}}\right)\right]\div\left[\left(1+\frac{1}{10+\frac{1}{10}}\right)+\left(1-\frac{1}{10+\frac{1}{10}}\right)\right]$$

simplifies to

(1) $\frac{100}{101}$ (2) $\frac{90}{101}$

(3) $\frac{20}{101}$ (4) $\frac{101}{100}$

(SSC CPO S.I. Exam. 07.09.2003)

11. $\cfrac{5\frac{9}{14}}{5+\cfrac{3}{3+\cfrac{1}{\frac{3}{5}}}}$ is equal to

(1) 1 (2) 1.5

(3) 2 (4) 2.5

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

12. $\cfrac{2}{2+\cfrac{2}{3+\cfrac{2}{3+\frac{2}{3}}}}\times0.39$ is simplified to

(1) $\frac{1}{3}$ (2) 2

(3) 6 (4) None of these

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

13. $1+\dfrac{1}{1+\dfrac{1}{2}}$ is equal to

(1) 3 (2) $\dfrac{3}{2}$

(3) $\dfrac{2}{3}$ (4) $\dfrac{5}{3}$

(SSC CPO S.I. Exam. 05.09.2004)

14. $\dfrac{13}{48}$ is equal to

(1) $\dfrac{1}{3+\dfrac{1}{1+\dfrac{1}{16}}}$

(2) $\dfrac{1}{2+\dfrac{1}{1+\dfrac{1}{8}}}$

(3) $\dfrac{1}{3+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{8}}}}$

(4) $\dfrac{1}{3+\dfrac{1}{1+\dfrac{1}{2+\dfrac{1}{4}}}}$

(SSC CPO S.I. Exam. 03.09.2006)

15. The value of

$1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{2}{3}}}}}$ is

(1) $\dfrac{21}{13}$ (2) $\dfrac{17}{3}$

(3) $\dfrac{34}{21}$ (4) $\dfrac{8}{5}$

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

16. The value of $\dfrac{2\frac{1}{3}-1\frac{2}{11}}{3+\dfrac{1}{3+\dfrac{1}{3+\frac{1}{3}}}}$ is

(1) $\dfrac{38}{109}$ (2) $\dfrac{109}{38}$

(3) 1 (4) $\dfrac{116}{109}$

(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

17. The value of $3+\dfrac{3}{3+\dfrac{1}{3+\frac{1}{3}}}$ is

(1) $\frac{40}{11}$ (2) $\frac{43}{11}$

(3) $\frac{46}{11}$ (4) $\frac{41}{11}$

(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

18. $1+\dfrac{1}{1+\dfrac{1}{5}}=?$

(1) $\dfrac{11}{6}$ (2) $\dfrac{13}{6}$

(3) $\dfrac{15}{6}$

(4) None of the above

(SSC CISF Constable (GD) Exam. 05.06.2011)

19.

$$\frac{4\frac{2}{7}-\frac{1}{2}}{3\frac{1}{2}+1\frac{1}{7}}\div\frac{1}{2+\dfrac{1}{2+\dfrac{1}{5-\frac{1}{5}}}}$$

is equal to

(1) 1 (2) $\dfrac{1}{2}$

(3) 2 (4) $\dfrac{1}{3}$

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

20. If $\left[4-\dfrac{5}{1+\dfrac{1}{3+\dfrac{1}{2+\frac{1}{4}}}}\right]^{th}$ part of a journey takes 10 minutes, then to complete $\dfrac{3}{5}$ th of that journey, it will take

(1) 40 minutes (2) 45 minutes

(3) 48 minutes (4) 36 minutes

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

21.

$$\sqrt{\frac{4\frac{1}{7}-2\frac{1}{4}}{3\frac{1}{2}+1\frac{1}{7}}\div\frac{2}{2+\dfrac{1}{2+\dfrac{1}{5-\frac{1}{5}}}}}$$

is equal to

(1) 1 (2) 4

(3) 3 (4) 2

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

22. The value of $1+\dfrac{1}{1+\dfrac{2}{3+\frac{4}{5}}}$ is :

(1) $\dfrac{12}{29}$ (2) $\dfrac{8}{19}$

(3) $\dfrac{48}{29}$ (4) $\dfrac{2}{19}$

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

23. The value of $1-\dfrac{a}{1-\dfrac{1}{1+\dfrac{a}{1-a}}}$ is

(1) a (2) $1-a$

(3) 1 (4) 0

(SSC CGL Tier-I Exam. 26.10.2014)

24. On simplification, the expression

$$\frac{4\frac{1}{7}-2\frac{1}{7}}{3\frac{1}{2}+1\frac{1}{7}}\div\frac{1}{2+\dfrac{1}{2+\dfrac{1}{5-\frac{1}{5}}}}$$

is equal to

(1) $\dfrac{28}{65}$ (2) $\dfrac{24}{53}$

(3) $\dfrac{56}{53}$ (4) $\dfrac{14}{65}$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

25. The simplified value of :

$$\left\{\left(1+\frac{1}{10+\frac{1}{10}}\right)\left(1+\frac{1}{10+\frac{1}{10}}\right)-\left(1-\frac{1}{10+\frac{1}{10}}\right)\left(1-\frac{1}{10+\frac{1}{10}}\right)\right\} \div \left\{\left(1+\frac{1}{10+\frac{1}{10}}\right)\left(1-\frac{1}{10+\frac{1}{10}}\right)\right\}$$

(1) $\frac{20}{101}$ (2) $\frac{100}{101}$

(3) 2 (4) $\frac{90}{101}$

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

26. The value of

$$4-\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{4}}}} \text{ is}$$

(1) $\frac{1}{8}$ (2) $\frac{1}{64}$

(3) $\frac{1}{16}$ (4) $\frac{1}{32}$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

TYPE–II

1. Evaluate : $\frac{9|3-5|-5|4|\div 10}{-3(5)-2\times 4\div 2}$

(1) $\frac{9}{10}$ (2) $-\frac{8}{17}$

(3) $-\frac{16}{19}$ (4) $\frac{4}{7}$

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. 5–[4–{3–(3–3–6)}] is equal to :

(1) 10 (2) 6

(3) 4 (4) 0

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

3. Evaluate :

$$\frac{-(4-6)^2-3(-2)+|-6|}{18-9\div 3\times 5}$$

(1) $\frac{3}{8}$ (2) $\frac{4}{7}$

(3) $\frac{8}{3}$ (4) $\frac{7}{4}$

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

4. Simplify : $\dfrac{\frac{5}{3}\times\frac{7}{51} \text{ of } \frac{17}{5}-\frac{1}{3}}{\frac{2}{9}\times\frac{5}{7} \text{ of } \frac{28}{5}-\frac{2}{3}}$

(1) $\frac{1}{2}$ (2) 4

(3) 2 (4) $\frac{1}{4}$

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

5. 1– [5 – {2 + (– 5 + 6 – 2) 2}] is equal to :

(1) –4 (2) 2

(3) 0 (4) –2

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

6. On simplification 3034 – (1002 ÷ 20.04) is equal to

(1) 3029 (2) 2984

(3) 2993 (4) 2543

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

7. When simplified, the expression

$(100)^{\frac{1}{2}}\times(0.001)^{\frac{1}{3}}-(0.0016)^{\frac{1}{4}}\times 3^0+\left(\frac{5}{4}\right)^{-1}$ is equal to:

(1) 1.6 (2) 0.8

(3) 1.0 (4) 0

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

8. When $\left(\frac{1}{2}-\frac{1}{4}+\frac{1}{5}-\frac{1}{6}\right)$ is divided by $\left(\frac{2}{5}-\frac{5}{9}+\frac{3}{5}-\frac{7}{18}\right)$, the result is :

(1) $5\frac{1}{10}$ (2) $2\frac{1}{18}$

(3) $3\frac{1}{6}$ (4) $3\frac{3}{10}$

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

9. Simplify :

$$8\frac{1}{2}-\left[3\frac{1}{4}\div\left\{1\frac{1}{4}-\frac{1}{2}\left(1\frac{1}{2}-\frac{1}{3}-\frac{1}{6}\right)\right\}\right]$$

(1) $4\frac{1}{2}$ (2) $4\frac{1}{6}$

(3) $9\frac{1}{2}$ (4) $\frac{2}{9}$

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

10. If $\frac{50}{*}=\frac{*}{12\frac{1}{2}}$, then the value of * is :

(1) $\frac{25}{2}$ (2) $\frac{4}{25}$

(3) 4 (4) 25

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

11. The value of 0.008 × 0.01 × 0.072 ÷ (0.12 × 0.0004) is :

(1) 1.2 (2) 0.12

(3) 0.012 (4) 1.02

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

12. The value of

$$\frac{2}{3}\times\frac{3}{\frac{5}{6}\div\frac{2}{3} \text{ of } 1\frac{1}{4}} \text{ is :}$$

(1) 2 (2) 1

(3) $\frac{1}{2}$ (4) $\frac{2}{3}$

(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting)

13. Find the sum of the following :

$$\frac{1}{9}+\frac{1}{6}+\frac{1}{12}+\frac{1}{20}+\frac{1}{30}+\frac{1}{42}+\frac{1}{56}+\frac{1}{72}$$

(1) $\frac{1}{2}$ (2) 0

(3) $\frac{1}{9}$ (4) $\frac{1}{2520}$

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

14. The value of 25 – 5 [2 + 3 (2 – 2 (5 – 3) + 5) – 10] ÷ 4 is :

(1) 5 (2) 23.25

(3) 23.75 (4) 25

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

15. Find the value of * in the following

$$1\frac{2}{3} \div \frac{2}{7} \times \frac{*}{7} = 1\frac{1}{4} \times \frac{2}{3} \div \frac{1}{6}$$

(1) $\frac{1}{6}$ (2) 0.6
(3) 0.006 (4) 6

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

16. $9 - 1\frac{2}{9}$ of $3\frac{3}{11} \div 5\frac{1}{7}$ of $\frac{7}{9}$ is equal to :

(1) 8 (2) 9
(3) $8\frac{32}{81}$ (4) $\frac{3}{4}$

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

17. The value of

$$\frac{5}{1\frac{7}{8} \text{ of } 1\frac{1}{3}} \times \frac{2\frac{1}{10}}{3\frac{1}{2}} \text{ of } 1\frac{1}{4}$$

(1) $1\frac{1}{2}$ (2) 0.05
(3) 1 (4) 2

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

18. $\frac{9}{20} - \left[\frac{1}{5} + \left\{\frac{1}{4} + \left(\frac{5}{6} - \overline{\frac{1}{3} + \frac{1}{2}}\right)\right\}\right]$

is equal to

(1) 0 (2) 1
(3) $\frac{9}{20}$ (4) $\frac{9}{10}$

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

19. $\frac{0.8\overline{3} \div 7.5}{2.3\overline{21} - 0.0\overline{98}}$ is equal to

(1) 0.6 (2) 0.1
(3) 0.06 (4) 0.05

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

20. For what value of *, statement

$\left[\frac{(*)}{21} \times \frac{(*)}{189}\right] = 1$ is correct ?

(1) 3969 (2) 147
(3) 63 (4) 21

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

21. If $\frac{1120}{\sqrt{P}} = 80$, then P is equal to

(1) 14 (2) 140
(3) 196 (4) 225

(SSC CPO S.I. Exam. 12.01.2003

22. $\frac{3\frac{1}{4} - \frac{4}{5} \text{ of } \frac{5}{6}}{4\frac{1}{3} \div \frac{1}{5} - \left(\frac{3}{10} + 21\frac{1}{5}\right)} - \left(1\frac{2}{3} \text{ of } 1\frac{1}{2}\right)$

is equal to

(1) 9 (2) $11\frac{1}{2}$
(3) 13 (4) $15\frac{1}{2}$

(SSC CPO S.I. Exam. 12.01.2003

23. Simplify

$$\left[3\frac{1}{4} \div \left\{1\frac{1}{4} - \frac{1}{2}\left(2\frac{1}{2} - \overline{\frac{1}{4} - \frac{1}{6}}\right)\right\}\right] \div \left(\frac{1}{2} \text{ of } 4\frac{1}{3}\right)$$

(1) 18 (2) 36
(3) 39 (4) 78

(SSC CPO S.I. Exam. 12.01.2003

24. The value of

$$\frac{0.1 \times 0.1 \times 0.1 + 0.2 \times 0.2 \times 0.2 + 0.3 \times 0.3 \times 0.3 - 3 \times 0.1 \times 0.2 \times 0.3}{0.1 \times 0.1 + 0.2 \times 0.2 + 0.3 \times 0.3 - 0.1 \times 0.2 - 0.2 \times 0.3 - 0.3 \times 0.1}$$

is

(1) 0.006 (2) 0.6
(3) 0 (4) 0.2

(SSC CPO S.I. Exam. 12.01.2003

25.

$$\frac{1}{30} + \frac{1}{42} + \frac{1}{56} + \frac{1}{72} + \frac{1}{90} + \frac{1}{110} = ?$$

(1) $\sqrt{2}\frac{2}{27}$ (2) $\frac{1}{9}$
(3) $\frac{5}{27}$ (4) $\frac{6}{55}$

(SSC CPO S.I. Exam. 12.01.2003

26. If $I = \frac{3}{4} \div \frac{5}{6}$, II = 3 ÷ [(4 ÷ 5) ÷ 6], III = [3 ÷ (4 ÷ 5)] ÷ 6, IV = 3 ÷ 4 (5 ÷ 6) then

(1) I and II are equal
(2) I and IV are equal
(3) I and III are equal
(4) All are equal

(SSC CPO S.I. Exam. 12.01.2003

27. The value of 1 ÷ [1 + 1 ÷ {1 + 1 ÷ (1 + 1 ÷ 2)}] is

(1) 1 (2) $\frac{5}{8}$
(3) 2 (4) $\frac{1}{2}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

28. The simplified value of

$$\frac{\frac{1}{3} \div \frac{1}{3} \times \frac{1}{3}}{\frac{1}{3} \div \frac{1}{3} \text{ of } \frac{1}{3}} - \frac{1}{9} \text{ is}$$

(1) 0 (2) 1
(3) $\frac{1}{3}$ (4) $\frac{1}{9}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

29. Simplify :

$$\frac{2\frac{3}{4}}{1\frac{5}{6}} \div \frac{7}{8} \times \left(\frac{1}{3} + \frac{1}{4}\right) + \frac{5}{7} \div \frac{3}{4} \text{ of } \frac{3}{7}$$

(1) $\frac{56}{77}$ (2) $\frac{49}{80}$
(3) $\frac{2}{3}$ (4) $3\frac{2}{9}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

30. The simplification of

$3.\overline{36} - 2.\overline{05} + 1.\overline{33}$ equals :

(1) 2.60 (2) $2.\overline{61}$
(3) 2.64 (4) $2.\overline{64}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

31. The value of

$$\frac{0.9 \times 0.9 \times 0.9 + 0.2 \times 0.2 \times 0.2 + 0.3 \times 0.3 \times 0.3 - 3 \times 0.9 \times 0.2 \times 0.3}{0.9 \times 0.9 + 0.2 \times 0.2 + 0.3 \times 0.3 - 0.9 \times 0.2 - 0.2 \times 0.3 - 0.3 \times 0.9}$$

is

(1) 1.4 (2) 0.054
(3) 0.8 (4) 1.0

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

32. Simplify :

$$\left(0.\overline{1}\right)^2\left\{1-9\left(0.1\overline{6}\right)^2\right\}$$

(1) $-\frac{1}{162}$ (2) $\frac{1}{108}$

(3) $\frac{7696}{10^6}$ (4) $\frac{1}{109}$

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

33. Simplify :

$$\frac{1+\frac{1}{2}}{1-\frac{1}{2}} \div \frac{4}{7}\left(\frac{2}{5}+\frac{3}{10}\right) \text{ of } \frac{\frac{1}{2}+\frac{1}{3}}{\frac{1}{2}-\frac{1}{3}}$$

(1) $\frac{2}{3}$ (2) $37\frac{1}{2}$

(3) $\frac{3}{2}$ (4) $18\frac{3}{8}$

(SSC CGL Prelim Exam. 11.05.2003) (Second Sitting)

34. Simplify :
[0.9 – {2.3 – 3.2 – (7.1 – 5.4 – 3.5)}]

(1) 0.18 (2) 1.8
(3) 0 (4) 2.6

(SSC CGL Prelim Exam. 11.05.2003) (Second Sitting)

35. $(32)^3 + (79)^3 - (111)^3 + 3 \times 32 \times 79 \times 111$ is equal to

(1) 10000 (2) 0
(3) 30007 (4) 1

(SSC CPO S.I. Exam. 07.09.2003)

36. $\left(\frac{5}{2}+\frac{3}{2}\right)\left(\frac{25}{4}-\frac{15}{4}+\frac{9}{4}\right)$ is equal to

(1) 38 (2) 19
(3) 37 (4) 36

(SSC CPO S.I. Exam. 07.09.2003)

37. $(0.2 \times 0.2 + 0.01)\ (0.1 \times 0.1 + 0.02)^{-1}$ is equal to

(1) $\frac{5}{3}$ (2) $\frac{41}{12}$

(3) $\frac{41}{4}$ (4) $\frac{9}{5}$

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

38. $\frac{1}{2}+\left\{4\frac{3}{4}-\left(3\frac{1}{6}-2\frac{1}{3}\right)\right\}$ is equal to

(1) $3\frac{2}{3}$ (2) $1\frac{1}{4}$

(3) $4\frac{5}{12}$ (4) $1\frac{2}{3}$

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

39. The simplification of $\frac{1}{8}+\frac{1}{8^2}+\frac{1}{8^3}+\frac{1}{8^4}+\frac{1}{8^5}$ upto three-places of decimals yields

(1) 0.143 (2) 0.163
(3) 0.215 (4) 0.715

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

40. $8.7-\left[7.6-\left\{6.5-\left(5.4-\overline{4.3-2}\right)\right\}\right]$ is simplified to :

(1) 2.5 (2) 3.5
(3) 4.5 (4) 5.5

(SSC CGL Prelim Exam. 08.02.2004) (Second Sitting)

41. The simplified value of $[(0.111)^3 + (0.222)^3 - (0.333)^3 + (0.333)^2\ (0.222)]^3$ is :

(1) 0.999 (2) 0
(3) 0.888 (4) 0.111

(SSC CGL Prelim Exam. 08.02.2004) (Second Sitting)

42. $\frac{1\frac{1}{4}\div 1\frac{1}{2}}{\left(\frac{1}{15}+1-\frac{9}{10}\right)}$ is equal to :

(1) 3 (2) 6

(3) $\frac{2}{5}$ (4) 5

(SSC CGL Prelim Exam. 08.02.2004) (Second Sitting)

43. $\frac{-\frac{1}{2}-\frac{2}{3}+\frac{4}{5}-\frac{1}{3}+\frac{1}{5}+\frac{3}{4}}{\frac{1}{2}+\frac{2}{3}-\frac{4}{3}+\frac{1}{3}-\frac{1}{5}-\frac{4}{5}}$ is simplified to

(1) $-\frac{10}{3}$ (2) $-\frac{3}{10}$

(3) 1 (4) – 2

(SSC CGL Prelim Exam. 08.02.2004) (Second Sitting)

44. The simplification of $\left(0.\overline{63}+0.\overline{37}+0.\overline{80}\right)$ yields the result

(1) $1.\overline{80}$ (2) $1.\overline{81}$
(3) $1.\overline{79}$ (4) 1.80

(SSC CGL Prelim Exam. 08.02.2004) (Second Sitting)

45. $\frac{(4.53-3.07)^2}{(3.07-2.15)\ (2.15-4.53)}+\frac{(3.07-2.15)^2}{(2.15-4.53)\ (4.53-3.07)}+\frac{(2.15-4.53)^2}{(4.53-3.07)\ (3.07-2.15)}$ is simplified to

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CPO S.I. Exam. 05.09.2004)

46. $\frac{17}{15}\times\frac{17}{15}+\frac{2}{15}\times\frac{2}{15}-\frac{17}{15}\times\frac{4}{15}$ is equal to

(1) 0 (2) 1
(3) 10 (4) 11

(SSC CPO S.I. Exam. 05.09.2004)

47. $\left(4\frac{11}{15}+\frac{15}{71}\right)^2-\left(4\frac{11}{15}-\frac{15}{71}\right)^2$ is equal to :

(1) 1 (2) 2
(3) 3 (4) 4

(SSC CPO S.I. Exam. 26.05.2005)

48. The value of $\frac{0.1\times0.1\times0.1+0.02\times0.02\times0.02}{0.2\times0.2\times0.2+0.04\times0.04\times0.04}$ is :

(1) 0.0125 (2) 0.125
(3) 0.25 (4) 0.5

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

49. If * represents a number, then the value of * in $5\frac{3}{*}\times3\frac{1}{2}=19$ is :

(1) 7 (2) 4
(3) 6 (4) 2

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

50. $\left(\sqrt{2}+\frac{1}{\sqrt{2}}\right)^2$ is equal to :

(1) $2\frac{1}{2}$ (2) $3\frac{1}{2}$

(3) $4\frac{1}{2}$ (4) $5\frac{1}{2}$

(SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting) & (SSC CISF ASI Exam. 29.08.2010)

51. The value of $(0.98)^3 + (0.02)^3 + 3 \times 0.98 \times 0.02 - 1$ is :
(1) 1.98 (2) 1.09
(3) 1 (4) 0
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

52. $(71 \times 29 + 27 \times 15 + 8 \times 4)$ equals
(1) 3450 (2) 3458
(3) 2496 (4) None of these
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

53. $(0.05 \times 5 - 0.005 \times 5)$ equals
(1) 2.250 (2) 0.225
(3) 0.0225 (4) 0.275
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

54. The value of

$$\sqrt[3]{\frac{0.2 \times 0.2 \times 0.2 + 0.04 \times 0.04 \times 0.04}{0.4 \times 0.4 \times 0.4 + 0.08 \times 0.08 \times 0.08}}$$

is
(1) 0.5 (2) 0.25
(3) 0.75 (4) 0.125
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

55. $(256)^{0.16} \times (16)^{0.18}$ is equal to
(1) 4 (2) 16
(3) 64 (4) 256.25
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

56.

$$\left(\frac{1}{3.5} + \frac{1}{5.7} + \frac{1}{7.9} + \frac{1}{9.11} + \frac{1}{11.13} + \frac{1}{13.15}\right)$$

is equal to
(1) $\frac{2}{45}$ (2) $\frac{4}{45}$
(3) $\frac{7}{45}$ (4) $\frac{2}{15}$
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

57. $(53 \times 87 + 159 \times 21 + 106 \times 25)$ is equal to
(1) 16000 (2) 1060
(3) 10600 (4) 60100
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

58. The value of $\frac{0.125 + 0.027}{0.25 - 0.15 + 0.09}$ is
(1) 0.2 (2) 0.25
(3) 0.3 (4) 0.8
(SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting) & (SSC CGL Tier-I Exam. 16.05.2010 (Ist Sitting)

59. $\frac{8(3.75)^3 + 1}{(7.5)^2 - 6.5}$ is equal to
(1) 2.75 (2) $\frac{9}{5}$
(3) 4.75 (4) 8.5
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

60. The value of

$$\frac{(2.697 - 0.498)^2 + (2.697 + 0.498)^2}{2.697 \times 2.697 + 0.498 \times 0.498}$$ is
(1) 4 (2) 2
(3) 2.199 (4) 3.195
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

61. The least fraction to be subtracted from the expression

$$\frac{3\frac{1}{4} - \frac{4}{5} \text{ of } \frac{5}{6}}{4\frac{1}{3} \div \frac{1}{5} - \left(\frac{3}{10} + 21\frac{1}{5}\right)}$$ to make it an integer.
(1) $\frac{1}{2}$ (2) $\frac{5}{6}$
(3) $\frac{1}{4}$ (4) $\frac{3}{10}$
(SSC CPO S.I. Exam. 06.09.2009)

62. If $\sqrt[2]{0.014 \times 0.14x} = 0.014 \times 0.14\sqrt[2]{y}$, find the value of $\frac{x}{y}$.
(1) 0.000196 (2) 0.00196
(3) 0.0196 (4) 0.196
(SSC CPO S.I. Exam. 06.09.2009)

63. $\frac{4.41 \times 0.16}{2.1 \times 1.6 \times 0.21}$ is simplified to
(1) 1 (2) 0.1
(3) 0.01 (4) 10
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

64. $(0.1 \times 0.01 \times 0.001 \times 10^7)$ is equal to
(1) 100 (2) $\frac{1}{10}$
(3) $\frac{1}{100}$ (4) 10
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

65. $\frac{3.25 \times 3.20 - 3.20 \times 3.05}{0.064}$ is equal to :
(1) 1 (2) $\frac{1}{2}$
(3) $\frac{1}{10}$ (4) 10
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

66. $\left\{\frac{(0.1)^2 - (0.01)^2}{0.0001} + 1\right\}$ is equal to
(1) 1010 (2) 110
(3) 101 (4) 100
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

67. $(0.5 \times 5 + 0.25 \times 0.5 + 0.5 \times 4 + 0.5 \times 0.75)$ is equal to
(1) 5 (2) 10
(3) 15 (4) 20
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

68. $\frac{(5+5+5+5) \div 5}{3+3+3+3 \div 3}$ is equal to
(1) 1 (2) $\frac{3}{10}$
(3) $\frac{4}{9}$ (4) $\frac{2}{5}$
(SSC (South Zone) Investigator Exam. 12.09.2010)

69.

$$\frac{(100-1)(100-2)(100-3)\ldots(100-200)}{100 \times 99 \times 98 \times \ldots \times 3 \times 2 \times 1}$$

is equal to
(1) $\frac{100}{99 \times 98 \times 97 \times \ldots \times 3 \times 2 \times 1}$
(2) $-\frac{1}{99 \times 98 \times 97 \times \ldots \times 3 \times 2 \times 1}$
(3) 0
(4) $-\frac{2}{99 \times 98 \times 97 \times \ldots \times 3 \times 2 \times 1}$
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

70. $(0.9 \times 0.9 \times 0.9 + 0.1 \times 0.1 \times 0.1)$ is equal to
(1) 0.73 (2) 0.82
(3) 0.91 (4) 1.00
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

71. Simplify:

$$\frac{0.0347\times0.0347\times0.0347+(0.9653)^3}{(0.0347)^2-(0.347)(0.09653)+(0.9653)^2}$$

(1) 0.9306 (2) 1.0009
(3) 1.0050 (4) 1

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

72. The value of $\frac{(3.2)^3-0.008}{(3.2)^2+0.64+0.04}$ is

(1) 0 (2) 2.994
(3) 3.208 (4) 3

(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

73. Simplify:

$$\frac{\frac{1}{3}+\frac{1}{4}\left[\frac{2}{5}-\frac{1}{2}\right]}{1\frac{2}{3}\text{ of }\frac{3}{4}-\frac{3}{4}\text{ of }\frac{4}{5}}$$

(1) $\frac{37}{78}$ (2) $\frac{37}{13}$

(3) $\frac{74}{78}$ (4) $\frac{74}{13}$

(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

74. $\frac{0.04}{0.03}$ of $\frac{\left(3\frac{1}{3}-2\frac{1}{2}\right)\div\frac{1}{2}\text{ of }1\frac{1}{4}}{\frac{1}{3}+\frac{1}{5}\text{ of }\frac{1}{9}}$

(1) 1 (2) 5

(3) $\frac{1}{5}$ (4) $\frac{1}{2}$

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

75. $\frac{0.3555\times0.5555\times2.025}{0.225\times1.7775\times0.2222}$ is equal to :

(1) 5.4 (2) 4.58
(3) 4.5 (4) 5.45

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

76. 100 ×10 –100 + 2000 ÷ 100= ?

(1) 29 (2) 920
(3) 980 (4) 1000

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

77. If $\frac{547.527}{0.0082}=x$, then the value of $\frac{547527}{82}$ is

(1) $10x$ (2) $100x$

(3) $\frac{x}{100}$ (4) $\frac{x}{10}$

(SSC CHSL DEO & LDC Exam. 04.11.2012 Ist Sitting)

78. $\frac{1}{1+2^{a-b}}+\frac{1}{1+2^{b-a}}$ is

(1) $a-b$ (2) $b-a$
(3) 1 (4) 0

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

79. The value of

$$3\frac{1}{2}-\left[2\frac{1}{4}\div\left\{1\frac{1}{4}-\frac{1}{2}\left(1\frac{1}{2}-\frac{1}{3}-\frac{1}{6}\right)\right\}\right]$$

is

(1) $\frac{1}{2}$ (2) $2\frac{1}{2}$

(3) $3\frac{1}{2}$ (4) $9\frac{1}{2}$

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

80. $3\frac{3}{5}\times3\frac{3}{5}+2\times3\frac{3}{5}\times\frac{2}{5}+\frac{2}{5}\times\frac{2}{5}=?$

(1)15 (2) 16
(3) 17 (4) 18

(SSC Constable (GD) Exam. 12.05.2013)

81. Find the sum of

$$\left(1-\frac{1}{n+1}\right)+\left(1-\frac{2}{n+1}\right)+\left(1-\frac{3}{n+1}\right)+\ldots\ldots\left(1-\frac{n}{n+1}\right)$$

(1) n (2) $\frac{1}{2}n$

(3) $(n+1)$ (4) $\frac{1}{2}(n+1)$

(SSC Graduate Level Tier-II Exam. 29.09.2013

82. The value of

$$5\frac{1}{3}\div1\frac{2}{9}\times\frac{1}{4}\left(10+\frac{3}{1-\frac{1}{5}}\right)\text{ is}$$

(1) 15 (2) $\frac{67}{25}$

(3) $\frac{128}{11}$ (4) $\frac{128}{99}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

83. If x [–2 {–4 (–a)}] +5 [–2 {–2 (–a)}] = 4a, then x =

(1) –2 (2) –3
(3) –4 (4) –5

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

84. The value of

$$3\div\left[(8-5)\div\left\{(4-2)+\left(2+\frac{8}{13}\right)\right\}\right]\text{ is}$$

(1) $\frac{15}{17}$ (2) $\frac{13}{17}$

(3) $\frac{15}{19}$ (4) $\frac{13}{19}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

85. If '+' means '÷', '×', means '–', '÷' means '×' and '–' means '+', what will be the value of the following expression ?

9 + 3 ÷ 4 – 8 × 2 = ?

(1) $6\frac{1}{4}$ (2) $6\frac{3}{4}$

(3) $-1\frac{3}{4}$ (4) 18

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

86. The simplified value of

$\frac{4}{15}$ of $\frac{5}{8}$ × 6 + 15 – 10 is

(1) 6 (2) 3
(3) 5 (4) 4

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

87. The value of the following is :

$$\frac{0.2 \times 0.02 \times 0.002 \times 32}{0.4 \times 0.04 \times 0.004 \times 16}$$

(1) 0.20 (2) 0.50
(3) 0.40 (4) 0.25

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

88. $(113^2 + 115^2 + 117^2 - 113 \times 115 - 115 \times 117 - 117 \times 113)$ is equal to

(1) 0 (2) 4
(3) 8 (4) 12

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

TYPE–III

1. Assume that

$\sqrt{13} = 3.605$ (approximately)

$\sqrt{130} = 11.40$ (approximately)

Find the value of :

$$\sqrt{1.3} + \sqrt{1300} + \sqrt{0.013}$$

(1) 36.164 (2) 36.304
(3) 37.304 (4) 37.164

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. On simplification of

$$\frac{(2.644)^2 - (2.356)^2}{0.288}$$

we get :

(1) 1 (2) 4
(3) 5 (4) 6

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

3. Simplification of

$$\frac{(3.4567)^2 - (3.4533)^2}{0.0034}$$

yields the result :

(1) 6.91 (2) 7
(3) 6.81 (4) 7.1

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

4. The value of $\frac{(0.03)^2 - (0.01)^2}{0.03 - 0.01}$ is:

(1) 0.02 (2) 0.004
(3) 0.4 (4) 0.04

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

5. $\left(\sqrt{72} - \sqrt{18}\right) \div \sqrt{12}$ is equal to:

(1) $\sqrt{6}$ (2) $\sqrt{3}/2$
(3) $\sqrt{2}/3$ (4) $\sqrt{6}/2$

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

6. The value of $\frac{\sqrt{80} - \sqrt{112}}{\sqrt{45} - \sqrt{63}}$ is :

(1) $\frac{3}{4}$ (2) $1\frac{3}{4}$
(3) $1\frac{1}{3}$ (4) $1\frac{7}{9}$

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

7. The value of

$$\sqrt{\frac{(0.1)^2 + (0.01)^2 + (0.009)^2}{(0.01)^2 + (0.001)^2 + (0.0009)^2}}$$

is :

(1) 10^2 (2) 10
(3) 0.1 (4) 0.01

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

8. The value of

$$\sqrt{\frac{(0.03)^2 + (0.21)^2 + (0.065)^2}{(0.003)^2 + (0.021)^2 + (0.0065)^2}}$$

is :

(1) 0.1 (2) 10
(3) 10^2 (4) 10^3

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

9. The sum of

$\sqrt{0.01} + \sqrt{0.81} + \sqrt{1.21} + \sqrt{0.0009}$

is :

(1) 2.1 (2) 2.13
(3) 2.03 (4) 2.11

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

10. The value of

$$\sqrt{\frac{(6.1)^2 + (61.1)^2 + (611.1)^2}{(0.61)^2 + (6.11)^2 + (61.11)^2}}$$ is

(1) 0.1 (2) 1.1
(3) 10 (4) 100

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

11. Simplify

$$\sqrt{\left[(12.1)^2 - (8.1)^2\right] \div \left[(0.25)^2 + (0.25)(19.95)\right]}$$

(1) 1 (2) 2
(3) 3 (4) 4

(SSC CPO S.I. Exam. 12.01.2003

12. The value of

$$\frac{0.051 \times 0.051 \times 0.051 + 0.041 \times 0.041 \times 0.041}{0.051 \times 0.051 - 0.051 \times 0.041 + 0.041 \times 0.041}$$

is :

(1) 0.92 (2) 0.092
(3) 0.0092 (4) 0.00092

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

13. The value of

$$\sqrt{5 + \sqrt{11 + \sqrt{19 + \sqrt{29 + \sqrt{49}}}}}$$ is

(1) 3 (2) 9
(3) 7 (4) 5

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

14. The value of $\frac{(75.8)^2 - (55.8)^2}{20}$ is

(1) 20 (2) 40
(3) 121.6 (4) 131.6

(SSC CPO S.I. Exam. 07.09.2003)

15. $\sqrt{\frac{0.25}{0.0009}} \times \sqrt{\frac{0.09}{0.36}}$ is equal to :

(1) $\frac{5}{6}$ (2) $7\frac{1}{6}$
(3) $7\frac{1}{3}$ (4) $8\frac{1}{3}$

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

16. $\frac{(3.63)^2 - (2.37)^2}{3.63 + 2.37}$ is simplified to

(1) 6 (2) 1.36
(3) 2.26 (4) 1.26

(SSC CPO S.I. Exam. 03.09.2006)

17. $\sqrt{\frac{0.081 \times 0.484}{0.0064 \times 6.25}}$ is equal to

(1) 9 (2) 0.9
(3) 99 (4) 0.99

(SSC CPO S.I. Exam. 09.11.2008)

18. The simplified value of

$\sqrt{900} + \sqrt{0.09} - \sqrt{0.000009}$ is

(1) 30.27 (2) 30.297
(3) 30.097 (4) 30.197

(SSC CPO S.I. Exam. 06.09.2009)

19. $\sqrt{\dfrac{0.009 \times 0.036 \times 0.016 \times 0.08}{0.002 \times 0.0008 \times 0.0002}}$ is equal to

(1) 34 (2) 36
(3) 38 (4) 39

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

20. $\sqrt{1\frac{1}{4} \times \frac{64}{125} \times 1.44}$ is equal to

(1) $1\frac{1}{25}$ (2) $\frac{24}{25}$
(3) $\frac{23}{25}$ (4) $\frac{21}{25}$

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

21. $\left[2\sqrt{54} - 6\sqrt{\frac{2}{3}} - \sqrt{96}\right]$ is equal to

(1) 0 (2) 1
(3) 2 (4) $\sqrt{6}$

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

22. $\dfrac{\sqrt{24} + \sqrt{216}}{\sqrt{96}}$ is equal to

(1) $\frac{2}{\sqrt{6}}$ (2) $2\sqrt{6}$
(3) $4\sqrt{6}$ (4) 2

(SSC CPO Sub-Inspector Exam. 12.12.2010 (Paper-I)

23. The value of $\dfrac{4 - \sqrt{0.04}}{4 + \sqrt{0.4}}$ is close to

(1) 0.4 (2) 0.8
(3) 1.0 (4) 1.4

(SSC CPO S.I. Exam. 12.01.2003)

24. The value of

$\left(3+\sqrt{8}\right)+\dfrac{1}{3-\sqrt{8}}-\left(6+4\sqrt{2}\right)$ is

(1) 8 (2) 1
(3) $\sqrt{2}$ (4) 0

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

25. What is the square root of 0.09?

(1) 0.3 (2) 0.03
(3) 0.003 (4) 3.0

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

26. The square root of :

$\dfrac{(0.75)^3}{1-0.75} + \left[0.75 + (0.75)^2 + 1\right]$

is :

(1) 4 (2) 3
(3) 2 (4) 1

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting

27. The square root of $(272^2 - 128^2)$ is :

(1) 256 (2) 200
(3) 240 (4) 144

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

28. The value of $\sqrt{0.000441}$ is equal to :

(1) 0.21 (2) 0.0021
(3) 0.021 (4) 0.00021

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

29. The value of $\dfrac{\sqrt{0.441}}{\sqrt{0.625}}$ is equal to :

(1) 0.048 (2) 0.84
(3) 0.48 (4) 0.084

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

30. The square root of

$\dfrac{0.342 \times 0.684}{0.000342 \times 0.000171}$ is :

(1) 250 (2) 2500
(3) 2000 (4) 4000

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

31. $\sqrt{0.00060516}$ is equal to

(1) 0.0246 (2) 0.00246
(3) 0.246 (4) 0.000246

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

32. The Square root of

$\dfrac{9.5 \times 0.085}{0.017 \times 0.019}$ is

(1) 0.5 (2) 5
(3) 50 (4) 500

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & SSC MTS Exam. 17.03.2013 (IInd Sitting)

33. Find the value of

$\sqrt{248 + \sqrt{52 + \sqrt{144}}}$

(1) –16 (2) ±16
(3) 16 (4) 16.2

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & SSC CGL Exam. 08.02.2004 (IInd Sitting)

34. If $(102)^2 = 10404$ then, the value of

$\sqrt{104.04} + \sqrt{1.0404} + \sqrt{0.010404}$

is equal to

(1) 0.306 (2) 0.0306
(3) 11.122 (4) 11.322

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

35. $\sqrt{0.00004761}$ equals

(1) 0.069 (2) 0.0069
(3) 0.00069 (4) 0.0609

(SSC CPO S.I. Exam. 12.01.2003

36. If $\sqrt{2} = 1.414$, the square root of $\dfrac{\sqrt{2}-1}{\sqrt{2}+1}$ is nearest to

(1) 0.172 (2) 0.414
(3) 0.586 (4) 1.414

(SSC CPO S.I. Exam. 12.01.2003

37. $\sqrt{\dfrac{0.00001225}{0.00005392}}$ is equal to :

(1) $\frac{25}{77}$ (2) $\frac{35}{73}$
(3) $\frac{35}{77}$ (4) $\frac{25}{73}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

38. The square root of $0.\overline{4}$ is :

(1) $0.\overline{8}$ (2) $0.\overline{6}$
(3) $0.\overline{7}$ (4) $0.\overline{9}$

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

39. The square root of

$\dfrac{\left(3\frac{1}{4}\right)^4 - \left(4\frac{1}{3}\right)^4}{\left(3\frac{1}{4}\right)^2 - \left(4\frac{1}{3}\right)^2}$ is :

(1) $7\frac{1}{12}$ (2) $5\frac{5}{12}$
(3) $1\frac{1}{12}$ (4) $1\frac{7}{12}$

(SSC CPO S.I. Exam. 26.05.2005)

40. The positive square root of [0.6 × 0.6 × 0.6 + 0.4 × 0.4 × 0.4 + 3 × 0.6 × 0.4] is equal to

(1) 2.1736 (2) 1
(3) 0.21736 (4) 0.072

(SSC SAS Exam. 26.06.2010 (Paper-1)

41. $\sqrt{\frac{0.49}{0.25}}+\sqrt{\frac{0.81}{0.36}}$ is equal to :

(1) $7\frac{9}{10}$ (2) $2\frac{9}{10}$

(3) $\frac{9}{10}$ (4) $9\frac{9}{10}$

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

42. If $\sqrt{x} \div \sqrt{441} = 0.02$, then value of x is :

(1) 1.64 (2) 2.64
(3) 1.764 (4) 0.1764

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

43. Find the value of

$\sqrt{4+\sqrt{44+\sqrt{10000}}}$

(1) 12 (2) 8
(3) 4 (4) –4

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

44. Given that

$\sqrt{574.6} = 23.97$

$\sqrt{5746} = 75.8$

then $\sqrt{0.00005746}$ equals

(1) 0.002397 (2) 0.0002397
(3) 0.007580 (4) 0.00758

(SSC CPO S.I. Exam. 12.01.2003

45.

$\sqrt{(0.798)^2+0.404\times0.798+(0.202)^2}$

+1 = 2 ?

(1) 0 (2) 2
(3) 1.596 (4) 0.404

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

46. The value of

$\sqrt{11.981+7\sqrt{1.2996}}$ is closest to

(1) 5.1 (2) 4.9
(3) 4.5 (4) 4.1

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

47. The value of

$\sqrt{32}-\sqrt{128}+\sqrt{50}$ correct to 3 places of decimal is :

(1) 1.732 (2) 1.141
(3) 1.414 (4) 1.441

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

48. The square root of

$(7+3\sqrt{5})(7-3\sqrt{5})$ is :

(1) 4 (2) $\sqrt{5}$

(3) $3\sqrt{5}$ (4) 2

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

49. The value of

$\sqrt{400}+\sqrt{0.0400}+\sqrt{0.000004}$ is

(1) 0.222 (2) 20.22
(3) 20.202 (4) 2.022

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

50. If $\sqrt{3}$ = 1.7321, the value of

$\sqrt{192}-\frac{1}{2}\sqrt{48}-\sqrt{75}$, correct to 3 places of decimal, is

(1) 8.661 (2) 4.331
(3) 1.7321 (4) –1.732

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

51. $\sqrt{\frac{48.4}{0.289}}$ is equal to

(1) $129\frac{7}{17}$ (2) $1\frac{5}{17}$

(3) $12\frac{16}{17}$ (4) $12\frac{1}{17}$

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

52. The sum of the squares of 3 consecutive positive numbers is 365. The sum of the numbers is

(1) 30 (2) 33
(3) 36 (4) 45

(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

53. If $\sqrt{4096}$ = 64, then the value of

$\sqrt{40.96}+\sqrt{0.4096}$

$+\sqrt{0.004096}$ $+\sqrt{0.00004096}$

up to two places of decimals is :

(1) 7.09 (2) 7.10
(3) 7.11 (4) 7.12

(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting) & FCI Assistant Grade III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

54. Given that $\sqrt{13}$ = 3.6 and $\sqrt{130}=11.4$, then the value of

$\sqrt{1.3}+\sqrt{1300}+\sqrt{0.013}$ is equal to

(1) 36.164 (2) 37.254
(3) 36.254 (4) 37.154

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

55. The simplified value of

$\sqrt{5+\sqrt{11+\sqrt{19+\sqrt{29+\sqrt{49}}}}}$ is

(1) 3 (2) 2
(3) 4 (4) 6

(SSC CPO S.I. Exam. 06.09.2009)

56. $\sqrt{110\frac{1}{4}}$ is equal to

(1) 12.0 (2) 11.5
(3) 11.0 (4) 10.5

(SSC CPO Sub-Inspector Exam 12.12.2010 (Paper-I)

57. $\sqrt{8+\sqrt{57+\sqrt{38+\sqrt{108+\sqrt{169}}}}}$ =?

(1) 4 (2) 6
(3) 8 (4) 10

(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

58. If $(10.15)^2$ = 103.0225, then the value of $\sqrt{1.030225}$ +

$\sqrt{10302.25}$ is

(1) 1025·15 (2) 103·515
(3) 102·515 (4) 102·0515

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

59. The number of digits in the square root of 625686734489 is

(1) 4 (2) 5
(3) 6 (4) 7

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

60. If the square root of 841 is 29, then 0.00000841 is equal to :

(1) 0.029 (2) 0.0029
(3) 0.00029 (4) 0.29

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting) & Tier-1 Exam,16.05.2010 (First Sitting)

61. The square root of

$\frac{0.324\times0.081\times4.624}{1.5625\times0.0289\times72.9\times64}$ is

(1) 24 (2) 2.4
(3) 0.024 (4) 1.2

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

62. The simplified value of

$\sqrt{0.25 \times 2.25}$ is

(1) 0.075 (2) 0.705
(3) 0.750 (4) 7.500

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

63. $\sqrt{64} - \sqrt{36}$ is equal to

(1) –2 (2) 2
(3) 0 (4) 1

(SSC CISF Constable (GD) Exam.

64. If $\sqrt{18225} = 135$, then the value of

$\sqrt{18225} + \sqrt{182.25} + \sqrt{1.8225} + \sqrt{0.018225}$ is

(1) 14.9985 (2) 149.985
(3) 1499.85 (4) 1.49985

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

65. The square root of $21\frac{51}{169}$ is

(1) $5\frac{8}{13}$ (2) $4\frac{8}{13}$
(3) $4\frac{3}{13}$ (4) $5\frac{5}{13}$

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

66. If $(1101)^2 = 1212201$, find the value of $\sqrt{121.2201}$.

(1) 110.1 (2) 11.01
(3) 1.101 (4) 11.001

(SSC CGL Tier-I Exam. 11.11.2012 (Ist Sitting)

67. The value of

$\sqrt{\frac{0.064 \times 0.256 \times 15.625}{0.025 \times 0.625 \times 4.096}}$ is

(1) 2 (2) 2.4
(3) 0.24 (4) 4.2

(SSC Delhi Police Sub-Inspector (SI) Exam. 19.08.2012)

68. The value of

$\sqrt{19.36} + \sqrt{0.1936} + \sqrt{0.001936} + \sqrt{0.00001936}$ is :

(1) 4.8484 (2) 4.8694
(3) 4.8884 (4) 4.8234

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

69. The number of pairs of natural numbers, the difference of whose squares is 45 will be

(1) 2 (2) 3
(3) 6 (4) 5

(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

70. What is the value of

$\frac{\sqrt{24} + \sqrt{216}}{\sqrt{96}}$?

(1) $2\sqrt{6}$ (2) $4\sqrt{6}$
(3) 2 (4) 4

(SSC Multi-Tasking Staff Exam. 10.03.2013)

71. Simplify :

$\sqrt{3\frac{33}{64}} \div \sqrt{9\frac{1}{7}} \times 2\sqrt{3\frac{1}{9}}$

(1) $\frac{45}{256}$ (2) $1\frac{17}{28}$
(3) $4\frac{3}{8}$ (4) $2\frac{3}{16}$

(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

72. The simplified value of

$\frac{\sqrt{32} + \sqrt{48}}{\sqrt{8} + \sqrt{12}}$ is

(1) 3 (2) 2
(3) 6 (4) 4

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

73. Number of digits in the square root of 62478078 is:

(1) 4 (2) 5
(3) 6 (4) 3

(SSC CGL Tier-I Exam. 21.04.2013, Ist Sitting)

74. If $\left(n^r - t\,n + \frac{1}{4}\right)$ be a perfect square, then the values of t are:

(1) ± 2 (2) 1, 2
(3) 2,3 (4) ± 1

(SSC CGL Tier-I Exam. 21.04.2013, Ist Sitting)

75. The square root of $33 - 4\sqrt{35}$ is :

(1) $\pm\left(2\sqrt{7} + \sqrt{5}\right)$

(2) $\pm\left(\sqrt{7} + 2\sqrt{5}\right)$

(3) $\pm\left(\sqrt{7} - 2\sqrt{5}\right)$

(4) $\pm\left(2\sqrt{7} - \sqrt{5}\right)$

(SSC CGL Tier-I Exam. 21.04.2013)

76. Find the value of

$\sqrt{156.25} + \sqrt{0.0081} - \sqrt{0.0361}$

(1) 13.4 (2) 15.4
(3) 12.4 (4) 17.4

(SSC Constable (GD) Exam. 12.05.2013)

77. The fourth root of 24010000 is

(1) 7 (2) 49
(3) 490 (4) 70

(SSC CGL Tier-I Exam. 19.05.2013)

78. The digit at the unit's place in the square-root of 15876 is :

(1) 8 (2) 6
(3) 4 (4) 2

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

79. The digit at unit's place of the number $(1570)^2 + (1571)^2 + (1572)^2 + (1573)^2$ is :

(1) 4 (2) 1
(3) 2 (4) 3

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

80. The smallest 4-digit number, which is a perfect square, is

(1) 1009 (2) 1016
(3) 1024 (4) 1025

(SSC CPO Sub-Inspector Exam. 05.09.2004 & SAS Exam. 26.06.2010)

81. The smallest number added to 680621 to make the sum a perfect square is :

(1) 4 (2) 5
(3) 6 (4) 8

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

82. The smallest positive integer, when multiplied by 392, the product is a perfect square, is

(1) 6 (2) 5
(3) 3 (4) 2

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

83. Which smallest number must be added to 2203 so that we get a perfect square ?

(1) 1 (2) 3
(3) 6 (4) 8

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

84. The number of perfect square numbers between 50 and 1000 is

(1) 21 (2) 22
(3) 23 (4) 24

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

85. The smallest number which should be added to the number 8958 so that the result is a perfect square is
(1) 69 (2) 67
(3) 77 (4) 79
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

86. The largest number of five digits, which is a perfect square is
(1) 99999 (2) 99976
(3) 99856 (4) 99764
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

87. How many perfect squares lie between 120 and 300 ?
(1) 5 (2) 6
(3) 7 (4) 8
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

88. The smallest number that must be subtracted from 1000 to make the resulting number a perfect square is
(1) 37 (2) 38
(3) 39 (4) 40
(SSC Data Entry Operator Exam. 02.08.2009)

89. The least integer which should be added to 1000 so as to make it a perfect square is
(1) 10 (2) 18
(3) 24 (4) 89
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

90. The greatest 4 digit number which is a perfect square, is
(1) 9999 (2) 9909
(3) 9801 (4) 9081
(SSC CGL Tier-I Exam. 19.05.2013)

91. What number must be added to the expression $16a^2 - 12a$ to make it a perfect square ?
(1) $\frac{9}{4}$ (2) $\frac{11}{2}$
(3) $\frac{13}{2}$ (4) 16
(SSC CGL Tier-I Exam. 19.05.2013)

92. If the number p is 5 more than q and the sum of the squares of p and q is 55, then the product of p and q is
(1) 10 (2) –10
(3) 15 (4) –15
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

93. The square root of a positive number less than 100 lies between :
(1) 0 and 1000
(2) 0 and 10
(3) –10 and 10
(4) –100 and 100
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

94. If the sum of two numbers is 22 and the sum of their squares is 404, then the product of the numbers is :
(1) 40 (2) 44
(3) 80 (4) 88
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

95. One-third of the square root of which number is 0.001?
(1) 0.0009 (2) 0.000001
(3) 0.00009 (4) None of the above
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

96. Three fifth of the square of a certain number is 126.15. What is the number?
(1) 210.25 (2) 75.69
(3) 14.5 (4) 145
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting) & SSC CGL Prelim Exam. 13.11.2005)

97. How many positive integers less than 1000 are multiples of 11 whose square roots are whole numbers.
(1) 2 (2) 4
(3) 8 (4) 11
(SSC CPO S.I. Exam. 07.09.2003)

98. The number, whose square is equal to the difference of the squares of 75.15 and 60.12, is
(1) 46.09 (2) 48.09
(3) 45.09 (4) 47.09
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

99. The sum of the squares of two numbers is 386. If one of the number is 5, the other will be :
(1) 18 (2) 19
(3) 15 (4) 20
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

100. The number, whose square is equal to the difference between the squares of 975 and 585, is :
(1) 780 (2) 390
(3) 1560 (4) 130
(SSC CPO S.I. Exam. 26.05.2005)

101. If the sum and difference of two numbers are 20 and 8 respectively, then the difference of their squares is :
(1) 12 (2) 28
(3) 80 (4) 160
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

102. The sum of the squares of two positive integers is 100 and the difference of their squares is 28. The sum of the numbers is :
(1) 12 (2) 13
(3) 14 (4) 15
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

103. If x is a perfect square integer such that $7 < (2x - 3) < 17$, then the value of x is :
(1) 25 (2) 16
(3) 9 (4) 4
(SSC CHSL DEO & LDC Exam. 27.11.2010)

104. If the product of four consecutive natural numbers increased by a natural number p, is a perfect square; then the value of p is
(1) 8 (2) 4
(3) 2 (4) 1
(SSC CPO S.I. Exam. 03.09.2006)

105. Given that $\sqrt{24}$ is approximately equal to 4.898. $\sqrt{\frac{8}{3}}$ is nearly equal to
(1) 0.544 (2) 1.333
(3) 1.633 (4) 2.666
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

106. There are some boys and girls in a room. The square of the number of the girls is less than the square of the number of boys by 28. If there were two more girls, the number of boys would have been the same as that of the girls. The total number of the boys and girls in the room are
(1) 56 (2) 14
(3) 10 (4) 7
(SSC CPO S.I. Exam. 16.12.2007)

107. If the sum of the squares of three consecutive natural numbers is 110, then the smallest of these natural numbers is :
(1) 8 (2) 6
(3) 7 (4) 5
(SSC CPO S.I. Exam. 16.12.2007)

108. The product of two whole numbers is 37. The square root of the difference of the numbers is
(1) 8 (2) 7.5
(3) 6 (4) 4.5
(SSC CPO S.I. Exam. 16.12.2007)

109. The number, whose square is equal to the difference of the squares of the numbers 68 and 32, is
(1) 36 (2) 48
(3) 60 (4) 64
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

110. The sum of a positive integer and its square is 2450. The positive integer is
(1) 45 (2) 48
(3) 49 (4) 50
(SSC (South Zone) Investigator Exam 12.09.2010)

111. The product of two numbers is 45 and their difference is 4. The sum of squares of the two numbers is
(1) 135 (2) 240
(3) 73 (4) 106
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

112. 1008 divided by which single digit number gives a perfect square?
(1) 9 (2) 4
(3) 8 (4) 7
(SSC CGL Exam. 27.02.2000 (Ist Sitting)

113. The least number that must be subtracted from 63520 to make the result a perfect square is :
(1) 16 (2) 20
(3) 24 (4) 30
(SSC CGL Exam. 24.02.2002 (IInd Sitting)

114. What is the least number which should be subtracted from 0.000326, to have perfect square ?
(1) 0.000004 (2) 0.000002
(3) 0.04 (4) 0.02
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

115. By which smallest number should 5808 be multiplied so that it becomes a perfect square?
(1) 2 (2) 7
(3) 11 (4) 3
(SSC CGL Exam. 04.07.1999 (Ist Sitting)

116. By which smallest number should 20184 be multiplied so that it becomes a perfect square ?
(1) 2 (2) 3
(3) 5 (4) 6
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

117. The least number which must be added to 1728 to make it a perfect square is _____.
(1) 36 (2) 32
(3) 38 (4) 30
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

118. If a = 64 and b = 289, then the value of

$$\left(\sqrt{\sqrt{a}+\sqrt{b}}-\sqrt{\sqrt{b}-\sqrt{a}}\right)^{\frac{1}{2}} \text{ is}$$

(1) $2^{1/2}$ (2) 2
(3) 4 (4) –2
(SSC CGL Tier-II Exam. 21.09.2014

119. $\sqrt{64009}$ is equal to
(1) 352 (2) 523
(3) 253 (4) 532
(SSC CGL Tier-II Exam. 21.09.2014

120. A tourist spends daily as many rupees as the number of days of his total tour. If his total expenses were ₹ 361, then how many days did his tour last ?
(1) 17 days (2) 19 days
(3) 21 days (4) 31 days

121. The value of $\sqrt{10^{-6}\times 0.25}$ is
(1) 0.0025 (2) 0.0005
(3) 0.25 (4) 0.50
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014

122. The simplified value of

$$\frac{3\sqrt{2}}{\sqrt{3}+\sqrt{6}}-\frac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}}+\frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}} \text{ is}$$

(1) $\sqrt{2}$ (2) $\frac{1}{\sqrt{2}}$
(3) $\sqrt{3}-\sqrt{2}$ (4) 0
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

123. The value of $\frac{4-\sqrt{0.04}}{4+\sqrt{0.4}}$ is close to
(1) 0.4 (2) 0.8
(3) 1.0 (4) 1.4
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

124. If $\sqrt{0.05\times 0.5\times a} = 0.5\times 0.05 \times \sqrt{b}$, then $\frac{a}{b}$ is equal to
(1) 0.0025 (2) 0.025
(3) 0.25 (4) 0.00025
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

125. A teacher wants to arrange his students in an equal number of rows and columns. If there are 1369 students, the number of students in the last row are
(1) 37 (2) 33
(3) 63 (4) 47
(SSC CHSL DEO & LDC Exam. 9.11.2014)

126. Which of the following is true?
(1) $\sqrt{5}+\sqrt{3} > \sqrt{6}+\sqrt{2}$
(2) $\sqrt{5}+\sqrt{3} < \sqrt{6}+\sqrt{2}$
(3) $\sqrt{5}+\sqrt{3} = \sqrt{6}+\sqrt{2}$
(4) $(\sqrt{5}+\sqrt{3})(\sqrt{6}+\sqrt{2}) = 1$
(SSC CHSL DEO & LDC Exam. 9.11.2014)

127. The least number by which 20184 must be multiplied so as to make the product a perfect square is
(1) 2 (2) 3
(3) 5 (4) 6
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

128. 1008 divided by which single digit number gives a perfect square ?
(1) 9 (2) 4
(3) 8 (4) 7
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

129. The sum of two numbers is 37 and the difference of their squares is 185. then the difference between the two numbers is :
(1) 10 (2) 4
(3) 5 (4) 3
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

130. A General of Army wants to form a square from 36562 armies. After arrangement, he found some armies left. How many armies were left ?
(1) 81 (2) 36
(3) 97 (4) 65
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

131. The square root of $\frac{2+\sqrt{3}}{2}$ is
(1) $\pm\frac{1}{\sqrt{2}}(\sqrt{3}+1)$
(2) $\pm\frac{1}{2}(\sqrt{3}-2)$
(3) None of these
(4) $\pm\frac{1}{2}(\sqrt{3}-1)$
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

132. The value of $(11111)^2$ is
(1) 12344321 (2) 121212121
(3) 123454321 (4) 11344311
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

133. The smallest whole number that is to be multiplied with 59535 to make a perfect square number is x. The sum of digits of x is
(1) 9 (2) 5
(3) 7 (4) 6
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

134. The digit in the unit place in the square root of 66049 is
(1) 3 (2) 7
(3) 8 (4) 2
(SSC CGL Tier-I Re-Exam, 30.08.2015)

135. The value of $\sqrt{0.000441}$ is equal to
(1) 0.21 (2) 0.00021
(3) 0.0021 (4) 0.021
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

136. The sum of the perfect squares between 120 and 300 is
(1) 1400 (2) 1296
(3) 1024 (4) 1204
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

137. The least number that should be subtracted from the number 32146 to make it a perfect square is :
(1) 305 (2) 105
(3) 205 (4) 405
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

138. If 5416 * 6 is a perfect square, then the digit at '*' is :
(1) 9 (2) 4
(3) 6 (4) 5
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

139. A number of boys raised Rs. 12,544 for a famine fund, each boy has given as many rupees as there were boys. The number of boys was :
(1) 102 (2) 112
(3) 122 (4) 132
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

140. The sum of three positive numbers is 18 and their product is 162. If the sum of two numbers is equal to the third number, then the sum of squares of the numbers is
(1) 120 (2) 126
(3) 132 (4) 138
(SSC CGL Tier-II Online Exam.01.12.2016)

141. three numbers are such that their sum is 50, product is 3750 and the sum of their reciprocals is $\frac{31}{150}$. Find the sum of the squares of the three numbers.
(1) 2500 (2) 1250
(3) 950 (4) 122
(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

142. The greatest perfect square number of 6 digits is
(1) 999001 (2) 998001
(3) 998009 (4) 998101
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

143. If a perfect square, not divisible by 6, be divided by 6, the remainder will be
(1) 1, 3 or 5 (2) 1, 2 or 5
(3) 1, 3 or 4 (4) 1, 2 or 4
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

144. Find the least number which must be subtracted from 18265 to make it a perfect square.
(1) 30 (2) 38
(3) 40 (4) 45
(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

145. If the sum of squares of two real numbers is 41 and their sum is 9, then the sum of cubes of these two numbers is
(1) 169 (2) 209
(3) 189 (4) 198
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

146. The product of two positive integers is 2048 and one of them is twice the other. The smaller number is
(1) 32 (2) 64
(3) 16 (4) 1024
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

147. A number when divided by 6 leaves remainder 3. When the square of the same number is divided by 6, the remainder is:
(1) 0 (2) 2
(3) 1 (4) 3
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

148. Each member of a club contributes as much rupees and as much paise as the number of members of the club. If the total contribution is Rs. 2525, then the number of members of the club is
(1) 60 (2) 45
(3) 55 (4) 50
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

149. The sum of squares of three positive integers is 323. If the sum of squares of two numbers is twice the third, their product is
(1) 255 (2) 260
(3) 265 (4) 270
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

150. The difference between two numbers is 9 and the difference between their squares is 207. The numbers are :
(1) 17 and 8 (2) 16 and 7
(3) 15 and 6 (4) 23 and 14
(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (IST Sitting)

151. The least number that must be subtracted from 63520 to make the result a perfect square is
(1) 30 (2) 24
(3) 14 (4) 16
(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

152. The least six digit number which is a perfect square is
(1) 100489 (2) 100000
(3) 100256 (4) 100225
(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

153. The sum of two positive integers is 80 and the difference between them is 20. What is the difference between squares of those numbers ?
(1) 1400 (2) 1600
(3) 1800 (4) 2000
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

154. Twenty one times of a positive number is less than its square by 100. The value of the positive number is
(1) 25 (2) 26
(3) 42 (4) 41
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

155. A General of an Army wants to create a formation of square from 36562 army men. After arrangement, he found some army men remained unused. Then the number of such army men remained unused was
(1) 36 (2) 65
(3) 81 (4) 97
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

156. The least number to be subtracted from 16800 to make it a perfect square is
(1) 169 (2) 219
(3) 159 (4) 249
(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE–IV

1. The sum of the cubes of the numbers 22, –15 and –7 is equal to
(1) 6930 (2) 9630
(3) 3 (4) 0
(SSC CPO S.I. Exam. 05.09.2004)

2. $\frac{\sqrt[3]{8}}{\sqrt{16}} \div \sqrt{\frac{100}{49}} \times \sqrt[3]{125}$ is equal to :
(1) 7 (2) $1\frac{3}{4}$
(3) $\frac{7}{100}$ (4) $\frac{4}{7}$
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. $\sqrt[3]{\frac{72.9}{0.4096}}$ is equal to :
(1) 0.5625 (2) 5.625
(3) 182 (4) 13.6
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. $(5.5)^3-(4.5)^3$ is equal to :
(1) 1 (2) 75
(3) 74.25 (4) 75.25
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

5. The value of $\sqrt[3]{\frac{7}{875}}$ is equal to
(1) $\frac{1}{3}$ (2) $\frac{1}{15}$
(3) $\frac{1}{4}$ (4) $\frac{1}{5}$
(SSC CPO S.I. Exam. 07.09.2003)

6. $\sqrt[3]{\frac{19}{513}}$ is equal to
(1) $\frac{1}{9}$ (2) $\frac{1}{3}$
(3) $\frac{1}{\sqrt{27}}$ (4) $\frac{1}{\sqrt{3}}$
(SSC CPO S.I. Exam. 05.09.2004)

7. $\sqrt[3]{(333)^3+(333)^3+(334)^3-3\times333\times333\times334}$ is equal to
(1) 12 (2) 11
(3) 10 (4) 15
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

8. If cube root of 175616 is 56, then the value of $\sqrt[3]{175.616}+\sqrt[3]{0.175616}+\sqrt[3]{0.000175616}$ is equal to :
(1) 0.168 (2) 62.16
(3) 6.216 (4) 6.116
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

9. $\sqrt[3]{\sqrt{0.000064}}$ is equal to
(1) 0.0002 (2) 0.002
(3) 0.02 (4) 0.2
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

10. $\sqrt[3]{15612+\sqrt{154+\sqrt{225}}}$ is equal to
(1) 15 (2) 25
(3) 75 (4) 125
(SSC (South Zone) Investigator Exam 12.09.2010)

11. $\sqrt[3]{0.000125}$ is equal to
(1) 0.5 (2) 0.15
(3) 0.05 (4) 0.005
(SSC (South Zone) Investigator Exam 12.09.2010)

12. The sum of the squares of 2 numbers is 146 and the square root of one of them is $\sqrt{5}$. The cube of the other number is
(1) 1111 (2) 1221
(3) 1331 (4) 1441
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

13. $\left(\sqrt[3]{1000}+\sqrt[3]{0.008}-\sqrt[3]{0.125}\right)$ is equal to
(1) 9.7 (2) 9.97
(3) 9.997 (4) 9.9997
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

14. $\sqrt[3]{1-\frac{127}{343}}$ is equal to
(1) $\frac{5}{9}$ (2) $1-\frac{1}{7}$
(3) $\frac{4}{7}$ (4) $1-\frac{2}{7}$
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

15. If $\sqrt[3]{3^n}=27$, then the value of n is :
(1) 9 (2) 6
(3) 1 (4) 3
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

16. The value of $\sqrt{\sqrt[3]{0.000729}}$ is
(1) 0.9 (2) 0.3
(3) 0.03 (4) 0.09
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

17. The value of $\left(\sqrt{4^3+15^2}\right)^3$ is :
(1) 4913 (2) 4313
(3) 4193 (4) 3943
(SSC Multi-Tasking Staff Exam. 10.03.2013)

18. $\sqrt[3]{4\frac{12}{125}}$ is equal to
(1) 1.4 (2) 1.6
(3) 1.8 (4) 2.4
(SSC CPO Sub Inspector Exam. 06.09.2009) & SSC CPO S.I. Exam. 12.12.2010 (Paper-I) & SSC MTS Exam. 17.03.2013 (Ist Sitting)

19. By which smallest number 1323 must be multiplied, so that it becomes a perfect cube?
(1) 2 (2) 3
(3) 5 (4) 7
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

20. Sum of digits of the smallest number by which 1440 be multiplied so that it becomes a perfect cube, is
(1) 4 (2) 6
(3) 7 (4) 8
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

21. The sum of the digits of the smallest number which, when multiplied by 1800, gives a perfect cube, is :
(1) 2 (2) 3
(3) 6 (4) 8
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

22. Which smallest number must be added to 710 so that the sum is a perfect cube ?
(1) 29 (2) 19
(3) 11 (4) 21
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

23. The least number, by which 1944 must be multiplied so as to make the result a perfect cube, is
(1) 2 (2) 3
(3) 6 (4) 13
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

24. The smallest natural number, by which 3000 must be divided to make the quotient a perfect cube, is :
(1) 3 (2) 4
(3) 5 (4) 6
(SSC CPO S.I. Exam. 16.12.2007)

25. The smallest positive integer n, for which $864n$ is a perfect cube, is :
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CPO S.I. Exam. 16.12.2007)

26. By what least number should 675 be multiplied so as to obtain a perfect cube number ?
(1) 3 (2) 5
(3) 24 (4) 40
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

27. The least number, that must be added to 1720 so as to obtain a perfect cube, is
(1) 7 (2) 8
(3) 11 (4) 13
(SSC SAS Exam 26.06.2010 (Paper-1)

28. By what least number should 4320 be multiplied so as to obtain a number which is a perfect cube ?
(1) 40 (2) 50
(3) 60 (4) 80
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

29. Which of the following is a perfect square as well as a cube?
343, 125, 81, or 64
(1) 81 (2) 125
(3) 343 (4) 64
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

30. The square of a natural number subtracted from its cube is 48. The number is :
(1) 8 (2) 6
(3) 5 (4) 4
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

31. The least possible value of A for which 90 × A is a perfect cube is
(1) 200 (2) 300
(3) 500 (4) 600
(SSC CPO S.I. Exam. 12.01.2003

32. If the square root of x is the cube root of y, then the relation between x and y is
(1) $x^3 = y^2$ (2) $x^2 = y^3$
(3) $x = y$ (4) $x^6 = y^5$
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

33. If $x = \sqrt{3} + \sqrt{2}$ then the value of $x^3 - \frac{1}{x^3}$ is
(1) $10\sqrt{2}$ (2) $14\sqrt{2}$
(3) $22\sqrt{2}$ (4) $8\sqrt{2}$
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

34. The value of $(1001)^3$ is
(1) 1003003001
(2) 100303001
(3) 100300301
(4) 103003001
(SSC CGL Tier-I Exam. 26.10.2014)

35. What is the smallest number by which 625 must be divided so that the quotient is a perfect cube ?
(1) 25 (2) 5
(3) 2 (4) 3
(SSC CGL Tier-II Exam. 21.09.2014)

36. The sum of the cubes of two numbers is 793. The sum of the numbers is 13. Then the difference of the two numbers is
(1) 7 (2) 6
(3) 5 (4) 8
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

37. The smallest number by which 243000 be divided so that the quotient is a perfect cube is
(1) 3 (2) 27
(3) 9 (4) 1
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

38. When simplified, the product
$$\left(2-\frac{1}{3}\right)\left(2-\frac{3}{5}\right)\left(2-\frac{5}{7}\right)\ldots\left(2-\frac{997}{999}\right)$$
equals
(1) $\frac{5}{999}$ (2) $\frac{5}{3}$
(3) $\frac{1001}{999}$ (4) $\frac{1001}{3}$
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

39. If the cube root of 79507 is 43, then the value of
$$\sqrt[3]{79.507} + \sqrt[3]{0.079507} + \sqrt[3]{0.000079507}$$
is
(1) 0.4773 (2) 477.3
(3) 47.73 (4) 4.773
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

40. Find the cube root of (–13824).
or
Find the value of $\sqrt[3]{-13824}$.
(1) 38 (2) –38
(3) 24 (4) –24
(SSC CGL Tier-II Online Exam.01.12.2016)

41. The cube of 105 is
(1) 1157625 (2) 1175625
(3) 1185625 (4) 1158625
(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

42. The least number which when divides 37044, gives the result a perfect cube, is :
(1) 2 (2) 4
(3) 14 (4) 21
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

43. The cube of 997 is :
(1) 991026973 (2) 991029673
(3) 991029773 (4) 991097273
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

44. The sum of the cubes of two numbers in the ratio 3 : 4 is 5824. The sum of the numbers is :
(1) $(5824)^{\frac{1}{3}}$ (2) 28
(3) 24 (4) 14
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

TYPE–V

1. The simplified value of

$$\frac{(0.0539 - 0.002) \times 0.4 + 0.56 \times 0.07}{0.04 \times 0.25} = ?$$

(1) 59.96 (2) 0.5996
(3) 5.996 (4) 599.6

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

SHORT ANSWERS

TYPE-I

1. (1)	**2.** (1)	**3.** (4)	**4.** (3)
5. (1)	**6.** (3)	**7.** (2)	**8.** (4)
9. (2)	**10.** (3)	**11.** (1)	**12.** (4)
13. (4)	**14.** (4)	**15.** (3)	**16.** (1)
17. (2)	**18.** (1)	**19.** (3)	**20.** (3)
21. (1)	**22.** (3)	**23.** (4)	**24.** (3)
25. (*)	**26.** (1)		

TYPE-II

1. (3)	**2.** (1)	**3.** (3)	**4.** (3)
5. (1)	**6.** (2)	**7.** (1)	**8.** (1)
9. (2)	**10.** (4)	**11.** (2)	**12.** (1)
13. (1)	**14.** (3)	**15.** (4)	**16.** (1)
17. (1)	**18.** (1)	**19.** (4)	**20.** (3)
21. (3)	**22.** (3)	**23.** (2)	**24.** (2)
25. (4)	**26.** (2)	**27.** (2)	**28.** (1)
29. (4)	**30.** (4)	**31.** (1)	**32.** (2)
33. (3)	**34.** (3)	**35.** (2)	**36.** (2)
37. (1)	**38.** (3)	**39.** (1)	**40.** (3)
41. (2)	**42.** (4)	**43.** (2)	**44.** (2)
45. (4)	**46.** (2)	**47.** (4)	**48.** (2)
49. (1)	**50.** (3)	**51.** (4)	**52.** (3)
53. (2)	**54.** (1)	**55.** (1)	**56.** (4)
57. (3)	**58.** (4)	**59.** (4)	**60.** (2)
61. (1)	**62.** (2)	**63.** (1)	**64.** (4)
65. (4)	**66.** (4)	**67.** (1)	**68.** (4)
69. (3)	**70.** (1)	**71.** (4)	**72.** (4)
73. (1)	**74.** (2)	**75.** (3)	**76.** (2)
77. (4)	**78.** (3)	**79.** (1)	**80.** (2)
81. (2)	**82.** (1)	**83.** (2)	**84.** (*)
85. (4)	**86.** (1)	**87.** (4)	**88.** (4)

TYPE-III

1. (3)	**2.** (3)	**3.** (1)	**4.** (4)
5. (4)	**6.** (3)	**7.** (2)	**8.** (2)
9. (2)	**10.** (3)	**11.** (4)	**12.** (2)
13. (1)	**14.** (4)	**15.** (4)	**16.** (4)
17. (4)	**18.** (2)	**19.** (2)	**20.** (2)
21. (1)	**22.** (4)	**23.** (2)	**24.** (4)
25. (1)	**26.** (3)	**27.** (3)	**28.** (3)
29. (2)	**30.** (3)	**31.** (1)	**32.** (3)
33. (2)	**34.** (4)	**35.** (2)	**36.** (1)
37. (2)	**38.** (2)	**39.** (2)	**40.** (2)
41. (2)	**42.** (4)	**43.** (3)	**44.** (4)
45. (2)	**46.** (3)	**47.** (3)	**48.** (4)
49. (3)	**50.** (3)	**51.** (3)	**52.** (2)
53. (3)	**54.** (2)	**55.** (1)	**56.** (4)
57. (1)	**58.** (3)	**59.** (3)	**60.** (2)
61. (3)	**62.** (3)	**63.** (2)	**64.** (2)
65. (2)	**66.** (2)	**67.** (1)	**68.** (3)
69. (2)	**70.** (3)	**71.** (4)	**72.** (2)
73. (1)	**74.** (4)	**75.** (4)	**76.** (3)
77. (4)	**78.** (2)	**79.** (1)	**80.** (3)
81. (1)	**82.** (4)	**83.** (3)	**84.** (4)
85. (2)	**86.** (3)	**87.** (3)	**88.** (3)
89. (3)	**90.** (3)	**91.** (1)	**92.** (3)
93. (3)	**94.** (1)	**95.** (4)	**96.** (3)
97. (1)	**98.** (3)	**99.** (2)	**100.** (1)
101. (4)	**102.** (3)	**103.** (3)	**104.** (4)
105. (3)	**106.** (2)	**107.** (4)	**108.** (3)
109. (3)	**110.** (3)	**111.** (4)	**112.** (4)
113. (1)	**114.** (2)	**115.** (4)	**116.** (4)
117. (1)	**118.** (1)	**119.** (3)	**120.** (2)
121. (2)	**122.** (4)	**123.** (2)	**124.** (2)
125. (1)	**126.** (1)	**127.** (4)	**128.** (4)
129. (3)	**130.** (1)	**131.** (3)	**132.** (3)
133. (4)	**134.** (2)	**135.** (4)	**136.** (1)
137. (2)	**138.** (1)	**139.** (2)	**140.** (2)
141. (3)	**142.** (2)	**143.** (3)	**144.** (3)
145. (3)	**146.** (1)	**147.** (4)	**148.** (4)
149. (1)	**150.** (2)	**151.** (4)	**152.** (1)
153. (2)	**154.** (1)	**155.** (3)	**156.** (3)

TYPE-IV

1. (1)	**2.** (2)	**3.** (2)	**4.** (4)
5. (4)	**6.** (2)	**7.** (3)	**8.** (3)
9. (4)	**10.** (2)	**11.** (3)	**12.** (3)
13. (1)	**14.** (2)	**15.** (1)	**16.** (2)
17. (1)	**18.** (2)	**19.** (4)	**20.** (2)
21. (3)	**22.** (2)	**23.** (2)	**24.** (1)
25. (2)	**26.** (2)	**27.** (2)	**28.** (2)
29. (4)	**30.** (4)	**31.** (2)	**32.** (1)
33. (3)	**34.** (1)	**35.** (2)	**36.** (3)
37. (3)	**38.** (4)	**39.** (4)	**40.** (4)
41. (1)	**42.** (2	**43.** (1)	**44.** (2)

TYPE-V

1. (3)			

EXPLANATIONS

TYPE-I

1. (1)

$$? = 1 + \cfrac{1}{1 + \cfrac{2}{2 + \cfrac{3}{1 + \cfrac{4}{5}}}}$$

$$= 1 + \cfrac{1}{1 + \cfrac{2}{2 + \cfrac{3 \times 5}{5 + 4}}} = 1 + \cfrac{1}{1 + \cfrac{2}{2 + \cfrac{5}{3}}}$$

$$= 1 + \cfrac{1}{1 + \cfrac{2 \times 3}{6 + 5}} = 1 + \frac{1 \times 11}{11 + 6}$$

$$= 1 + \frac{11}{17} = 1\frac{11}{17}$$

2. (1) $? = 1 + \cfrac{2}{1 + \cfrac{3 \times 5}{9}} = 1 + \cfrac{2}{1 + \cfrac{5}{3}}$

$$= 1 + \frac{2 \times 3}{8} = \frac{7}{4}$$

3. (4) $\cfrac{1}{3 + \cfrac{1}{2 - \cfrac{1}{\cfrac{7}{9}}}} + \frac{17}{22}$

$$= \frac{1}{3+\frac{1}{2-\frac{9}{7}}} + \frac{17}{22}$$

$$= \frac{1}{3+\frac{1}{\frac{14-9}{7}}} + \frac{17}{22}$$

$$= \frac{1}{3+\frac{1}{\frac{5}{7}}} + \frac{17}{22} = \frac{1}{3+\frac{7}{5}} + \frac{17}{22}$$

$$= \frac{1}{\frac{15+7}{5}} + \frac{17}{22}$$

$$= \frac{5}{22} + \frac{17}{2} = \frac{22}{22} = 1$$

4. (3) $x = 1 + \frac{1}{1+\frac{1}{1+\frac{1}{1+\frac{1}{2}}}}$

$$= 1 + \frac{1}{1+\frac{1}{1+\frac{1}{\frac{3}{2}}}} = 1 + \frac{1}{1+\frac{1}{1+\frac{2}{3}}}$$

$$= 1 + \frac{1}{1+\frac{1}{\frac{5}{3}}} = 1 + \frac{1}{1+\frac{3}{5}}$$

$$= 1 + \frac{1}{\frac{8}{5}} = 1 + \frac{5}{8} = \frac{13}{8}$$

$$\therefore 2x + \frac{7}{4} = 2 \times \frac{13}{8} + \frac{7}{4}$$

$$= \frac{13+7}{4} = \frac{20}{4} = 5$$

5. (1) $\frac{19}{43} \div \frac{1}{2+\frac{1}{3+\frac{1}{1+\frac{1}{4}}}}$

$$= \frac{19}{43} \div \frac{1}{2+\frac{1}{3+\frac{4}{5}}}$$

$$= \frac{19}{43} \div \frac{1}{2+\frac{5}{19}} = \frac{19}{43} \div \frac{19}{43}$$

$$= \frac{19}{43} \times \frac{43}{19} = 1$$

6. (3) $\frac{5}{3+\frac{3}{\frac{3-2}{3}}} = \frac{5}{3+\frac{3}{\frac{1}{3}}}$

$$\frac{5}{3+3\times 3} = \frac{5}{3+9} = \frac{5}{12}$$

7. (2) $2 = x + \frac{1}{1+\frac{1}{3+\frac{1}{4}}}$

$$\Rightarrow 2 = x + \frac{1}{1+\frac{1}{\frac{12+1}{4}}}$$

$$\Rightarrow 2 = x + \frac{1}{1+\frac{4}{13}}$$

$$\Rightarrow 2 = x + \frac{1}{\frac{13+4}{13}}$$

$$\Rightarrow 2 = x + \frac{1}{\frac{17}{13}}$$

$$\Rightarrow 2 = x + \frac{13}{17} \Rightarrow x = 2 - \frac{13}{17}$$

$$= \frac{34-13}{17} = \frac{21}{17}$$

8. (4) $\frac{2}{1+\frac{1}{\frac{1}{2}}} \times \frac{3}{\left(\frac{5}{6}\times\frac{3}{2}\right)\div\frac{5}{4}}$

$$= \frac{2}{1+2} \times \frac{3}{\frac{5}{4}\div\frac{5}{4}}$$

$$= \frac{2}{3} \times \frac{3}{\frac{5}{4}\times\frac{4}{5}} = \frac{2}{3}\times 3 = 2$$

9. (2) $1 + \frac{4}{2+\frac{3}{\frac{10-1}{2}}} - \frac{1}{2}\times 5$

$$= 1 + \frac{4}{2+\frac{6}{9}} - \frac{5}{2} = 1 + \frac{4}{2+\frac{2}{3}} - \frac{5}{2}$$

$$= 1 + \frac{4}{\frac{8}{3}} - \frac{5}{2} = 1 + \frac{4\times 3}{8} - \frac{5}{2}$$

$$= 1 + \frac{3}{2} - \frac{5}{2} = \frac{2+3-5}{2} = 0$$

10. (3) Suppose that

$$1 + \frac{1}{10+\frac{1}{10}} = \frac{111}{101} = a$$

and, $1 - \frac{1}{10+\frac{1}{10}} = \frac{91}{101} = b.$

$$\therefore \frac{a^2-b^2}{(a+b)} = \frac{(a+b)(a-b)}{(a+b)}$$

$= (a - b)$

$$= \frac{111}{101} - \frac{91}{101} = \frac{20}{101}$$

11. (1) $\frac{\frac{79}{14}}{5+\frac{3}{3+\frac{5}{3}}}$

$$= \frac{\frac{79}{14}}{5+\frac{3}{\frac{9+5}{3}}}$$

$$= \frac{\frac{79}{14}}{5+\frac{9}{14}} = \frac{\frac{79}{14}}{\frac{70+9}{14}}$$

$$= \frac{79}{14} \times \frac{14}{79} = 1$$

12. (4) $\frac{2}{2+\frac{2}{3+\frac{2}{\frac{11}{3}}}\times 0.39}$

$$= \frac{2}{2+\frac{2}{3+\frac{6}{11}}\times 0.39}$$

$$= \frac{2}{2 + \frac{2}{\frac{33+6}{11}} \times 0.39}$$

$$= \frac{2}{2 + \frac{11 \times 2}{39} \times 0.39}$$

$$= \frac{2}{2 + \frac{11 \times 2}{39} \times \frac{39}{100}}$$

$$= \frac{2}{2 + \frac{11}{50}} = \frac{2}{\frac{100+11}{50}}$$

$$= \frac{100}{111}$$

13. (4) Expression $= 1 + \frac{1}{1 + \frac{1}{2}}$

$$= 1 + \frac{1}{\frac{2+1}{2}} = 1 + \frac{2}{3} = \frac{3+2}{3} = \frac{5}{3}$$

14. (4) Check through options

$$\frac{1}{3 + \frac{1}{1 + \frac{1}{2 + \frac{1}{4}}}}$$

$$= \frac{1}{3 + \frac{1}{1 + \frac{1}{\frac{8+1}{4}}}} = \frac{1}{3 + \frac{1}{1 + \frac{4}{9}}}$$

$$= \frac{1}{3 + \frac{1}{\frac{9+4}{9}}} = \frac{1}{3 + \frac{9}{13}} = \frac{1}{\frac{39+9}{13}} = \frac{13}{48}$$

15. (3) Expression

$$= 1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{\frac{3+2}{3}}}}}$$

$$= 1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{3}{5}}}}$$

$$= 1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{\frac{5+3}{5}}}}$$

$$= 1 + \frac{1}{1 + \frac{1}{1 + \frac{5}{8}}}$$

$$= 1 + \frac{1}{1 + \frac{1}{\frac{8+5}{8}}}$$

$$= 1 + \frac{1}{1 + \frac{8}{13}} = 1 + \frac{1}{\frac{13+8}{13}}$$

$$= 1 + \frac{13}{21} = \frac{21+13}{21} = \frac{34}{21}$$

16. (1) Expression

$$= \frac{\frac{7}{3} - \frac{13}{11}}{3 + \frac{1}{3 + \frac{1}{\frac{9+1}{3}}}} = \frac{\frac{77-39}{33}}{3 + \frac{1}{3 + \frac{3}{10}}}$$

$$= \frac{\frac{38}{33}}{3 + \frac{1}{\frac{30+3}{10}}} = \frac{\frac{38}{33}}{3 + \frac{10}{33}}$$

$$= \frac{\frac{38}{33}}{\frac{99+10}{33}} = \frac{38}{33} \times \frac{33}{109} = \frac{38}{109}$$

17. (2) Expression $= 3 + \frac{3}{3 + \frac{1}{\frac{9+1}{3}}}$

$$= 3 + \frac{3}{3 + \frac{3}{10}} = 3 + \frac{3}{\frac{30+3}{10}}$$

$$= 3 + \frac{30}{33} = 3 + \frac{10}{11} = \frac{33+10}{11} = \frac{43}{11}$$

18. (1) Expression $= 1 + \frac{1}{1 + \frac{1}{5}}$

$$= 1 + \frac{1}{\frac{5+1}{5}} = 1 + \frac{5}{6} = \frac{6+5}{6} = \frac{11}{6}$$

19. (3) First part $= \frac{\frac{30}{7} - \frac{1}{2}}{\frac{7}{2} + \frac{8}{7}}$

$$= \frac{\frac{60-7}{14}}{\frac{49+16}{14}} = \frac{53}{14} \times \frac{14}{65} = \frac{53}{65}$$

Second part $= \frac{1}{2 + \frac{1}{2 + \frac{1}{\frac{25-1}{5}}}}$

$$= \frac{1}{2 + \frac{1}{2 + \frac{5}{24}}} = \frac{1}{2 + \frac{1}{\frac{48+5}{24}}}$$

$$= \frac{1}{2 + \frac{24}{53}} = \frac{1}{\frac{106+24}{53}}$$

$$= \frac{53}{130}$$

$\therefore$ Expression

$$= \frac{53}{65} \div \frac{53}{130} = \frac{53}{65} \times \frac{130}{53} = 2$$

20. (3)

$$4 - \frac{5}{1 + \frac{1}{3 + \frac{1}{\frac{9}{4}}}} = 4 - \frac{5}{1 + \frac{1}{3 + \frac{4}{9}}}$$

$$= 4 - \frac{5}{1 + \frac{1}{\frac{27+4}{9}}} = 4 - \frac{5}{1 + \frac{9}{31}}$$

$$= 4 - \frac{5}{\frac{40}{31}} = 4 - \frac{5 \times 31}{40}$$

$$= 4 - \frac{31}{8} = \frac{32-31}{8} = \frac{1}{8}$$

$\because$ Time taken in completing $\frac{1}{8}$ part = 10 minutes

$\therefore$ Time taken in completing $\frac{3}{5}$ part

$= 10 \times 8 \times \frac{3}{5}$

= 48 minutes

21. (1) $\dfrac{4\frac{1}{7}-2\frac{1}{4}}{3\frac{1}{2}+1\frac{1}{7}} = \dfrac{\frac{29}{7}-\frac{9}{4}}{\frac{7}{2}+\frac{8}{7}}$

$= \dfrac{\frac{116-63}{28}}{\frac{49+16}{14}} = \dfrac{53}{28} \times \dfrac{14}{65} = \dfrac{53}{130}$

Again,

$\dfrac{1}{2+\dfrac{1}{2+\dfrac{1}{\frac{25-1}{5}}}} = \dfrac{1}{2+\dfrac{1}{2+\frac{5}{24}}}$

$= \dfrac{1}{2+\dfrac{1}{\frac{48+5}{24}}} = \dfrac{1}{2+\frac{24}{53}}$

$= \dfrac{1}{\frac{106+24}{53}} = \dfrac{53}{130}$

$\therefore$ Expression $= \sqrt{\dfrac{53}{130} \div \dfrac{53}{130}} = 1$

22. (3) $1+\dfrac{1}{1+\dfrac{2}{\frac{15+4}{5}}}$

$= 1+\dfrac{1}{1+\frac{2\times 5}{19}} = 1+\dfrac{1}{\frac{19+10}{19}}$

$= 1+\dfrac{19}{29} = \dfrac{29+19}{29} = \dfrac{48}{29}$

23. (4) Expression $= 1 - \dfrac{a}{1-\dfrac{1}{1+\frac{a}{1-a}}}$

$= 1 - \dfrac{a}{1-\dfrac{1}{\frac{1-a+a}{1-a}}}$

$= 1 - \dfrac{a}{1-\dfrac{1}{\frac{1}{1-a}}}$

$= 1 - \dfrac{a}{1-(1-a)} = 1 - \dfrac{a}{1-1+a}$

$= 1 - 1 = 0$

24. (3) First part $= \dfrac{4\frac{1}{7}-2\frac{1}{7}}{3\frac{1}{2}+1\frac{1}{7}}$

$= \dfrac{\frac{29}{7}-\frac{15}{7}}{\frac{7}{2}+\frac{8}{7}} = \dfrac{\frac{14}{7}}{\frac{49+16}{14}}$

$= \dfrac{2}{\frac{65}{14}} = \dfrac{2\times 14}{65} = \dfrac{28}{65}$

Second part $= \dfrac{1}{2+\dfrac{1}{2+\dfrac{1}{\frac{25-1}{5}}}}$

$= \dfrac{1}{2+\dfrac{1}{2+\frac{5}{24}}} = \dfrac{1}{2+\dfrac{1}{\frac{48+5}{24}}}$

$= \dfrac{1}{2+\frac{24}{53}} = \dfrac{1}{\frac{106+24}{53}} = \dfrac{53}{130}$

$\therefore$ Expression $= \dfrac{28}{65} \div \dfrac{53}{130}$

$= \dfrac{28}{65} \times \dfrac{130}{53} = \dfrac{56}{53}$

25. (*) Let, $a = 1 + \dfrac{1}{10+\frac{1}{10}}$

$= 1 + \dfrac{1}{\frac{100+1}{10}} = 1+\dfrac{10}{101}$

$= \dfrac{101+10}{101} = \dfrac{111}{101}$

Again,

$b = 1-\dfrac{1}{10+\frac{1}{10}} = 1-\dfrac{1}{\frac{100+1}{10}}$

$= 1-\dfrac{10}{101}$

$= \dfrac{101-10}{101} = \dfrac{91}{101}$

$\therefore$ Expression

$= \left(a^2-b^2\right) \div ab$

$= \{(a+b)(a-b)\} \div ab$

$= \left(\frac{111}{101}+\frac{91}{101}\right)\left(\frac{111}{101}-\frac{91}{101}\right)$

$\div \left(\frac{111}{101}\times\frac{91}{101}\right)$

$= \frac{202}{101} \times \frac{20}{101} \times \frac{101\times 101}{111\times 91}$

$= \frac{4040}{10101}$

26. (1) Expression

$= 4-\dfrac{5}{1+\dfrac{1}{3+\dfrac{1}{\frac{8+1}{4}}}}$

$= 4-\dfrac{5}{1+\dfrac{1}{3+\frac{4}{9}}} = 4-\dfrac{5}{1+\dfrac{1}{\frac{27+4}{9}}}$

$= 4-\dfrac{5}{1+\frac{9}{31}} = 4-\dfrac{5}{\frac{31+9}{31}}$

$= 4-\dfrac{5\times 31}{40} = \dfrac{160-155}{40}$

$= \dfrac{5}{40} = \dfrac{1}{8}$

TYPE-II

1. (3) $? = \dfrac{9|3-5|-5|4|\div 10}{-3(5)-2\times 4\div 2}$

$= \dfrac{9\times 2-5\times 4\div 10}{-15-8\div 2}$

$= \dfrac{18-2}{-19} = -\dfrac{16}{19}$

2. (1) Using Rule 1,

? = 5 – [4 – {3 – (3– 3 – 6)}]

= 5 – [4 – { 3 – (– 6)}]

= 5 – [4 – {3 + 6}]

= 5 – [4 – 9]

= 5 + 5 = 10

3. (3) $? = \dfrac{-(-2)^2 + 6 + 6}{18 - 15}$

$= \dfrac{-4 + 12}{3} = \dfrac{8}{3}$

4. (3) Using Rule 1,

$$\frac{\frac{5}{3} \times \frac{7}{51} \text{ of } \frac{17}{5} - \frac{1}{3}}{\frac{2}{9} \times \frac{5}{7} \text{ of } \frac{28}{5} - \frac{2}{3}}$$

$$= \frac{\frac{5}{3} \times \frac{7}{15} - \frac{1}{3}}{\frac{2}{9} \times 4 - \frac{2}{3}}$$

$$= \frac{\frac{7}{9} - \frac{1}{3}}{\frac{8}{9} - \frac{2}{3}} = \frac{4}{9} \times \frac{9}{2} = 2$$

5. (1) Using Rule 1,
? = 1 – [5 – {2 + (–1)2}]
= 1 – [5 – {2 – 2}]
= 1 – [5 – 0]
= 1 – 5 = – 4

6. (2) Using Rule 1,
3034 – (1002 ÷ 20.04)

$= 3034 - \dfrac{1002}{20.04}$

$= 3034 - \dfrac{1002}{2004} \times 100$

= 3034 – 50 = 2984

7. (1) Using Rule 1,

$$(100)^{\frac{1}{2}} \times (0.001)^{\frac{1}{3}} - (0.0016)^{\frac{1}{4}} \times 3^0 + \left(\frac{5}{4}\right)^{-1}$$

$= 10 \times 0.1 - 0.2 \times 1 + \dfrac{4}{5}$

= 1 – 0.2 + 0.8 = 1.6

8. (1) Using Rule 1,

$$? = \left(\frac{1}{2} - \frac{1}{4} + \frac{1}{5} - \frac{1}{6}\right) \div \left(\frac{2}{5} - \frac{5}{9} + \frac{3}{5} - \frac{7}{18}\right)$$

$$= \left(\frac{30 - 15 + 12 - 10}{60}\right) \div \left(\frac{36 - 50 + 54 - 35}{90}\right)$$

$$= \left(\frac{17}{60}\right) \div \left(\frac{5}{90}\right) = \frac{17}{60} \times 18$$

$$= \frac{51}{10} = 5\frac{1}{10}$$

9. (2) Using Rule 1,

$$8\frac{1}{2} - \left[3\frac{1}{4} \div \left\{1\frac{1}{4} - \frac{1}{2}\left(1\frac{1}{2} - \frac{1}{3} - \frac{1}{6}\right)\right\}\right]$$

$$= \frac{17}{2} - \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{3}{2} - \frac{1}{3} - \frac{1}{6}\right)\right\}\right]$$

$$= \frac{17}{2} - \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{9 - 2 - 1}{6}\right)\right\}\right]$$

$$= \frac{17}{2} - \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2} \times \frac{6}{6}\right\}\right]$$

$$= \frac{17}{2} - \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\right\}\right]$$

$$= \frac{17}{2} - \left[\frac{13}{4} \div \left\{\frac{5 - 2}{4}\right\}\right]$$

$$= \frac{17}{2} - \left[\frac{13}{4} \div \frac{3}{4}\right]$$

$$= \frac{17}{2} - \left[\frac{13}{4} \times \frac{4}{3}\right] = \frac{17}{2} - \frac{13}{3}$$

$$= \frac{51 - 26}{6} = \frac{25}{6} = 4\frac{1}{6}$$

10. (4) Let the value of * be x.

$$\therefore \frac{50}{x} = \frac{x}{12\frac{1}{2}}$$

$$\Rightarrow \frac{50}{x} = \frac{2x}{25}$$

$\Rightarrow 2x^2 = 50 \times 25$
$\Rightarrow x^2 = 25 \times 25$
$\therefore x = 25$

11. (2) Using Rule 1,
0.008 × 0.01 × 0.072 ÷ (0.12 × 0.0004)
= 0.008 × 0.01 × 0.072 ÷ (0.000048)

$$= 0.008 \times 0.01 \times \frac{0.072}{0.000048}$$

$$= \frac{0.00000576}{0.000048} = 0.12$$

12. (1) Using Rule 1,

$$\frac{2}{3} \times \frac{3}{\frac{5}{6} \div \frac{2}{3} \text{ of } 1\frac{1}{4}}$$

$$= \frac{2}{3} \times \frac{3}{\frac{5}{6} \div \frac{2}{3} \text{ of } \frac{5}{4}}$$

$$= \frac{2}{3} \times \frac{3}{\frac{5}{6} \div \frac{10}{12}}$$

$$= \frac{2}{3} \times \frac{3}{\frac{5}{6} \times \frac{12}{10}} = \frac{2}{3} \times \frac{3}{1} = 2$$

13. (1)

$$\frac{1}{9} + \frac{1}{6} + \frac{1}{12} + \frac{1}{20} + \frac{1}{30} + \frac{1}{42} + \frac{1}{56} + \frac{1}{72}$$

$$= \frac{1}{9} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \frac{1}{4 \times 5} + \frac{1}{5 \times 6} + \ldots \frac{1}{8 \times 9}$$

$$= \frac{1}{9} + \frac{1}{2} - \frac{1}{3} + \frac{1}{3} - \frac{1}{4} + \ldots + \frac{1}{8} - \frac{1}{9} = \frac{1}{2}$$

Aliter :
Using Rule 2,

$$\frac{1}{9} + \frac{1}{6} + \frac{1}{12} + \frac{1}{20} + \frac{1}{30} + \frac{1}{42} + \frac{1}{56} + \frac{1}{72}$$

$$= \frac{1}{9} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \frac{1}{4 \times 5} + \frac{1}{5 \times 6} + \frac{1}{6 \times 7} + \frac{1}{7 \times 8} + \frac{1}{8 \times 9}$$

$$= \frac{1}{9} + \left[\frac{1}{2} - \frac{1}{(2 + 7)}\right]$$

$\because$ n = 2 and r = 7

$$= \frac{1}{9} + \frac{1}{2} - \frac{1}{9} = \frac{1}{2}$$

14. (3) Using Rule 1,
Expression
= 25 – 5 [2 + 3 {2 – 2(5 – 3) + 5} – 10] ÷ 4
= 25 – 5 [2 + 3 {2 – 2 × 2 + 5} – 10] ÷ 4
= 25 – 5 [2 + 9 – 10] ÷ 4

$= 25 - 5 \div 4 = 25 - \dfrac{5}{4}$

$= \dfrac{100 - 5}{4} = \dfrac{95}{4} = 23.75$

15. (4) Using Rule 1,
We have

$$\frac{5}{3} \div \frac{2}{7} \times \frac{*}{7} = \frac{5}{4} \times \frac{2}{3} \times 6$$

$$\Rightarrow \frac{5}{3} \times \frac{7}{2} \times \frac{*}{7} = \frac{5 \times 2 \times 6}{4 \times 3}$$

$$\therefore * = \frac{5 \times 2 \times 6 \times 3 \times 2 \times 7}{5 \times 7 \times 4 \times 3} = 6$$

16. (1) Using Rule 1,
Expression

$$= 9 - \frac{11}{9} \text{ of } \frac{36}{11} \div \frac{36}{7} \text{ of } \frac{7}{9}$$

$$= 9 - \frac{11}{9} \times \frac{36}{11} \div \frac{36}{7} \times \frac{7}{9}$$

$= 9 - 4 \div 4$

$$= 9 - 4 \times \frac{1}{4} = 9 - 1 = 8$$

17. (1) Using Rule 1,

$$\frac{5}{\frac{15}{8} \times \frac{4}{3}} \times \frac{\frac{21}{10}}{\frac{7}{2}} of \frac{5}{4}$$

$$= 5 \times \frac{2}{5} \times \frac{21}{10} \times \frac{2}{7} \times \frac{5}{4}$$

$$= \frac{3}{2} = 1\frac{1}{2}$$

18. (1) Using Rule 1,

$$\frac{9}{20} - \left[\frac{1}{5} + \left\{\frac{1}{4} + \left(\frac{5}{6} - \overline{\frac{1}{3} + \frac{1}{2}}\right)\right\}\right]$$

$$= \frac{9}{20} - \left[\frac{1}{5} + \left\{\frac{1}{4} + \left(\frac{5}{6} - \frac{5}{6}\right)\right\}\right]$$

$$= \frac{9}{20} - \left[\frac{1}{5} + \frac{1}{4}\right] = \frac{9}{20} - \frac{9}{20} = 0$$

19. (4) $\dfrac{0.8\overline{3} \div 7.5}{2.3\overline{21} - 0.0\overline{98}} = \dfrac{\frac{83-8}{90} \div 7.5}{2\frac{321-3}{990} - \frac{98}{990}}$

$$= \frac{\frac{75}{90} \div 7.5}{2\frac{318}{990} - \frac{98}{990}} = \frac{\frac{75}{90} \div 7.5}{2\frac{220}{990}}$$

$$= \frac{7.5}{90 \times 7.5} \times \frac{990}{2200} = \frac{1}{20} = 0.05$$

20. (3) Let '*' be H

$$\left[\frac{(H)}{21} \times \frac{(H)}{189}\right] = 1$$

$$\Rightarrow (H)^2 = 21 \times 189$$

$$\Rightarrow H = \sqrt{21 \times 189} = 63$$

21. (3) $80 \times \sqrt{P} = 1120$

$$\Rightarrow \sqrt{P} = \frac{1120}{80} = 14$$

$$\Rightarrow P = (14)^2 = 196$$

22. (3) Using Rule 1,

$$\frac{\frac{13}{4} - \frac{5}{6} \times \frac{4}{5}}{\frac{13}{3} \div \frac{1}{5} - \left(\frac{3}{10} + \frac{106}{5}\right)} - \left(\frac{3}{2} \times \frac{5}{3}\right)$$

$$= \frac{\frac{13}{4} - \frac{2}{3}}{\frac{13 \times 5}{3} - \left(\frac{3 + 212}{10}\right)} - \frac{5}{2}$$

$$= \frac{\frac{39-8}{12}}{\frac{65}{3} - \frac{215}{10}} - \frac{5}{2} = \frac{\frac{31}{12}}{\frac{650-645}{30}} - \frac{5}{2}$$

$$= \frac{31}{12} \times \frac{30}{5} - \frac{5}{2}$$

$$= \frac{31}{2} - \frac{5}{2} = \frac{31-5}{2} = \frac{26}{2} = 13$$

23. (2) Using Rule 1,

$$\left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{5}{2} - \frac{3-2}{12}\right)\right\}\right] \div \frac{13}{6}$$

$$= \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{5}{2} - \frac{1}{12}\right)\right\}\right] \div \frac{13}{6}$$

$$= \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{30-1}{12}\right)\right\}\right] \div \frac{13}{6}$$

$$= \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2} \times \frac{29}{12}\right\}\right] \div \frac{13}{6}$$

$$= \left[\frac{13}{4} \div \left\{\frac{30-29}{24}\right\}\right] \div \frac{13}{6}$$

$$= \left[\frac{13}{4} \div \frac{1}{24}\right] \div \frac{13}{6}$$

$$= \left[\frac{13}{4} \times 24\right] \div \frac{13}{6}$$

$$= 13 \times 6 \times \frac{6}{13} = 36$$

24. (2) Using (x) of Basic Formulae
Let 0.1 = a, 0.2 = b and 0.3 = c
Then, we have,

$$\frac{a \times a \times a + b \times b \times b + c \times c \times c - 3abc}{a \times a + b \times b + c \times c - ab - bc - ac}$$

$$= \frac{a^3 + b^3 + c^3 - 3abc}{a^2 + b^2 + c^2 - ab - bc - ac}$$

$= a + b + c$

$= 0.1 + 0.2 + 0.3 = 0.6$

25. (4) Using Rule 2,

$$\frac{1}{5 \times 6} + \frac{1}{6 \times 7} + \frac{1}{7 \times 8} + \frac{1}{8 \times 9} + \frac{1}{9 \times 10} + \frac{1}{10 \times 11}$$

$$= \frac{1}{5} - \frac{1}{6} + \frac{1}{6} - \frac{1}{7} + \frac{1}{7} - \frac{1}{8} + \frac{1}{8} - \frac{1}{9} + \frac{1}{9} - \frac{1}{10} + \frac{1}{10} - \frac{1}{11}$$

$$= \frac{1}{5} - \frac{1}{11} = \frac{11-5}{55} = \frac{6}{55}$$

26. (2) Using Rule 1,

I. $= \dfrac{3}{4} \times \dfrac{6}{5} = \dfrac{9}{10}$

II. $= 3 \div \left[\dfrac{4}{5} \times \dfrac{1}{6}\right] = 3 \div \dfrac{2}{15} = \dfrac{45}{2}$

III. $= \left[3 \div \dfrac{4}{5}\right] \div 6 = \dfrac{15}{4} \div 6 = \dfrac{5}{8}$

IV. $= 3 \div 4 \times \dfrac{5}{6} = 3 \div \dfrac{10}{3} = \dfrac{9}{10}$

Obviously, (I) and (IV) are equal

27. (2) Using Rule 1,

$$= 1 \div \left[1 + 1 \div \left\{1 + 1 \div (1 + 1 \div 2)\right\}\right]$$

$$= 1 \div \left[1 + 1 \div \left\{1 + 1 \div \left(1 + \frac{1}{2}\right)\right\}\right]$$

$$= 1 \div \left[1 + 1 \div \left\{1 + 1 \div \frac{3}{2}\right\}\right]$$

$$= 1 \div \left[1 + 1 \div \left\{1 + \frac{2}{3}\right\}\right] = 1 \div \left[1 + 1 \div \frac{5}{3}\right]$$

$$= 1 \div \left[1 + \frac{3}{5}\right] = 1 \div \frac{8}{5} = \frac{5}{8}$$

28. (1) Using Rule 1,
The given expression

$$= \frac{\frac{1}{3} \times 3 \times \frac{1}{3}}{\frac{1}{3} \div \left(\frac{1}{3} \times \frac{1}{3}\right)} - \frac{1}{9}$$

$$= \frac{\frac{1}{3}}{\frac{1}{3} \div \frac{1}{9}} - \frac{1}{9} = \frac{\frac{1}{3}}{\frac{1}{3} \times 9} - \frac{1}{9}$$

$$= \frac{\frac{1}{3}}{3} - \frac{1}{9} = \frac{1}{9} - \frac{1}{9} = 0$$

29. (4) Using Rule 1,
The given expression

$$= \frac{\frac{11}{4}}{\frac{11}{6}} \div \frac{7}{8}\left(\frac{4+3}{12}\right) + \frac{5}{7} \div \frac{3}{4} \text{ of } \frac{3}{7}$$

$$= \left(\frac{11}{4} \times \frac{6}{11}\right) \div \frac{7}{8} \times \frac{7}{12} + \frac{5}{7} \div \left(\frac{3}{4} \times \frac{3}{7}\right)$$

$$= \frac{3}{2} \div \frac{7}{8} \times \frac{7}{12} + \frac{5}{7} \div \frac{9}{28}$$

$$= \frac{3}{2} \times \frac{8}{7} \times \frac{7}{12} + \frac{5}{7} \times \frac{28}{9}$$

$$= 1 + \frac{20}{9} = \frac{9+20}{9} = \frac{29}{9} = 3\frac{2}{9}$$

30. (4) $3.\overline{36} - 2.\overline{05} + 1.\overline{33}$

$$= 3\frac{36}{99} - 2\frac{05}{99} + 1\frac{33}{99}$$

$$= 3 + \frac{36}{99} - 2 - \frac{5}{99} + 1 + \frac{33}{99}$$

$$= (3 - 2 + 1) + \left(\frac{36}{99} - \frac{5}{99} + \frac{33}{99}\right)$$

$$= 2 + \left(\frac{36 - 5 + 33}{99}\right)$$

$$= 2 + \frac{64}{99} = 2\frac{64}{99} = 2.\overline{64}$$

31. (1) Using (x) of Basic Formulae
Let 0.9 = x, 0.2 = y and 0.3 = z
Then, the given expression

$$= \frac{x \times x \times x + y \times y \times y + z \times z \times z - 3 \times x \times y \times z}{x \times x + y \times y + z \times z - x \times y - y \times z - z \times x}$$

$$= \frac{x^3 + y^3 + z^3 - 3xyz}{x^2 + y^2 + z^2 - xy - yz - zx}$$

$$= \frac{(x + y + z)\left(x^2 + y^2 + z^2 - xy - yz - zx\right)}{x^2 + y^2 + z^2 - xy - yz - zx}$$

$= x + y + z$
$= 0.9 + 0.2 + 0.3 = 1.4$

32. (2) Using Rule 1,

$$\left(\frac{1}{9}\right)^2 \left\{1 - 9\left(\frac{16-1}{90}\right)^2\right\}$$

$$= \frac{1}{81}\left\{1 - \frac{9 \times 15 \times 15}{90 \times 90}\right\}$$

$$= \frac{1}{81} \times \left\{1 - \frac{1}{4}\right\}$$

$$= \frac{1}{81} \times \frac{3}{4} = \frac{1}{108}$$

33. (3) Using Rule 1,

$$\frac{\frac{3}{2}}{\frac{1}{2}} \div \frac{4}{7}\left(\frac{4+3}{10}\right) \text{ of } \frac{\frac{3+2}{6}}{\frac{3-2}{6}}$$

$$= 3 \div \frac{4}{7}\left(\frac{7}{10}\right) \text{ of } \left(\frac{5}{6} \times 6\right)$$

$$= 3 \div \left(\frac{4}{7} \times \frac{7}{10} \times 5\right) = 3 \div 2 = \frac{3}{2}$$

34. (3) Using Rule 1,
[0.9 – {2.3 – 3.2 – (7.1 – 8.9)}]
= [0.9 – {2.3 – 3.2 + 1.8}]
= [0.9 – 0.9] = 0

35. (2) Using (x) of Basic Formulae
Let, 32 = a
79 = b, –111 = c
When (a + b + c) = 0

then $a^3 + b^3 + c^3 - 3abc = 0$
Here, a+ b+c = 32+79–111 = 0
$\therefore (32)^3 + (79)^3 - (111)^3 + 3 \times 32 \times 79 \times 111 = 0$

36. (2) Using Rule 1,

$$\left(\frac{5}{2} + \frac{3}{2}\right)\left(\frac{25}{4} - \frac{15}{4} + \frac{9}{4}\right)$$

$$= 4 \times \frac{19}{4} = 19$$

37. (1) Expression $= \frac{(0.04 + 0.01)}{(0.01 + 0.02)}$

$$= \frac{0.05}{0.03} = \frac{5}{3}$$

38. (3) Using Rule 1,
Expression

$$= \frac{1}{2} + \left\{\frac{19}{4} - \left(\frac{19}{6} - \frac{7}{3}\right)\right\}$$

$$= \frac{1}{2} + \left\{\frac{19}{4} - \left(\frac{19-14}{6}\right)\right\}$$

$$= \frac{1}{2} + \left\{\frac{19}{4} - \frac{5}{6}\right\}$$

$$= \frac{1}{2} + \frac{19}{4} - \frac{5}{6}$$

$$= \frac{6 + 57 - 10}{12} = \frac{53}{12} = 4\frac{5}{12}$$

39. (1) Expression = 0.125 + 0.015625 + 0.001953125 + 0.00024414 + 0.000030517
= 0.1428 ≈ 0.143

40. (3) Using Rule 1,
Expression
= 8.7 – [7.6 – {6.5 – (5.4 – 4.3 – 2)}]
=8.7 – [7.6 – {6.5 – (5.4 – 2.3)}]
=8.7 – [7.6 – {6.5 – 3.1}]
=8.7 – [7.6 – 3.4}]
= 8.7 – 4.2 = 4.5

41. (2) Using (x) of Basic Formulae
If $a + b + c = 0$, then
$a^3 + b^3 + c^3 = 3abc$
Here, 0.111 + 0.222 + (–0.333) = 0
$\therefore (0.111)^3 + (0.222)^3 + (-0.333)^3$
$= -3 \times 0.111 \times 0.222 \times 0.333$
$= -(0.333)^2 \times 0.222$
∴ Expression
$= [-(0.333)^2 \times 0.222 + (0.333)^2 \times 0.222]^3 = 0$

42. (4) Using Rule 1,
Expression

$$= \frac{\frac{5}{4} \div \frac{3}{2}}{\left(\frac{2 + 30 - 27}{30}\right)}$$

$$= \frac{\frac{5}{4} \times \frac{2}{3}}{\frac{5}{30}} = \frac{5}{6} \times \frac{30}{5} = 5$$

43. (2) Using Rule 1,
Expression

$$= \frac{\frac{-30 - 40 + 48 - 20 + 12 + 45}{60}}{\frac{30 + 40 - 80 + 20 - 12 - 48}{60}}$$

$$= \frac{105 - 90}{90 - 140} = -\frac{15}{50} = -\frac{3}{10}$$

44. (2) Expression

$$= 0.\overline{63} + 0.\overline{37} + 0.\overline{80}$$

$$= \frac{63}{99} + \frac{37}{99} + \frac{80}{99}$$

$$= \frac{63 + 37 + 80}{99} = \frac{180}{99}$$

$$= 1\frac{81}{99} = 1.\overline{81}$$

45. (4) Let (4.53 – 3.07) = a
(3.07 – 2.15) = b and
(2.15 – 4.53) = c ∴ $a + b + c = 0$
∴ Expression

$= \frac{a^2}{bc} + \frac{b^2}{ac} + \frac{c^2}{ab}$

$= \frac{a^3 + b^3 + c^3}{abc} = \frac{3\ abc}{abc} = 3$

[If $a + b + c = 0$, $a^3 + b^3 + c^3 = 3\ abc$]

46. (2) Using Rule 1,
Expression

$= \frac{17}{15} \times \frac{17}{15} + \frac{2}{15} \times \frac{2}{15} - 2 \times \frac{17}{15} \times \frac{2}{15}$

$= \left(\frac{17}{15} - \frac{2}{15}\right)^2$

$= \left(\frac{17-2}{15}\right)^2 = \left(\frac{15}{15}\right)^2 = 1$

47. (4) Using (v) of Basic Formulae

Let $4\frac{11}{15} = a$ and $\frac{15}{71} = b$.

$\therefore$ Expression

$= (a + b)^2 - (a - b)^2$

$= (a^2 + b^2 + 2ab) - (a^2 + b^2 - 2ab) = 4ab$

$= 4 \times 4\frac{11}{15} \times \frac{15}{71} = 4 \times \frac{71}{15} \times \frac{15}{71} = 4$

48. (2) Let $0.1 = a \Rightarrow 0.2 = 2a$ and $0.02 = b \Rightarrow 0.04 = 2b$

$\therefore$ Expression

$= \frac{a^3 + b^3}{8a^3 + 8b^3}$

$= \frac{a^3 + b^3}{8(a^3 + b^3)} = \frac{1}{8} = 0.125$

49. (1) $5\frac{3}{*} \times \frac{7}{2} = 19$

$\Rightarrow 5\frac{3}{*} = \frac{19 \times 2}{7}$

$\Rightarrow 5\frac{3}{*} = \frac{38}{7} = 5\frac{3}{7}$

$\Rightarrow * = 7$

50. (3) Using Rule 7,

$\left(\sqrt{2} + \frac{1}{\sqrt{2}}\right)^2$

$= 2 + \frac{1}{2} + 2 \times \sqrt{2} \times \frac{1}{\sqrt{2}} = 4\frac{1}{2}$

51. (4) Expression

$= (0.98)^3 + (0.02)^3 + 3 \times 0.98 \times 0.02 - 1$

$= (0.98)^3 + (0.02)^3 + 3 \times 0.98 \times 0.02\ (0.98+0.02) - 1$

$= (0.98 + 0.02)^3 - 1 = 1 - 1 = 0$

52. (3) Expression

$= 71 \times 29 + 27 \times 15 + 8 \times 4$

$= 2059 + 405 + 32 = 2496$

53. (2) Expression

$= 0.05 \times 5 - 0.005 \times 5$

$= 0.25 - 0.025 = 0.225$

54. (1) Let $0.2 = a$ and $0.04 = b$

$\Rightarrow 0.4 = 2a$ and $0.08 = 2b$

$\therefore$ Expression

$= \sqrt[3]{\frac{a \times a \times a + b \times b \times b}{2a \times 2a \times 2a + 2b \times 2b \times 2b}}$

$= \sqrt[3]{\frac{a^3 + b^3}{8(a^3 + b^3)}} = \sqrt[3]{\frac{1}{8}} = \frac{1}{2} = 0.5$

55. (1) Expression

$= (256)^{0.16} \times (16)^{0.18}$

$= (2^8)^{0.16} \times (2^4)^{0.18}$

$= (2)^{8\times0.16} \times (2)^{4\times0.18}$

$= (2)^{1.28} \times (2)^{0.72} = (2)^{1.28+0.72}$

$= (2)^2 = 4$

56. (4) Expression

$\left(\frac{1}{3.5} + \frac{1}{5.7} + \frac{1}{7.9} + \frac{1}{9.11} + \frac{1}{11.13} + \frac{1}{13.15}\right)$

$= \frac{1}{2}\left(\frac{2}{3.5} + \frac{2}{5.7} + \frac{2}{7.9} + \frac{2}{9.11} + \frac{2}{11.13} + \frac{2}{13.15}\right)$

$= \frac{1}{2}\left(\frac{1}{3} - \frac{1}{5} + \frac{1}{5} - \frac{1}{7} + \frac{1}{7} - \frac{1}{9} + \frac{1}{9} - \frac{1}{11} + \frac{1}{11} - \frac{1}{13} + \frac{1}{13} - \frac{1}{15}\right)$

$= \frac{1}{2}\left(\frac{1}{3} - \frac{1}{15}\right) = \frac{1}{2}\left(\frac{5-1}{15}\right)$

$= \frac{1}{2} \times \frac{4}{15} = \frac{2}{15}$

Aliter :

Using Rule 3,

$\frac{1}{3.5} + \frac{1}{5.7} + \frac{1}{7.9} + \frac{1}{9.11} + \frac{1}{11.13} + \frac{1}{13.15}$

Here, n = 3 and r = 6

$\Rightarrow \frac{1}{2}\left(\frac{1}{n} - \frac{1}{n + 2r}\right)$

$= \frac{1}{2}\left(\frac{1}{3} - \frac{1}{3 + 2 \times 6}\right)$

$= \frac{1}{2}\left(\frac{1}{3} - \frac{1}{15}\right)$

$= \frac{1}{2}\left(\frac{5-1}{15}\right) = \frac{2}{15}$

57. (3) Expression

$= (53 \times 87 + 159 \times 21 + 106 \times 25)$

$= 53\ (87 + 3 \times 21 + 2 \times 25)$

$= 53\ (87 + 63 + 50)$

$= 53 \times 200 = 10600$

58. (4) Using Rule 4,
Expression

$= \frac{(0.5)^3 + (0.3)^3}{(0.5)^2 - 0.5 \times 0.3 + (0.3)^2}$

Let $0.5 = a$,and $0.3 = b$

$\therefore$ Expression $= \frac{a^3 + b^3}{a^2 - ab + b^2}$

$= \frac{(a + b)(a^2 - ab + b^2)}{a^2 - ab + b^2}$

$= a + b = 0.5 + 0.3 = 0.8$

59. (4) Using Rule 4,

Expression $= \frac{8(3.75)^3 + 1}{(7.5)^2 - 6.5}$

$= \frac{(2 \times 3.75)^3 + 1}{(7.5)^2 - 7.5 \times 1 + 1^2}$

$= \frac{(7.5)^3 + 1}{(7.5)^2 - 7.5 \times 1 + 1^2}$

$\left[a^3 + b^3 = (a + b)(a^2 - ab + b^2)\right]$

$= 7.5 + 1 = 8.5$

60. (2) Using Rule 6,
Let $2.697 = a$ and $0.498 = b$

$\therefore$ Expression

$= \frac{(a - b)^2 + (a + b)^2}{a^2 + b^2}$

$= \frac{2(a^2 + b^2)}{a^2 + b^2} = 2$

61. (1) Using Rule 1,
Expression

$= \frac{\frac{13}{4} - \frac{4}{5} \times \frac{5}{6}}{\frac{13}{3} \times 5 - \left(\frac{3}{10} + \frac{106}{5}\right)}$

$= \frac{\frac{13}{4} - \frac{2}{3}}{\frac{65}{3} - \frac{3}{10} - \frac{106}{5}}$

$= \frac{\frac{39-8}{12}}{\frac{650-9-636}{30}}$

$= \frac{31}{12} \times \frac{30}{5} = \frac{31}{2} = 15\frac{1}{2}$

$\therefore$ Required answer

$= 15\frac{1}{2} - 15 = \frac{1}{2}$

62. (2) $\sqrt[2]{0.014 \times 0.14x}$

$= 0.014 \times 0.14 \quad \sqrt[2]{y}$

On squaring both sides,

$0.014 \times 0.14x$

$= (0.014)^2 \times (0.14)^2 \times y$

$\therefore \quad \dfrac{x}{y} = 0.014 \times 0.14 = 0.00196$

63. (1)

$$\frac{4.41 \times 0.16}{2.1 \times 1.6 \times 0.21} = \frac{441 \times 16}{21 \times 16 \times 21} = 1$$

64. (4) $0.1 \times 0.01 \times 0.001 \times 10^7$

$= 10^{-6} \times 10^7 = 10$

65. (4) Expression

$$= \frac{3.20(3.25 - 3.05)}{0.064}$$

$$= \frac{3.20 \times 0.20}{0.064} = 10$$

66. (4) $\dfrac{0.01 - 0.0001}{0.0001} + 1 = \dfrac{0.0099}{0.0001} + 1$

$= 99 + 1 = 100$

67. (1) Expression

$= 0.5\ (5 + 0.25 + 4 + 0.75)$

$= 0.5 \times 10 = 5$

68. (4) Using Rule 1,

Expression

$$= \frac{20 \div 5}{9 + 3 \div 3} = \frac{4}{10} = \frac{2}{5}$$

69. (3) Expression

$$= \frac{(100-1)(100-2)(100-3)\ldots(100-100)\ldots(100-200)}{100 \times 99 \times 98 \times \ldots \times 3 \times 2 \times 1}$$

$= 0\ [\because 100 - 100 = 0]$

70. (1) $(0.9)^3 + (0.1)^3$

$= 0.729 + 0.001 = 0.73$

71. (4) Using Rule 4,

Let $0.0347 = a$

and, $0.9653 = b$

$$\therefore \text{ Expression} = \frac{a^3 + b^3}{a^2 - ab + b^2}$$

$$= \frac{(a+b)(a^2 - ab + b^2)}{a^2 - ab + b^2} = a + b$$

$= 0.0347 + 0.9653 = 1$

72. (4) Using Rule 5,

Expression

$$= \frac{(3.2)^3 - (0.2)^3}{(3.2)^2 + 3.2 \times 0.2 + (0.2)^2}$$

Let $3.2 = a$ and $0.2 = b$

$$\therefore \text{ Expression} = \frac{a^3 - b^3}{a^2 + ab + b^2}$$

$$= \frac{(a-b)(a^2 + ab + b^2)}{a^2 + ab + b^2} = a - b$$

$= 3.2 - 0.2 = 3$

73. (1) Using Rule 1,

$$\text{Expression} = \frac{\frac{1}{3} + \frac{1}{4}\left[\frac{4-5}{10}\right]}{\frac{3}{4} \times \frac{5}{3} - \frac{4}{5} \times \frac{3}{4}}$$

$$= \frac{\frac{1}{3} - \frac{1}{4} \times \frac{1}{10}}{\frac{5}{4} - \frac{3}{5}} = \frac{\frac{1}{3} - \frac{1}{40}}{\frac{5}{4} - \frac{3}{5}}$$

$$= \frac{\frac{40-3}{120}}{\frac{25-12}{20}} = \frac{37}{120} \times \frac{20}{13} = \frac{37}{78}$$

74. (2) Using Rule 1,

Expression

$$= \frac{0.04}{0.03} \times \frac{\left(\frac{10}{3} - \frac{5}{2}\right) \div \frac{5}{4} \times \frac{1}{2}}{\frac{1}{3} + \frac{1}{9} \times \frac{1}{5}}$$

$$= \frac{4}{3} \times \frac{\left(\frac{20-15}{6}\right) \div \frac{5}{8}}{\frac{1}{3} + \frac{1}{45}}$$

$$= \frac{4}{3} \times \frac{\frac{5}{6} \times \frac{8}{5}}{\frac{15+1}{45}} = \frac{4}{3} \times \frac{45}{16} \times \frac{4}{3} = 5$$

75. (3) Expression

$$= \frac{0.3555 \times 0.5555 \times 2.025}{0.225 \times 1.7775 \times 0.2222}$$

$$= \frac{3555 \times 5555 \times 2025}{225 \times 17775 \times 2222} = 4.5$$

76. (2) Using Rule 1,

$100 \times 10 - 100 + 2000 \div 100$

$= 100 \times 10 - 100 + 20$

$= 100\ (10 - 1) + 20$

$= 100 \times 9 + 20$

$= 900 + 20 = 920$

77. (4) $\dfrac{547.527}{0.0082} = x$

$$\Rightarrow \frac{5475270}{82} = x$$

$$\Rightarrow \frac{547527}{82} = \frac{x}{10}$$

78. (3) $\dfrac{1}{1 + 2^{a-b}} + \dfrac{1}{1 + 2^{b-a}}$

$$= \frac{1}{1 + \frac{2^a}{2^b}} + \frac{1}{1 + \frac{2^b}{2^a}}$$

$$= \frac{2^b}{2^b + 2^a} + \frac{2^a}{2^a + 2^b} = \frac{2^b + 2^a}{2^b + 2^a} = 1$$

79. (1) Using Rule 1,

Expression

$$= \frac{7}{2} - \left[\frac{9}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{3}{2} - \frac{1}{3} - \frac{1}{6}\right)\right\}\right]$$

$$= \frac{7}{2} - \left[\frac{9}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{9-2-1}{6}\right)\right\}\right]$$

$$= \frac{7}{2} - \left[\frac{9}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\right\}\right]$$

$$= \frac{7}{2} - \left[\frac{9}{4} \div \left\{\frac{5-2}{4}\right\}\right]$$

$$= \frac{7}{2} - \left[\frac{9}{4} \div \frac{3}{4}\right]$$

$$= \frac{7}{2} - \frac{9}{4} \times \frac{4}{3}$$

$$= \frac{7}{2} - 3 = \frac{7-6}{2} = \frac{1}{2}$$

80. (2) Using Rule 7,

Let $3\frac{3}{5} = a$ and $\frac{2}{5} = b$, then

Expression $= a^2 + 2ab + b^2$

$= (a + b)^2$

$$= \left(3\frac{3}{5} + \frac{2}{5}\right)^2 = (4)^2 = 16$$

81. (2)

$$\left(1 - \frac{1}{n+1}\right) + \left(1 - \frac{2}{n+1}\right) + \left(1 - \frac{3}{n+1}\right) + \ldots\ldots \left(1 - \frac{n}{n+1}\right)$$

$$= n - \left(\frac{1}{n+1} + \frac{2}{n+1} + \frac{3}{n+1} + \ldots + \frac{n}{n+1}\right)$$

$$= n - \frac{1 + 2 + 3 + \ldots\ldots + n}{n+1}$$

$$= n - \frac{n(n+1)}{2(n+1)} = n - \frac{n}{2} = \frac{n}{2} = \frac{1}{2}n$$

82. (1) Using Rule 1,
Expression

$$= \frac{16}{3} \div \frac{11}{9} \times \frac{1}{4}\left(10 + \frac{3}{\frac{5-1}{5}}\right)$$

$$= \frac{16}{3} \times \frac{9}{11} \times \frac{1}{4}\left(10 + \frac{15}{4}\right)$$

$$= \frac{16}{3} \times \frac{9}{11} \times \frac{1}{4}\left(\frac{40+15}{4}\right)$$

$$= \frac{16}{3} \times \frac{9}{11} \times \frac{1}{4} \times \frac{55}{4} = 15$$

83. (2) Using Rule 1,
$x[-2\{-4(-a)\}] + 5[-2\{-2(-a)\}] = 4a$
$\Rightarrow x \times (-8a) + 5 \times (-4a) = 4a$
$\Rightarrow x \times (-2) + 5 \times (-1) = 1$
$\Rightarrow 2x + 5 = -1$
$\Rightarrow 2x = -5 - 1 = -6$

$$\Rightarrow x = \frac{-6}{2} = -3$$

84. (*) Using Rule 1,
Expression

$$= 3 \div \left[(8-5) \div \left\{(4-2) + \left(2 + \frac{8}{13}\right)\right\}\right]$$

$$= 3 \div \left[3 \div \left\{2 + \frac{26+8}{13}\right\}\right]$$

$$= 3 \div \left[3 \div \left\{2 + \frac{34}{13}\right\}\right]$$

$$= 3 \div \left[3 \div \left\{\frac{26+34}{13}\right\}\right]$$

$$= 3 \div \left[3 \div \frac{60}{13}\right]$$

$$= 3 \div \left[\frac{3 \times 13}{60}\right]$$

$$= 3 \div \frac{13}{20} = 3 \times \frac{20}{13} = \frac{60}{13}$$

85. (4) Using Rule 1,
? = 9 + 3 ÷ 4 – 8 × 2
After respective substitutions,
? = 9 ÷ 3 × 4 + 8 – 2

$$= \frac{9}{3} \times 4 + 8 - 2$$

= 20 – 2 = 18

86. (1) Using Rule 1,
Expression

$$= \frac{4}{15} \text{ of } \frac{5}{8} \times 6 + 15 - 10$$

= 1 + 15 – 10 = 16 – 10 = 6

87. (4) Expression

$$= \frac{0.2 \times 0.02 \times 0.002 \times 32}{0.4 \times 0.04 \times 0.004 \times 16}$$

$$= \frac{32}{2 \times 2 \times 2 \times 16} = \frac{1}{4} = 0.25$$

88. (4) $a^2 + b^2 + c^2 - ab - bc - ac$

$$= \frac{1}{2}(2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ac)$$

$$= \frac{1}{2}[(a-b)^2 + (b-c)^2 + (c-a)^2]$$

$$= \frac{1}{2}[(113-115)^2 + (115-117)^2 + (117-113)^2]$$

Where, $a = 113$, $b = 115$, $c = 117$.

$$= \frac{1}{2}[(-2)^2 + (-2)^2 + 4^2]$$

$$= \frac{1}{2}(4 + 4 + 16)$$

$$= \frac{1}{2} \times 24 = 12$$

TYPE-III

1. (3) $\sqrt{1.3} + \sqrt{1300} + \sqrt{0.013}$

$$= \sqrt{\frac{130}{100}} + 10\sqrt{13} + \sqrt{\frac{130}{10000}}$$

$$= \frac{1}{10}\sqrt{130} + 10\sqrt{13} + \frac{1}{100}\sqrt{130}$$

$$= \frac{11.40}{10} + 3.605 \times 10 + \frac{11.40}{100}$$

= 1.140 + 36.05 + 0.1140
= 37.304

2. (3) $? = \frac{(2.644)^2 - (2.356)^2}{0.288}$

$$= \frac{(2.644 - 2.356)(2.644 + 2.356)}{0.288}$$

$$= \frac{0.288 \times 5}{0.288} = 5$$

Aliter :
Using Rule 8,

$$\frac{(2.644)^2 - (2.356)^2}{0.288}$$

$$= \frac{(2.644)^2 - (2.356)^2}{(2.644 - 2.356}$$

= (2. 644 + 2.356) = 5

3. (1)

$$? = \frac{(3.4567 + 3.4533)(3.4567 - 3.4533)}{0.0034}$$

$$= \frac{6.9100 \times 0.0034}{0.0034} = 6.91$$

Aliter :
Using Rule 8,

$$\frac{(3.4567 + 3.4533)(3.4567 - 3.4533)}{0.0034}$$

$$= \frac{3.4567^2 - 3.4533^2}{(3.4567 - 3.4533)}$$

= 3.4567 + 3.4533 = 6.91

4. (4) $\frac{(0.03)^2 - (0.01)^2}{0.03 - 0.01}$

[Using $a^2 - b^2 = (a + b)(a - b)$]

$$= \frac{(0.03 + 0.01)(0.03 - 0.01)}{0.03 - 0.01}$$

= 0.03 + 0.01 = 0.04

Aliter :
Using Rule 8,

$$\frac{(0.03)^2 - (0.01)^2}{0.03 - 0.01}$$

= (0.03 + 0.01 = 0.04

5. (4) $\left(\sqrt{72} - \sqrt{18}\right) \div \sqrt{12}$

$$= \frac{\sqrt{72} - \sqrt{18}}{\sqrt{12}}$$

$$= \frac{6\sqrt{2} - 3\sqrt{2}}{2\sqrt{3}} = \frac{3\sqrt{2}}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{6}}{2}$$

6. (3) $\frac{\sqrt{80} - \sqrt{112}}{\sqrt{45} - \sqrt{63}}$

$$= \frac{\sqrt{16 \times 5} - \sqrt{16 \times 7}}{\sqrt{9 \times 5} - \sqrt{9 \times 7}}$$

$$= \frac{4\sqrt{5} - 4\sqrt{7}}{3\sqrt{5} - 3\sqrt{7}} = \frac{4\left(\sqrt{5} - \sqrt{7}\right)}{3\left(\sqrt{5} - \sqrt{7}\right)}$$

$$= \frac{4}{3} = 1\frac{1}{3}$$

7. (2)

$$\sqrt{\frac{(0.1)^2+(0.01)^2+(0.009)^2}{(0.01)^2+(0.001)^2+(0.0009)^2}}$$

$$=\sqrt{\frac{0.01+0.0001+0.000081}{0.0001+0.000001+0.00000081}}$$

$$=\sqrt{\frac{0.010181}{0.00010181}}=\sqrt{100}=10$$

8. (2) Let $0.03 = x \Rightarrow 0.003 = \frac{x}{10}$

$0.21 = y \Rightarrow 0.021 = \frac{y}{10}$

and $0.065 = z \Rightarrow 0.0065 = \frac{z}{10}$

$\therefore$ Expression

$$=\sqrt{\frac{x^2+y^2+z^2}{\left(\frac{x}{10}\right)^2+\left(\frac{y}{10}\right)^2+\left(\frac{z}{10}\right)^2}}$$

$$=\sqrt{100\frac{\left(x^2+y^2+z^2\right)}{\left(x^2+y^2+z^2\right)}}$$

$$=\sqrt{100}=10$$

9. (2)

$\sqrt{0.01}+\sqrt{0.81}+\sqrt{1.21}+\sqrt{0.0009}$

$= 0.1 + 0.9 + 1.1 + 0.03$

$= 2.13$

10. (3) $\sqrt{\frac{(6.1)^2+(61.1)^2+(611.1)^2}{(0.61)^2+(6.11)^2+(61.11)^2}}$

$$=\sqrt{\frac{(10\times0.61)^2+(10\times6.11)^2+(10\times61.11)^2}{(0.61)^2+(6.11)^2+(61.11)^2}}$$

$$=\sqrt{100}=10$$

11. (4) $\sqrt{\frac{20.2\times4}{0.25\times20.2}}=\sqrt{\frac{4}{0.25}}$

$$=\sqrt{\frac{400}{25}}=\sqrt{16}=4$$

12. (2) Using Rule 4,

Let $0.051 = x$ and $0.041 = y$

$\therefore$ The given expression

$$=\frac{x^3+y^3}{x^2-xy+y^2}$$

$$=\frac{(x+y)\left(x^2-xy+y^2\right)}{x^2-xy+y^2}$$

$= x + y = 0.051 + 0.041$

$= 0.092$

13. (1) $\sqrt{5+\sqrt{11+\sqrt{19+\sqrt{29+7}}}}$

$$=\sqrt{5+\sqrt{11+\sqrt{19+6}}}$$

$$=\sqrt{5+\sqrt{11+\sqrt{25}}}$$

$$=\sqrt{5+\sqrt{11+5}}=\sqrt{5+4}$$

$$=\sqrt{9}=3$$

14. (4) $\frac{(75\cdot8)^2-(55\cdot8)^2}{20}$

$$=\frac{(75\cdot8-55\cdot8)(75\cdot8+55\cdot8)}{20}$$

$$=\frac{20\times131\cdot6}{20}=131\cdot6$$

Aliter :

Using Rule 8,

$$\frac{(75.8)^2-(55.8)^2}{(75.8-55.8)}$$

$= 75.8 + 55.8 = 131.6$

15. (4) Expression

$$=\sqrt{\frac{(0.25\times0.09)}{0.0009\times0.36}}$$

$$=\sqrt{\frac{\frac{25}{100}\times\frac{9}{100}}{\frac{9}{10000}\times\frac{36}{100}}}$$

$$=\sqrt{\frac{25\times9\times1000000}{9\times36\times10000}}$$

$$=\frac{5\times10}{6}=\frac{25}{3}=8\frac{1}{3}$$

16. (4) Using Rule 8,

Let $3.63 = a$ and $2.37 = b$

$\therefore$ Expression $=\frac{a^2-b^2}{a+b}$

$$=\frac{(a-b)(a+b)}{a+b}$$

$= a - b = 3.63 - 2.37 = 1.26$

17. (4) Expression

$$=\sqrt{\frac{0.081\times0.484}{0.0064\times6.25}}$$

$$=\sqrt{\frac{81\times484}{64\times625}}=\frac{9\times22}{8\times25}=0.99$$

18. (2) Expression

$= \sqrt{900}+\sqrt{0.09}-\sqrt{0.000009}$

$= 30 + 0.3 - 0.003$

$= 30.297$

19. (2) Expression

$$=\sqrt{\frac{0.009\times0.036\times0.016\times0.08}{0.002\times0.0008\times0.0002}}$$

$$=\sqrt{\frac{9\times36\times16\times8}{2\times8\times2}}$$

$= 3 \times 2 \times 3 \times 2 = 36$

20. (2) Expression

$$=\sqrt{\frac{5}{4}\times\frac{64}{125}\times1.44}$$

$$=\sqrt{\frac{16}{25}\times\frac{144}{100}}=\frac{4}{5}\times\frac{12}{10}=\frac{24}{25}$$

21. (1) Expression

$$=2\sqrt{54}-6\sqrt{\frac{2}{3}}-\sqrt{96}$$

$$=2\sqrt{9\times6}-\sqrt{\frac{2\times6\times6}{3}}-\sqrt{16\times6}$$

$$=2\times3\sqrt{6}-2\sqrt{6}-4\sqrt{6}=0$$

22. (4) $\frac{\sqrt{24}+\sqrt{216}}{\sqrt{96}}=\frac{2\sqrt{6}+6\sqrt{6}}{4\sqrt{6}}$

$$=\frac{8\sqrt{6}}{4\sqrt{6}}=2$$

23. (2) $\frac{4-\sqrt{0.04}}{4+\sqrt{0.4}}=\frac{4-0.2}{4+\sqrt{0.4}}$

$$=\frac{3.8}{4+0.632}=\frac{3.8}{4.632}=0.8$$

$= (a + b) = 0.08 + 0.02 = 0.1$

24. (4) $\frac{1}{3-\sqrt{8}}=\frac{3+\sqrt{8}}{\left(3-\sqrt{8}\right)\left(3+\sqrt{8}\right)}$

(Rationalising the denominator)

$$=\frac{3+\sqrt{8}}{9-8}=3+\sqrt{8}$$

$\therefore$ Expression

$= 3+\sqrt{8}+3+\sqrt{8}-6-4\sqrt{2}$

$= 6+2\sqrt{8}-6-4\sqrt{2}=2\sqrt{8}-4\sqrt{2}$

$= 2\times2\sqrt{2}-4\sqrt{2}=0$

25. (1) $\sqrt{0.09} = \sqrt{0.3 \times 0.3} = 0.3$

26. (3) Expression

$$= \frac{(0.75)^3 + (1-0.75)\left((0.75)^2 + 0.75 \times 1 + 1^2\right)}{1-0.075}$$

$$= \frac{(0.75)^3 + 1^3 - (0.75)^3}{0.25}$$

$$= \frac{1}{0.25} = \frac{100}{25} = 4$$

$\therefore$ Required square root

$= \sqrt{4} = 2$

27. (3) $? = \sqrt{\left(272^2 - 128^2\right)}$

$$= \sqrt{(272+128)(272-128)}$$

$$= \sqrt{400 \times 144} = 20 \times 12 = 240$$

28. (3) $\sqrt{0.000441}$

$= \sqrt{0.021 \times 0.021}$

$= 0.021$

29. (2) Expression $= \dfrac{\sqrt{0.441}}{\sqrt{0.625}}$

$$= \sqrt{\frac{0.441}{0.625}} = \sqrt{\frac{441}{625}}$$

$$= \frac{21}{25} = 0.84$$

30. (3) $\sqrt{\dfrac{0.342 \times 0.684}{0.000342 \times 0.000171}}$

$$= \sqrt{\frac{342 \times 684 \times 10^6}{342 \times 171}}$$

$$= \sqrt{4 \times 10^6} = 2 \times 10^3 = 2000$$

31. (1) $\sqrt{0.00060516} = 0.0246$

32. (3) $= \sqrt{\dfrac{9.5 \times 0.085}{0.017 \times 0.019}} = \sqrt{2500}$

$= 50$

33. (2) $\sqrt{248 + \sqrt{52 + \sqrt{144}}}$

$$= \sqrt{248 + \sqrt{52+12}}$$

$$= \sqrt{248 + \sqrt{64}} = \sqrt{248+8}$$

$\sqrt{256} = \pm 16$

34. (4) $\because (102)^2 = 10404$

$\Rightarrow \sqrt{10404} = 102$

$\sqrt{104.04} + \sqrt{1.0404} + \sqrt{0.010404}$

$= 10.2 + 1.02 + 0.102$

$= 11.322$

35. (2) $\sqrt{0.00004761} = \sqrt{\dfrac{4761}{10^8}}$

$$= \sqrt{\frac{3 \times 3 \times 23 \times 23}{10^4 \times 10^4}}$$

$$= \frac{69}{10^4} = 0.0069$$

36. (1) $\sqrt{2} = 1.414$ (Given)

Now,

$$\frac{\sqrt{2}-1}{\sqrt{2}+1} = \frac{\left(\sqrt{2}-1\right)\left(\sqrt{2}-1\right)}{\left(\sqrt{2}+1\right)\left(\sqrt{2}-1\right)}$$

$$= \frac{\left(\sqrt{2}-1\right)^2}{2-1} = \left(\sqrt{2}-1\right)^2$$

$= 2 + 1 - 2\sqrt{2}$

$= 3 - 2\sqrt{2}$

$= 3 - 2 \times 1.44$

$= 3 - 2.828$

$= 0.172$

37. (2) $\sqrt{\dfrac{0.00001225}{0.00005329}}$

$$= \sqrt{\frac{\frac{1225}{10^8}}{\frac{5329}{10^8}}} = \sqrt{\frac{1225}{5329}} = \frac{35}{73}$$

38. (2) $0.\overline{4} = \dfrac{4}{9}$

$$\therefore \sqrt{\frac{4}{9}} = \frac{2}{3} = \frac{2 \times 3}{3 \times 3} = \frac{6}{9} = 0.\overline{6}$$

39. (2) Given expression

$$= \frac{\left(3\frac{1}{4}\right)^4 - \left(4\frac{1}{3}\right)^4}{\left(3\frac{1}{4}\right)^2 - \left(4\frac{1}{3}\right)^2}$$

$$= \frac{\left[\left(3\frac{1}{4}\right)^2 + \left(4\frac{1}{3}\right)^2\right]\left[\left(3\frac{1}{4}\right)^2 - \left(4\frac{1}{3}\right)^2\right]}{\left(3\frac{1}{4}\right)^2 - \left(4\frac{1}{3}\right)^2}$$

$$\left[\because a^2 - b^2 = (a+b)(a-b)\right]$$

$$= \left(3\frac{1}{4}\right)^2 + \left(4\frac{1}{3}\right)^2 = \left(\frac{13}{4}\right)^2 + \left(\frac{13}{3}\right)^2$$

$$= \frac{169}{16} + \frac{169}{9} = 169\left(\frac{1}{16} + \frac{1}{9}\right)$$

$$= 169\left(\frac{9+16}{144}\right) = \frac{169 \times 25}{144}$$

$\therefore$ Required answer

$$= \sqrt{\frac{169 \times 25}{144}} = \frac{13 \times 5}{12} = \frac{65}{12} = 5\frac{5}{12}$$

40. (2) Expression $= 0.6 \times 0.6 \times 0.6 + 0.4 \times 0.4 \times 0.4 + 3 \times 0.6 \times 0.4 (0.6 + 0.4) = (0.6+0.4)^3 = 1$

$\therefore$ Required square root $= 1$

41. (2) $\sqrt{\dfrac{0.49}{0.25}} + \sqrt{\dfrac{0.81}{0.36}}$

$$= \frac{0.7}{0.5} + \frac{0.9}{0.6} = \frac{42+45}{30} = \frac{87}{30}$$

$$= \frac{29}{10} = 2\frac{9}{10}$$

42. (4) $\sqrt{x} \div \sqrt{441} = 0.02$

$\Rightarrow \sqrt{x} = 0.02 \times 21$

$\Rightarrow x = 0.1764$

43. (3) $? = \sqrt{4 + \sqrt{44 + 100}}$

$$= \sqrt{4 + \sqrt{144}} = \sqrt{4+12} = 4$$

44. (4) $\sqrt{0.00005746} = \sqrt{5746 \times 10^{-8}}$

$= 75.8 \times 10^{-4} = 0.00758$

45. (2)

$$\sqrt{(0.798)^2 + 0.404 \times 0.798 + (0.202)^2} + 1$$

$$= \sqrt{(0.798)^2 + 2 \times 0.798 \times 0.202 + (0.202)^2} + 1$$

$$= \sqrt{(0.798 + 0.202)^2} + 1$$

$$= \sqrt{(1.000)^2} + 1 = 1 + 1 = 2$$

46. (3) $\sqrt{11.981 + 7\sqrt{1.2996}}$

$$= \sqrt{11.981 + 7 \times 1.14}$$

$$= \sqrt{11.981 + 7.98}$$

$$= \sqrt{19.961}$$

$= 4.467 \approx 4.5$

47. (3) Expression

$= 4\sqrt{2} - 8\sqrt{2} + 5\sqrt{2}$

$= \sqrt{2}(4 - 8 + 5) = \sqrt{2}$

$= 1.414$

48. (4)

$$(7 + 3\sqrt{5})(7 - 3\sqrt{5}) = (7)^2 - (3\sqrt{5})^2$$

$= 49 - 45 = 4$

$\therefore$ Required square root

$= \sqrt{4} = 2$

49. (3) Expression

$= \sqrt{400} + \sqrt{0.0400} + \sqrt{0.000004}$
$= 20 + 0.2 + 0.002$
$= 20.202$

50. (3) Expression

$= \sqrt{192} - \frac{1}{2}\sqrt{48} - \sqrt{75}$

$= \sqrt{64 \times 3} - \frac{1}{2}\sqrt{16 \times 3} - \sqrt{25 \times 3}$

$= 8\sqrt{3} - \frac{1}{2} \times 4\sqrt{3} - 5\sqrt{3}$

$= 8\sqrt{3} - 2\sqrt{3} - 5\sqrt{3}$

$= \sqrt{3} = 1.7321$

51. (3) $\sqrt{\frac{48.4}{0.289}} = \sqrt{\frac{484}{2.89}}$

$= \frac{22}{1.7} = \frac{220}{17} = 12\frac{16}{17}$

52. (2) $10^2 + 11^2 + 12^2$
$= 100 + 121 + 144 = 365$
$\therefore$ Required sum = 10+11+12= 33

53. (3) $\sqrt{4096} = 64$

$\therefore \sqrt{40.96} = 6.4$ and

$\sqrt{0.4096} = 0.64$ etc.

$\therefore$ Expression
$= 6.4 + 0.64 + 0.064 + 0.0064$
$= 7.1104$

54. (2) $\sqrt{13} = 3.6$ and $\sqrt{130} = 11.4$

$\therefore \sqrt{1.3} + \sqrt{1300} + \sqrt{0.013}$

$= \sqrt{\frac{130}{100}} + \sqrt{13 \times 100} + \sqrt{\frac{130}{10000}}$

$= \frac{11.4}{10} + 3.6 \times 10 + \frac{11.4}{100}$
$= 1.14 + 36 + 0.114$
$= 37.254$

55. (1) Expression

$= \sqrt{5 + \sqrt{11 + \sqrt{19 + \sqrt{29 + 7}}}}$

$= \sqrt{5 + \sqrt{11 + \sqrt{19 + 6}}}$

$= \sqrt{5 + \sqrt{11 + 5}}$

$= \sqrt{5 + 4} = \sqrt{9} = 3$

56. (4) $\sqrt{110\frac{1}{4}} = \sqrt{\frac{441}{4}} = \sqrt{\frac{21 \times 21}{2 \times 2}}$

$= \frac{21}{2} = 10\frac{1}{2} = 10.5$

57. (1) Expression

$= \sqrt{8 + \sqrt{57 + \sqrt{38 + \sqrt{108 + \sqrt{169}}}}}$

$= \sqrt{8 + \sqrt{57 + \sqrt{38 + \sqrt{108 + 13}}}}$

$= \sqrt{8 + \sqrt{57 + \sqrt{38 + \sqrt{121}}}}$

$= \sqrt{8 + \sqrt{57 + \sqrt{38 + 11}}}$

$= \sqrt{8 + \sqrt{57 + \sqrt{49}}}$

$= \sqrt{8 + \sqrt{57 + 7}} = \sqrt{8 + \sqrt{64}}$

$= \sqrt{8 + 8} = \sqrt{16} = 4$

58. (3) $(10.15)^2 = 103.0225$
$\Rightarrow (1.015)^2 = 1.030225$
and $(101.5)^2 = 10302.25$

$\therefore \sqrt{1.030225} + \sqrt{10302.25}$

$= \sqrt{(1.015)^2} + \sqrt{(101.5)^2}$

$= 1.015 + 101.5$
$= 102.515$

59. (3) The number of digits in 625686734489 is 12.

$\therefore$ Number of digits in its square root = 6

i.e., $\sqrt{625686734489} = 791003.625$

60. (2) $\sqrt{841} = 29$

$\frac{\sqrt{841}}{10000} = \frac{29}{10000}$

$\Rightarrow \frac{\sqrt{841}}{100000000} = \frac{29}{10000}$

$\therefore \sqrt{0.00000841} = 0.0029$

61. (3) Expression

$= \sqrt{\frac{0.324 \times 0.081 \times 4.624}{1.5625 \times 0.0289 \times 72.9 \times 64}}$

$= \sqrt{\frac{324 \times 81 \times 4624}{15625 \times 289 \times 729 \times 64}}$

$= \frac{18 \times 9 \times 68}{125 \times 17 \times 27 \times 8} = 0.024$

62. (3) $\sqrt{0.25 \times 2.25} = 0.5 \times 1.5$
$= 0.75$

63. (2) $\sqrt{64} - \sqrt{36} = 8 - 6 = 2$

64. (2) $\sqrt{18225} = 135$

$\therefore \sqrt{182.25} = 13.5;$

$\sqrt{1.8225} = 1.35;$

$\sqrt{0.018225} = 0.135$

$\therefore$ Expression
$= 135 + 13.5 + 1.35 + 0.135$
$= 149.985$

65. (2) $21\frac{51}{169} = \frac{21 \times 169 + 51}{169}$

$= \frac{3600}{169}$

$\therefore \sqrt{21\frac{51}{169}} = \sqrt{\frac{3600}{169}} = \frac{60}{13} = 4\frac{8}{13}$

66. (2) $(1101)^2 = 1212201$

$\Rightarrow 1101 = \sqrt{1212201}$

$= \sqrt{121.2201}$

$\Rightarrow \sqrt{\frac{121.2201}{10000}} = \frac{1101}{100} = 11.01$

67. (1) Expression

$= \sqrt{\frac{0.064 \times 0.256 \times 15.625}{0.025 \times 0.625 \times 4.096}}$

$= \sqrt{\frac{64 \times 256 \times 15625}{25 \times 625 \times 4096}}$

$= \frac{8 \times 16 \times 125}{5 \times 25 \times 64} = 2$

68. (3)

$\sqrt{19.36} + \sqrt{0.1936} + \sqrt{0.001936}$

$+ \sqrt{0.00001936}$
$= 4.4 + 0.44 + 0.044 + 0.0044$
$= 4.8884$

69. (2) Let the numbers be x and y where $x > y$

$\therefore x^2 - y^2 = 45$
$\Rightarrow (x + y)(x - y) = 45$
Now, $45 = 5 \times 9$
$= 15 \times 3 = 45 \times 1$
$\therefore$ Number of pairs = 3

70. (3) Expression $= \frac{\sqrt{24} + \sqrt{216}}{\sqrt{96}}$

$= \frac{2\sqrt{6} + 6\sqrt{6}}{4\sqrt{6}} = \frac{8\sqrt{6}}{4\sqrt{6}} = 2$

71. (4) Expression

$$= \sqrt{3\frac{33}{64}} \div \sqrt{9\frac{1}{7}} \times 2\sqrt{3\frac{1}{9}}$$

$$= \sqrt{\frac{225}{64}} \div \sqrt{\frac{64}{7}} \times 2\sqrt{\frac{28}{9}}$$

$$= \sqrt{\frac{225}{64} \times \frac{7}{64} \times \frac{28}{9}} \times 2$$

$$= \frac{5 \times 7}{8 \times 4} \times 2 = \frac{35}{16} = 2\frac{3}{16}$$

72. (2) Expression

$$= \frac{\sqrt{32} + \sqrt{48}}{\sqrt{8} + \sqrt{12}}$$

$$= \frac{4\sqrt{2} + 4\sqrt{3}}{2\sqrt{2} + 2\sqrt{3}} = \frac{4\left(\sqrt{2} + \sqrt{3}\right)}{2\left(\sqrt{2} + \sqrt{3}\right)} = 2$$

73. (1) Number of digits in 62478078 = 8

∴ Number of digits in its square root = 4

$\Rightarrow \sqrt{62478078} \approx 7904$

$\Rightarrow \sqrt{62473216} = 7904$

74. (4) For $n^r - tn + \frac{1}{4}$ to be a perfect square,

$r = 2$ and $t = \pm 1$

$$\left[n^2 - n + \frac{1}{4} = n^2 - 2.n.\frac{1}{2} + \frac{1}{4}\right.$$

$$\left. = \left(n - \frac{1}{2}\right)^2\right]$$

$$n^2 + n + \frac{1}{4} = n^2 + 2.n.\frac{1}{2} + \frac{1}{4}$$

$$= \left(n + \frac{1}{2}\right)^2$$

75. (4) $33 - 4\sqrt{35}$

$= 33 - 2 \times 2\sqrt{5 \times 7}$

$= 33 - 2 \times 2\sqrt{7} \times \sqrt{5}$

$= 28 + 5 - 2 \times 2\sqrt{7} \times \sqrt{5}$

$= \left(2\sqrt{7}\right)^2 + \left(\sqrt{5}\right)^2 - 2 \times 2\sqrt{7} \times \sqrt{5}$

$= \left(2\sqrt{7} - \sqrt{5}\right)^2$

$\therefore \sqrt{33 - 4\sqrt{35}}$

$= \sqrt{\left(2\sqrt{7} - \sqrt{5}\right)^2}$

$= \pm\left(2\sqrt{7} - \sqrt{5}\right)$

76. (3) Expression

$= \sqrt{156.25} + \sqrt{0.0081} - \sqrt{0.0361}$

$= 12.5 + 0.09 - 0.19 = 12.4$

77. (4) $\sqrt{24010000} = 4900$

Again, $\sqrt{4900} = 70$

$\therefore \sqrt[4]{24010000} = 70$

78. (2) $\sqrt{15876} = 126$

The digit at the unit's place is 6.

```
  1 | 1 58 76 | 126
  1 | 1
 22 | 58
  2 | 44
246 | 1476
  6 | 1476
252 |   ×
```

79. (1) Unit's digit in $(1570)^2 = 0$

Unit's digit in $(1571)^2 = 1$

Unit's digit in $(1572)^2 = 4$

Unit's digit in $(1573)^2 = 9$

∴ Required unit's digit

= Unit's digit in (0 +1 + 4 + 9) = 4

80. (3) The smallest 4-digit number = 1000

The smallest 4 digit perfect square number = $2^{10} = 1024$

81. (1)

```
   8 | 68 06 21 | 824
   8 | 64
 162 |  406
   2 |  324
1644 |   8221
     |   6576
     |   1645
```

$\therefore (824)^2 < 680621 < (825)^2$

∴ Required number

$= [(825)^2 - 680621] = 4$

82. (4) $392 = 2 \times 2 \times 2 \times 7 \times 7$

$= 2^2 \times 7^2 \times 2$

Clearly, when 392 is multiplied by 2, the product is a perfect square.

83. (3) $47 \times 47 = 2209$

Clearly, 6 should be added to 2203 to get a perfect square.

84. (4) Perfect square numbers between 50 and 1000 start from 64 to 961 i.e., $(8)^2$ to $(31)^2$

∴ The required number

$= (31 - 8) + 1 = 24$

85. (2)

```
  9 | 89  58 | 94
  9 | 81
184 | × 858
  4 |   736
188 |   122
```

Now, $95 \times 95 = 9025$

∴ Required number

$= 9025 - 8958 = 67$

86. (3) Largest 5-digit number = 99999

Now,

```
  3 | 9 99 99 | 316
  3 | 9
 61 | × 99
  1 |   62
626 |  3799
  6 |  3756
632 |    × 43
```

∴ Required number

= 99999 – 43 = 99856

87. (3) $11^2 = 121$, $12^2 = 144$, $13^2 = 169$, $14^2 = 196$, $15^2 = 225$, $16^2 = 256$, $17^2 = 289$

So, total perfect squares = 7

88. (3) $31^2 = 961$

$32^2 = 1024$

∴ Required number

= 1000 – 961 = 39

89. (3) $(31)^2 < 1000 < 32^2$

$32 \times 32 = 1024$

∴ Required number

= 1024 – 1000 = 24

90. (3) $99 \times 99 = 9801$

91. (1) $a^2 - 2ab + b^2 = (a - b)^2$

$\therefore 16a^2 - 12a$

$= (4a)^2 - 2 \times 4a \times \frac{3}{2}$

Hence, on adding $\left(\frac{3}{2}\right)^2 = \frac{9}{4}$, expression will be a perfect square.

92. (3) $p = q + 5$

$\Rightarrow p - q = 5$

$p^2 + q^2 = 55$

$\therefore (p - q)^2 + 2pq = 55$

$\Rightarrow 25 + 2\,pq = 55$

$\Rightarrow 2\,pq = 30$

$\Rightarrow pq = 15$

93. (3) Since the numbers between –10 and 10 will be single digit and the numbers below 100 will be either one digit or two digit. We know that the square root of one or two digit number is always single digit number. Therefore, required answer is option (3).

94. (1) Let the two numbers be A and B.
Then, A + B = 22
and $A^2 + B^2 = 404$
We know that
$(A + B)^2 = A^2 + B^2 + 2AB$
or $(22)^2 = 404 + 2AB$
or 484 = 404 + 2 AB
or 2AB = 80
or AB = 40
∴ The product of the two numbers = 40

95. (4) According to question,

$$\frac{1}{3} \times \sqrt{x} = 0.001$$

$$\Rightarrow \sqrt{x} = 0.003 \Rightarrow x = 0.000009$$

96. (3) Let the number be x
According to the question

$$\frac{3}{5} \text{ of } x^2 = 126.15$$

$$\Rightarrow x^2 = \frac{126.15 \times 5}{3}$$

$$\Rightarrow x^2 = 210.25$$

$$\therefore x = \sqrt{210.25} = 14.5$$

97. (1) Multiples of 11 whose square root are whole number
First = 11 × 11 = 121
Second = 11 × 11 × 4 = 484

98. (3) Let the number be x. Then,
$x^2 = (75.15)^2 - (60.12)^2$
$= (75.15 + 60.12)(75.15 - 60.12)$
$= 135.27 \times 15.03$
$= 2033.1081$

$$\Rightarrow x = \sqrt{2033.1081}$$

$= 45.09$

99. (2) Let the required number be x. Then,
$x^2 + 5^2 = 386$
$\Rightarrow x^2 = 386 - 25$
$\Rightarrow x^2 = 361$

$$\Rightarrow x = \sqrt{361} = 19$$

100. (1) Let the required number be x.
As per given information,
$x^2 = (975)^2 - (585)^2$
$\Rightarrow x^2 = (975 + 585)(975 - 585)$
$\Rightarrow x^2 = 1560 \times 390$

$$\Rightarrow x = \sqrt{1560 \times 390}$$

$$= \sqrt{13 \times 12 \times 3 \times 13 \times 10 \times 10}$$

$= 780$

101. (4) Let $x + y = 20$ and
$x - y = 8$
$\therefore (x + y)(x - y) = 20 \times 8$
$\Rightarrow x^2 - y^2 = 160$

102. (3) Let the numbers be x and y. Then,
$x^2 + y^2 = 100$ ...(i)
$x^2 - y^2 = 28$ ...(ii)
On adding,
$2x^2 = 128$
$\Rightarrow x^2 = 64 \Rightarrow x = 8$
From equation (i),
$64 + y^2 = 100$
$\Rightarrow y^2 = 36 \Rightarrow y = 6$
∴ Required sum
$= 8 + 6 = 14$

103. (3) Check through options
When $x = 9$,
$2x - 3 = 2 \times 9 - 3 = 15 < 17$

104. (4) $1 \times 2 \times 3 \times 4 = 24$
$\Rightarrow 24 + 1 = 25 = 5^2$;
$2 \times 3 \times 4 \times 5 = 120$
$\Rightarrow 120 + 1 = 121 = 11^2$
$\therefore P = 1$

105. (3) Expression

$$= \sqrt{\frac{8}{3}} = \sqrt{\frac{8 \times 3}{3 \times 3}} = \frac{\sqrt{24}}{3}$$

$$= \frac{4.898}{3} = 1.6326 \approx 1.633$$

106. (2) Let the number of boys and girls in the room be x and y respectively.
According to the question,
$x^2 = y^2 + 28$
$\Rightarrow x^2 - y^2 = 28$ .....(i)
and $x = y + 2$
$\Rightarrow x - y = 2$ .....(ii)
On dividing equation (i) by equation (ii), we have

$$\frac{x^2 - y^2}{x - y} = \frac{28}{2}$$

$$\Rightarrow \frac{(x+y)(x-y)}{x-y} = 14$$

$\Rightarrow x + y = 14$
∴ Total number of boys and girls = 14

107. (4) From the given alternatives,
$5^2 + 6^2 + 7^2 = 110$
∴ The smallest number = 5

108. (3) 37 is a prime number.
∴ 37 = 1 × 37
∴ Required answer

$$= \sqrt{37 - 1} = \sqrt{36} = 6$$

109. (3) According to the question,
$= 68^2 - 32^2 = (68 + 32)(68 - 32)$
$= 100 \times 36$
$= 3600 = (60)^2$

110. (3) $x^2 + x = 2450$
$\Rightarrow x(x + 1) = 2450 = 49 \times 50$
$\therefore x = 49$

111. (4) Let the numbers be x and y and $x > y$.
$\therefore xy = 45$
and $x - y = 4$
$\therefore x^2 + y^2 = (x - y)^2 + 2xy$
$= (4)^2 + 2 \times 45 = 16 + 90$
$= 106$

112. (4) $1008 = 4 \times 4 \times 3 \times 3 \times 7$

$$\therefore \frac{1008}{7} = (4 \times 3)^2 = (12)^2$$

113. (1) Obviously, 16 must be subtracted to make the result a perfect square.

i.e. $63520 - 16 = \sqrt{63504} = 252$

114. (2) The given number has 6 decimal places.

Now,

1	326	18
1	1	
28	226	
8	224	
36	2	

i.e. 326 – 2 = 324 Which is a perfect square of 18.
Therefore, 0.000002 should be subtracted from 0.000326 to make it a perfect square of 0.018.

115. (4) $5808 = 2 \times 2 \times 2 \times 2 \times 3 \times 11 \times 11 = 2^2 \times 2^2 \times 11^2 \times 3$
Therefore, when 5808 is multiplied by 3, then it will be perfect square number.

116. (4)

2	20184
2	10092
2	5046
3	2523
29	841
	29

$\therefore 20184 = 2 \times 2 \times 2 \times 3 \times 29 \times 29 \times = 2^2 \times 29^2 \times 2 \times 3$.
∴ Required number
$= 2 \times 3 = 6$

117. (1) $41 \times 41 = 1681$
$42 \times 42 = 1764$
$\therefore$ Required answer
$= 1764 - 1728 = 36$

118. (1) $a = 64$ and $b = 289$

$\therefore \sqrt{a} = \sqrt{64} = 8$ and

$\sqrt{b} = \sqrt{289} = 17$

$$\therefore \left(\sqrt{\sqrt{a}+\sqrt{b}} - \sqrt{\sqrt{b}-\sqrt{a}}\right)^{\frac{1}{2}}$$

$$= \left(\sqrt{8+17} - \sqrt{17-8}\right)^{\frac{1}{2}}$$

$$= \left(\sqrt{25} - \sqrt{9}\right)^{\frac{1}{2}}$$

$$= (5-3)^{\frac{1}{2}} = (2)^{\frac{1}{2}}$$

119. (3)

2	$6\ \overline{40}\,\overline{09}$	253
2	4	
45	240	
5	225	
503	1509	
3	1509	
506	×	

$\therefore \sqrt{64009} = 253$

120. (2) Let the number of days of tour be x.
$\therefore$ Total expenditure $= x^2$
$\therefore x^2 = 361 \Rightarrow x = \sqrt{361} = 19$

121. (2) Expression $= \sqrt{10^{-6} \times 0.25}$

$$= \sqrt{\frac{0.25}{10^6}} = \sqrt{\frac{25}{10^6 \times 10^2}}$$

$$= \sqrt{\frac{25}{10^8}} = \frac{5}{10^4} = 0.0005$$

122. (4) $\dfrac{3\sqrt{2}}{\sqrt{6}+\sqrt{3}}$

$$= \frac{3\sqrt{2}(\sqrt{6}-\sqrt{3})}{(\sqrt{6}+\sqrt{3})(\sqrt{6}-\sqrt{3})}$$

$$= \frac{3\sqrt{2}(\sqrt{6}-\sqrt{3})}{6-3}$$

$$= \sqrt{2}\left(\sqrt{6}-\sqrt{3}\right) = \sqrt{12} - \sqrt{6}$$

$$= 2\sqrt{3} - \sqrt{6}$$

$$\frac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}}$$

$$= \frac{4\sqrt{3}(\sqrt{6}-\sqrt{2})}{(\sqrt{6}+\sqrt{2})(\sqrt{6}-\sqrt{2})}$$

$$= \frac{4\sqrt{3}(\sqrt{6}-\sqrt{2})}{6-2}$$

$$= \sqrt{3}\left(\sqrt{6}-\sqrt{2}\right) = \sqrt{18} - \sqrt{6}$$

$$= 3\sqrt{2} - \sqrt{6}$$

$$\frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}}$$

$$= \frac{\sqrt{6}\left(\sqrt{3}-\sqrt{2}\right)}{\left(\sqrt{3}+\sqrt{2}\right)\left(\sqrt{3}-\sqrt{2}\right)}$$

$$= \frac{\sqrt{18}-\sqrt{12}}{3-2}$$

$$= 3\sqrt{2} - 2\sqrt{3}$$

$\therefore$ Expression

$$= 2\sqrt{3} - \sqrt{6} - \left(3\sqrt{2}-\sqrt{6}\right) + 3\sqrt{2} - 2\sqrt{3}$$

$$= 2\sqrt{3} - \sqrt{6} - 3\sqrt{2} + \sqrt{6} + 3\sqrt{2} - 2\sqrt{3} = 0$$

123. (2) Expression $= \dfrac{4-\sqrt{0.04}}{4+\sqrt{0.4}}$

$$= \frac{4-0.2}{4+0.6}$$

$$= \frac{3.8}{4.6} = \frac{38}{46} = \frac{19}{23}$$

$\approx 0.83 \approx 0.8$

124. (2) $\sqrt{0.05 \times 0.5 \times a}$

$= 0.5 \times 0.05 \times \sqrt{b}$

On squaring both sides,
$0.05 \times 0.5 \times a = 0.5 \times 0.5 \times 0.05 \times 0.05 \times b$
$\Rightarrow a = 0.5 \times 0.05b$

$$\Rightarrow \frac{a}{b} = 0.5 \times 0.05 = 0.025$$

125. (1) Number of students in the last row $= \sqrt{1369} = 37$

Illustration :

3	$\overline{13}\ \overline{69}$	37
3	9	
67	469	
7	469	
74	×	

126. (1) $\sqrt{5} = 2.24$

$\sqrt{3} = 1.73$

$\sqrt{6} = 2.45$

$\sqrt{2} = 1.41$

$\therefore \sqrt{5} + \sqrt{3} = 2.24 + 1.73$
$= 3.97$

$\sqrt{6} + \sqrt{2} = 2.45 + 1.41 = 3.86$

Clearly, $3.97 > 3.86$

127. (4)

2	20184
2	10092
2	5046
3	2523
29	841
	29

$\therefore 20184 = 2 \times 2 \times 2 \times 3 \times 29 \times 29$
$= 2^2 \times 29^2 \times 2 \times 3$
$\therefore$ For making it a perfect square, 20184 should be multiplied by $2 \times 3 = 6$
$20184 \times 6 = 121104$;

$\sqrt{121104} = 348$

128. (4)

2	1008
2	504
2	252
2	126
3	63
3	21
	7

$\therefore 1008$
$= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7$

$= 2^2 \times 2^2 \times 3^2 \times 7$

$\therefore$ Required answer $= 7$

129. (3) Let the numbers be x and y where $x > y$.
According to the question,
$x + y = 37$
and
$x^2 - y^2 = 185$
$\Rightarrow (x + y)(x - y) = 185$
$\Rightarrow 37(x - y) = 185$

$$\Rightarrow x - y = \frac{185}{37} = 5$$

130. (1)

1	$36\overline{56}\overline{62}$ | 191
1	1
29	265
9	261
381	462
1	381
	81

$\therefore$ Number of armies left = 81

131. (3) $\dfrac{2+\sqrt{3}}{2} = \dfrac{2(2+\sqrt{3})}{4}$

$$= \frac{4+2\sqrt{3}}{4} = \frac{3+1+2\sqrt{3}}{4}$$

$$= \frac{\left(\sqrt{3}\right)^2 + (1)^2 + 2\times\sqrt{3}\times 1}{4}$$

$$= \left(\frac{\sqrt{3}+1}{2}\right)^2$$

$$\therefore \sqrt{\frac{2+\sqrt{3}}{2}} = \pm\frac{\sqrt{3}+1}{2}$$

132. (3) $11^2 = 121$
$111^2 = 12321$
$1111^2 = 1234321$
$11111^2 = 123454321$

133. (4)

5	59535
3	11907
3	3969
3	1323
3	441
3	147
7	49
	7

$\therefore 59535 = 3\times3\times3\times3\times7^2\times3\times5$
$= 3^2\times3^2\times7^2\times3\times5$
$\therefore$ According to the question,
$x = 3\times5 = 15$
$\therefore$ Sum of digits = 1 + 5 = 6

134. (2)

2	$\overline{6}\ \overline{60}\ \overline{49}$	257
2	4	
45	260	
5	225	
507	3549	
7	3549	
514	×	

$\therefore \sqrt{66049} = 257$
$\therefore$ Unit place digit = 7

135. (4) $\sqrt{0.000441} = \sqrt{\dfrac{441}{1000000}}$

$$= \frac{21}{1000} = 0.021$$

136. (1) Required sum = 121 + 144 + 169 + 196 + 225 + 256 + 289 = 1400

137. (2) $\sqrt{32146} > 179$
$179 \times 179 = 32041$
$\therefore$ Required answer
$= 32146 - 32041 = 105$

138. (1)

7	$\overline{54}\overline{16}\ *\ \overline{6}$ | 736
7	49
143	516
3	429
1466	87*6

$\because 1466 \times 6 = 8796$
$\therefore * = 9$

139. (2) Number of boys = $\sqrt{12544}$
= 112
Illustration :

1	$1\overline{25}\overline{44}$	112
1	1	
21	× 25	
1	21	
222	444	
2	444	
224	×	

140. (2) Let three positive integers be x, y and z.
According to the question,
$x + y + z = 18$ ..... (i)
$xyz = 162$ ..... (ii)
and $x + y = z$ ..... (iii)
From equation (i),
$z + z = 18 \Rightarrow 2z = 18 \Rightarrow z = 9$
$\therefore xyz = 162$
$\Rightarrow xy \times 9 = 162$

$$\Rightarrow xy = \frac{162}{9} = 18 \quad \text{..... (iv)}$$

$\therefore (x - y)^2 = (x + y)^2 - 4xy$
$= (9)^2 - 4 \times 18$
$= 81 - 72 = 9$
$\therefore x - y = 3$
$\therefore x + y + x - y = 9 + 3$
$\Rightarrow 2x = 12 \Rightarrow x = 6$
$\therefore x + y + z = 18$
$\Rightarrow 6 + y + 9 = 18$
$\Rightarrow y = 18 - 15 = 3$
$\therefore x^2 + y^2 + z^2$
$= (6)^2 + (3)^2 + (9)^2$
$= 36 + 9 + 81 = 126$

141. (3) $x + y + z = 50$; $xyz = 3750$

$$\therefore \frac{1}{x}+\frac{1}{y}+\frac{1}{z} = \frac{yz+zx+xy}{xyz}$$

$$= \frac{31}{150}$$

$$\Rightarrow xy + yz + zx = \frac{31}{150}xyz$$

$$= \frac{31}{150}\times 3750 = 775$$

$\therefore (x+y+z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$
$\Rightarrow (50)^2 = x^2 + y^2 + z^2 + 2 \times 775$
$\Rightarrow 2500 = x^2 + y^2 + z^2 + 1550$
$\Rightarrow x^2 + y^2 + z^2 = 2500 - 1550$
$= 950$

142. (2) Largest 6-digit number
= 999999

9	$\overline{99}\overline{99}\overline{99}$	999
9	81	
189	1899	
9	1701	
1989	19899	
9	17901	
1998	1998	

$\therefore$ Required perfect square number = 999999 − 1998
= 998001

143. (3) Remainder on dividing $3^2 = 9$ by 6 = 3
Remainder on dividing $4^2 = 16$ by 6 = 4
Remainder on dividing $5^2 = 25$ by 6 = 1

144. (3)

1	18265	135
1	1	
23	× 82	
3	69	
265	1365	
5	1325	
	40	

$\therefore$ Required answer = 40

145. (3) Let the two real numbers be x and y.
According to the question,
$x^2 + y^2 = 41$
$x + y = 9$
$\therefore (x + y)^2 = x^2 + y^2 + 2xy$
$\Rightarrow 81 = 41 + 2xy$
$\Rightarrow 2xy = 81 - 41 = 40$
$\Rightarrow xy = \frac{40}{2} = 20$
$\therefore x^3 + y^3 = (x + y)^3 - 3xy(x + y)$
$= (9)^3 - 3 \times 20 (9)$
$= 729 - 540 = 189$

146. (1) Let the smaller number be x.
$\therefore$ Larger number = $2x$
According to the question,
$2x^2 = 2048$
$\Rightarrow x^2 = \frac{2048}{2} = 1024$
$\therefore x = \sqrt{1024} = 32$

147. (4) Let the number (n) be 6m + 3 where m = quotient.
On squaring both sides,
$n^2 = (6m + 3)^2$
$= 36 m^2 + 36 m + 3^2$
$\therefore$ Required remainder = 3^2
$\therefore$ Remainder on dividing 9 by 6 = 3

148. (4) Number of members in the club = x (let)
According to the question,
$x^2 + \frac{x^2}{100} = 2525$
$\Rightarrow \frac{100x^2 + x^2}{100} = 2525$
$\Rightarrow 101x^2 = 252500$
$\Rightarrow x^2 = \frac{252500}{101} = 2500$
$\Rightarrow x = \sqrt{2500} = 50$

149. (1) Let the positive numbers be x, y and z (respectively).
$\therefore x^2 + y^2 + z^2 = 323$ ... (i)
and, $x^2 + y^2 = 2z$ ... (ii)
$\therefore z^2 + 2z = 323$
$\Rightarrow z^2 + 2z - 323 = 0$
$\Rightarrow z^2 + 19z - 17z - 323 = 0$
$\Rightarrow z(z + 19) - 17(z + 19) = 0$
$\Rightarrow (z - 17)(z + 19) = 0$
$\Rightarrow z = 17$ because $z \neq -19$
$\therefore x^2 + y^2 = 2 \times 17 = 34$
$= 3^2 + 5^2$
$\therefore xyz = 3 \times 5 \times 17 = 255$

150. (2) Let the numbers be a and b where $a > b$.
According to the question,
$a - b = 9$ .... (i)
and $a^2 - b^2 = 207$
$\Rightarrow (a + b)(a - b) = 207$
$\Rightarrow 9(a + b) = 207$
$\Rightarrow a + b = \frac{207}{9} = 23$ .... (ii)
On adding equations (i) and (ii),
$a + b + a - b = 23 + 9$
$\Rightarrow 2a = 32 \Rightarrow a = 16$
$\therefore a - b = 9$
$\Rightarrow 16 - b = 9$
$\Rightarrow b = 16 - 9 = 7$

151. (4)

2	$63\overline{35}\overline{20}$	252
2	4	
45	235	
5	225	
502	1020	
2	1004	
504	16	

Now, 63520 – 16 = 63504
and $\sqrt{63504} = 252$
$\therefore$ Required number = 16

152. (1) The smallest 6-digit number = 100000

3	$\overline{10}\,\overline{00}\,\overline{00}$	316
3	9	
61	100	
1	61	
626	3900	
6	3756	
632	144	

Clearly,
$316 < \sqrt{100000} < 317$
$317 \times 317 = 100489$
$\therefore$ Required number = 100489

153. (2) Let the numbers be x and y where $x > y$.
$\therefore x + y = 80$
$x - y = 20$
$\therefore (x + y)(x - y) = 80 \times 20$
$\Rightarrow x^2 - y^2 = 1600$

154. (1) Suppose, the positive number be x.
According to the question,
$x^2 - 21x = 100$
$\Rightarrow x^2 - 21x - 100 = 0$
$\Rightarrow x^2 - 25x + 4x - 100 = 0$
$\Rightarrow x(x - 25) + 4(x - 25) = 0$
$\Rightarrow (x - 25)(x + 4) = 0$
$\Rightarrow x = 25$ because $x \neq -4$

155. (3) Let's find the square root of 36562.

1	$\overline{3}\ \overline{65}\ \overline{62}$	191
1	1	
29	265	
9	261	
381	462	
1	381	
382	81	

Clearly, the remaining army men = 81

156. (3)

1	$1\ \overline{6}\ \overline{8}\ \overline{0}\ \overline{0}$	129
1	1	
22	×68	
2	44	
249	2400	
9	2241	
258	159 $\Rightarrow$ Remainder	

$\therefore$ Required number = 159
16800 – 159 = 16641
and $\sqrt{16641} = 129$

TYPE-IV

1. (1) Here, 22 – 15 – 7 = 0
We know that
$a^2 + b^3 + c^3 = 3abc$,
if $a + b + c = 0$
$\therefore (22)^3 + (-15)^3 + (-7)^3$
$= 3 \times 22 \times (-15)(-7) = 6930$

2. (2) On simplification,
Expression = $\frac{2}{4} \times \frac{7}{10} \times 5$
$= \frac{7}{4} = 1\frac{3}{4}$

3. (2) $\sqrt[3]{\frac{72.9}{0.4096}} = \sqrt[3]{\frac{729000}{4096}}$
$= \sqrt[3]{\frac{(90)^3}{(16)^3}} = \frac{90}{16} = \frac{45}{8} = 5.625$

4. (4) $(5.5)^3 - (4.5)^3$
$= (5.5 - 4.5)^3 + 3 \times 5.5 \times 4.5 (5.5 - 4.5)$
$= (1)^3 + 74.25 (1)$
$= 1 + 74.25 = 75.25$

5. (4) $\sqrt[3]{\frac{7}{875}} = \left(\frac{7}{875}\right)^{\frac{1}{3}}$
$= \left(\frac{1}{125}\right)^{\frac{1}{3}} = \frac{1}{5}$

6. (2) $\sqrt[3]{\frac{19}{513}} = \sqrt[3]{\frac{1}{27}} = \frac{1}{3}$

7. (3) We know that

$a^3 + b^3 + c^3 - 3abc$

$= (a+b+c)\ (a^2+b^2+c^2-ab-bc-ca)$

$= \frac{1}{2}(a+b+c)\ [(a-b)^2 + (b-c)^2 + (c-a)^2]$

$\therefore \sqrt[3]{(333)^3+(333)^3+(334)^3 - 3\times333\times333\times334}$

$= \sqrt[3]{\frac{1}{2}(333+333+334)\ [(333-333)^2 + (333-334)^2 + (334-333)^2]}$

$= \sqrt[3]{\frac{1}{2}\times1000\times2} = \sqrt[3]{1000}$

$= \sqrt[3]{10\times10\times10} = 10$

8. (3) Here, $\sqrt[3]{175616} = 56$

$\therefore \sqrt[3]{175.616} = 5.6$

$\sqrt[3]{0.175616} = 0.56$

and $\sqrt[3]{0.000175616} = 0.056$

$\therefore$ Required sum

$= 56. + 0.56 + 0.056 = 6.216$

9. (4) $\sqrt[3]{\sqrt{0.000064}} = \sqrt[3]{0.008}$

$= \sqrt[3]{0.2\times0.2\times0.2}$

$= 0.2$

10. (2) Expression

$= \sqrt[3]{15612+\sqrt{154+\sqrt{225}}}$

$= \sqrt[3]{15612+\sqrt{154+15}}$

$= \sqrt[3]{15612+13}$

$= \sqrt[3]{15625} = 25$

11. (3)

$\sqrt[3]{0.000125} = \sqrt[3]{0.05\times0.05\times0.05}$

$= 0.05$

12. (3) First number $= (\sqrt{5})^2 = 5$

Let the second number be x.

$\therefore x^2 + 5^2 = 146$

$\Rightarrow x^2 = 146 - 25 = 121$

$\Rightarrow x = \sqrt{121} = 11$

$\therefore$ Cube of 11 =1331

13. (1) $\sqrt[3]{1000} + \sqrt[3]{0.008} - \sqrt[3]{0.125}$

$= 10 + 0.2 - 0.5 = 9.7$

14. (2) Expression

$= \sqrt[3]{1-\frac{127}{343}} = \sqrt[3]{\frac{343-127}{343}}$

$= \sqrt[3]{\frac{216}{343}} = \sqrt[3]{\frac{(6)^3}{(7)^3}} = \frac{6}{7} = 1-\frac{1}{7}$

15. (1) $\sqrt[3]{3^n} = 27$

$\Rightarrow (3)^{\frac{n}{3}} = 3^3$

$\Rightarrow \frac{n}{3} = 3 \Rightarrow n = 3\times3 = 9$

16. (2) Expression

$= \sqrt{\sqrt[3]{0.000729}}$

$= \sqrt{\sqrt[3]{0.09\times0.09\times0.09}}$

$= \sqrt{0.09} = \sqrt{0.3\times0.3}$

$= 0.3$

17. (1) Expression $= \left(\sqrt{4^3+15^2}\right)^3$

$= \left(\sqrt{64+225}\right)^3 = \left(\sqrt{289}\right)^3$

$= (17)^3 = 4913$

18. (2) Expression $= \sqrt[3]{4\frac{12}{125}}$

$= \sqrt[3]{\frac{512}{125}} = \sqrt[3]{\frac{8\times8\times8}{5\times5\times5}} = \frac{8}{5} = 1.6$

19. (4) $1323 = 3\times3\times3\times7\times7$

$\therefore$ It must be multiplied by 7.

20. (2) $1440 = 2\times2\times2\times2\times2\times3\times3\times5 = 2^3\times2^2\times3^2\times5$

To make 1440 a perfect cube, it must be mulitplied by $2\times3\times5\times5 = 150$.

$\therefore$ The required sum = 1+5 + 0 = 6

21. (3) $1800 = 2\times2\times2\times3\times3\times5\times5 = 2^3\times3^2\times5^2$

To make 1800 a perfect cube, it must be multiplied by 15 (least number).

$\therefore$ Required sum = 1 + 5 = 6

22. (2) Clearly, $\sqrt[3]{729} = 9$

$\therefore$ 19 should be added to 710 to get a perfect cube.

23. (2)

2	1944
2	972
2	486
3	243
3	81
3	27
3	9
	3

$\therefore 1944 = 2\times2\times2\times3\times3\times3\times3\times3$

$= 2^3\times3^3\times3^2$

Clearly, 1944 should be multiplied by 3 to make the result a perfect cube.

24. (1) $3000 = 3\times1000 = 3\times10^3$

Clearly, when we divide 3000 by natural number 3, the quotient is 1000 which is a perfect cube.

25. (2)

2	864
2	432
2	216
2	108
2	54
3	27
3	9
	3

$\therefore 864 = 2^3\times3^3\times2^2$

For $864n$ to be a perfect cube, $n = 2$

26. (2) $675 = 5\times5\times3\times3\times3$

$\therefore$ Required number = 5

27. (2) $12\times12\times12 = 1728$

$\therefore$ Required number

$= 1728 - 1720 = 8$

28. (2) $4320 = 2\times2\times2\times2\times2\times3\times3\times3\times5$

$= 2^3\times3^3\times2^2\times5$

$\therefore$ Required number $= 2\times5\times5 = 50$

29. (4) $343 = 7\times7\times7$

$125 = 5\times5\times5$

$81 = 3\times3\times3\times3$

$64 = 8\times8 = 4\times4\times4$

We see that 343 and 125 are only perfect cubes of 7 and 5 respectively. 81 is only a perfect square of 9. 64 is a perfect square of 8 as well as a perfect cube of 4.

30. (4) Let number be x

$\therefore$ According to question,

$x^3 - x^2 = 48 \quad \therefore x = 4$

31. (2) The number = 90 × A
= 3 × 3 × 2 × 5 × A
The least value of A for which the given number is a perfect cube
= $3 \times 2^2 \times 5^2$
= 3 × 4 × 25 = 300

32. (1) $\sqrt{x} = \sqrt[3]{y}$

$\Rightarrow x^{\frac{1}{2}} = y^{\frac{1}{3}}$

$\Rightarrow (x^{\frac{1}{2}})^6 = (y^{\frac{1}{3}})^6$

$\Rightarrow x^3 = y^2$

33. (3) $x = \sqrt{3} + \sqrt{2}$

$\therefore \frac{1}{x} = \frac{1}{\sqrt{3}+\sqrt{2}} = \frac{\sqrt{3}-\sqrt{2}}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$

$= \frac{\sqrt{3}-\sqrt{2}}{3-2} = \sqrt{3} - \sqrt{2}$

$\therefore x - \frac{1}{x} = \sqrt{3} + \sqrt{2} - \sqrt{3} + \sqrt{2}$

$= 2\sqrt{2}$

$\therefore x^3 - \frac{1}{x^3} = \left(x - \frac{1}{x}\right)^3 + 3\left(x - \frac{1}{x}\right)$

$= \left(2\sqrt{2}\right)^3 + 3 \times 2\sqrt{2}$

$= 16\sqrt{2} + 6\sqrt{2} = 22\sqrt{2}$

34. (1) **Look at the pattern :**
1001 × 1001 = 1002001
1001×1001×1001 = 1003003001

35. (2)

5	625
5	125
5	25
	5

∴ 625 = 5 × 5 × 5 × 5 = $5^3 \times 5$
For the smallest cube number, 625 should be divided 5,
625 ÷ 5 = 125 = 5^3

36. (3) Let the numbers be a and b where $a > b$.
According to the question,
$a^3 + b^3 = 793$
and $a + b = 13$
$\therefore (a + b)^3 = a^3 + b^3 + 3ab\,(a + b)$
$\Rightarrow (13)^3 = 793 + 3ab \times 13$
$\Rightarrow 2197 = 793 + 39ab$
$\Rightarrow 39ab = 2197 - 793 = 1404$

$\Rightarrow ab = \frac{1404}{39} = 36$

$\therefore (a + b)^2 = (a + b)^2 - 4ab$
$= (13)^2 - 4 \times 36$
$= 169 - 144 = 25$

$\Rightarrow a - b = \sqrt{25} = 5$

37. (3) 243000 = 243 × 1000
= 3 × 3 × 3 × 3 × 3 × 10 × 10 × 10
$= 3^3 \times 3^2 \times 10^3$
∴ Required number = 3^2 = 9

38. (4) Expression

$= \left(2 - \frac{1}{3}\right)\left(2 - \frac{3}{5}\right)\left(2 - \frac{5}{7}\right) \ldots \left(2 - \frac{997}{999}\right)$

$= \left(\frac{6-1}{3}\right)\left(\frac{10-3}{5}\right)\left(\frac{14-5}{7}\right) \ldots \left(\frac{1998-997}{999}\right)$

$= \frac{5}{3} \times \frac{7}{5} \times \frac{9}{7} \times \ldots \times \frac{1001}{999}$

$= \frac{1001}{3}$

39. (4) $\sqrt[3]{79507} = 43$

$\therefore \sqrt[3]{79.507} + \sqrt[3]{0.079507} + \sqrt[3]{0.000079507}$
= 4.3 + 0.43 + 0.043
= 4.773

40. (4)

2	13824
2	6912
2	3456
2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
	3

$\therefore 13824 = 2^3 \times 2^3 \times 2^3 \times 3^3$

$\therefore \sqrt[3]{-13824}$

$= \sqrt[3]{(-1)^3 2^3 \times 2^3 \times 2^3 \times 3^3}$

$= (-1)\ 2 \times 2 \times 2 \times 3 = -24$

41. (1) $(105)^3 = (100 + 5)^3$
$= (100)^3 + (5)^3 + 3 \times 100 \times 5\,(100 + 5)$
$[\because (a + b)^3 = a^3 + b^3 + 3ab\,(a + b)]$
= 1000000 + 125 + 1500 × 105
= 1000000 + 125 + 157500
= 1157625

42. (2)

2	37044
2	18522
3	9261
3	3087
3	1029
7	343
7	49
	7

∴ 37044 = 3 × 3 × 3 × 7 × 7 × 7 × 2 × 2
$= 3^3 \times 7^3 \times 2^2$
∴ Required number = 2 × 2
= 4

43. (1) $(997)^3 = (1000 - 3)^3$
$= (1000)^3 - (3)^3 - 3 \times 1000 \times 3\,(1000 - 3)$
= 1000000000 – 27 – 9000 × 997
= 1000000000 – 27 – 8973000
= 991026973

44. (2) Let the numbers be $3x$ and $4x$.
According to the question,
$(3x)^3 + (4x)^3 = 5824$
$\Rightarrow 27x^3 + 64x^3 = 5824$
$\Rightarrow 91x^3 = 5824$

$\Rightarrow x^3 = \frac{5824}{91} = 64$

$\Rightarrow x = \sqrt[3]{64} = 4$

∴ Sum of numbers
$= 3x + 4x = 7x$
= 7 × 4 = 28

TYPE-V

1. (3) ? =

$\frac{(0.0539 - 0.002) \times 0.4 + 0.56 \times 0.07}{0.04 \times 0.25}$

$= \frac{0.0519 \times 0.4 + 0.0392}{0.01}$

$= \frac{0.02076 + 0.0392}{0.01}$

$= \frac{0.05996}{0.01} = 5.996$

TEST YOURSELF

1. Simplify :

$$\frac{3.5\times1.5}{0.025\div0.125\times7.5}\times\frac{1}{3+\frac{1}{1+\frac{1}{2}}}$$

(1) 0.9 (2) 0.95
(3) 0.095 (4) 0.082

2. Simplify :

$$\frac{3}{4+\frac{5}{6+\frac{7}{8}}}-\frac{3}{5}\div\frac{1}{2}\text{ of }1\frac{1}{5}+1\frac{3}{26}$$

(1) $\frac{3}{4}$ (2) $\frac{1}{2}$
(3) $\frac{3}{5}$ (4) $\frac{3}{7}$

3. Simplify :

$$999\frac{998}{999}\times999+999$$

(1) 999997 (2) 999998
(3) 99998 (4) 999994

4. Simplify

$$2\div\frac{3}{17}\text{ of }\left(2\frac{3}{4}+3\frac{5}{8}\right)+\frac{2}{5}\div2\frac{1}{5}+\frac{2}{9}$$

(1) $\frac{9}{17}$ (2) $\frac{7}{11}$
(3) $\frac{13}{11}$ (4) $\frac{24}{11}$

5. Simplify :

$$120+3\,of\,5\div\left[7\times2\left\{10\div5\left(24-10\times2+\overline{7+3\times10\div5}\right)\right\}\right]$$

(1) 120.03 (2) 116.04
(3) 118 (4) 125

6. $\frac{2.5\times3+7.5\div2.5-0.5\text{ of }3}{47+12\div1.5-6\text{ of }2\times3}=?$

(1) $\frac{3}{17}$ (2) $\frac{9}{19}$
(3) $\frac{4}{11}$ (4) $\frac{3}{11}$

7. Simplilfy :

$$\frac{17}{7+\frac{3}{4-2\frac{3}{4}}}\times\frac{2021}{2193}\div\left(1\frac{37}{48}-\frac{15}{16}\right)+\frac{3}{4}\,of\,\frac{3\frac{1\frac{1}{2}}{2}}{2\frac{1}{2}}$$

(1) $2\frac{1}{8}$ (2) $4\frac{1}{8}$
(3) $3\frac{1}{8}$ (4) $3\frac{1}{7}$

8. $\frac{1\frac{7}{9}\text{ of }\frac{27}{64}}{\frac{11}{12}\times9\frac{9}{11}}\div\frac{4\frac{4}{7}\text{ of }\frac{21}{160}}{2\frac{5}{6}\div2\frac{2}{15}}=?$

(1) $\frac{425}{2344}$ (2) $\frac{425}{2434}$
(3) $\frac{421}{2443}$ (4) $\frac{425}{2304}$

9. Simplify :

$$\frac{8\frac{3}{5}+7\frac{3}{4}+5\frac{2}{3}-4\frac{1}{2}}{13-11\frac{9}{10}+10\frac{7}{9}-9\frac{17}{20}}\,of\,\frac{2}{11}\,of\,365$$

(1) $573\frac{3}{11}$ (2) $571\frac{7}{11}$
(3) $572\frac{3}{11}$ (4) $575\frac{4}{11}$

10. Simplify :

$$\frac{1}{8}\,of\left(\frac{1}{10}-\frac{1}{11}\right)\div\frac{\frac{1}{7}-\frac{1}{9}\div\left(\frac{4}{9}+\frac{4}{11}\right)}{\frac{1}{7}+\frac{1}{9}\div\left(\frac{4}{9}-\frac{4}{11}\right)}\times\frac{\frac{1}{3}+\frac{1}{7}\div\left(\frac{1}{7}-\frac{1}{9}\right)}{\left(\frac{1}{3}+\frac{1}{7}\right)\div\frac{1}{7}-\frac{1}{9}}$$

(1) $\frac{85}{176}$ (2) $\frac{83}{176}$
(3) 83 (4) 86

11. Simplify

$$\frac{2\frac{4}{9}\div3\frac{2}{3}\text{ of }\frac{2}{5}\times\frac{3}{5}+1\frac{1}{9}}{1\frac{1}{9}\times\frac{3}{4}\text{ of }1\frac{2}{5}\div\frac{21}{38}-\frac{1}{3}}-\frac{5\frac{1}{2}-\frac{3}{4}}{2\frac{1}{5}\times1\frac{9}{11}}$$

(1) 1 (2) 0
(3) 2 (4) 3

12. Simplify :

$$\frac{\frac{5}{6}+\frac{7}{8}\,of\,\frac{4}{5}\div\frac{3}{4}\,of\,\frac{9}{10}}{8\frac{1}{3}-\left(\frac{4}{1-\frac{7}{8}}\,of\,2\frac{1}{4}\right)\div\frac{7}{9}\,of\,12}\,of\,6\frac{1}{2}+5\frac{1}{9}$$

(1) $24\frac{1}{4}$ (2) $24\frac{3}{4}$
(3) $22\frac{1}{2}$ (4) $23\frac{1}{3}$

13. Simplify :

$$\frac{\frac{2}{3}\div\frac{3}{4}\text{ of }\frac{5}{6}}{\frac{2}{3}\div\frac{3}{4}\times\frac{5}{6}}+\frac{2+2\times2}{2\div2\times2}\div\frac{\frac{1}{2}\div\frac{1}{2}\text{ of }\frac{1}{2}}{\frac{1}{2}+\frac{1}{2}\text{ of }\frac{1}{2}}$$

(1) 2 (2) 2.5
(3) 4 (4) 4.5

14. Simplify :

$$\frac{5+5\times5}{5\times5+5}\times\frac{\frac{1}{5}\div\frac{1}{5}\,of\,\frac{1}{5}}{\frac{1}{5}\,of\,\frac{1}{5}\div\frac{1}{5}}\times\left(5-\frac{1}{5}\right)\times\frac{1}{\frac{46}{5}-\frac{3}{1-\frac{2}{3}}}$$

(1) 400 (2) 500
(3) 600 (4) 300

15. Simplify $1+\frac{1}{1+\frac{1}{1+\frac{1}{9}}}$

(1) $1\frac{9}{19}$ (2) $1\frac{10}{19}$
(3) $2\frac{9}{19}$ (4) $3\frac{9}{19}$

16. Compute the following :

$$7+\frac{2}{5+\frac{3}{4+\frac{2}{3+\frac{1}{4}}}}$$

(1) $3\frac{40}{113}$ (2) $6\frac{40}{113}$
(3) $7\frac{40}{113}$ (4) $5\frac{40}{113}$

17. Simplify :

$$7\frac{1}{2}-\left[2\frac{1}{4}\div\left\{1\frac{1}{4}-\frac{1}{2}\left(1\frac{1}{2}-\frac{1}{3}-\frac{1}{6}\right)\right\}\right]$$

(1) $4\frac{1}{2}$ (2) $3\frac{1}{2}$

(3) $4\frac{1}{3}$ (4) $\frac{1}{3}$

18. Simplify :

$$3\div\left[(8-5)\div\left\{(4-2)\div\left(2+\frac{8}{13}\right)\right\}\right]=?$$

(1) $\frac{17}{13}$ (2) $\frac{13}{17}$

(3) $\frac{15}{17}$ (4) $\frac{17}{15}$

19. Simplify

$$5\frac{1}{2}-\left[2\frac{1}{3}\div\left\{\frac{3}{4}-\frac{1}{2}\left(\frac{2}{3}-\overline{\frac{1}{6}-\frac{1}{8}}\right)\right\}\right]$$

(1) $\frac{1}{2}$ (2) $\frac{1}{4}$

(3) $\frac{1}{6}$ (4) $\frac{2}{3}$

SHORT ANSWERS

1. (2)	**2.** (1)	**3.** (2)	**4.** (4)
5. (1)	**6.** (2)	**7.** (3)	**8.** (4)
9. (1)	**10.** (1)	**11.** (2)	**12.** (2)
13. (2)	**14.** (3)	**15.** (2)	**16.** (3)
17. (1)	**18.** (2)	**19.** (3)	

EXPLANATIONS

1. (2) Expression =

$$\frac{3.5\times1.5}{0.025\times\frac{1}{0.125}\times7.5}\times\frac{1}{3+\frac{1}{1+\frac{1}{2}}}$$

$$=\frac{3.5\times1.5\times125}{25\times7.5}\times\frac{1}{3+\frac{1}{\frac{3}{2}}}$$

$$=3.5\times\frac{1}{3+\frac{2}{3}}=3.5\times\frac{1}{\frac{9+2}{3}}$$

$$=\frac{3.5\times3}{11}=\frac{10.5}{11}=0.95$$

2. (1) $\dfrac{3}{4+\dfrac{5}{6+\dfrac{7}{8}}}=\dfrac{3}{4+\dfrac{5}{\dfrac{48+7}{8}}}$

$$=\frac{3}{4+\frac{5\times8}{55}}$$

$$=\frac{3}{4+\frac{8}{11}}$$

$$=\frac{3}{\frac{44+8}{11}}=\frac{3\times11}{52}=\frac{33}{52}$$

$\therefore$ Expression $=\frac{33}{52}-\frac{3}{5}\div\frac{1}{2}$

of $1\frac{1}{5}+1\frac{3}{26}$

$$=\frac{33}{52}-\frac{3}{5}\div\frac{1}{2}\times\frac{6}{5}+\frac{29}{26}$$

$$=\frac{33}{52}-\frac{3}{5}\times\frac{5}{3}+\frac{29}{26}$$

$$=\frac{33}{52}-1+\frac{29}{26}$$

$$=\frac{33-52+58}{52}=\frac{39}{52}=\frac{3}{4}$$

3. (2) $\left(999+\frac{998}{999}\right)999+999$

$=(999)^2+998+999$

$=(1000-1)^2+998+999$

$=1000000+1-2000+998+999$

$=999998$

4. (4) The given expression

$$=2\div\frac{3}{17}\text{ of }\left(\frac{11}{4}+\frac{29}{8}\right)+\frac{2}{5}\div\frac{11}{5}+\frac{2}{9}$$

$$=2\div\frac{3}{17}\text{ of }\left(\frac{22+29}{8}\right)+\frac{2}{5}\div\frac{11}{5}+\frac{2}{9}$$

$$=2\div\frac{3}{17}\text{ of }\frac{51}{8}+\frac{2}{5}\div\frac{11}{5}+\frac{2}{9}$$

$$=2\div\frac{3}{17}\times\frac{51}{8}+\frac{2}{5}\div\frac{11}{5}+\frac{2}{9}$$

$$=2\div\frac{9}{8}+\frac{2}{5}\div\frac{11}{5}+\frac{2}{9}$$

$$=2\times\frac{8}{9}+\frac{2}{5}\times\frac{5}{11}+\frac{2}{9}$$

$$=\frac{16}{9}+\frac{2}{11}+\frac{2}{9}=\frac{176+18+22}{99}$$

$$=\frac{216}{99}=\frac{24}{11}$$

5. (1) The given expression

$120+3\ of\ 5\div$

$\left[7\times2\left\{10\div5\left(24-10\times2+\overline{7+3\times10\div5}\right)\right\}\right]$

$=120+3\ of\ 5\div$

$\left[7\times2\left\{10\div5\left(24-10\times2+\overline{7+3\times2}\right)\right\}\right]$

$=120+3\ of\ 5\div$

$\left[7\times2\left\{10\div5\left(24-10\times2+\overline{7+6}\right)\right\}\right]$

$=120+3\ of\ 5\div$

$\left[7\times2\{10\div5(24-10\times2+13)\}\right]$

$=120+3\ of\ 5\div$

$\left[7\times2\{10\div5(24-20+13)\}\right]$

$=120+3\text{ of }5\div\left[7\times2\{10\div5\times17\}\right]$

$=120+3\text{ of }5\div\left[7\times2\left\{10\times\frac{1}{5}\times17\right\}\right]$

$=120+3\text{ of }5\div\left[7\times2\{2\times17\}\right]$

$=120+3\text{ of }5\div\left[7\times2\times34\right]$

$=120+3\times5\div476=120+15\div476$

$=120+\frac{15}{476}=120\frac{15}{476}$

$=120.03$

6. (2) The given expression

$$=\frac{2.5\times3+7.5\div2.5-0.5\text{ of }3}{47+12\div1.5-6\text{ of }2\times3}$$

$$=\frac{2.5\times3+7.5\times\frac{1}{2.5}-0.5\times3}{47+12\times\frac{1}{1.5}-6\times2\times3}$$

$$=\frac{7.5+3-1.5}{47+8-36}=\frac{9}{19}$$

7. (3)

$$\frac{17}{7+\frac{3}{4-\frac{11}{4}}}\times\frac{2021}{2193}\div\left(\frac{85}{48}-\frac{15}{16}\right)+\frac{3}{4}\text{ of }\frac{3\frac{\frac{3}{2}}{2}}{\frac{5}{2}}$$

$$=\frac{17}{7+\frac{3}{\frac{16-11}{4}}}\times\frac{47}{51}\div\left(\frac{85}{48}-\frac{15}{16}\right)+\frac{3}{4}\ of\ \frac{3\frac{3}{4}}{\frac{5}{2}}$$

$$=\frac{17}{7+\frac{12}{5}}\times\frac{47}{51}\div\left(\frac{85-45}{48}\right)$$

$$+\frac{3}{4}\times\frac{15}{4}\times\frac{2}{5}$$

$$= \frac{17}{\frac{35+12}{5}} \times \frac{47}{51} \div \frac{40}{48} + \frac{9}{8}$$

$$= \frac{17 \times 5}{47} \times \frac{47}{51} \times \frac{48}{40} + \frac{9}{8}$$

$$= 2 + 1\frac{1}{8} = 3\frac{1}{8}$$

8. (4) $\dfrac{\frac{16}{9} \text{ of } \frac{27}{64}}{\frac{11}{12} \times \frac{108}{11}} \div \dfrac{\frac{32}{7} \text{ of } \frac{21}{160}}{\frac{17}{6} \div \frac{32}{15}}$

$$= \frac{\frac{16}{9} \times \frac{27}{64}}{\frac{11}{12} \times \frac{108}{11}} \div \frac{\frac{32}{7} \times \frac{21}{160}}{\frac{17}{6} \times \frac{15}{32}}$$

$$= \frac{\frac{3}{4}}{\frac{9}{1}} \div \frac{\frac{3}{5}}{\frac{17 \times 5}{32 \times 2}}$$

$$= \frac{3}{4} \times \frac{1}{9} \div \frac{3 \times 2 \times 32}{17 \times 5 \times 5}$$

$$= \frac{1}{4} \times \frac{1}{3} \times \frac{17 \times 5 \times 5}{3 \times 2 \times 32} = \frac{425}{2304}$$

9. (1)

$$\frac{\frac{43}{5} + \frac{31}{4} + \frac{17}{3} - \frac{9}{2}}{13 - \frac{119}{10} + \frac{97}{9} - \frac{197}{20}} \text{ of } \frac{2}{11} \text{ of } 365$$

$$= \frac{\frac{516 + 465 + 340 - 270}{60}}{\frac{2340 - 2142 + 1940 - 1773}{180}}$$

$$of\ \frac{2}{11} \times 365$$

$$= \frac{\frac{1321 - 270}{60}}{\frac{4280 - 3915}{180}} \text{ of } \frac{2 \times 365}{11}$$

$$= \frac{\frac{1051}{60}}{\frac{365}{180}} \text{ of } \frac{2 \times 365}{11}$$

$$= \frac{1051}{60} \times \frac{180}{365} \times \frac{2 \times 365}{11}$$

$$= \frac{1051 \times 3 \times 2}{11}$$

$$= \frac{6306}{11} = 573\frac{3}{11}$$

10. (1) $\dfrac{1}{8} of \left(\dfrac{11-10}{110}\right)$

$$\div \frac{\frac{1}{7} - \frac{1}{9} \div \left(\frac{44+36}{99}\right)}{\frac{1}{7} + \frac{1}{9} \div \left(\frac{44-36}{99}\right)}$$

$$\times \frac{\frac{1}{3} + \frac{1}{7} \div \left(\frac{9-7}{63}\right)}{\left(\frac{7+3}{21}\right) \div \frac{1}{7} - \frac{1}{9}}$$

$$= \frac{1}{8} \text{ of } \frac{1}{110} \div \frac{\frac{1}{7} - \frac{1}{9} \times \frac{99}{80}}{\frac{1}{7} + \frac{1}{9} \times \frac{99}{8}} \times \frac{\frac{1}{3} + \frac{1}{7} \times \frac{63}{2}}{\frac{10}{21} \times \frac{7}{1} - \frac{1}{9}}$$

$$= \frac{1}{8} \text{ of } \frac{1}{110} \div \frac{\frac{1}{7} - \frac{11}{80}}{\frac{1}{7} + \frac{11}{8}} \times \frac{\frac{1}{3} + \frac{9}{2}}{\frac{10}{3} - \frac{1}{9}}$$

$$= \frac{1}{8} \times \frac{1}{110} \div \frac{\frac{80-77}{560}}{\frac{8177}{56}} \times \frac{\frac{2127}{6}}{\frac{30-1}{9}}$$

$$= \frac{1}{8} \times \frac{1}{110} \times \frac{850}{3} \times \frac{9}{6} = \frac{85}{176}$$

11. (2)

$$\frac{2\frac{4}{9} \div 3\frac{2}{3} \text{ of } \frac{2}{5} \times \frac{3}{5} + 1\frac{1}{9}}{1\frac{1}{9} \times \frac{3}{4} \text{ of } 1\frac{2}{5} \div \frac{21}{38} - \frac{1}{3}} - \frac{5\frac{1}{2} - \frac{3}{4}}{2\frac{1}{5} \times 1\frac{9}{11}}$$

$$= \frac{\frac{22}{9} \div \frac{11}{3} \text{ of } \frac{2}{5} \times \frac{3}{5} + \frac{10}{9}}{\frac{10}{9} \times \frac{3}{4} \text{ of } \frac{7}{5} \div \frac{21}{38} - \frac{1}{3}} - \frac{\frac{11}{2} - \frac{3}{4}}{\frac{11}{5} \times \frac{20}{11}}$$

$$= \frac{\frac{22}{9} \div \frac{22}{15} \times \frac{3}{5} + \frac{10}{9}}{\frac{10}{9} \times \frac{21}{20} \div \frac{21}{38} - \frac{1}{3}} - \frac{\frac{22-3}{4}}{4}$$

$$= \frac{\left(\frac{22}{9} \times \frac{15}{22}\right) \times \frac{3}{5} + \frac{10}{9}}{\frac{10}{9} \times \left(\frac{21}{20} \times \frac{38}{21}\right) - \frac{1}{3}} - \frac{\frac{19}{4}}{4}$$

$$= \frac{\frac{5}{3} \times \frac{3}{5} + \frac{10}{9}}{\frac{10}{9} \times \frac{19}{10} - \frac{1}{3}} - \frac{19}{4} \times \frac{1}{4}$$

$$= \frac{1 + \frac{10}{9}}{\frac{19}{9} - \frac{1}{3}} - \frac{19}{16} = \frac{\frac{9+10}{9}}{\frac{19-3}{9}} - \frac{19}{16}$$

$$= \frac{\frac{19}{9}}{\frac{16}{9}} - \frac{19}{16} = \frac{19}{16} - \frac{19}{16} = 0$$

12. (2)

$$\frac{\frac{5}{6} + \left(\frac{7}{8} \times \frac{4}{5}\right) \div \left(\frac{3}{4} \times \frac{9}{10}\right)}{\frac{25}{3} - \left(\frac{4}{\frac{8-7}{8}} of\ \frac{9}{4}\right) \div \left(\frac{7}{9} \times 12\right)}$$

$$of\ \frac{13}{2} + \frac{46}{9}$$

$$= \frac{\frac{5}{6} + \frac{7}{10} \div \frac{27}{40}}{\frac{25}{3} - 32 \times \frac{9}{4} \div \frac{28}{3}} \text{ of } \frac{13}{2} + \frac{46}{9}$$

$$= \frac{\frac{5}{6} + \frac{7}{10} \times \frac{40}{27}}{\frac{25}{3} - 32 \times \frac{9}{4} \times \frac{3}{28}} \text{ of } \frac{13}{2} + \frac{46}{9}$$

$$= \frac{\frac{5}{6} + \frac{28}{27}}{\frac{25}{3} - \frac{54}{7}} \text{ of } \frac{13}{2} + \frac{46}{9}$$

$$= \frac{\frac{45+56}{54}}{\frac{175-162}{21}} \text{ of } \frac{13}{2} + \frac{46}{9}$$

$$= \frac{101}{54} \times \frac{21}{13} \times \frac{13}{2} + \frac{46}{9}$$

$$= \frac{707}{36} + \frac{46}{9} = \frac{707+184}{36}$$

$$8\frac{91}{36} = 24\frac{27}{36} = 24\frac{3}{4}$$

13. (2) The given expression

$$\frac{\frac{2}{3} \div \frac{3}{4} \text{ of } \frac{5}{6}}{\frac{2}{3} \div \frac{3}{4} \times \frac{5}{6}} + \frac{2 + 2 \times 2}{2 \div 2 \times 2} \div \frac{\frac{1}{2} \div \frac{1}{2} \text{ of } \frac{1}{2}}{\frac{1}{2} + \frac{1}{2} \text{ of } \frac{1}{2}}$$

$$= \frac{\frac{2}{3} \div \left(\frac{3}{4} \times \frac{5}{6}\right)}{\left(\frac{2}{3} \times \frac{4}{3}\right) \times \frac{5}{6}} + \frac{2+4}{\left(2 \times \frac{1}{2}\right) \times 2} \div \frac{\frac{1}{2} \div \left(\frac{1}{2} \times \frac{1}{2}\right)}{\frac{1}{2} + \frac{1}{2} \times \frac{1}{2}}$$

$$= \frac{\frac{2}{3} \div \frac{5}{8}}{\frac{8}{9} \times \frac{5}{6}} + \frac{6}{2} \div \frac{\frac{1}{2} \div \frac{1}{4}}{\frac{1}{2} + \frac{1}{4}}$$

$$= \frac{\frac{2}{3} \times \frac{8}{5}}{\frac{20}{27}} + 3 \div \frac{\frac{1}{2} \times 4}{\frac{2+1}{4}}$$

$$= \frac{16}{15} \times \frac{27}{20} + 3 \div \frac{2}{\frac{3}{4}}$$

$$= \frac{36}{25} + 3 \div \left(2 \times \frac{4}{3}\right)$$

$$= \frac{36}{25} + 3 \div \frac{8}{3} = \frac{36}{25} + 3 \times \frac{3}{8}$$

$$= \frac{288+225}{200} = \frac{513}{200} = 2\frac{113}{200} = 2.5$$

14. (3) The given expression

$$= \frac{5+25}{25+5} \times \frac{\frac{1}{5} \div \left(\frac{1}{5} \times \frac{1}{5}\right)}{\left(\frac{1}{5} \times \frac{1}{5}\right) \div \frac{1}{5}}$$

$$\times \left(\frac{25-1}{5}\right) \times \frac{1}{\frac{46}{5} - \frac{3}{\frac{3-2}{3}}}$$

$$= \frac{30}{30} \times \frac{\frac{1}{5} \div \frac{1}{25}}{\frac{1}{25} \div \frac{1}{5}} \times \frac{24}{5} \times \frac{1}{\frac{46}{5} - \frac{3}{\frac{1}{3}}}$$

$$= \frac{\frac{1}{5} \times 25}{\frac{1}{25} \times 5} \times \frac{24}{5} \times \frac{1}{\frac{46}{5} - 9}$$

$$= \frac{5}{\frac{1}{5}} \times \frac{24}{5} \times \frac{1}{\frac{46-45}{5}}$$

$$= 5 \times 5 \times \frac{24}{5} \times \frac{5}{1} = 600$$

15. (2) It is a continued fraction. In such problems, we should start from the bottom and work upwards.
The given expression

$$= 1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{9}}} = 1 + \frac{1}{1 + \frac{1}{\frac{9+1}{9}}}$$

$$= 1 + \frac{1}{1 + \frac{1}{\frac{10}{9}}} = 1 + \frac{1}{1 + 1 \times \frac{9}{10}}$$

$$= 1 + \frac{1}{1 + \frac{9}{10}} = 1 + \frac{1}{\frac{10+9}{10}}$$

$$= 1 + \frac{10}{19} = \frac{19+10}{19} = \frac{29}{19} = 1\frac{10}{19}$$

16. (3) $7 + \cfrac{2}{5 + \cfrac{3}{4 + \cfrac{2}{3 + \frac{1}{4}}}}$

$$= 7 + \cfrac{2}{5 + \cfrac{3}{4 + \cfrac{2}{\frac{12+1}{4}}}}$$

$$= 7 + \cfrac{2}{5 + \cfrac{3}{4 + \frac{2 \times 4}{13}}}$$

$$= 7 + \cfrac{2}{5 + \cfrac{3}{4 + \frac{8}{13}}}$$

$$= 7 + \cfrac{2}{5 + \cfrac{3}{\frac{52+8}{13}}}$$

$$= 7 + \frac{2}{5 + 3 \times \frac{13}{60}}$$

$$= 7 + \frac{2}{5 + \frac{13}{20}} = 7 + \frac{2}{\frac{100+13}{20}}$$

$$= 7 + \frac{2 \times 20}{113}$$

$$= 7 + \frac{40}{113} = 7\frac{40}{113}$$

17. (1) The given expression

$$= 7\frac{1}{2} - \left[2\frac{1}{4} \div \left\{1\frac{1}{4} - \frac{1}{2}\left(1\frac{1}{2} - \frac{1}{3} - \frac{1}{6}\right)\right\}\right]$$

$$= \frac{15}{2} - \left[\frac{9}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{3}{2} - \frac{1}{3} - \frac{1}{6}\right)\right\}\right]$$

$$= \frac{15}{2} - \left[\frac{9}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{9-2-1}{6}\right)\right\}\right]$$

$$= \frac{15}{2} - \left[\frac{9}{4} \div \left\{\frac{5}{4} - \frac{1}{2} \times 1\right\}\right]$$

$$= \frac{15}{2} - \left[\frac{9}{4} \div \left\{\frac{5-2}{4}\right\}\right]$$

$$= \frac{15}{2} - \left[\frac{9}{4} \div \frac{3}{4}\right]$$

$$= \frac{15}{2} - \left[\frac{9}{4} \times \frac{4}{3}\right]$$

$$= \frac{15}{2} - 3 = \frac{15-6}{2} = \frac{9}{2} = 4\frac{1}{2}$$

18. (2) The given expression

$$= 3 \div \left[(8-5) \div \left\{(4-2) \div \left(2 + \frac{8}{13}\right)\right\}\right]$$

$$= 3 \div \left[3 \div \left\{2 \div \left(\frac{26+8}{13}\right)\right\}\right]$$

$$= 3 \div \left[3 \div \left\{2 \div \frac{34}{13}\right\}\right]$$

$$= 3 \div \left[3 \div \left\{2 \times \frac{13}{34}\right\}\right]$$

$$= 3 \div \left[\frac{3 \times 34}{26}\right] = \frac{3 \times 26}{3 \times 34} = \frac{13}{17}$$

19. (3) The given expression

$$= 5\frac{1}{2} - \left[2\frac{1}{3} \div \left\{\frac{3}{4} - \frac{1}{2}\left(\frac{2}{3} - \overline{\frac{1}{6} - \frac{1}{8}}\right)\right\}\right]$$

$$= \frac{11}{2} - \left[\frac{7}{3} \div \left\{\frac{3}{4} - \frac{1}{2}\left(\frac{2}{3} - \overline{\frac{1}{6} - \frac{1}{8}}\right)\right\}\right]$$

$$= \frac{11}{2} - \left[\frac{7}{3} \div \left\{\frac{3}{4} - \frac{1}{2}\left(\frac{2}{3} - \frac{4-3}{24}\right)\right\}\right]$$

$$= \frac{11}{2} - \left[\frac{7}{3} \div \left\{\frac{3}{4} - \frac{1}{2}\left(\frac{2}{3} - \frac{1}{24}\right)\right\}\right]$$

$$= \frac{11}{2} - \left[\frac{7}{3} \div \left\{\frac{3}{4} - \frac{1}{2}\left(\frac{16-1}{24}\right)\right\}\right]$$

$$= \frac{11}{2} - \left[\frac{7}{3} \div \left\{\frac{3}{4} - \frac{1}{2} \times \frac{15}{24}\right\}\right]$$

$$= \frac{11}{2} - \left[\frac{7}{3} \div \left\{\frac{3}{4} - \frac{15}{48}\right\}\right]$$

$$= \frac{11}{2} - \left[\frac{7}{3} \div \left\{\frac{36-15}{48}\right\}\right]$$

$$= \frac{11}{2} - \left[\frac{7}{3} \div \frac{21}{48}\right]$$

$$= \frac{11}{2} - \left[\frac{7}{3} \times \frac{48}{21}\right]$$

$$= \frac{11}{2} - \frac{16}{3} = \frac{33-32}{6} = \frac{1}{6}$$

❑❑❑

4 POWER, INDICES AND SURDS

Importance : 1 or 2 questions from 'Surds and Indices' have essentially been asked in every exam. In order to accuracy in your calculations you will require complete practice of this chapter.

Scope of questions : Asked questions are based on basic concepts, completely arithmetic and without language like to evaluate/simply, greatest/lowest number, increasing/ decreasing order, square, cube, square root, cube root and higher powers starting from easier to tougher levels.

Way to success : Note that practice to solve these questions with full concentration and accuracy is essential. Only because of small mistake or not understanding the basic concepts many students are unable to solve these questions.

INDICES

In seventeenth century a French mathematician Reni Dakata' multiplied a number several times and showed the obtained product by a special rule, which called 'indices' and the converse of indices is called surds.

Rule 1 : If any number is multiplied by the same number 'n' times, then,

$a \times a \times a \times a$ ..... $\times$ a (n times) = a^n

(1) where n and a are real numbers. (including fractions)
(ii) a is called base.
(iii) n is called indices.

Rule 2 : $a^m \times a^n = a^{m+n}$

and $a^m \times a^n \times a^p = a^{m+n+p}$

While multiplying. If base is same then powers get added.

Rule 3 : While multiplying, if bases are different but powers are same then,

$a^x \times b^x \times c^x = (abc)^x$

Rule 4 : While dividing, if base is same then powers get subtracted, as

$a^m \div a^n = a^{m-n}$

Rule 5 : If there is negative indices on a number, then

$a^{-m} = \frac{1}{a^m}$ or, $a^m = \frac{1}{a^{-m}}$

Rule 6 : If there are indices on indices, then indices are multiplied. as–

(i) $\left(a^m\right)^n = a^{mn}$ (ii) $\left(a^m\right)^{\frac{1}{n}} = a^{\frac{m}{n}}$

(iii) $\left\{\left(a^m\right)^n\right\}^p = a^{mnp}$

Rule 7 : (i) $a^{m^n} \neq \left(a^m\right)^n$

(ii) $a^{m^{\frac{1}{n}}} \neq \left(a^m\right)^{\frac{1}{n}}$ (NOTE)

(iii) $a^{m^{n^p}} \neq \left\{\left(a^m\right)^n\right\}^p$ (NOTE)

Rule 8 : Indices as fraction.

(i) $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ (ii) $\left(\frac{a}{b}\right)^{-m} = \left(\frac{b}{a}\right)^m$

Rule 9 : If $a^x = a^y$ then x = y and
if $x^n = y^n$ then x = y

Rule 10 : If the indices on any number is zero, the value of that number is 1, as

$x^\circ = 1$, $5^\circ = 1$, $10^\circ = 1$, $(50000)^\circ = 1$

Rule 11 : If 'a' is a rational number and n is a positive integer, then, nth root of 'a', $a^{\frac{1}{n}}$ or $\sqrt[n]{a}$ is an irrational number, $\sqrt[n]{a}$ is called the surd of n indices, it means $\sqrt[n]{a}$ is a surd where,

(i) 'a' is a rational number. (ii) 'n' is a positive integer.

(iii) $\sqrt[n]{a}$ is an irrational number.

Rule 12 : If $\sqrt[n]{a}$ is a surd, then n is called surd indices and a is called 'Radicand'. Every surd can be an irrational number, but every irrational number can not be a surd.

Rule 13 : Mixed Surds– A surd having a rational co–efficient other than unity is called a mixed surd.

Rule 14 : Pure Surd : The surds whose one factor is 1 and other factor is an irrational number, then that type of surd is called pure surd or the surd which is completely under radical sign.

Rule 15 : Similar Surds–The surds whose irrational factor is same, that is called similar surds.

Rule 16 : Irrational numbers as – $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$, $\sqrt{7}$ .....etc. have infinite recurring decimals.

Rule 17 : $\sqrt[n]{a} = (a)^{\frac{1}{n}}$

Rule 18 : $\left(\sqrt[n]{a}\right)^n = a$

Rule 19 : $\sqrt[n]{ab} = \sqrt[n]{a} \times \sqrt[n]{b} = (a)^{\frac{1}{n}} \times (b)^{\frac{1}{n}}$

Rule 20 : $\sqrt[n]{\sqrt[n]{a}} = \left((a)^{\frac{1}{n}}\right)^{\frac{1}{n}} = a^{n^{\frac{1}{2}}}$

Rule 21 : $\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \left(\frac{a}{b}\right)^{\frac{1}{n}}$

Rule 22 : $\sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a}$

Rule 23: $\sqrt{x\sqrt{x\sqrt{x\sqrt{x \ldots\ldots\ldots\ldots\ldots \text{n times}}}}} = x^{\left(1-\frac{1}{x^n}\right)}$

Rule 24 : If $\sqrt{x-\sqrt{x-\sqrt{x-\ldots\ldots\infty}}}$, where x=n(n + 1)

then, $\sqrt{x-\sqrt{x-\sqrt{x-\ldots\ldots\infty}}} = n$

Rule 25 : If $\sqrt{x+\sqrt{x+\sqrt{x+\ldots\ldots\infty}}}$ where, x=n(n + 1)

then $\sqrt{x+\sqrt{x+\sqrt{x+\ldots\ldots\infty}}} = (n + 1)$

Rule 26 : $\sqrt[a]{b}, \sqrt[x]{y}, \sqrt[n]{m}, \sqrt[p]{q}$

To find smallest or greatest out of these, we should equate all the indices and compare the base. ❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. By how much does $\sqrt{12}+\sqrt{18}$ exceed $\sqrt{3}+\sqrt{2}$?

(1) $2\left(\sqrt{3}-\sqrt{2}\right)$ (2) $2\left(\sqrt{3}+\sqrt{2}\right)$

(3) $\sqrt{3}+2\sqrt{2}$ (4) $\sqrt{2}-4\sqrt{3}$

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The value of

$\sqrt{5+2\sqrt{6}}-\dfrac{1}{\sqrt{5+2\sqrt{6}}}$ is :

(1) $2\sqrt{2}$ (2) $2\sqrt{3}$

(3) $1+\sqrt{5}$ (4) $\sqrt{5}-1$

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

3. The value of $\sqrt{2^4}+\sqrt[3]{64}+\sqrt[4]{2^8}$ is :

(1) 12 (2) 16

(3) 18 (4) 24

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

4. $2\sqrt[3]{32}-3\sqrt[3]{4}+\sqrt[3]{500}$ is equal to :

(1) $4\sqrt[3]{6}$ (2) $3\sqrt{24}$

(3) $6\sqrt[3]{4}$ (4) 916

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

5. $\left(\sqrt{8}-\sqrt{4}-\sqrt{2}\right)$ equals :

(1) $2-\sqrt{2}$ (2) $\sqrt{2}-2$

(3) 2 (4) –2

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

6. $8^{2/3}$ is equal to :

(1) $5\frac{1}{2}$ (2) $21\frac{1}{3}$

(3) 4 (4) $3\frac{1}{3}$

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

7. The simplified form of $\left(16^{3/2}+16^{-3/2}\right)$ is :

(1) 0 (2) $\dfrac{4097}{64}$

(3) 1 (4) $\dfrac{16}{4097}$

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

8. $16^{3/4}$ is equal to :

(1) $4\sqrt{2}$ (2) 8

(3) $2\sqrt{2}$ (4) 16

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

9. $(0.01024)^{1/5}$ is equal to :

(1) 4.0 (2) 0.04

(3) 0.4 (4) 0.00004

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

10. $(16^{0.16}\times 2^{0.36})$ is equal to

(1) 2 (2) 16

(3) 32 (4) 64

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

11. The value of $(256)^{0.16}\times(16)^{0.18}$ is :

(1) 4 (2) – 4

(3) 16 (4) 256

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

12. The value of

$$\frac{(243)^{0.13}\times(243)^{0.07}}{(7)^{0.25}\times(49)^{0.075}\times(343)^{0.2}}$$

(1) $\frac{3}{7}$ (2) $\frac{7}{3}$

(3) $1\frac{3}{7}$ (4) $2\frac{2}{7}$

(SSC CPO S.I. Exam. 12.01.2003

13. The value of :

$\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{7+4\sqrt{3}}}}$ is

(1) 1 (2) 2

(3) 3 (4) 8

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

14. $\sqrt{\sqrt[3]{0.004096}}$ is equal to

(1) 4 (2) 0.4

(3) 0.04 (4) 0.004

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

15. The **approximate** value of

$\dfrac{3\sqrt{12}}{2\sqrt{28}}\div\dfrac{2\sqrt{21}}{\sqrt{98}}$ is

(1) 1.0727 (2) 1.0606

(3) 1.6026 (4) 1.6007

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

16. The value of

$2+\sqrt{0.09}-\sqrt[3]{0.008}-75\%$ of 2.80 is :

(1) 0 (2) 0.01

(3) –1 (4) 0.001

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

17. The value of

$\left(\sqrt[3]{3.5}+\sqrt[3]{2.5}\right)\left\{\left(\sqrt[3]{3.5}\right)^2-\sqrt[3]{8.75}+\left(\sqrt[3]{2.5}\right)^2\right\}$

is :

(1) 5.375 (2) 1

(3) 6 (4) 5

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

18. The value of

$\left(3+2\sqrt{2}\right)^{-3}+\left(3-2\sqrt{2}\right)^{-3}$ is

(1) 189 (2) 180

(3) 108 (4) 198

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

19. $\dfrac{\sqrt{5}}{\sqrt{3}+\sqrt{2}}-\dfrac{3\sqrt{3}}{\sqrt{5}+\sqrt{2}}+\dfrac{2\sqrt{2}}{\sqrt{5}+\sqrt{3}}$

is equal to :

(1) 0 (2) $2\sqrt{15}$

(3) $2\sqrt{10}$ (4) $2\sqrt{6}$

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

20. When $(4+\sqrt{7})$ is presented in the form of perfect square it will be equal to

(1) $(2+\sqrt{7})^2$ (2) $\left(\dfrac{\sqrt{7}}{2}+\dfrac{1}{2}\right)^2$

(3) $\left\{\dfrac{1}{\sqrt{2}}\left(\sqrt{7}+1\right)\right\}^2$ (4) $\left(\sqrt{3}+\sqrt{4}\right)^2$

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

21. The value of

$$\frac{1}{\sqrt{3.25}+\sqrt{2.25}}+\frac{1}{\sqrt{4.25}+\sqrt{3.25}}+\frac{1}{\sqrt{5.25}+\sqrt{4.25}}+\frac{1}{\sqrt{6.25}+\sqrt{5.25}}$$ is

(1) 1.00 (2) 1.25

(3) 1.50 (4) 2.25

(SSC CPO S.I. Exam. 05.09.2004)

22. The simplified form of

$$\frac{2}{\sqrt{7}+\sqrt{5}}+\frac{7}{\sqrt{12}-\sqrt{5}}-\frac{5}{\sqrt{12}-\sqrt{7}}$$

is :

(1) 5 (2) 2
(3) 1 (4) 0

(SSC CPO S.I. Exam. 26.05.2005)

23. $\left(\frac{1}{2}\right)^{-\frac{1}{2}}$ is equal to

(1) $\frac{1}{\sqrt{2}}$ (2) $2\sqrt{2}$
(3) $-\sqrt{2}$ (4) $\sqrt{2}$

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005 & SSC HSL DEO & LDC Exam. 28.11.2010)

24. $\frac{1}{\sqrt{3}+\sqrt{4}}+\frac{1}{\sqrt{4}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{6}}+\frac{1}{\sqrt{6}+\sqrt{7}}+\frac{1}{\sqrt{7}+\sqrt{8}}+\frac{1}{\sqrt{8}+\sqrt{9}}$ is equal to

(1) $\sqrt{3}$ (2) $3\sqrt{3}$
(3) $3-\sqrt{3}$ (4) $5-\sqrt{3}$

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

25. $(16)^{0.16}\times(16)^{0.04}\times(2)^{0.2}$ is equal to :

(1) 1 (2) 2
(3) 4 (4) 16

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

26. $\frac{12}{3+\sqrt{5}+2\sqrt{2}}$ is equal to

(1) $1-\sqrt{5}+\sqrt{2}+\sqrt{10}$
(2) $1+\sqrt{5}+\sqrt{2}-\sqrt{10}$
(3) $1+\sqrt{5}-\sqrt{2}+\sqrt{10}$
(4) $1-\sqrt{5}-\sqrt{2}+\sqrt{10}$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

27. $\left(3+\frac{1}{\sqrt{3}}+\frac{1}{3+\sqrt{3}}+\frac{1}{\sqrt{3}-3}\right)$ is equal to

(1) 1 (2) 3
(3) $3+\sqrt{3}$ (4) $3-\sqrt{3}$

(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting) & SSC CGL Tier-I Exam. 19.06.2011 (IInd Sitting) & SSC (10+2) DEO & LDC Exam. 20.10.2013)

28. $\sqrt{8-2\sqrt{15}}$ is equal to :

(1) $\sqrt{5}+\sqrt{3}$ (2) $5-\sqrt{3}$
(3) $\sqrt{5}-\sqrt{3}$ (4) $3-\sqrt{5}$

(SSC CPO S.I. Exam. 16.12.2007)

29. $(0.04)^{-(1.5)}$ is equal to

(1) 25 (2) 125
(3) 60 (4) 5

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

30. The value of

$\sqrt[3]{1372}\times\sqrt[3]{1458}\div\sqrt[3]{343}$ is

(1) 18 (2) 15
(3) 13 (4) 12

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

31. $\left(\frac{2}{\sqrt{5}+\sqrt{3}}-\frac{3}{\sqrt{6}-\sqrt{3}}+\frac{1}{\sqrt{6}+\sqrt{5}}\right)$ is equal to

(1) $2\sqrt{6}$ (2) $2\sqrt{5}$
(3) $2\sqrt{3}$ (4) 0

(SSC CPO S.I. Exam. 09.11.2008)

32. $\frac{1}{3-\sqrt{8}}-\frac{1}{\sqrt{8}-\sqrt{7}}+\frac{1}{\sqrt{7}-\sqrt{6}}-\frac{1}{\sqrt{6}-\sqrt{5}}+\frac{1}{\sqrt{5}-2}=$

(1) 5 (2) 4
(3) 3 (4) 2

(SSC CPO S.I.Exam. 06.09.2009) & SSC MTS (Non-Tech.) Exam. 20.02.2011)

33. $\frac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}-2\sqrt{3}}$ is equal to

(1) $5+2\sqrt{6}$ (2) $\frac{3+2\sqrt{6}}{2}$
(3) $5-2\sqrt{3}$ (4) $5+2\sqrt{3}$

(SSC CISF ASI Exam 29.08.2010 (Paper-1)

34. The value of

$\frac{2+\sqrt{3}}{2-\sqrt{3}}+\frac{2-\sqrt{3}}{2+\sqrt{3}}+\frac{\sqrt{3}+1}{\sqrt{3}-1}$ is

(1) $16+\sqrt{3}$ (2) $4-\sqrt{3}$
(3) $2-\sqrt{3}$ (4) $2+\sqrt{3}$

(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

35. The square root of $14+6\sqrt{5}$ is

(1) $2+\sqrt{5}$ (2) $3+\sqrt{5}$
(3) $5+\sqrt{3}$ (4) $3+2\sqrt{5}$

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

36. The value of

$\frac{3\sqrt{2}}{\sqrt{3}+\sqrt{6}}-\frac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}}+\frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}}$ is

(1) 4 (2) 0
(3) $\sqrt{2}$ (4) $3\sqrt{6}$

(SSC CGL Prelim Exam. 11.05.2003 (IInd Sitting) & SSC CPO S.I. 16.12.2007 & SSC CGL 27.07.2008 (Ist Sitting) & SSC CGL Tier-I Exam. 26.06.2011 (Ist Sitting) & SSC CGL Tier-II Exam. 29.09.2013)

37. Simplify : $\left(\frac{\frac{3}{2+\sqrt{3}}-\frac{2}{2-\sqrt{3}}}{2-5\sqrt{3}}\right)$

(1) $\frac{1}{2}-5\sqrt{3}$ (2) $2-5\sqrt{3}$
(3) 1 (4) 0

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

38. $(64)^{-\frac{2}{3}}\times\left(\frac{1}{4}\right)^{-2}$ is equal to :

(1) 1 (2) 2
(3) $\frac{1}{2}$ (4) $\frac{1}{16}$

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

39. $\left(\frac{1+\sqrt{2}}{\sqrt{5}+\sqrt{3}}+\frac{1-\sqrt{2}}{\sqrt{5}-\sqrt{3}}\right)$ simplifies to :

(1) $\sqrt{5}+\sqrt{6}$ (2) $2\sqrt{5}+\sqrt{6}$
(3) $\sqrt{5}-\sqrt{6}$ (4) $2\sqrt{5}-3\sqrt{6}$

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

40. $\left(\frac{2+\sqrt{3}}{2-\sqrt{3}}+\frac{2-\sqrt{3}}{2+\sqrt{3}}+\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)$ simplifies to :

(1) $2-\sqrt{3}$ (2) $2+\sqrt{3}$
(3) $16-\sqrt{3}$ (4) $40-\sqrt{3}$

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

41. $\left(\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}\right)^2+\left(\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}\right)^2$ is equal to :

(1) 64 (2) 62
(3) 66 (4) 68

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

42. The value of

$$\sqrt{\frac{\left(\sqrt{12}-\sqrt{8}\right)\left(\sqrt{3}+\sqrt{2}\right)}{5+\sqrt{24}}}$$ is :

(1) $\sqrt{6}-\sqrt{2}$ (2) $\sqrt{6}+\sqrt{2}$
(3) $\sqrt{6}-2$ (4) $2-\sqrt{6}$

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

43. Simplify :

$$\left[64^{\frac{2}{3}}\times 2^{-2}\div 8^0\right]^{\frac{1}{2}}$$

(1) 0 (2) 1
(3) 2 (4) $\frac{1}{2}$

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

44. The value of

$$\frac{1}{\sqrt{\left(12-\sqrt{140}\right)}}-\frac{1}{\sqrt{\left(8-\sqrt{60}\right)}}-\frac{2}{\sqrt{10+\sqrt{84}}}$$

is :

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & SSC CGL Exam. 13.11.2005 (IInd Sitting)

45. The value of

$$\sqrt{11+2\sqrt{30}}-\frac{1}{\sqrt{11+2\sqrt{30}}}$$ is

(1) $2\sqrt{5}$ (2) $2\sqrt{6}$
(3) $1+\sqrt{6}$ (4) $1+\sqrt{5}$

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

46. The value of $(243)^{0.16}\times(243)^{0.04}$ is equal to :

(1) 0.16 (2) 3
(3) $\frac{1}{3}$ (4) 0.04

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

47. $\frac{3^0+3^{-1}}{3^{-1}-3^0}$ is simplified to

(1) –2 (2) –1
(3) 1 (4) 2

(SSC CPO S.I. Exam. 05.09.2004)

48. Simplify

$$\frac{1}{\sqrt{100}-\sqrt{99}}-\frac{1}{\sqrt{99}-\sqrt{98}}+\frac{1}{\sqrt{98}-\sqrt{97}}-\frac{1}{\sqrt{97}-\sqrt{96}}+\ldots+\frac{1}{\sqrt{2}-\sqrt{1}}$$

(1) 0 (2) 9
(3) 10 (4) 11

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

49. $\left[\frac{1}{\sqrt{2}+\sqrt{3}-\sqrt{5}}+\frac{1}{\sqrt{2}-\sqrt{3}-\sqrt{5}}\right]$ in simplified form equals to :

(1) 1 (2) $\sqrt{2}$
(3) $\frac{1}{\sqrt{2}}$ (4) 0

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

50. $\left[\sqrt[3]{2}\times\sqrt{2}\times\sqrt[3]{3}\times\sqrt{3}\right]$ is equal to

(1) 6^5 (2) $6^{5/6}$
(3) 6
(4) None of these

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

51. The value of $(256)^{0.16}\times(256)^{0.09}$ is :

(1) 256.25 (2) 64
(3) 16 (4) 4

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

52. $\left[8-\left(\frac{4^{\frac{9}{4}}\sqrt{2.2^2}}{2\sqrt{2^{-2}}}\right)^{\frac{1}{2}}\right]$ is equal to

(1) 32 (2) 8
(3) 1 (4) 0

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

53. $\frac{3\sqrt{2}}{\sqrt{6}+\sqrt{3}}-\frac{2\sqrt{6}}{\sqrt{3}+1}+\frac{2\sqrt{3}}{\sqrt{6}+2}$ is equal to

(1) 3 (2) 2
(3) 0 (4) $\sqrt{3}$

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

54. $(4)^{0.5}\times(0.5)^4$ is equal to :

(1) 1 (2) 4
(3) $\frac{1}{8}$ (4) $\frac{1}{32}$

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

55. $\left[\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}-\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}\right]$ simplifies to

(1) $2\sqrt{6}$ (2) $4\sqrt{6}$
(3) $2\sqrt{3}$ (4) $3\sqrt{2}$

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

56. The value of $\sqrt{40+\sqrt{9\sqrt{81}}}$ is

(1) $\sqrt{111}$ (2) 9
(3) 7 (4) 11

(SSC CHSL DEO & LDC Exam. 20.10.2013)

57. $\frac{1}{\sqrt{9}-\sqrt{8}}-\frac{1}{\sqrt{8}-\sqrt{7}}+\frac{1}{\sqrt{7}-\sqrt{6}}-\frac{1}{\sqrt{6}-\sqrt{5}}+\frac{1}{\sqrt{5}-\sqrt{4}}$ is equal to

(1) 5 (2) 1
(3) 3 (4) 0

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

58. Simplified form of

$$\left[\left(\sqrt[5]{x^{-3/5}}\right)^{-5/3}\right]^5$$ is

(1) x^5 (2) x^{-5}
(3) x (4) $\frac{1}{x}$

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

59. $\left[\frac{\sqrt{3}+1}{\sqrt{3}-1}+\frac{\sqrt{2}+1}{\sqrt{2}-1}+\frac{\sqrt{3}-1}{\sqrt{3}+1}+\frac{\sqrt{2}-1}{\sqrt{2}+1}\right]$ is simplified to

(1) 10 (2) 12
(3) 14 (4) 18

(SSC (South Zone) Investigator Exam. 12.09.2010)

60. $\dfrac{3+\sqrt{6}}{5\sqrt{3}-2\sqrt{12}-\sqrt{32}+\sqrt{50}}$ is equal to

(1) 3 (2) $\sqrt{3}$

(3) $3\sqrt{2}$ (4) $2\sqrt{3}$

(SSC (South Zone) Investigator Exam. 12.09.2010)

61. $\left(\dfrac{1+\sqrt{2}}{\sqrt{5}+\sqrt{3}}+\dfrac{1-\sqrt{2}}{\sqrt{5}-\sqrt{3}}\right)$ simplifies to

(1) $\sqrt{5}+\sqrt{6}$ (2) $2\sqrt{5}+\sqrt{6}$

(3) $\sqrt{5}-\sqrt{6}$ (4) $2\sqrt{5}-3\sqrt{6}$

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

62. When simplified equal to $(256)^{-\left(4^{-\frac{3}{2}}\right)}$ is

(1) 8 (2) $\dfrac{1}{8}$

(3) 2 (4) $\dfrac{1}{2}$

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

63. $\left\{(-2)^{(-2)}\right\}^{(-2)}$ is equal to :

(1) 16 (2) 8

(3) –8 (4) –1

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

64. $\left(\sqrt{2}+\sqrt{7-2\sqrt{10}}\right)$ is equal to

(1) $\sqrt{2}$ (2) $\sqrt{7}$

(3) $\sqrt{5}$ (4) $2\sqrt{5}$

(SSC Data Entry Operator Exam. 31.08.2008)

65. $(256)^{0.16}\times(4)^{0.36}$ is equal to

(1) 64 (2) 16

(3) 256.25 (4) 4

(SSC Data Entry Operator Exam. 02.08.2009)

66. By how much does $5\sqrt{7}-2\sqrt{5}$ exceed $3\sqrt{7}-4\sqrt{5}$?

(1) $5\left(\sqrt{7}+\sqrt{5}\right)$ (2) $\sqrt{7}+\sqrt{5}$

(3) $2\left(\sqrt{7}+\sqrt{5}\right)$ (4) $7\left(\sqrt{2}+\sqrt{5}\right)$

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

67. $\dfrac{\sqrt{7}-\sqrt{5}}{\sqrt{7}+\sqrt{5}}+\dfrac{\sqrt{7}+\sqrt{5}}{\sqrt{7}-\sqrt{5}}$ is equal to :

(1) 12 (2) $6\sqrt{35}$

(3) 6 (4) $2\sqrt{35}$

(SSC HSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

68. $\left(\dfrac{2}{\sqrt{6}+2}+\dfrac{1}{\sqrt{7}+\sqrt{6}}+\dfrac{1}{\sqrt{8}-\sqrt{7}}+2-2\sqrt{2}\right)$ is equal to

(1) 0 (2) $2\sqrt{2}$

(3) $\sqrt{6}$ (4) $2\sqrt{7}$

(SSC HSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

69. By how much does $\left(\sqrt{12}+\sqrt{18}\right)$ exceed $\left(2\sqrt{3}+2\sqrt{2}\right)$?

(1) 2 (2) $\sqrt{3}$

(3) $\sqrt{2}$ (4) 3

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

70. The value of $\dfrac{1}{\sqrt{2}+1}+\dfrac{1}{\sqrt{3}+\sqrt{2}}+\dfrac{1}{\sqrt{4}+\sqrt{3}}+\ldots+\dfrac{1}{\sqrt{100}+\sqrt{99}}$ is

(1) 1 (2) 9

(3) $\sqrt{99}$ (4) $\sqrt{99}-1$

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

71. $\left[\left\{\left(-\dfrac{1}{2}\right)^{2}\right\}^{-2}\right]^{-1}$ is equal to :

(1) $\dfrac{1}{16}$ (2) 16

(3) $-\dfrac{1}{16}$ (4) –16

(SSC HSL DEO & LDC Exam. 27.11.2010)

72. $2\sqrt[3]{40}-4\sqrt[3]{320}+3\sqrt[3]{625}-3\sqrt[3]{5}$ is equal to

(1) $-2\sqrt[3]{340}$ (2) 0

(3) $\sqrt[3]{340}$ (4) $\sqrt[3]{660}$

(SSC CGL Tier-II Exam. 16.09.2012)

73. The value of $\sqrt[3]{0.000125}$ is

(1) 0.005 (2) 0.05

(3) 0.5 (4) 0.0005

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

74. $\dfrac{0.3555\times0.5555\times2.025}{0.225\times1.7775\times0.2222}$ is equal to

(1) 5.4 (2) 4.58

(3) 4.5 (4) 5.45

(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

75. The simplification of

$$\frac{0.06\times0.06\times0.06-0.05\times0.05\times0.05}{0.06\times0.06+0.06\times0.05+0.05\times0.05}$$

gives :

(1) 0.01 (2) 0.001

(3) 0.1 (4) 0.02

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

76. Simplify :

$$\frac{0.05\times0.05\times0.05-0.04\times0.04\times0.04}{0.05\times0.05+0.002+0.04\times0.04}$$

(1) 1 (2) 0.1

(3) 0.01 (4) 0.001

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

77. If $\dfrac{\left(x-\sqrt{24}\right)\left(\sqrt{75}+\sqrt{50}\right)}{\sqrt{75}-\sqrt{50}}=1$, then the value of x is

(1) $\sqrt{5}$ (2) 5

(3) $2\sqrt{5}$ (4) $3\sqrt{5}$

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

78. Evaluate

$$\sqrt{20}+\sqrt{12}+\sqrt[3]{729}-\frac{4}{\sqrt{5}-\sqrt{3}}-\sqrt{81}$$

(1) $\sqrt{2}$ (2) $\sqrt{3}$

(3) 0 (4) $2\sqrt{2}$

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

79. Let

$$a=\frac{1}{2-\sqrt{3}}+\frac{1}{3-\sqrt{8}}+\frac{1}{4-\sqrt{15}}.$$

Then we have

(1) $a<18$ but $a\neq9$

(2) $a>18$

(3) $a=18$

(4) $a=9$

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

80. If a, b are rationals and

$a\sqrt{2}+b\sqrt{3}$

$=\sqrt{98}+\sqrt{108}-\sqrt{48}-\sqrt{72}$

then the values of a, b are respectively

(1) 1, 2 (2) 1, 3
(3) 2, 1 (4) 2, 3

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

81. Let $\sqrt[3]{a}=\sqrt[3]{26}+\sqrt[3]{7}+\sqrt[3]{63}$. Then

(1) $a < 729$ but $a > 216$
(2) $a < 216$
(3) $a > 729$
(4) $a = 729$

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

82. The value of

$$\frac{\sqrt{72}\times\sqrt{363}\times\sqrt{175}}{\sqrt{32}\times\sqrt{147}\times\sqrt{252}} \text{ is}$$

(1) $\frac{55}{42}$ (2) $\frac{45}{56}$
(3) $\frac{45}{28}$ (4) $\frac{55}{28}$

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

83. Simplify :

$$\frac{5.32\times56+5.32\times44}{(7.66)^2-(2.34)^2}$$

(1) 7.2 (2) 8.5
(3) 10 (4) 12

(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting) & (SSC SO Commercial Audit Exam. 16.11.2003)

84. $2+\frac{6}{\sqrt{3}}+\frac{1}{2+\sqrt{3}}+\frac{1}{\sqrt{3}-2}$ equals to

(1) $+\left(2\sqrt{3}\right)$ (2) $-\left(2+\sqrt{3}\right)$
(3) 1 (4) 2

(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

85. If $\frac{4+3\sqrt{3}}{\sqrt{7+4\sqrt{3}}}=A+\sqrt{B}$, then B – A is

(1) –13 (2) $2\sqrt{13}$
(3) 13 (4) $3\sqrt{3}-\sqrt{7}$

(SSC CGL Tier-I Exam. 21.04.2013 IInd Sitting)

86. Find the simplest value of $2\sqrt{50}+\sqrt{18}-\sqrt{72}$ (given $\sqrt{2}$ = 1.414).

(1) 4.242 (2) 9.898
(3) 10.312 (4) 8.484

(SSC CGL Tier-I Exam. 19.05.2013 Ist Sitting)

87. (6.5 × 6.5 – 45.5 + 3.5 × 3.5) is equal to :

(1) 10 (2) 9
(3) 7 (4) 6

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

88. (7.5 × 7.5 + 37.5 + 2.5 × 2.5) is equal to :

(1) 100 (2) 80
(3) 60 (4) 30

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

89. Simplify :

$$\frac{(1.5)^3+(4.7)^3+(3.8)^3-3\times1.5\times4.7\times3.8}{(1.5)^2+(4.7)^2+(3.8)^2-1.5\times4.7-4.7\times3.8-3.8\times1.5}$$

(1) 0 (2) 1
(3) 10 (4) 30

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

90. Simplify :

$$\frac{(6.25)^{\frac{1}{2}}\times(0.0144)^{\frac{1}{2}}+1}{(0.027)^{\frac{1}{3}}\times(81)^{\frac{1}{4}}}$$

(1) 0.14 (2) 1.4
(3) 1 (4) $1.\overline{4}$

(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & (SSC CGL Prelim Exam. 13.11.2005)

91. Simplify :

$$\frac{0.41\times0.41\times0.41+0.69\times0.69\times0.69}{0.41\times0.41-0.41\times0.69+0.69+0.69}$$

(1) 0.28 (2) 1.1
(3) 11 (4) 2.8

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

92. $\frac{10.3\times10.3\times10.3+1}{10.3\times10.3-10.3+1}$ is equal to :

(1) 9.3 (2) 10.3
(3) 11.3 (4) 12.3

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

93. $\frac{1.49\times14.9-0.51\times5.1}{14.9-5.1}$ is equal to :

(1) 0.20 (2) 20.00
(3) 2.00 (4) 22.00

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

94. $(0.04)^{-1.5}$ on simplification gives :

(1) 25 (2) 125
(3) 250 (4) 625

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

95. $\frac{(0.96)^3-(0.1)^3}{(0.96)^2+0.096+(0.1)^2}$ is simplified to :

(1) 1.06 (2) 0.95
(3) 0.86 (4) 0.97

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

96. The value of $\frac{64-0.008}{16+0.8+0.04}$ is :

(1) 2 (2) 3.8
(3) 0.6 (4) 4.2

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

97. The value of

$$\frac{0.796\times0.796-0.204\times0.204}{0.796-0.204} \text{ is :}$$

(1) 0.408 (2) 0.59
(3) 0.592 (4) 1

(SSC CPO S.I. Exam. 26.05.2005)

98. $\frac{(2.3)^3+0.027}{(2.3)^2-0.69+0.09}$ is equal to :

(1) 2.60 (2) 2.00
(3) 2.33 (4) 2.80

(SSC CPO S.I. Exam. 26.05.2005)

99. The value of

$$\frac{5.71\times5.71\times5.71-2.79\times2.79\times2.79}{5.71\times5.71+5.71\times2.79+2.79\times2.79}$$

in simplified form is :

(1) 8.5 (2) 8.6
(3) 2.82 (4) 2.92

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

100. The value of

$$\frac{(1.5)^3+(4.7)^3+(3.8)^3-3\times1.5\times4.7\times3.8}{(1.5)^2+(4.7)^2+(3.8)^2-1.5\times4.7-4.7\times3.8-3.8\times1.5} \text{ is :}$$

(1) 0 (2) 1
(3) 10 (4) 30

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

101.

$$\left[\frac{(0.73)^3+(0.27)^3}{(0.73)^2+(0.27)^2-(0.73)\times(0.27)}\right]$$

simplifies to

(1) 1 (2) 0.4087
(3) 0.73 (4) 0.27

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

102. 0.75 × 7.5 – 2 × 7.5 × 0.25 + 0.25 × 2.5 is equal to

(1) 250 2) 2500
(3) 2.5 (4) 25

(SSC CPO S.I. Exam. 03.09.2006)

103. $\left(\frac{1}{1.4}+\frac{1}{4.7}+\frac{1}{7.10}+\frac{1}{10.13}+\frac{1}{13.16}\right)$ is equal to

(1) $\frac{1}{3}$ (2) $\frac{5}{16}$
(3) $\frac{3}{8}$ (4) $\frac{41}{7280}$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

104. $\frac{137\times137+133\times133+18221}{137\times137\times137-133\times133\times133}$ is equal to

(1) 4 (2) 270
(3) $\frac{1}{4}$ (4) $\frac{1}{270}$

(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting) & (SSC CGL Prelim Exam. 27.07.2008) & (SSC DEO Exam. 31.08.2008)

105.

$$\left(\frac{2.75\times2.75\times2.75-2.25\times2.25\times2.25}{2.75\times2.75+2.75\times2.25+2.25\times2.25}\right)$$

is equal to :

(1) – 5 (2) 0.5
(3) –0.5 (4) 5

(SSC CPO S.I. Exam. 16.12.2007)

106.

$$\frac{(5.624)^3+(4.376)^3}{5.624\times5.624-(5.624\times4.376)+4.376\times4.376}$$

is equal to

(1) 10 (2) 1.248
(3) 20.44 (4) 1

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

107. The value of

$$\left[\frac{(0.337+0.126)^2-(0.337-0.126)^2}{0.337\times0.126}\right]$$ is

(1) 4 (2) 0.211
(2) 0.463 (4) 0.4246

(SSC CPO S.I. Exam. 06.09.2009)

108. $\frac{256\times256-144\times144}{112}$ is equal to

(1) 420 (2) 400
(3) 360 (4) 320

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

109. [8.7 × 8.7 + 2 × 8.7 × 1.3 + 1.3 × 1.3] is equal to

(1) 1.69 (2) 10
(3) 75.69 (4) 100

(SSC (South Zone) Investigator Exam. 12.09.2010)

110. $\frac{(3.06)^3-(1.98)^3}{(3.06)^2+3.06\times1.98+(1.98)^2}$ is equal to

(1) 1.08 (2) 5.04
(3) 2.16 (4) 1.92

(SSC (South Zone) Investigator Exam. 12.09.2010)

111. $\frac{3.25\times3.25+1.75\times1.75-2\times3.25\times1.75}{3.25\times3.25-1.75\times1.75}$ is simplified to

(1) 0.5 (2) 0.4
(3) 0.3 (4) 0.2

(SSC CPO Sub-Inspector Exam. 12.12.2010 (Paper-I)

112. $\frac{(0.05)^2+(0.41)^2+(0.073)^2}{(0.005)^2+(0.041)^2+(0.0073)^2}$ is

(1) 10 (2) 100
(3) 1000 (4) None of these

(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

113. $\frac{2.3\times2.3\times2.3-1}{2.3\times2.3+2.3+1}$ is equal to

(1) 1.3 (2) 3.3
(3) 0.3 (4) 2.2

(SSC CPO S.I. Exam. 07.09.2003)

114. Find the value of :

$(0.98)^3+(0.02)^3+3\times0.98\times0.02-1$

(1) 1.98 (2) 1.09
(3) 1 (4) 0

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

115.

$\frac{0.08\times0.08\times0.08+0.02\times0.02\times0.02}{0.08\times0.08-0.0016+0.02\times0.02}$ is simplified to :

(1) 0.001 (2) 0.1
(3) 0.0016 (4) 0.016

(SSC CHSL DEO & LDC Exam. 27.11.2010)

116. The value of 0.65 × 0.65 + 0.35 × 0.35 + 0.70 × 0.65 is

(1) 1.75 (2) 1.00
(3) 1.65 (4) 1.55

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

117. $(2.4\times10^3)\div(8\times10^{-2})$ equals

(1) 3×10^5 (2) 3×10^4
(3) 3×10^{-5} (4) 30

(SSC CPO S.I. Exam. 12.01.2003)

118. $[3-4(3-4)^{-1}]^{-1}$ is equal to :

(1) 7 (2) –7
(3) $\frac{1}{7}$ (4) $-\frac{1}{7}$

(SSC CPO S.I.Exam. 26.05.2005)

119. $\frac{(998)^2-(997)^2-45}{(98)^2-(97)^2}$ equals

(1) 1995 (2) 195
(3) 95 (4) 10

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

120. Evaluate : $\frac{\sqrt{24}+\sqrt{6}}{\sqrt{24}-\sqrt{6}}$.

(1) 2 (2) 3
(3) 4 (4) 5

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

121. $55^3+17^3-72^3+201960$ is equal to

(1) –1 (2) 0
(3) 1 (4) 17

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

122. What is the value of

$\frac{2.75\times2.75\times2.75-2.25\times2.25\times2.25}{2.75\times2.75+2.75\times2.25+2.25\times2.25}$ is

(1) 3 (2) $\frac{3}{2}$
(3) 1 (4) $\frac{1}{2}$

(SSC CGL Tier-I Exam. 26.10.2014)

123. The value of $\frac{(243)^{\frac{n}{5}}\times3^{2n+1}}{9^n\times3^{n-1}}$ is

(1) 3 (2) 9
(3) 6 (4) 12

(SSC CGL Tier-I Exam. 26.10.2014

124. The simplified value of $(\sqrt{3}+1)(10+\sqrt{12})(\sqrt{12}-2)(5-\sqrt{3})$ is

(1) 16 (2) 88
(3) 176 (4) 132

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014

125. The simplified value of $(0.2)^3 \times 200 \div 2000$ of $(0.2)^2$ is

(1) $\frac{1}{100}$ (2) $\frac{1}{50}$
(3) $\frac{1}{10}$ (4) 1

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

126. The simplified value of

$$\left(\sqrt{6}+\sqrt{10}-\sqrt{21}-\sqrt{35}\right)\left(\sqrt{6}-\sqrt{10}+\sqrt{21}-\sqrt{35}\right) \text{ is}$$

(1) 13 (2) 12
(3) 11 (4) 10

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

127. The value of

$$\frac{1}{1+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+\frac{1}{\sqrt{4}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{6}}+\frac{1}{\sqrt{6}+\sqrt{7}}+\frac{1}{\sqrt{7}+\sqrt{8}}+\frac{1}{\sqrt{8}+\sqrt{9}} \text{ is}$$

(1) 2 (2) 0
(3) 4 (4) 1

(SSC CGL Tier-II Exam. 12.04.2015 (TF No. 567 TL 9)

128. The value of

$$\frac{1}{\sqrt{7}-\sqrt{6}}-\frac{1}{\sqrt{6}-\sqrt{5}}+\frac{1}{\sqrt{5}-2}-\frac{1}{\sqrt{8}-\sqrt{7}}+\frac{1}{3-\sqrt{8}} \text{ is}$$

(1) 7 (2) 0
(3) 1 (4) 5

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

129. If $2+x\sqrt{3}=\frac{1}{2+\sqrt{3}}$, then the simplest vlaue of x is

(1) – 1 (2) 1
(3) – 2 (4) 2

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

130. The value of :

$$\sqrt{\frac{0.324\times0.081\times4.624}{1.5625\times0.0289\times72.9\times64}} \text{ is}$$

(1) 2.4 (2) 24
(3) 0.024 (4) 0.24

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

131. If $\frac{\sqrt{7}-1}{\sqrt{7}+1}-\frac{\sqrt{7}+1}{\sqrt{7}-1}=a+\sqrt{7}\,b$, then the values of a and b are respectively

(1) $\sqrt{7}$, –1 (2) $\sqrt{7}$, 1
(3) 0, $-\frac{2}{3}$ (4) $-\frac{2}{3}$, 0

(SSC CGL Tier-I Re-Exam, 30.08.2015)

132. The value of

$$\frac{1}{1+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+\ldots\ldots+\frac{1}{\sqrt{8}+\sqrt{9}} \text{ is}$$

(1) 1 (2) 0
(3) 2 (4) $\sqrt{2}$

(SSC CGL Tier-I Re-Exam, 30.08.2015)

133. If $\frac{\sqrt{a+2b}+\sqrt{a-2b}}{\sqrt{a+2b}-\sqrt{a-2b}}=\sqrt{3}$, then $a : b$ is equal to

(1) $2 : \sqrt{3}$ (2) $\sqrt{3} : 4$
(3) $\sqrt{3} : 2$ (4) $4 : \sqrt{3}$

(SSC CGL Tier-I Re-Exam, 30.08.2015)

134. The value of

$$\frac{(75.8)^2-(35.8)^2}{40} \text{ is}$$

(1) 121.6 (2) 40
(3) 160 (4) 111.6

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

135. The value of

$$\frac{(0.67\times0.67\times0.67)-(0.33\times0.33\times0.33)}{(0.67\times0.67)-(0.67\times0.33)-(0.33\times0.33)} \text{ is}$$

(1) 11 (2) 1.1
(3) 3.4 (4) 0.34

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

136. The value of $\frac{1}{1+\sqrt{2}+\sqrt{3}}+\frac{1}{1-\sqrt{2}+\sqrt{3}}$ is :

(1) $\sqrt{2}$ (2) $\sqrt{3}$
(3) 1 (4) $4\left(\sqrt{3}+\sqrt{2}\right)$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

137. If $a=\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ and $b=\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$, then the value of $\frac{a^2}{b}+\frac{b^2}{a}$ is :

(1) 1030 (2) 1025
(3) 970 (4) 930

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

138. If $1^3+2^3+\ldots\ldots+10^3=3025$, then the value of $2^3+4^3+\ldots\ldots+20^3$ is :

(1) 7590 (2) 5060
(3) 24200 (4) 12100

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

139. The value of $\frac{(2.3)^3+0.027}{(2.3)^2-0.69+0.09}$ is :

(1) 2 (2) 2.27
(3) 2.33 (4) 2.6

(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

140. The value of $\left(1-\sqrt{2}\right)+\left(\sqrt{2}-\sqrt{3}\right)+\left(\sqrt{3}-\sqrt{4}\right)+\ldots\ldots+\left(\sqrt{15}-\sqrt{16}\right)$ is

(1) 0 (2) 1
(3) –3 (4) 4

(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

141. The simplified value of the following expression is :

$$\frac{1}{\sqrt{11-2\sqrt{30}}} - \frac{3}{\sqrt{7-2\sqrt{10}}} - \frac{4}{\sqrt{8+4\sqrt{3}}}$$

(1) 0 (2) 1
(3) $\sqrt{2}$ (4) $\sqrt{3}$

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

142. Find the value of

$$\frac{(243)^{\frac{n}{5}} \times 3^{2n+1}}{9^n \times 3^{n-1}}.$$

(1) 3 (2) 9
(3) 27 (4) 4

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

143. The value of $(d^{s+t} \div d^s) \div d^t$ would be

(1) $d^{2(s+t)}$ (2) 1
(3) 0 (4) d^{s-t}

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

144. $(2^{51} + 2^{52} + 2^{53} + 2^{54} + 2^{55})$ is divisible by

(1) 23 (2) 58
(3) 124 (4) 127

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

145. If $\frac{\sqrt{2+x}+\sqrt{2-x}}{\sqrt{2+x}-\sqrt{2-x}} = 2$, the value of x is

(1) $\frac{4}{5}$ (2) $\frac{3}{5}$
(3) $\frac{8}{5}$ (4) $\frac{1}{5}$

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

146. The value of

$$\frac{3 \times 9^{n+1} + 9 \times 3^{2n-1}}{9 \times 3^{2n} - 6 \times 9^{n-1}}$$ is equal to

(1) $3\frac{3}{5}$ (2) $3\frac{2}{5}$
(3) $3\frac{1}{5}$ (4) 3

(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

147. The value of $\left(\frac{2+\sqrt{3}}{2-\sqrt{3}} - 4\sqrt{3}\right)^2$ is

(1) 36 (2) $36\sqrt{3}$
(3) 49 (4) $49 + \sqrt{3}$

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

148. Simplify :

$$\sqrt[3]{-2197} \times \sqrt[3]{-125} \div \sqrt[3]{\frac{27}{512}}$$

(1) $\frac{492}{7}$ (2) $\frac{520}{3}$
(3) $\frac{554}{7}$ (4) $\frac{571}{5}$

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

149. On simplification the value of $1 - \frac{1}{1+\sqrt{2}} + \frac{1}{1-\sqrt{2}}$ is

(1) $2\sqrt{2} - 1$ (2) $1 - 2\sqrt{2}$
(3) $1 - \sqrt{2}$ (4) $-2\sqrt{2}$

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

150. The simplest value of

$$\frac{3\sqrt{8} - 2\sqrt{12} + \sqrt{20}}{3\sqrt{18} - 2\sqrt{27} + \sqrt{45}}$$ is :

(1) $\frac{3}{2}$ (2) $\frac{2}{3}$
(3) $\frac{1}{3}$ (4) 2

(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (IST Sitting)

151. The simplified value of

$$\frac{3\sqrt{7}}{\sqrt{5}+\sqrt{2}} - \frac{5\sqrt{5}}{\sqrt{2}+\sqrt{7}} + \frac{2\sqrt{2}}{\sqrt{7}+\sqrt{5}}$$ is

(1) 0 (2) 1
(3) 5 (4) 6

(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

152. Simplify :

$$\frac{(0.73)^3 + (0.27)^3}{(0.73)^2 + (0.27)^2 - (0.73) \times (0.27)}$$

(1) 1 (2) 0.4087
(3) 0.73 (4) 0.27

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

153. The simplified value of $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{12}-\sqrt{18}} - \frac{1}{3} \times \sqrt{27} - \frac{1}{2} \times \sqrt[3]{27}$ is closest to

(1) $(\sqrt{3}-1)$ (2) $(1-\sqrt{3})$
(3) $-(-\sqrt{3}-1)$ (4) $-(\sqrt{3}+1)$

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–II

1. Which one of the following is the least?

$\sqrt{3}, \sqrt[3]{2}, \sqrt{2}$ and $\sqrt[3]{4}$

(1) $\sqrt{2}$ (2) $\sqrt[3]{4}$
(3) $\sqrt{3}$ (4) $\sqrt[3]{2}$

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. Which of the following is the biggest ?

$\sqrt[3]{4}, \sqrt[4]{6}, \sqrt[6]{15}$, and $\sqrt[12]{245}$,

(1) $\sqrt[3]{4}$ (2) $\sqrt[4]{6}$
(3) $\sqrt[6]{15}$ (4) $\sqrt[12]{245}$

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. Which of the following number is the least?

$(0.5)^2, \sqrt{0.49}, \sqrt[3]{0.008}, 0.23$

(1) $(0.5)^2$ (2) $\sqrt{0.49}$
(3) $\sqrt[3]{0.008}$ (4) 0.23

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. Arrange the following in descending order : $\sqrt[3]{4}$, $\sqrt{2}$, $\sqrt[6]{3}$, $\sqrt[4]{5}$

(1) $\sqrt[3]{4} > \sqrt[4]{5} > \sqrt{2} > \sqrt[6]{3}$
(2) $\sqrt[4]{5} > \sqrt[3]{4} > \sqrt[6]{3} > \sqrt{2}$
(3) $\sqrt{2} > \sqrt[6]{3} > \sqrt[3]{4} > \sqrt[4]{5}$
(4) $\sqrt[6]{3} > \sqrt[4]{5} > \sqrt[3]{4} > \sqrt{2}$

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

5. The greatest of the numbers $(2.89)^{0.5}$, $2-(0.5)^2$, $1 + \frac{0.5}{1-\frac{1}{2}}$, $\sqrt{3}$ is :

(1) $(2.89)^{0.5}$ (2) $2-(0.5)^2$
(3) $1 + \frac{0.5}{1-\frac{1}{2}}$ (4) $\sqrt{3}$

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

6. Among $\sqrt{2}, \sqrt[3]{3}, \sqrt[4]{5}, \sqrt[3]{2}$ which one is the greatest ?

(1) $\sqrt[4]{5}$ (2) $\sqrt{2}$
(3) $\sqrt[3]{3}$ (4) $\sqrt[3]{2}$

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

7. The ascending order of $(2.89)^{0.5}$, $2-(0.5)^2$, $\sqrt{3}$ and $\sqrt[3]{0.008}$ is

(1) $2-(0.5)^2$, $\sqrt{3}$, $\sqrt[3]{0.008}$, $(2.89)^{0.5}$

(2) $\sqrt[3]{0.008}$, $(2.89)^{0.5}$, $\sqrt{3}$, $2-(0.5)^2$

(3) $\sqrt[3]{0.008}$, $\sqrt{3}$, $(2.89)^{0.5}$, $2-(0.5)^2$

(4) $\sqrt{3}$, $\sqrt[3]{0.008}$, $2-(0.5)^2$, $(2.89)^{0.5}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. The greatest one of $\sqrt{2}$, $\sqrt[3]{3}$, $\sqrt[6]{6}$, $\sqrt[5]{5}$ is

(1) $\sqrt{2}$ (2) $\sqrt[3]{3}$

(3) $\sqrt[6]{6}$ (4) $\sqrt[5]{5}$

(SSC CPO S.I. Exam. 07.09.2003)

9. The smallest of $\sqrt{8}+\sqrt{5}$, $\sqrt{7}+\sqrt{6}$, $\sqrt{10}+\sqrt{3}$ and $\sqrt{11}+\sqrt{2}$ is :

(1) $\sqrt{8}+\sqrt{5}$ (2) $\sqrt{7}+\sqrt{6}$

(3) $\sqrt{10}+\sqrt{3}$ (4) $\sqrt{11}+\sqrt{2}$

(SSC CPO S.I. Exam. 26.05.2005)

10. Which of the following is the largest number ?

$\sqrt{2}, \sqrt[3]{3}, \sqrt[4]{4}, \sqrt[6]{6}$

(1) $\sqrt{2}$ (2) $\sqrt[3]{3}$

(3) $\sqrt[4]{4}$ (4) $\sqrt[6]{6}$

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005) & SSC CGL Prelim Exam. 27.07.2008 (Ist Sitting)

11. Which is the greatest among $\left(\sqrt{19}-\sqrt{17}\right)$, $\left(\sqrt{13}-\sqrt{11}\right)$, $\left(\sqrt{7}-\sqrt{5}\right)$ and $\left(\sqrt{5}-\sqrt{3}\right)$?

(1) $\sqrt{19}-\sqrt{17}$ (2) $\sqrt{13}-\sqrt{11}$

(3) $\sqrt{7}-\sqrt{5}$ (4) $\sqrt{5}-\sqrt{3}$

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

12. The greatest number among $\sqrt[3]{2}, \sqrt{3}, \sqrt[3]{5}$ and 1.5 is :

(1) $\sqrt[3]{2}$ (2) $\sqrt[3]{5}$

(3) $\sqrt{3}$ (4) 1.5

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

13. The greatest of $\sqrt{2}, \sqrt[6]{3}, \sqrt[3]{4}, \sqrt[4]{5}$ is

(1) $\sqrt{2}$ (2) $\sqrt[6]{3}$

(3) $\sqrt[3]{4}$ (4) $\sqrt[4]{5}$

(SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting) & SSC (10+2) DEO & LDC Exam. 11.12.2011 (East Zone)

14. The greatest one of $\sqrt{4}, \sqrt[3]{4}, \sqrt[4]{6}$ and $\sqrt[6]{8}$ is

(1) $\sqrt{3}$ (2) $\sqrt[3]{4}$

(3) $\sqrt[4]{6}$ (4) $\sqrt[6]{8}$

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

15. The greatest among $\sqrt{7}-\sqrt{5}, \sqrt{5}-\sqrt{3}, \sqrt{9}-\sqrt{7}, \sqrt{11}-\sqrt{9}$ is

(1) $\sqrt{7}-\sqrt{5}$ (2) $\sqrt{5}-\sqrt{3}$

(3) $\sqrt{9}-\sqrt{7}$ (4) $\sqrt{11}-\sqrt{9}$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

16. Greatest among the numbers $\sqrt[3]{9}, \sqrt{3}, \sqrt[4]{16}, \sqrt[6]{80}$ is

(1) $\sqrt[3]{9}$ (2) $\sqrt{3}$

(3) $\sqrt[4]{16}$ (4) $\sqrt[6]{80}$

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

17. The least one of $2\sqrt{3}, 2\sqrt[4]{5}, \sqrt{8}$ and $3\sqrt{2}$ is

(1) $2\sqrt{3}$ (2) $2\sqrt[4]{5}$

(3) $\sqrt{8}$ (4) $3\sqrt{2}$

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

18. Out of the numbers 0.3, 0.03, 0.9, 0.09 the number that is nearest to the value of $\sqrt{0.9}$ is

(1) 0.3 (2) 0.03

(3) 0.9 (4) 0.09

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

19. The greatest number among 2^{60}, 3^{48}, 4^{36} and 5^{24} is

(1) 2^{60} (2) 3^{48}

(3) 4^{36} (4) 5^{24}

(SSC SAS Exam 26.06.2010 (Paper-1)

20. The greatest among the numbers $\sqrt{2}, \sqrt[3]{3}, \sqrt[4]{5}, \sqrt[6]{6}$ is

(1) $\sqrt{2}$ (2) $\sqrt[3]{3}$

(3) $\sqrt[6]{6}$ (4) $\sqrt[4]{5}$

(SSC (South Zone) Investigator Exam 12.09.2010)

21. The smallest among $\sqrt[6]{12}$, $\sqrt[3]{4}$, $\sqrt[4]{5}$, $\sqrt{3}$ is

(1) $\sqrt[6]{12}$ (2) $\sqrt[3]{4}$

(3) $\sqrt{3}$ (4) $\sqrt[4]{5}$

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I) & SSC (10+2) Data Entry Operator & LDC Exam 11.12.2011 (Delhi Zone)

22. The largest among the numbers $0.9, (0.9)^2, \sqrt{0.9}, 0.\overline{9}$ is :

(1) 0.9 (2) $(0.9)^2$

(3) $\sqrt{0.9}$ (4) $0.\overline{9}$

(SSC CHSL DEO & LDC Exam. 27.11.2010)

23. Among the numbers $\sqrt{2}$, $\sqrt[3]{9}$, $\sqrt[4]{16}$, $\sqrt[5]{32}$, the greatest one is

(1) $\sqrt{2}$ (2) $\sqrt[3]{9}$

(3) $\sqrt[4]{16}$ (4) $\sqrt[5]{32}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

24. The greatest among the numbers $\sqrt[4]{3}, \sqrt[5]{4}, \sqrt[10]{12}$, 1 is

(1) 1 (2) $\sqrt[5]{4}$

(3) $\sqrt[4]{3}$ (4) $\sqrt[10]{12}$

(SSC CHSL DEO & LDC Exam. 04.12.2011(IInd Sitting (North Zone)

25. The greatest among the numbers $3\sqrt{2}$, $3\sqrt{7}$, $6\sqrt{5}$, $2\sqrt{20}$ is

(1) $3\sqrt{2}$ (2) $3\sqrt{7}$

(3) $6\sqrt{5}$ (4) $2\sqrt{20}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

26. The greatest among the numbers $\sqrt{0.09}, \sqrt[3]{0.064}$, 0·5 and $\frac{3}{5}$ is

(1) $\sqrt{0.09}$ (2) $\sqrt[3]{0.064}$

(3) 0·5 (4) $\frac{3}{5}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

27. The largest number among $\sqrt{2}$, $\sqrt[3]{3}$, $\sqrt[4]{4}$ is

(1) $\sqrt{2}$ (2) $\sqrt[3]{3}$

(3) $\sqrt[4]{4}$ (4)All are equal

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

28. The greatest of the following numbers

0.16, $\sqrt{0.16}$, $(0.16)^2$, 0.04 is

(1) 0.16 (2) $\sqrt{0.16}$

(3) 0.04 (4) $(0.16)^2$

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

29. The smallest among the numbers 2^{250}, 3^{150}, 5^{100} and 4^{200}

(1) 4^{200} (2) 5^{100}

(3) 3^{150} (4) 2^{250}

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

30. The greatest of the numbers $\sqrt[2]{8}$, $\sqrt[4]{13}$, $\sqrt[5]{16}$, $\sqrt[10]{41}$ is:

(1) $\sqrt[4]{13}$ (2) $\sqrt[5]{16}$

(3) $\sqrt[10]{41}$ (4) $\sqrt[2]{8}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

31. Which is greater $\sqrt[3]{2}$ or $\sqrt{3}$?

(1) Cannot be compared

(2) $\sqrt[3]{2}$

(3) $\sqrt{3}$

(4) Equal

(SSC CHSL DEO & LDC Exam. 20.10.2013)

32. Arranging the following in descending order, we get

$\sqrt[3]{4}, \sqrt{2}, \sqrt[6]{3}, \sqrt[4]{5}$

(1) $\sqrt[3]{4} > \sqrt[4]{5} > \sqrt{2} > \sqrt[6]{3}$

(2) $\sqrt[4]{5} > \sqrt[3]{4} > \sqrt[6]{3} > \sqrt{2}$

(3) $\sqrt{2} > \sqrt[6]{3} > \sqrt[3]{4} > \sqrt[4]{5}$

(4) $\sqrt[6]{3} > \sqrt[4]{5} > \sqrt[3]{4} > \sqrt{2}$

(SSC CGL Tier-I Exam. 19.10.2014

33. The greatest number among the following is

$\frac{4}{9}$, $\sqrt{\frac{9}{49}}$, $0.\dot{4}\dot{7}$, $(0.7)^2$

(1) $\frac{4}{9}$ (2) $\sqrt{\frac{9}{49}}$

(3) $0.\dot{4}\dot{7}$ (4) $(0.7)^2$

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting (TF No. 333 LO 2)

34. The greatest number among 3^{50}, 4^{40}, 5^{30} and 6^{20} is

(1) 3^{50} (2) 4^{40}

(3) 5^{30} (4) 6^{20}

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

35. Which is the largest among the numbers $\sqrt{5}$, $3\sqrt{7}$, $4\sqrt{13}$

(1) $\sqrt{5}$ (2) $3\sqrt{7}$

(3) $4\sqrt{13}$

(4) All are equal

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

36. If the numbers $\sqrt[3]{9}$, $\sqrt[4]{20}$, $\sqrt[6]{25}$ are arranged in adcending order, then the right arrangement is

(1) $\sqrt[6]{25} < \sqrt[4]{20} < \sqrt[3]{9}$

(2) $\sqrt[3]{9} < \sqrt[4]{20} < \sqrt[6]{25}$

(3) $\sqrt[4]{20} < \sqrt[6]{25} < \sqrt[3]{9}$

(4) $\sqrt[6]{25} < \sqrt[3]{9} < \sqrt[4]{20}$

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

TYPE–III

1. Given $\sqrt{2}$ = 1.414. The value of $\sqrt{8} + 2\sqrt{32} - 3\sqrt{128} + 4\sqrt{50}$ is

(1) 8.484 (2) 8.526

(3) 8.426 (4) 8.876

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

2. If $\sqrt{15} = 3.88$, then what is the value of $\sqrt{\frac{5}{3}}$

(1) $1.29\overline{3}$ (2) 1.2934

(3) 1.29 (4) 1.295

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

3. If $\sqrt{3}$ = 1.732, then what is the value of $\frac{4+3\sqrt{3}}{\sqrt{7+4\sqrt{3}}}$ upto three places of decimal ?

(1) 0.023 (2) 0.464

(3) 2.464 (4) 3.023

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

4. Given that $\sqrt{3}$ = 1.732, the value of

$$\frac{3+\sqrt{6}}{5\sqrt{3}-2\sqrt{12}-\sqrt{32}+\sqrt{50}} \text{ is}$$

(1) 4.899 (2) 2.551

(3) 1.414 (4) 1.732

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

5. Given that $\sqrt{5} = 2.236$ and $\sqrt{3} = 1.732$; the value of $\frac{1}{\sqrt{5}+\sqrt{3}}$ is

(1) 0.504 (2) 0.252

(3) 0.362 (4) 0.372

(SSC CPO S.I. Exam. 16.12.2007)

6. Given that $\sqrt{5} = 2.24$, then the value of $\frac{3\sqrt{5}}{2\sqrt{5}-0.48}$ is

(1) 0.168 (2) 1.68

(3) 16.8 (4) 168

(SSC CPO S.I. Exam. 09.11.2008)

7. Given that $\sqrt{2} = 1.414$; the value of $\frac{1}{\sqrt{2}+1}$ is

(1) 0.414 (2) 2.414

(3) 3.414 (4) 5.414

(SSC CPO S.I. Exam. 09.11.2008)

8. Evaluate :

$16\sqrt{\frac{3}{4}} - 9\sqrt{\frac{4}{3}}$ if $\sqrt{12} = 3.46$

(1) 3.46 (2) 10.38

(3) 13.84 (4) 24.22

(SSC CPO S.I. Exam. 06.09.2009)

9. If $\sqrt{2}$ = 1.4142, find the value of

$$2\sqrt{2} + \sqrt{2} + \frac{1}{2+\sqrt{2}} + \frac{1}{\sqrt{2}-2}$$

(1) 1.4144 (2) 2.8284

(3) 28.284 (4) 2.4142

(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

10. If $\sqrt{3}$ =1.732, is given, then the value of $\frac{2+\sqrt{3}}{2-\sqrt{3}}$ is

(1) 11.732 (2) 13.928
(3) 12.928 (4) 13.925

(SSC Data Entry Operator Exam. 31.08.2008)

11. If $\sqrt{2} = 1.4142...$ is given, then the value of $\frac{7}{(3+\sqrt{2})}$ correct upto two decimal places is

(1) 1.59 (2) 1.60
(3) 2.58 (4) 2.57

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

12. If $\sqrt{5329}$ = 73, then the value of $\sqrt{5329}$ + $\sqrt{53.29}$ + $\sqrt{0.5329}$ + $\sqrt{0.005329}$ + $\sqrt{0.00005329}$ is

(1) 81. 1003 (2) 81. 0113
(3) 81. 1103 (4) 81. 1013

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

13. If $\sqrt{33}$ = 5.745, then the value of $\sqrt{\frac{3}{11}}$ is approximately

(1) 1 (2) 0.5223
(3) 6.32 (4) 2.035

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

14. If $\sqrt{7}$ = 2.646, then the value of $\frac{1}{\sqrt{28}}$ up to three places of decimal is :

(1) 0.183 (2) 0.185
(3) 0.187 (4) 0.189

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

15. If $\sqrt{5}$ = 2.236, then what is the value of $\frac{\sqrt{5}}{2} + \frac{5}{3\sqrt{5}} - \sqrt{45}$?

(1) –8.571 (2) –4.845
(3) –2.987 (4) –6.261

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

16. If $\sqrt{3}$ = 1.732, then the value of $\frac{9+2\sqrt{3}}{\sqrt{3}}$ is :

(1) 7.169 (2) 7.196
(3) 5.198 (4) 7.296

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

TYPE–IV

1. The rationalising factor of $3\sqrt{3}$ is

(1) $\frac{1}{3}$ (2) 3
(3) – 3 (4) $\sqrt{3}$

(SSC CPO S.I. Exam. 07.09.2003)

2. A rationalising factor of $\left(\sqrt[3]{9} - \sqrt[3]{3} + 1\right)$ is

(1) $\sqrt[3]{3} - 1$ (2) $\sqrt[3]{3} + 1$
(3) $\sqrt[3]{9} + 1$ (4) $\sqrt[3]{9} - 1$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

3. The total number of prime factors in $4^{10} \times 7^3 \times 16^2 \times 11 \times 10^2$ is

(1) 34 (2) 35
(3) 36 (4) 37

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

4. The number of prime factors in $6^{333} \times 7^{222} \times 8^{111}$

(1) 1221 (2) 1222
(3) 1111 (4) 1211

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

5. The square root of $\left(\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}\right)$ is

(1) $\sqrt{3}+\sqrt{2}$ (2) $\sqrt{3}-\sqrt{2}$
(3) $\sqrt{2}\pm\sqrt{3}$ (4) $\sqrt{2}-\sqrt{3}$

(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

6. If $x = \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ and $y = \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$ then $(x + y)$ equals :

(1) 8 (2) 16
(3) $2\sqrt{15}$ (4) $2\left(\sqrt{5}+\sqrt{3}\right)$

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

7. If x, y are rational numbers and $\frac{5+\sqrt{11}}{3-2\sqrt{11}} = x + y\sqrt{11}$.

The values of x and y are

(1) $x = \frac{-14}{17}$, $y = \frac{-13}{26}$

(2) $x = \frac{4}{13}$, $y = \frac{11}{17}$

(3) $x = \frac{-27}{25}$, $y = \frac{-11}{37}$

(4) $x = \frac{-37}{35}$, $y = \frac{-13}{35}$

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

TYPE–V

1. Simplify : $\left[\sqrt[3]{\sqrt[6]{5^9}}\right]^4 \left[\sqrt[3]{\sqrt[6]{5^9}}\right]^4$

(1) 5^2 (2) 5^4
(3) 5^8 (4) 5^{12}

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If $27^{2x-1} = (243)^3$ then the value of x is :

(1) 3 (2) 6
(3) 7 (4) 9

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

3. If $3^{x+8} = 27^{2x+1}$, the value of x is :

(1) 7 (2) 3
(3) –2 (4) 1

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

4. $(36)^{\frac{1}{6}}$ is equal to :

(1) 1 (2) 6
(3) $\sqrt{6}$ (4) $\sqrt[3]{6}$

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

5. $\left(\frac{8}{125}\right)^{-\frac{4}{3}}$ simplifies to :

(1) $\frac{625}{16}$ (2) $\frac{625}{8}$
(3) $\frac{625}{32}$ (4) $\frac{16}{625}$

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

6. If $(125)^{2/3} \times (625)^{-1/4} = 5^x$ the value of x is

(1) 3 (2) 2
(3) 0 (4) 1

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

7. If $(2000)^{10} = 1{\cdot}024 \times 10^k$, then the value of k is

(1) 33 (2) 30
(3) 34 (4) 31

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I) (Middle Zone)

8. If $0.42 \times 100^k = 42$, then the value of k is

(1) 4 (2) 2
(3) 1 (4) 3

(SSC CISF Constable (GD) Exam. 05.06.2011)

9. If $3^{x+y} = 81$ and $81^{x-y} = 3$, then the value of x is

(1) 42 (2) $\frac{15}{8}$
(3) $\frac{17}{8}$ (4) 39

(SSC Data Entry Operator Exam. 02.08.2009)

10. If $2^x = 3^y = 6^{-z}$ then $\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$ is equal to

(1) 0 (2) 1
(3) $\frac{3}{2}$ (4) $-\frac{1}{2}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

11. If $a = 7 - 4\sqrt{3}$, the value of $a^{\frac{1}{2}} + a^{-\frac{1}{2}}$ is

(1) $3\sqrt{3}$ (2) 4
(3) 7 (4) $2\sqrt{3}$

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

12. If $\left(\frac{3}{4}\right)^3\left(\frac{4}{3}\right)^{-7} = \left(\frac{3}{4}\right)^{2x}$, then x is :

(1) –2 (2) 2
(3) 5 (4) $2\frac{1}{2}$

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

13. What is the product of the roots of the equation $x^2 - \sqrt{3} = 0$?

(1) $+\sqrt{3}$ (2) $\sqrt{3}\,i$
(3) $-\sqrt{3}\,i$ (4) $-\sqrt{3}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

14. If $2^{x-1} + 2^{x+1} = 320$, then the value of x is

(1) 6 (2) 8
(3) 5 (4) 7

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

15. $4^{61} + 4^{62} + 4^{63} + 4^{64}$ is divisible by

(1) 17 (2) 3
(3) 11 (4) 13

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

16. If $5\sqrt{5} \times 5^3 \div 5^{-\frac{3}{2}} = 5^{a+2}$, then the value of a is

(1) 4 (2) 5
(3) 6 (4) 8

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

17. The value of

$\left(3+2\sqrt{2}\right)^{-3} + \left(3-2\sqrt{2}\right)^{-3}$ is

(1) 198 (2) 180
(3) 108 (4) 189

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

18. Solve for x :
$3^x - 3^{x-1} = 486$.

(1) 7 (2) 9
(3) 5 (4) 6

(SSC CGL Tier-I Exam. 26.10.2014)

19. A tap is dripping at a constant rate into a container. The level (L cm) of the water in the container is given by the equation $L = 2 - 2^t$, where t is time taken in hours. Then the level of water in the container at the start is

(1) 0 cm (2) 1 cm
(3) 2 cm (4) 4 cm

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

20. Arranging the following in ascending order

3^{34}, 2^{51}, 7^{17} we get

(1) $3^{34} > 2^{51} > 7^{17}$
(2) $7^{17} > 2^{51} > 3^{34}$
(3) $3^{34} > 7^{17} > 2^{51}$
(4) $2^{51} > 3^{34} > 7^{17}$

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

21. If $3^{2x-y} = 3^{x+y} = \sqrt{27}$, then the value of 3^{x-y} will be

(1) 3 (2) $\frac{1}{\sqrt{3}}$
(3) $\sqrt{3}$ (4) $\frac{1}{\sqrt{27}}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

22. The value of $[(0.87)^2+(0.13)^2 + (0.87) \times (0.26)]^{2013}$ is

(1) 0 (2) 2013
(3) 1 (4) –1

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

23. The mean of 1^3, 2^3, 3^3, 4^3, 5^3, 6^3, 7^3 is

(1) 20 (2) 112
(3) 56 (4) 28

(SSC CGL Tier-I Re-Exam, 30.08.2015)

24. The unit digit in the product $(2467)^{153} \times (341)^{72}$ is

(1) 7 (2) 3
(3) 9 (4) 1

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

25. The exponential form of $\sqrt{\sqrt{2} \times \sqrt{3}}$ is :

(1) 6 (2) $6^{\frac{1}{2}}$
(3) $6^{-\frac{1}{2}}$ (4) $6^{\frac{1}{4}}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

26. The quotient when 10^{100} is divided by 5^{75} is :

(1) $2^{25} \times 10^{75}$ (2) 10^{25}
(3) 2^{75} (4) $2^{75} \times 10^{25}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

27. If $m^n = 169$, what is the value of $(m+1)^{(n-1)}$?

(1) 14 (2) 13
(3) 196 (4) 170

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

28. If $a = b^p$, $b = c^q$, $c = a^r$ then pqr is

(1) 1 (2) 0
(3) –1 (4) abc

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

29. Which of the following numbers is not a factor of $5^p 7^q$ ($p \neq 0$, $q \neq 0$)

(1) 35 (2) 175
(3) 1225 (4) 735

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

30. What will be the remainder when $252^{126} + 244^{152}$ is divided by 10 ?

(1) 4 (2) 6
(3) 0 (4) 8

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

31. If $x = 3^{\frac{1}{3}} - 3^{-\frac{1}{3}}$, then the value of $(3x^3 + 9x)$ is :

(1) 8 (2) 9
(3) 27 (4) 16

(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

32. If $3^{10} \times 27^2 = 9^2 \times 3^n$ then the value of n is :

(1) 10 (2) 12
(3) 15 (4) 30

(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

33. If $2^{x+4} - 2^{x+2} = 3$, then the value of 'x' is :

(1) 0 (2) 2
(3) –1 (4) –2

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

34. If $\sqrt{3^n} = 2187$ then the value of n is :

(1) 13 (2) 14
(3) 15 (4) 16

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

35. If $\left(x + \frac{1}{x}\right) = 2$, then the value of $\left(x^{99} + \frac{1}{x^{99}} - 2\right)$ is :

(1) – 2 (2) 0
(3) 2 (4) 4

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

36. The value of $\left(x^{\frac{1}{3}} + x^{\frac{-1}{3}}\right)\left(x^{\frac{2}{3}} - 1 + x^{\frac{-2}{3}}\right)$ is

(1) $x^{-1} + x^{\frac{2}{3}}$ (2) $x + x^{-\frac{1}{3}}$
(3) $x^{\frac{1}{3}} + x^{-1}$ (4) $x + x^{-1}$

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

37. If $(2^3)^2 = 4^x$ then 3^x is equal to

(1) 3 (2) 6
(3) 9 (4) 27

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

38. If $x = 3^{\frac{1}{3}} - 3^{-\frac{1}{3}}$, then $(3x^3 + 9x)$ is equal to

(1) 5 (2) 6
(3) 7 (4) 8

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

TYPE–VI

1. $\sqrt{1 + \sqrt{1 + \sqrt{1 + \ldots\ldots}}}$

(1) equals 1
(2) lies between 0 and 1
(3) lies between 1 and 2
(4) is greater than 2

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

2. $\sqrt{2 + \sqrt{2 + \sqrt{2 + \ldots\ldots}}}$ is equal to

(1) $\sqrt{2}$ (2) $2\sqrt{2}$
(3) 2 (4) 3

(SSC CPO S.I. Exam. 12.01.2003

3. $\sqrt{12 + \sqrt{12 + \sqrt{12 + \ldots.}}}$ is equal to

(1) 3 (2) 4
(3) 6 (4) 2

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

4. $\sqrt{6 + \sqrt{6 + \sqrt{6 + \ldots.}}}$ is equal to

(1) 3 (2) 4
(3) 5 (4) 6

(SSC SAS Exam 26.06.2010 (Paper-1) & SSC CGL Tier-I Exam 26.06.2010 (Ist Sitting) & SSC CGL Prelim Exam. 27.02.2000 (IInd Sitting)

5. $\sqrt{3\sqrt{3\sqrt{3\ldots..}}}$ is equal to

(1) $\sqrt{3}$ (2) 3
(3) $2\sqrt{3}$ (4) $3\sqrt{3}$

(SSC HSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

6. Find the value of

$\sqrt{30 + \sqrt{30 + \sqrt{30 + \ldots..}}}$

(1) 5 (2) $3\sqrt{10}$
(3) 6 (4) 7

(SSC Graduate Level Tier-II Exam. 29.09.2013

7. The value of

$\sqrt{2\sqrt[3]{4\sqrt{2\sqrt[3]{4\sqrt{2\sqrt[3]{4\ldots\ldots}}}}}}$ is

(1) 2 (2) 2^2
(3) 2^3 (4) 2^5

(SSC Graduate Level Tier-II Exam. 29.09.2013

8. If $m = \sqrt{5 + \sqrt{5 + \sqrt{5 + \ldots\ldots}}}$ and $n = \sqrt{5 - \sqrt{5 - \sqrt{5 - \ldots\ldots}}}$, then among the following the relation between m and n holds is

(1) $m - n + 1 = 0$
(2) $m + n - 1 = 0$
(3) $m + n + 1 = 0$
(4) $m - n - 1 = 0$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

9. The value of $\sqrt{72 + \sqrt{72 + \sqrt{72 + \ldots\ldots}}}$ is

(1) 9 (2) 8
(3) 18 (4) 12

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

10.

$$\frac{\sqrt{10 + \sqrt{25 + \sqrt{108 + \sqrt{154 + \sqrt{225}}}}}}{\sqrt[3]{8}} = ?$$

(1) 4 (2) 2
(3) 8 (4) $\frac{1}{2}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

11. The value of the expression $\sqrt{6+\sqrt{6+\sqrt{6+\ldots+\text{upto }\infty}}}$ is

(1) 5 (2) 3
(3) 2 (4) 30

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

12. The value of the following is :

$\sqrt{12+\sqrt{12+\sqrt{12+\ldots\ldots}}}$

(1) $2\sqrt{2}$ (2) $2\sqrt{3}$
(3) 2 (4) 4

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

13. Find the value of

$\sqrt{10+\sqrt{25+\sqrt{108+\sqrt{154+\sqrt{225}}}}}$.

(1) 6 (2) 10
(3) 8 (4) 4

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

14. The value of

$\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{7+4\sqrt{3}}}}$ is

(1) 2 (2) 4
(3) ±2 (4) –2

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

15. The value of $\sqrt{9+2\sqrt{16}+\sqrt[3]{512}}$ is :

(1) 6 (2) 5
(3) $2\sqrt{8}$ (4) $3\sqrt{6}$

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

TYPE–VII

1. Which of the following is closest to $\sqrt{3}$?

(1) $\frac{9}{5}$ (2) 1.75
(3) $\frac{173}{100}$ (4) 1.69

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

2. If $a=\frac{\sqrt{3}}{2}$, then the value of $\sqrt{1+a}+\sqrt{1-a}$ is

(1) $\sqrt{3}$ (2) $\frac{\sqrt{3}}{2}$
(3) $2+\sqrt{3}$ (4) $2-\sqrt{3}$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

3. If $a=\frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $b=\frac{\sqrt{5}-1}{\sqrt{5}+1}$, the value of $\left(\frac{a^2+ab+b^2}{a^2-ab+b^2}\right)$ is

(1) $\frac{3}{4}$ (2) $\frac{4}{3}$
(3) $\frac{3}{5}$ (4) $\frac{5}{3}$

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

4. If $x=1+\sqrt{2}+\sqrt{3}$, then the value of $\left(x+\frac{1}{x-1}\right)$ is

(1) $1+2\sqrt{3}$ (2) $2+\sqrt{3}$
(3) $3+\sqrt{2}$ (4) $2\sqrt{3}-1$

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

5. If $x+\frac{1}{x}=-2$ then the value of $x^{2n+1}+\frac{1}{x^{2n+1}}$ where n is a positive integer, is

(1) 0 (2) 2
(3) –2 (4) –5

(SSC CPO S.I. Exam. 09.11.2008)

6. If m and n $(n>1)$ are whole numbers such that $m^n = 121$, the value of $(m-1)^{n+1}$ is

(1) 1 (2) 10
(3) 121 (4) 1000

(SSC CPO S.I. Exam. 09.11.2008)

7. The number, which when multiplied with $\left(\sqrt{3}+\sqrt{2}\right)$ gives $\left(\sqrt{12}+\sqrt{18}\right)$, is

(1) $3\sqrt{2}-2\sqrt{3}$ (2) $3\sqrt{2}+2\sqrt{3}$
(3) $\sqrt{6}$ (4) $2\sqrt{3}-3\sqrt{2}$

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

8. If the product of first fifty positive consecutive integers be divisible by 7^n, where n is an integer, then the largest possible value of n is

(1) 7 (2) 8
(3) 10 (4) 5

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

9. If $9\sqrt{x} = \sqrt{12} + \sqrt{147}$, then x = ?

(1) 5 (2) 3
(3) 2 (4) 4

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

10. A man is born in the year 1896 A.D. If in the year x^2 A.D. his age is $x-4$, the value of x is

(1) 40 (2) 44
(3) 36 (4) 42

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

11. Choose the incorrect relation(s) from the following:

(i) $\sqrt{6}+\sqrt{2}=\sqrt{5}+\sqrt{3}$

(ii) $\sqrt{6}+\sqrt{2}<\sqrt{5}+\sqrt{3}$

(iii) $\sqrt{6}+\sqrt{2}>\sqrt{5}+\sqrt{3}$

(1) (ii) and (iii) (2) (i)
(3) (ii) (4) (i) and (iii)

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

12. If $x=\frac{1}{\sqrt{2}+1}$ then $(x+1)$ equals to

(1) 2 (2) $\sqrt{2}$
(3) $\sqrt{2}+1$ (4) $\sqrt{2}-1$

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

13. If $p = 5 + 2\sqrt{6}$ then $\frac{\sqrt{p}-1}{\sqrt{p}}$ is

(1) $1+\sqrt{2}-\sqrt{3}$
(2) $1-\sqrt{2}+\sqrt{3}$
(3) $-1+\sqrt{2}-\sqrt{3}$
(4) $1-\sqrt{2}-\sqrt{3}$

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

14. If $\sqrt{x}-\sqrt{y}=1$, $\sqrt{x}+\sqrt{y}=17$ then $\sqrt{xy}=?$

(1) $\sqrt{72}$ (2) 72
(3) 32 (4) 24

(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

15. If $x=\sqrt{3}+\frac{1}{\sqrt{3}}$, then the value of $\left(x-\frac{\sqrt{126}}{\sqrt{42}}\right)$ $\left(x-\frac{1}{x-\frac{2\sqrt{3}}{3}}\right)$ is

(1) $5\frac{\sqrt{3}}{6}$ (2) $\frac{2\sqrt{3}}{3}$
(3) $\frac{5}{6}$ (4) $\frac{2}{3}$

(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

16. If $4x=\sqrt{5}+2$, then the value of $\left(x-\frac{1}{16x}\right)$ is

(1) 1 (2) –1
(3) 4 (4) $2\sqrt{5}$

(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

17. What is x, if $x^3 = 1.5^3 - 0.9^3 - 2.43$

(1) –0.5 (2) 0.6
(3) –0.7 (4) –1.6

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

18. If $\left(\frac{1}{5}\right)^{3y}=0.008$, then the value of $(0.25)^y$ is :

(1) 0.25 (2) 6.25
(3) 2.5 (4) 53

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

19. If $x=1+\sqrt{2}+\sqrt{3}$, then find the value of x^2-2x+4.

(1) $2\left(7+\sqrt{6}\right)$ (2) $2\left(4+\sqrt{6}\right)$
(3) $2\left(3+\sqrt{7}\right)$ (4) $\left(4+\sqrt{6}\right)$

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

20. If $x=\sqrt{2}+1$, then the value of $x^4-\frac{1}{x^4}$ is

(1) $8\sqrt{2}$ (2) $18\sqrt{2}$
(3) $6\sqrt{2}$ (4) $24\sqrt{2}$

(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

21. $\frac{1}{\sqrt{a}}-\frac{1}{\sqrt{b}}=0$, then the value of $\frac{1}{a}+\frac{1}{b}$ is :

(1) $\frac{1}{\sqrt{ab}}$ (2) $\sqrt{ab}$
(3) $\frac{2}{\sqrt{ab}}$ (4) $\frac{1}{2\sqrt{ab}}$

(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

22. If $x=(0.25)^{\frac{1}{z}}$, $y=(0.4)^2$, $z=(0.216)^{\frac{1}{3}}$, then

(1) $y>x>z$ (2) $x>y>z$
(3) $z>x>y$ (4) $x>z>y$

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

23. If $a+\frac{1}{a}=2$, then the value of $\left(a^5+\frac{1}{a^5}\right)$ will be

(1) 0 (2) 1
(3) 3 (4) 2

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

24. If $x=2+\sqrt{3}$, then the value of $\frac{x^2-x+1}{x^2+x+1}$ is :

(1) $\frac{2}{3}$ (2) $\frac{3}{4}$
(3) $\frac{4}{5}$ (4) $\frac{3}{5}$

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

25. If $3a=4b=6c$ and $a+b+c=27\sqrt{29}$ then $\sqrt{a^2+b^2+c^2}$ is equal to

(1) 87 (2) $3\sqrt{29}$
(3) 82 (4) 83

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

26. If $\left(\sqrt{3}+1\right)^2=x+\sqrt{3}\,y$, then the value of $(x+y)$ is

(1) 2 (2) 4
(3) 6 (4) 8

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

27. If $p=9$, $q=\sqrt{17}$ then the value of $\left(p^2-q^2\right)^{\frac{-1}{3}}$ is equal to

(1) 4 (2) $\frac{1}{4}$
(3) 3 (4) $\frac{1}{3}$

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

28. If $\sqrt{1+\frac{x}{144}}=\frac{13}{12}$, then x equals to

(1) 1 (2) 13
(3) 27 (4) 25

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

29. If $a=\sqrt{2}+1$ and $b=\sqrt{2}-1$, then the value of $\frac{1}{a+1}+\frac{1}{b+1}$ will be

(1) 0 (2) 1
(3) 2 (4) –1

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

30. If $x = \frac{1}{\left(\sqrt{2}+1\right)}$ then the value of $(x^2 + 2x - 1)$ is :

(1) $2\sqrt{2}$ (2) 4
(3) 0 (4) 2

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

31. If $x + \frac{1}{x} = \sqrt{13}$, then $\frac{3x}{\left(x^2-1\right)}$ equals to

(1) $3\sqrt{13}$ (2) $\frac{\sqrt{13}}{3}$
(3) 1 (4) 3

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

32. If $a = \sqrt{2} + 1$, $b = \sqrt{2} - 1$, then the value of $\left(\frac{1}{a+1}+\frac{1}{b+1}\right)$ is :

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

33. If $x + \sqrt{5} = 5 + \sqrt{y}$ and x, y are positive integers, then the value of $\frac{\sqrt{x}+y}{x+\sqrt{y}}$ is :

(1) 1 (2) 2
(3) $\sqrt{5}$ (4) 5

(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

34. If $c + \frac{1}{c} = \sqrt{3}$, then the value of $c^3 + \frac{1}{c^3}$ is equal to

(1) 0 (2) $3\sqrt{3}$
(3) $\frac{1}{\sqrt{3}}$ (4) $6\sqrt{3}$

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

SHORT ANSWERS

TYPE-I

1. (3)	**2.** (1)	**3.** (1)	**4.** (3)
5. (2)	**6.** (3)	**7.** (2)	**8.** (2)
9. (3)	**10.** (1)	**11.** (1)	**12.** (1)
13. (2)	**14.** (2)	**15.** (2)	**16.** (1)
17. (3)	**18.** (4)	**19.** (1)	**20.** (3)
21. (1)	**22.** (4)	**23.** (4)	**24.** (3)
25. (2)	**26.** (2)	**27.** (2)	**28.** (3)
29. (2)	**30.** (1)	**31.** (1)	**32.** (1)
33. (1)	**34.** (1)	**35.** (2)	**36.** (2)
37. (3)	**38.** (1)	**39.** (3)	**40.** (3)
41. (2)	**42.** (3)	**43.** (3)	**44.** (1)
45. (1)	**46.** (2)	**47.** (1)	**48.** (4)
49. (3)	**50.** (2)	**51.** (4)	**52.** (4)
53. (3)	**54.** (3)	**55.** (2)	**56.** (3)
57. (1)	**58.** (3)	**59.** (1)	**60.** (2)
61. (3)	**62.** (4)	**63.** (1)	**64.** (3)
65. (4)	**66.** (3)	**67.** (1)	**68.** (4)
69. (3)	**70.** (2)	**71.** (1)	**72.** (2)
73. (2)	**74.** (3)	**75.** (1)	**76.** (3)
77. (2)	**78.** (3)	**79.** (1)	**80.** (1)
81. (1)	**82.** (4)	**83.** (3)	**84.** (4)
85. (3)	**86.** (2)	**87.** (2)	**88.** (1)
89. (3)	**90.** (4)	**91.** (2)	**92.** (3)
93. (3)	**94.** (2)	**95.** (3)	**96.** (2)
97. (4)	**98.** (1)	**99.** (4)	**100.** (3)
101. (1)	**102.** (3)	**103.** (2)	**104.** (3)
105. (2)	**106.** (1)	**107.** (1)	**108.** (2)
109. (4)	**110.** (1)	**111.** (3)	**112.** (2)
113. (1)	**114.** (4)	**115.** (2)	**116.** (2)
117. (2)	**118.** (3)	**119.** (4)	**120.** (2)
121. (2)	**122.** (4)	**123.** (2)	**124.** (3)
125. (2)	**126.** (4)	**127.** (1)	**128.** (4)
129. (1)	**130.** (3)	**131.** (3)	**132.** (3)
133. (4)	**134.** (4)	**135.** (4)	**136.** (3)
137. (3)	**138.** (3)	**139.** (4)	**140.** (3)
141. (1)	**142.** (2)	**143.** (2)	**144.** (3)
145. (3)	**146.** (1)	**147.** (3)	**148.** (2)
149. (2)	**150.** (2)	**151.** (1)	**152.** (1)
153. (*)			

TYPE-II

1. (4)	**2.** (1)	**3.** (3)	**4.** (1)
5. (3)	**6.** (1)	**7.** (2)	**8.** (2)
9. (4)	**10.** (2)	**11.** (4)	**12.** (3)
13. (3)	**14.** (1)	**15.** (2)	**16.** (1)
17. (3)	**18.** (3)	**19.** (2)	**20.** (4)
21. (4)	**22.** (4)	**23.** (2)	**24.** (2)
25. (3)	**26.** (4)	**27.** (2)	**28.** (2)
29. (2)	**30.** (4)	**31.** (3)	**32.** (1)
33. (4)	**34.** (2)	**35.** (3)	**36.** (4)

TYPE-III

1. (1)	**2.** (1)	**3.** (3)	**4.** (4)
5. (2)	**6.** (2)	**7.** (1)	**8.** (1)
9. (2)	**10.** (2)	**11.** (1)	**12.** (3)
13. (2)	**14.** (4)	**15.** (2)	**16.** (2)

TYPE-IV

1. (4)	**2.** (2)	**3.** (3)	**4.** (1)
5. (1)	**6.** (1)	**7.** (4)	

TYPE-V

1. (2)	**2.** (1)	**3.** (4)	**4.** (4)
5. (1)	**6.** (4)	**7.** (1)	**8.** (3)
9. (3)	**10.** (1)	**11.** (2)	**12.** (3)
13. (4)	**14.** (4)	**15.** (1)	**16.** (1)
17. (1)	**18.** (4)	**19.** (2)	**20.** (1)
21. (3)	**22.** (3)	**23.** (2)	**24.** (1)
25. (4)	**26.** (4)	**27.** (1)	**28.** (1)
29. (4)	**30.** (3)	**31.** (1)	**32.** (2)
33. (4)	**34.** (2)	**35.** (2)	**36.** (4)
37. (4)	**38.** (4)		

TYPE-VI

1. (3)	**2.** (3)	**3.** (2)	**4.** (1)
5. (2)	**6.** (3)	**7.** (1)	**8.** (4)
9. (1)	**10.** (2)	**11.** (2)	**12.** (4)
13. (4)	**14.** (1)	**15.** (2)	

TYPE-VII

1. (3)	**2.** (1)	**3.** (2)	**4.** (1)
5. (3)	**6.** (4)	**7.** (3)	**8.** (2)
9. (2)	**10.** (2)	**11.** (4)	**12.** (2)
13. (1)	**14.** (2)	**15.** (3)	**16.** (1)
17. (2)	**18.** (1)	**19.** (2)	**20.** (4)
21. (3)	**22.** (3)	**23.** (4)	**24.** (4)
25. (1)	**26.** (3)	**27.** (2)	**28.** (4)
29. (2)	**30.** (3)	**31.** (3)	**32.** (2)
33. (1)	**34.** (1)		

EXPLANATIONS

TYPE-I

1. (3) $\left(\sqrt{12}+\sqrt{18}\right)-\left(\sqrt{3}+\sqrt{2}\right)$

$=\left(2\sqrt{3}-\sqrt{3}\right)+\left(3\sqrt{2}-\sqrt{2}\right)$

$=\sqrt{3}+2\sqrt{2}$

2. (1) $\sqrt{5+2\sqrt{6}}$

$=\sqrt{3+2+2\times\sqrt{3}\times\sqrt{2}}$

$=\sqrt{\left(\sqrt{3}+\sqrt{2}\right)^2}=\sqrt{3}+\sqrt{2}$

$\therefore\ \dfrac{1}{\sqrt{5+2\sqrt{6}}}=\sqrt{3}-\sqrt{2}$

Hence, Expression

$=\sqrt{3}+\sqrt{2}-\sqrt{3}+\sqrt{2}=2\sqrt{2}$

3. (1) $?=\sqrt{2^4}+\sqrt[3]{64}+\sqrt[4]{2^8}$

$=2^{4\times\frac{1}{2}}+4^{3\times\frac{1}{3}}+2^{8\times\frac{1}{4}}$

$=2^2+4+2^2$

$=4+4+4=12$

4. (3) Expression

$=2\sqrt[3]{8\times4}-3\sqrt[3]{4}+\sqrt[3]{125\times4}$

$=2\times2\sqrt[3]{4}-3\sqrt[3]{4}+5\sqrt[3]{4}=6\sqrt[3]{4}$

5. (2) $?=\left(\sqrt{8}-\sqrt{4}-\sqrt{2}\right)$

$=\left(2\sqrt{2}-2-\sqrt{2}\right)$

$=\sqrt{2}-2$

6. (3) $8^{\frac{2}{3}}=\left(2^3\right)^{\frac{2}{3}}$

$=2^{3\times\frac{2}{3}}=2^2=4$

7. (2) $\left(16^{\frac{3}{2}}+16^{\frac{-3}{2}}\right)$

$=\left(4^2\right)^{\frac{3}{2}}+\dfrac{1}{(16)^{\frac{3}{2}}}$

$=4^{2\times\frac{3}{2}}+\dfrac{1}{4^{2\times\frac{3}{2}}}=4^3+\dfrac{1}{4^3}$

$=64+\dfrac{1}{64}=\dfrac{4096+1}{64}=\dfrac{4097}{64}$

8. (2) $(16)^{\frac{3}{4}}=\left(4^2\right)^{\frac{3}{4}}$

$=4^{2\times\frac{3}{4}}=4^{\frac{3}{2}}=2^{2\times\frac{3}{2}}=2^3=8$

9. (3) $(0.01024)^{\frac{1}{5}}$

$=\left[(0.4)^5\right]^{1/5}=0.4^{5\times1/5}=0.4$

10. (1) $\left(16^{0.16}\times2^{0.36}\right)$

$=\left(16^{\frac{16}{100}}\times2^{\frac{36}{100}}\right)$

$=\left(2^{4\times\frac{16}{100}}\times2^{\frac{36}{100}}\right)$

$=\left(2^{\frac{64}{100}+\frac{36}{100}}\right)=\left(2^{\frac{100}{100}}\right)$

$=2$

11. (1) Expression

$=(256)^{0.16}\times(16)^{0.18}$

$=(4)^{4\times0.16}\times(4)^{2\times0.18}$

$=(4)^{0.64}\times(4)^{0.36}$

$=(4)^{0.64+0.36}=(4)^1=4$

12. (1) Expression

$=\dfrac{(243)^{0.13+0.07}}{(7)^{0.25}\times(7\times7)^{0.075}\times(7\times7\times7)^{0.2}}$

$=\dfrac{\left(3^5\right)^{0.2}}{(7)^{0.25}\times(7)^{0.075\times2}\times(7)^{3\times0.2}}$

$=\dfrac{(3)^{5\times0.2}}{(7)^{0.25+0.15+0.6}}=\dfrac{3}{7}$

13. (2) $\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{7+4\sqrt{3}}}}$

$=\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{4+3+2\times2\times\sqrt{3}}}}$

$=\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{(2)^2+\left(\sqrt{3}\right)^2+2\times2\times\sqrt{3}}}}$

$=\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{\left(2+\sqrt{3}\right)^2}}}$

$=\sqrt{-\sqrt{3}+\sqrt{3+8\left(2+\sqrt{3}\right)}}$

$=\sqrt{-\sqrt{3}+\sqrt{3+16+8\sqrt{3}}}$

$=\sqrt{-\sqrt{3}+\sqrt{\left(\sqrt{3}\right)^2+(4)^2+2\times4\times\sqrt{3}}}$

$=\sqrt{-\sqrt{3}+\sqrt{\left(4+\sqrt{3}\right)^2}}$

$=\sqrt{-\sqrt{3}+4+\sqrt{3}}=\sqrt{4}=2$

14. (2) $\left(\sqrt[3]{0.004096}\right)^{\frac{1}{2}}$

$=(0.004096)^{\frac{1}{3}\times\frac{1}{2}}$

$=\left(\dfrac{4096}{1000000}\right)^{\frac{1}{6}}=\left\{\left(\dfrac{4}{10}\right)^6\right\}^{\frac{1}{6}}$

$=\left(\dfrac{4}{10}\right)^{6\times\frac{1}{6}}=\dfrac{4}{10}=0.4$

15. (2) Expression

$=\dfrac{3\times\sqrt{12}}{2\times\sqrt{28}}\times\dfrac{\sqrt{98}}{2\times\sqrt{21}}$

$=\dfrac{3\times2\times\sqrt{3}}{2\times2\times\sqrt{7}}\times\dfrac{7\times\sqrt{2}}{2\times\sqrt{3}\times\sqrt{7}}$

$=\dfrac{3\sqrt{2}}{4}=\dfrac{3\times1.414}{4}=1.0605$

≈1.0606

16. (1) Expression

$=2+\sqrt{0.09}-\sqrt[3]{(0.2)^3}-75\%\ of\ 2.80$

$=2+0.3-0.2-\dfrac{75}{100}\times2.80$

$=2.3-0.2-2.1$

$=2.3-2.3=0$

17. (3) Let $\sqrt[3]{3.5} = a$ and $\sqrt[3]{2.5} = b$

$\therefore$ Expression

$= (a+b)(a^2 - ab + b^2)$

$= a^3 + b^3$

$= \left(\sqrt[3]{3.5}\right)^3 + \left(\sqrt[3]{2.5}\right)^3$

$= 3.5 + 2.5 = 6$

18. (4) We know that

$a^3 + b^3$

$= (a + b)^3 - 3ab\,(a + b)$

Now,

$$\left(3+2\sqrt{2}\right)^{-3} + \left(3-2\sqrt{2}\right)^{-3}$$

$$= \frac{1}{\left(3+2\sqrt{2}\right)^3} + \frac{1}{\left(3-2\sqrt{2}\right)^3}$$

$$= \frac{\left(3-2\sqrt{2}\right)^3 + \left(3+2\sqrt{2}\right)^3}{\left(3+2\sqrt{2}\right)^3 \times \left(3-2\sqrt{2}\right)^3}$$

$$= \frac{\left(3-2\sqrt{2}+3+2\sqrt{2}\right)^3 - 3\left(3-2\sqrt{2}\right)\left(3+2\sqrt{2}\right)\left(3-2\sqrt{2}+3+2\sqrt{2}\right)}{\left[\left(3+2\sqrt{2}\right)\left(3-2\sqrt{2}\right)\right]^3}$$

$$= \frac{(6)^3 - 3(9-8)(6)}{1}$$

$= 216 - 18 = 198$

19. (1)

$$\frac{\sqrt{5}}{\sqrt{3}+\sqrt{2}} = \frac{\sqrt{5}\left(\sqrt{3}-\sqrt{2}\right)}{\left(\sqrt{3}+\sqrt{2}\right)\left(\sqrt{3}-\sqrt{2}\right)}$$

$$= \frac{\sqrt{15}-\sqrt{10}}{3-2} = \sqrt{15}-\sqrt{10}$$

$$\frac{3\sqrt{3}}{\sqrt{5}+\sqrt{2}} = \frac{3\sqrt{3}}{\sqrt{5}+\sqrt{2}} \times \frac{\sqrt{5}-\sqrt{2}}{\sqrt{5}-\sqrt{2}}$$

$$= \frac{3\sqrt{3}\left(\sqrt{5}-\sqrt{2}\right)}{5-2} = \sqrt{15}-\sqrt{6}$$

$$\frac{2\sqrt{2}}{\sqrt{5}+\sqrt{3}} = \frac{2\sqrt{2}\left(\sqrt{5}-\sqrt{3}\right)}{\left(\sqrt{5}+\sqrt{3}\right)\left(\sqrt{5}-\sqrt{3}\right)}$$

$$= \frac{2\sqrt{2}\left(\sqrt{5}-\sqrt{3}\right)}{5-3} = \sqrt{10}-\sqrt{6}$$

$\therefore$ Expression

$$= \left(\sqrt{15}-\sqrt{10}\right) - \left(\sqrt{15}-\sqrt{6}\right) + \left(\sqrt{10}-\sqrt{6}\right)$$

$= \sqrt{15} - \sqrt{10} - \sqrt{15} + \sqrt{6} + \sqrt{10} - \sqrt{6}$

$= 0$

20. (3) $4 + \sqrt{7} = \dfrac{8 + 2\sqrt{7}}{2}$

$$= \frac{7 + 1 + 2 \times \sqrt{7} \times 1}{2}$$

$$= \frac{\left(\sqrt{7}\right)^2 + (1)^2 + 2 \times \sqrt{7} \times 1}{2}$$

$$= \frac{\left(\sqrt{7}+1\right)^2}{\left(\sqrt{2}\right)^2} = \left\{\frac{1}{\sqrt{2}}\left(\sqrt{7}+1\right)\right\}^2$$

21. (1) $\dfrac{1}{\sqrt{3.25}+\sqrt{2.25}}$

$$= \frac{1}{\left(\sqrt{3.25}+\sqrt{2.25}\right)} \times \frac{\sqrt{3.25}-\sqrt{2.25}}{\sqrt{3.25}-\sqrt{2.25}}$$

$$= \frac{\sqrt{3.25}-\sqrt{2.25}}{3.25-2.25} = \sqrt{3.25}-\sqrt{2.25}$$

Similarly,

$$\frac{1}{\sqrt{4.25}+\sqrt{3.25}} = \sqrt{4.25}-\sqrt{3.25}$$

$$\frac{1}{\sqrt{5.25}+\sqrt{4.25}} = \sqrt{5.25}-\sqrt{4.25}$$

$$\frac{1}{\sqrt{6.25}+\sqrt{5.25}} = \sqrt{6.25}-\sqrt{5.25}$$

$\therefore$ Expression

$= \sqrt{3.25} - \sqrt{2.25} + \sqrt{4.25} - \sqrt{3.25} + \sqrt{5.25} - \sqrt{4.25} + \sqrt{6.25} - \sqrt{5.25}$

$= \sqrt{6.25} - \sqrt{2.25} = 2.5 - 1.5 = 1$

22. (4) First term $= \dfrac{2}{\sqrt{7}+\sqrt{5}}$

$$= \frac{2 \times \left(\sqrt{7}-\sqrt{5}\right)}{\left(\sqrt{7}+\sqrt{5}\right)\left(\sqrt{7}-\sqrt{5}\right)}$$

$$= \frac{2\left(\sqrt{7}-\sqrt{5}\right)}{7-5} = \sqrt{7}-\sqrt{5}$$

Second term $= \dfrac{7}{\sqrt{12}-\sqrt{5}}$

$$= \frac{7\left(\sqrt{12}+\sqrt{5}\right)}{\left(\sqrt{12}-\sqrt{5}\right)\left(\sqrt{12}+\sqrt{5}\right)}$$

$$= \frac{7\left(\sqrt{12}+\sqrt{5}\right)}{12-5}$$

$$= \frac{7(\sqrt{12}+\sqrt{5})}{7} = \sqrt{12}+\sqrt{5}$$

Third term $= \dfrac{5}{\sqrt{12}-\sqrt{7}}$

$$= \frac{5\left(\sqrt{12}+\sqrt{7}\right)}{\left(\sqrt{12}-\sqrt{7}\right)\left(\sqrt{12}+\sqrt{7}\right)}$$

$$= \frac{5\left(\sqrt{12}+\sqrt{7}\right)}{12-7} = \sqrt{12}+\sqrt{7}$$

$\therefore$ Expression

$= \left(\sqrt{7}-\sqrt{5}\right) + \left(\sqrt{12}+\sqrt{5}\right) - \left(\sqrt{12}+\sqrt{7}\right)$

$= \sqrt{7} - \sqrt{5} + \sqrt{12} + \sqrt{5} - \sqrt{12} - \sqrt{7} = 0$

23. (4) $\left(\dfrac{1}{2}\right)^{-\frac{1}{2}} = (2)^{\frac{1}{2}} = \sqrt{2}$

24. (3) $\dfrac{1}{\sqrt{3}+\sqrt{4}}$

$$= \frac{1}{\sqrt{3}+\sqrt{4}} \times \frac{\sqrt{4}-\sqrt{3}}{\sqrt{4}-\sqrt{3}}$$

$$= \frac{\sqrt{4}-\sqrt{3}}{4-3} = \sqrt{4}-\sqrt{3}$$

Similarly,

$\dfrac{1}{\sqrt{4}+\sqrt{5}} = \sqrt{5}-\sqrt{4}\ldots$ so on

$\therefore$ Expression

$= \sqrt{4} - \sqrt{3} + \sqrt{5} - \sqrt{4} + \sqrt{6} - \sqrt{5} + \sqrt{7} - \sqrt{6} + \sqrt{8} - \sqrt{7} + \sqrt{9} - \sqrt{8}$

$= \sqrt{9} - \sqrt{3} = 3 - \sqrt{3}$

25. (2) $(16)^{0.16} \times (16)^{0.04} \times (2)^{0.2}$

$= (2^4)^{0.16} \times (2^4)^{0.04} \times (2)^{0.2}$

$= 2^{0.64} \times 2^{0.16} \times 2^{0.2}$

$= (2)^{0.64+0.16+0.2} = 2$

26. (2) Expression

$$= \frac{12}{3+\sqrt{5}+2\sqrt{2}}$$

$$= \frac{12(3+\sqrt{5}-2\sqrt{2})}{\left[(3+\sqrt{5})+2\sqrt{2}\right]\left[(3+\sqrt{5})-2\sqrt{2}\right]}$$

[Rationalising the denominator]

$$= \frac{12(3+\sqrt{5}-2\sqrt{2})}{(3+\sqrt{5})^2-(2\sqrt{2})^2}$$

$$= \frac{12(3+\sqrt{5}-2\sqrt{2})}{9+5+6\sqrt{5}-8}$$

$$= \frac{12(3+\sqrt{5}-2\sqrt{2})}{6\sqrt{5}+6}$$

$$= \frac{2(3+\sqrt{5}-2\sqrt{2})}{\sqrt{5}+1}$$

$$= \frac{2(3+\sqrt{5}-2\sqrt{2})(\sqrt{5}-1)}{(\sqrt{5}+1)(\sqrt{5}-1)}$$

$$= \frac{2(3\sqrt{5}+5-2\sqrt{10}-3-\sqrt{5}+2\sqrt{2})}{5-1}$$

$$= \frac{2\left(2\sqrt{5}+2\sqrt{2}-2\sqrt{10}+2\right)}{4}$$

$$= \frac{2\times 2(\sqrt{5}+\sqrt{2}-\sqrt{10}+1)}{4}$$

$$= 1+\sqrt{5}+\sqrt{2}-\sqrt{10}$$

27. (2) Expression

$$= 3+\frac{1}{\sqrt{3}}+\frac{1}{3+\sqrt{3}}+\frac{1}{\sqrt{3}-3}$$

$$= 3+\frac{1}{\sqrt{3}}+\frac{1}{3+\sqrt{3}}-\frac{1}{3-\sqrt{3}}$$

$$= 3+\frac{1}{\sqrt{3}}+\left(\frac{3-\sqrt{3}-3-\sqrt{3}}{(3+\sqrt{3})(3-\sqrt{3})}\right)$$

$$= 3+\frac{1}{\sqrt{3}}+\frac{-2\sqrt{3}}{9-3} = 3+\frac{1}{\sqrt{3}}-\frac{\sqrt{3}}{3}$$

$$= 3+\frac{1}{\sqrt{3}}-\frac{1}{\sqrt{3}} = 3$$

28. (3) Expression $= \sqrt{8-2\sqrt{15}}$

$$= \sqrt{5+3-2\sqrt{5}\times\sqrt{3}}$$

$$= \sqrt{\left(\sqrt{5}\right)^2+\left(\sqrt{3}\right)^2-2\sqrt{5}\times\sqrt{3}}$$

$$= \sqrt{\left(\sqrt{5}-\sqrt{3}\right)^2} = \sqrt{5}-\sqrt{3}$$

29. (2) Expression $= (0.04)^{-1.5}$

$$= \frac{1}{(0.04)^{1.5}} = \frac{1}{(0.04)^{\frac{3}{2}}}$$

$$= \frac{1}{(0.04\times 0.04\times 0.04)^{\frac{1}{2}}}$$

$$= \frac{1}{\sqrt{0.0000064}}$$

$$= \frac{1}{0.008} = \frac{1000}{8} = 125$$

30. (1) Expression

$$= \frac{\sqrt[3]{1372}\times\sqrt[3]{1458}}{\sqrt[3]{343}}$$

$$= \sqrt[3]{\frac{1372\times 1458}{343}}$$

$$= \sqrt[3]{5832}$$

$$= \sqrt[3]{18\times 18\times 18} = 18$$

31. (1)

$$\frac{2}{\sqrt{5}+\sqrt{3}} = \frac{2\left(\sqrt{5}-\sqrt{3}\right)}{\left(\sqrt{5}+\sqrt{3}\right)\left(\sqrt{5}-\sqrt{3}\right)}$$

(Rationalising the denominator)

$$= \frac{2\left(\sqrt{5}-\sqrt{3}\right)}{5-3} = \sqrt{5}-\sqrt{3}$$

Similarly,

$$\frac{3}{\sqrt{6}-\sqrt{3}} = \frac{3\left(\sqrt{6}+\sqrt{3}\right)}{6-3} = \sqrt{6}+\sqrt{3}$$

$$\frac{1}{\sqrt{6}+\sqrt{5}} = \frac{\sqrt{6}-\sqrt{5}}{6-5} = \sqrt{6}-\sqrt{5}$$

$\therefore$ Expression

$$= \sqrt{5}-\sqrt{3}+\sqrt{6}+\sqrt{3}+\sqrt{6}-\sqrt{5}$$

$$= 2\sqrt{6}$$

32. (1) Here,

$$\frac{1}{3-\sqrt{8}} = \frac{\left(3+\sqrt{8}\right)}{\left(3-\sqrt{8}\right)\left(3+\sqrt{8}\right)}$$

$$= \frac{3+\sqrt{8}}{9-8} = 3+\sqrt{8}$$

$$\frac{1}{\sqrt{8}-\sqrt{7}} = \frac{\sqrt{8}+\sqrt{7}}{\left(\sqrt{8}-\sqrt{7}\right)\left(\sqrt{8}+\sqrt{7}\right)}$$

$= \sqrt{8}+\sqrt{7}$ AND.... so on

Expression

$$= \left(3+\sqrt{8}\right)-\left(\sqrt{8}+\sqrt{7}\right)+\left(\sqrt{7}+\sqrt{6}\right)-\left(\sqrt{6}+\sqrt{5}\right)+\left(\sqrt{5}+2\right)$$

$$= 3+\sqrt{8}-\sqrt{8}-\sqrt{7}+\sqrt{7}+\sqrt{6}-\sqrt{6}-\sqrt{5}+\sqrt{5}+2$$

$$= 3 + 2 = 5$$

33. (1) Expression $= \dfrac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}-2\sqrt{3}}$

Rationalising the denominator,

$$= \frac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}-2\sqrt{3}}\times\frac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}}$$

$$= \frac{\left(3\sqrt{2}+2\sqrt{3}\right)^2}{\left(3\sqrt{2}\right)^2-\left(2\sqrt{3}\right)^2}$$

$$= \frac{18+12+2\times 3\sqrt{2}\times 2\sqrt{3}}{18-12}$$

$$= \frac{30+12\sqrt{6}}{6}$$

$$= \frac{6\left(5+2\sqrt{6}\right)}{6} = 5+2\sqrt{6}$$

34. (1) Expression

$$= \left(\frac{2+\sqrt{3}}{2-\sqrt{3}}+\frac{2-\sqrt{3}}{2+\sqrt{3}}\right)+\frac{\sqrt{3}+1}{\sqrt{3}-1}\times\frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$= \left[\frac{\left(2+\sqrt{3}\right)^2+\left(2-\sqrt{3}\right)^2}{\left(2-\sqrt{3}\right)\left(2+\sqrt{3}\right)}\right]+\frac{\left(\sqrt{3}+1\right)^2}{3-1}$$

$$= \frac{2(4+3)}{4-3} + \frac{3+1+2\sqrt{3}}{2}$$

$$\left[\because (a+b)^2 + (a-b)^2 = 2(a^2+b^2)\right]$$

$= 14 + 2 + \sqrt{3} = 16 + \sqrt{3}$

35. (2) $14 + 6\sqrt{5} = 14 + 2 \times 3 \times \sqrt{5}$

$= 9 + 5 + 2 \times 3 \times \sqrt{5}$

$= (3)^2 + (\sqrt{5})^2 + 2 \times 3 \times \sqrt{5}$

$= (3 + \sqrt{5})^2$

$\therefore \sqrt{14+6\sqrt{5}} = \sqrt{(3+\sqrt{5})^2}$

$= 3 + \sqrt{5}$

36. (2) Expression

$$= \frac{3\sqrt{2}}{\sqrt{3}+\sqrt{6}} - \frac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}} + \frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}}$$

$$= \frac{3\sqrt{2}(\sqrt{6}-\sqrt{3})}{(\sqrt{6}+\sqrt{3})(\sqrt{6}-\sqrt{3})} - \frac{4\sqrt{3}(\sqrt{6}-\sqrt{2})}{(\sqrt{6}+\sqrt{2})(\sqrt{6}-\sqrt{2})} + \frac{\sqrt{6}}{(\sqrt{3}+\sqrt{2})} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$$

$$= \frac{3\sqrt{2}(\sqrt{6}-\sqrt{3})}{6-3} - \frac{4\sqrt{3}(\sqrt{6}-\sqrt{2})}{(6-2)} + \frac{\sqrt{6}(\sqrt{3}-\sqrt{2})}{3-2}$$

$$= \sqrt{2}(\sqrt{6}-\sqrt{3}) - \sqrt{3}(\sqrt{6}-\sqrt{2}) + \sqrt{6}(\sqrt{3}-\sqrt{2})$$

$= \sqrt{12} - \sqrt{6} - \sqrt{18} + \sqrt{6} + \sqrt{18} - \sqrt{12}$

$= 0$

37. (3) Expression

$$= \frac{\dfrac{3(2-\sqrt{3}) - 2(2+\sqrt{3})}{(2+\sqrt{3})(2-\sqrt{3})}}{2-\sqrt{3}}$$

$$= \frac{6 - 3\sqrt{3} - 4 - 2\sqrt{3}}{(2+\sqrt{3})(2-\sqrt{3})(2-5\sqrt{3})}$$

$$= \frac{2-5\sqrt{3}}{2-5\sqrt{3}} = 1$$

38. (1) $(64)^{\frac{-2}{3}} \times \left(\frac{1}{4}\right)^{-2}$

$$= \frac{1}{(64)^{\frac{2}{3}}} \times (4)^2$$

$$= \frac{1}{(4)^{3\times\frac{2}{3}}} \times 4^2 \qquad = \frac{1}{4^2} \times 4^2 = 1$$

39. (3) $\frac{1+\sqrt{2}}{\sqrt{5}+\sqrt{3}} + \frac{1-\sqrt{2}}{\sqrt{5}-\sqrt{3}}$

$$= \frac{(1+\sqrt{2})(\sqrt{5}-\sqrt{3}) + (1-\sqrt{2})(\sqrt{5}+\sqrt{3})}{(\sqrt{5}+\sqrt{3})(\sqrt{5}-\sqrt{3})}$$

$$= \frac{\sqrt{5}-\sqrt{3}+\sqrt{10}-\sqrt{6}+\sqrt{5}+\sqrt{3}-\sqrt{10}-\sqrt{6}}{(\sqrt{5})^2-(\sqrt{3})^2}$$

[Using $(a + b)(a - b) = a^2 - b^2$]

$$= \frac{2\sqrt{5}-2\sqrt{6}}{5-3} = \frac{2(\sqrt{5}-\sqrt{6})}{2}$$

$= \sqrt{5} - \sqrt{6}$

40. (3) Given expression

$$= \left(\frac{2+\sqrt{3}}{2-\sqrt{3}} + \frac{2-\sqrt{3}}{2+\sqrt{3}} + \frac{\sqrt{3}-1}{\sqrt{3}+1}\right)$$

$$= \left[\frac{(2+\sqrt{3})^2 + (2-\sqrt{3})^2}{(2-\sqrt{3})(2+\sqrt{3})} + \frac{(\sqrt{3}-1)}{(\sqrt{3}+1)} \times \frac{(\sqrt{3}-1)}{(\sqrt{3}-1)}\right]$$

$$= \left[\frac{4+3+4\sqrt{3}+4+3-4\sqrt{3}}{(2)^2-(\sqrt{3})^2} + \frac{(\sqrt{3}-1)^2}{(\sqrt{3})^2-(1)^2}\right]$$

$$= \left[\frac{14}{4-3} + \frac{3+1-2\sqrt{3}}{3-1}\right]$$

$$= \left[14 + \frac{2(2-\sqrt{3})}{2}\right] = 16 - \sqrt{3}$$

41. (2) Given expression :

$$\left(\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}\right)^2 + \left(\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}\right)^2$$

Now,

$$\left(\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}\right)^2 = \frac{(\sqrt{5}+\sqrt{3})^2}{(\sqrt{5}-\sqrt{3})^2}$$

$$= \frac{(\sqrt{5})^2 + (\sqrt{3})^2 + 2\sqrt{5}\times\sqrt{3}}{(\sqrt{5})^2 + (\sqrt{3})^2 - 2\sqrt{5}\times\sqrt{3}}$$

$$= \frac{5+3+2\sqrt{15}}{5+3-2\sqrt{15}}$$

$$= \frac{8+2\sqrt{15}}{8-2\sqrt{15}} = \frac{4+\sqrt{15}}{4-\sqrt{15}}$$

Similarly,

$$\left(\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}\right)^2 = \frac{4-\sqrt{15}}{4+\sqrt{15}}$$

Therefore, given expression

$$= \frac{4+\sqrt{15}}{4-\sqrt{15}} + \frac{4-\sqrt{15}}{4+\sqrt{15}}$$

$$= \frac{16+15+8\sqrt{15}+16+15-8\sqrt{15}}{16-15}$$

$= 62$

42. (3) $\sqrt{\dfrac{(\sqrt{12}-\sqrt{8})(\sqrt{3}+\sqrt{2})}{5+\sqrt{24}}}$

$$= \sqrt{\frac{\sqrt{36}-\sqrt{24}+\sqrt{24}-\sqrt{16}}{5+\sqrt{24}}}$$

$$= \sqrt{\frac{6-4}{5+\sqrt{24}}} = \sqrt{\frac{2}{5+\sqrt{24}}}$$

$$= \sqrt{\frac{2}{5+\sqrt{6\times4}}} = \sqrt{\frac{2}{5+2\sqrt{6}}}$$

$$= \sqrt{\frac{2}{5+2\sqrt{6}} \times \frac{5-2\sqrt{6}}{5-2\sqrt{6}}}$$

$$= \sqrt{\frac{2(5-2\sqrt{6})}{25-24}} = \sqrt{2(5-2\sqrt{6})}$$

$$= \sqrt{2\left(3+2+2\sqrt{6}\right)}$$

$$= \sqrt{2\left[\left(\sqrt{3}\right)^2+\left(\sqrt{2}\right)^2-2\sqrt{3}\sqrt{2}\right]}$$

$$= \sqrt{2\left(\sqrt{3}-\sqrt{2}\right)^2} = \sqrt{2}\left(\sqrt{3}-\sqrt{2}\right)$$

$$= \sqrt{6}-2$$

43. (3) $\left[64^{\frac{2}{3}} \times 2^{-2} \div 8^{\circ}\right]^{\frac{1}{2}}$

$$= \left[\left(64^{\frac{1}{3}}\right)^2 \times \frac{1}{2^2} \div 1\right]^{\frac{1}{2}}$$

$$= \left[\left(\sqrt[3]{64}\right)^2 \times \frac{1}{4}\right]^{\frac{1}{2}} = \left[(4)^2 \times \frac{1}{4}\right]^{\frac{1}{2}}$$

$$= [4]^{\frac{1}{2}} = \sqrt{4} = 2$$

44. (1) Expression

$$= \frac{1}{\sqrt{12-\sqrt{140}}} - \frac{1}{\sqrt{8-\sqrt{60}}} - \frac{2}{\sqrt{10+\sqrt{84}}}$$

$$= \frac{1}{\sqrt{12-\sqrt{4\times 35}}} - \frac{1}{\sqrt{8-\sqrt{4\times 15}}} - \frac{2}{\sqrt{10+\sqrt{4\times 21}}}$$

$$= \frac{1}{\sqrt{12-2\times\sqrt{7}\times\sqrt{5}}} - \frac{1}{\sqrt{8-2\times\sqrt{5}\times\sqrt{3}}} - \frac{2}{\sqrt{10+2\times\sqrt{7}\times\sqrt{3}}}$$

$$= \frac{1}{\sqrt{\left(\sqrt{7}\right)^2+\left(\sqrt{5}\right)^2-2\times\sqrt{7}\times\sqrt{5}}} - \frac{1}{\sqrt{\left(\sqrt{5}\right)^2+\left(\sqrt{3}\right)^2-2\times\sqrt{5}\times\sqrt{3}}} - \frac{2}{\sqrt{\left(\sqrt{7}\right)^2+\left(\sqrt{3}\right)^2-2\times\sqrt{7}\times\sqrt{3}}}$$

$$= \frac{1}{\sqrt{\left(\sqrt{7}-\sqrt{5}\right)^2}} - \frac{1}{\sqrt{\left(\sqrt{5}-\sqrt{3}\right)^2}} - \frac{2}{\sqrt{\left(\sqrt{7}+\sqrt{3}\right)^2}}$$

$$= \frac{1}{\sqrt{7}-\sqrt{5}} - \frac{1}{\sqrt{5}-\sqrt{3}} - \frac{2}{\sqrt{7}+\sqrt{3}}$$

$$= \frac{\sqrt{7}+\sqrt{5}}{\left(\sqrt{7}\right)^2-\left(\sqrt{5}\right)^2} - \frac{\sqrt{5}+\sqrt{3}}{\left(\sqrt{5}\right)^2-\left(\sqrt{3}\right)^2} - \frac{2\left(\sqrt{7}-\sqrt{3}\right)}{\left(\sqrt{7}\right)^2-\left(\sqrt{3}\right)^2}$$

[Rationalizing each term by respective conjugates]

$$= \frac{\sqrt{7}+\sqrt{5}}{2} - \frac{\sqrt{5}+\sqrt{3}}{2} - \frac{2\left(\sqrt{7}-\sqrt{3}\right)}{4}$$

$$= \frac{\sqrt{7}+\sqrt{5}-\sqrt{5}-\sqrt{3}-\sqrt{7}+\sqrt{3}}{2} = 0$$

45. (1) $\sqrt{11+2\sqrt{30}}$

$$= \sqrt{5+6+2\times\sqrt{5}\times\sqrt{6}}$$

$$= \sqrt{\left(\sqrt{5}+\sqrt{6}\right)^2} = \sqrt{6}+\sqrt{5}$$

$$\therefore \frac{1}{\sqrt{11+2\sqrt{30}}} = \sqrt{6}-\sqrt{5}$$

$\therefore$ Expression

$$= \sqrt{6}+\sqrt{5}-\sqrt{6}+\sqrt{5} = 2\sqrt{5}$$

46. (2) $(243)^{0.16} \times (243)^{0.04}$

$= (243)^{0.16+0.04}$

$= (243)^{0.2} = (243)^{1/5}$

$= (3^5)^{1/5} = 3$

47. (1) Expression $= \dfrac{3^{\circ}+3^{-1}}{3^{-1}-3^{\circ}}$

$$= \frac{1+\frac{1}{3}}{\frac{1}{3}-1} = \frac{\frac{3+1}{3}}{\frac{1-3}{3}} = \frac{4}{3}\times\frac{-3}{2} = -2$$

48. (4) $\dfrac{1}{\sqrt{100}-\sqrt{99}}$

$$= \frac{\sqrt{100}+\sqrt{99}}{\left(\sqrt{100}-\sqrt{99}\right)\left(\sqrt{100}+\sqrt{99}\right)}$$

$$= \sqrt{100}+\sqrt{99}$$

Similarly, $\dfrac{1}{\sqrt{99}-\sqrt{98}}$

$= \sqrt{99}+\sqrt{98}$ ... and so on

$\therefore$ Expression

$= \sqrt{100}+\sqrt{99}-\sqrt{99}-\sqrt{98}+\sqrt{98}+\sqrt{97}....+\sqrt{2}+1$

$= \sqrt{100}+1 = 10+1 = 11$

49. (3) $\dfrac{1}{\sqrt{2}+\sqrt{3}-\sqrt{5}}$

$$= \left[\frac{\sqrt{2}+\sqrt{3}+\sqrt{5}}{\sqrt{2}+\sqrt{3}+\sqrt{5}}\right]\times\frac{1}{\sqrt{2}+\sqrt{3}-\sqrt{5}}$$

$$= \frac{\sqrt{2}+\sqrt{3}+\sqrt{5}}{2+3+2\sqrt{6}-5}$$

$$= \frac{\sqrt{2}+\sqrt{3}+\sqrt{5}}{2\sqrt{6}}$$

Similarly, $\dfrac{1}{\sqrt{2}-\sqrt{3}-\sqrt{5}}$

$$= \frac{\sqrt{2}-\sqrt{3}+\sqrt{5}}{\left[\left(\sqrt{2}-\sqrt{3}\right)-\sqrt{5}\right]\left[\left(\sqrt{2}-\sqrt{3}\right)+\sqrt{5}\right]}$$

$$= \frac{\sqrt{2}-\sqrt{3}+\sqrt{5}}{-2\sqrt{6}}$$

$\therefore$ Expression

$$= \frac{\sqrt{2}+\sqrt{3}+\sqrt{5}}{2\sqrt{6}} - \frac{\sqrt{2}-\sqrt{3}+\sqrt{5}}{2\sqrt{6}}$$

$$= \frac{\sqrt{2}+\sqrt{3}+\sqrt{5}-\sqrt{2}+\sqrt{3}-\sqrt{5}}{2\sqrt{6}}$$

$$= \frac{\sqrt{3}}{\sqrt{6}} = \frac{1}{\sqrt{2}}$$

50. (2) Expression

$$= \sqrt[3]{2}\times\sqrt{2}\times\sqrt[3]{3}\times 3$$

$$= 2^{\frac{1}{3}}\times 2^{\frac{1}{2}}\times 3^{\frac{1}{3}}\times 3^{\frac{1}{2}}$$

$$= 2^{\frac{5}{6}}\times 3^{\frac{5}{6}} = (6)^{\frac{5}{6}}$$

51. (4) $(256)^{16/100} \times (256)^{9/100}$

$= (256)^{25/100} = (256)^{1/4} = \left(4^4\right)^{\frac{1}{4}}$

$= (4)^{4\times\frac{1}{4}} = 4$

52. (4) Expression

$$= \left[8-\left(\frac{4^{\frac{9}{4}}\sqrt{2\times 2^2}}{2\sqrt{2^{-2}}}\right)^{\frac{1}{2}}\right]$$

$$= \left[8 - \left(\frac{(2)^{2\times\frac{9}{4}} \times 2^{\frac{3}{2}}}{2\times(2^{-2})^{\frac{1}{2}}}\right)^{\frac{1}{2}}\right]$$

$$= \left[8 - \left(\frac{2^{\frac{9}{2}} \times 2^{\frac{3}{2}}}{2^{1}\times 2^{-1}}\right)^{\frac{1}{2}}\right]$$

$$= \left[8 - \left(\frac{2^{\frac{9}{2}+\frac{3}{2}}}{2^{1-1}}\right)^{\frac{1}{2}}\right]$$

$$= \left[8 - \left(2^{6}\right)^{\frac{1}{2}}\right] = \left(8 - 2^{3}\right) = 8 - 8 = 0$$

53. (3) Expression

$$= \frac{3\sqrt{2}}{\sqrt{6}+\sqrt{3}} - \frac{2\sqrt{6}}{\sqrt{3}+1} + \frac{2\sqrt{3}}{\sqrt{6}+2}$$

Now,

$$\frac{3\sqrt{2}}{\sqrt{6}+\sqrt{3}} = \frac{3\sqrt{2}(\sqrt{6}-\sqrt{3})}{(\sqrt{6}+\sqrt{3})(\sqrt{6}-\sqrt{3})}$$

$$= \frac{3\sqrt{2}(\sqrt{6}-\sqrt{3})}{6-3} = \sqrt{2}(\sqrt{6}-\sqrt{3})$$

$$= \sqrt{12} - \sqrt{6} = 2\sqrt{3} - \sqrt{6}$$

$$= \frac{2\sqrt{6}}{\sqrt{3}+1} = \frac{2\sqrt{6}(\sqrt{3}-1)}{(\sqrt{3}+1)(\sqrt{3}-1)}$$

$$= \sqrt{6}(\sqrt{3}-1) = \sqrt{18} - \sqrt{6}$$

$$= 3\sqrt{2} - \sqrt{6}$$

$$= \frac{2\sqrt{3}}{\sqrt{6}+2} = \frac{2\sqrt{3}(\sqrt{6}-2)}{(\sqrt{6}+2)(\sqrt{6}-2)}$$

$$= \frac{2\sqrt{3}(\sqrt{6}-2)}{6-4} = \sqrt{3}(\sqrt{6}-2)$$

$$= \sqrt{3}\times\sqrt{6} - 2\sqrt{3} = 3\sqrt{2} - 2\sqrt{3}$$

$\therefore$ Expression

$$= (2\sqrt{3}-\sqrt{6}) - (3\sqrt{2}-\sqrt{6})$$

$$+ (3\sqrt{2} - 2\sqrt{3})$$

$$= 2\sqrt{3} - \sqrt{6} - 3\sqrt{2} + \sqrt{6}$$

$$+ 3\sqrt{2} - 2\sqrt{3} = 0$$

54. (3) $(4)^{0.5} \times (0.5)^4$

$$= \left(2^2\right)^{1/2} \times \left(\frac{5}{10}\right)^4 = 2\times\left(\frac{1}{2}\right)^4$$

$$= \frac{2}{2\times2\times2\times2} = \frac{1}{2\times2\times2} = \frac{1}{8}$$

55. (2) Expression

$$= \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} - \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$$

$$= \frac{\left(\sqrt{3}+\sqrt{2}\right)^2 - \left(\sqrt{3}-\sqrt{2}\right)^2}{\left(\sqrt{3}+\sqrt{2}\right)\left(\sqrt{3}-\sqrt{2}\right)}$$

$$= \frac{3+2+2\sqrt{6}-3-2+2\sqrt{6}}{\left(\sqrt{3}\right)^2 - \left(\sqrt{2}\right)^2}$$

$$= \frac{4\sqrt{6}}{3-2} = 4\sqrt{6}$$

56. (3) $\sqrt{40+\sqrt{9\sqrt{81}}}$

$$= \sqrt{40+\sqrt{9\times9}}$$

$$= \sqrt{40+9} = \sqrt{49} = 7$$

57. (1)

$$\frac{1}{\sqrt{9}-\sqrt{8}} = \frac{1}{\sqrt{9}-\sqrt{8}} \times \frac{\sqrt{9}+\sqrt{8}}{\sqrt{9}+\sqrt{8}} = \frac{\sqrt{9}+\sqrt{8}}{9-8}$$

$$= \sqrt{9}+\sqrt{8}$$

Similarly, $\frac{1}{\sqrt{8}-\sqrt{7}} = \sqrt{8}+\sqrt{7}$

... and so on

Expression =

$$\left(\sqrt{9}+\sqrt{8}\right) - \left(\sqrt{8}+\sqrt{7}\right) + \left(\sqrt{7}+\sqrt{6}\right) -$$

$$\left(\sqrt{6}+\sqrt{5}\right) + \left(\sqrt{5}+\sqrt{4}\right)$$

$$= \sqrt{9}+\sqrt{8}-\sqrt{8}-\sqrt{7}+\sqrt{7}+\sqrt{6}-\sqrt{6}$$

$$-\sqrt{5}+\sqrt{5}+\sqrt{4}$$

$$= \sqrt{9}+\sqrt{4} = 3+2 = 5$$

58. (3) $\left[\left(\sqrt[5]{x^{-3/5}}\right)^{\frac{-5}{3}}\right]^5$

$$= \left(x^{-\frac{3}{5}}\right)^{\frac{1}{5}\times\frac{-5}{3}\times5}$$

$$= x^{-\frac{3}{5}\times\frac{-5}{3}} = x$$

59. (1)

$$\frac{\sqrt{3}+1}{\sqrt{3}-1} = \frac{\sqrt{3}+1}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}-1} = \frac{\left(\sqrt{3}+1\right)^2}{3-1}$$

$$= \frac{3+1+2\sqrt{3}}{2} = 2+\sqrt{3}$$

$$\therefore \frac{\sqrt{3}-1}{\sqrt{3}+1} = 2-\sqrt{3}$$

$$\frac{\sqrt{2}+1}{\sqrt{2}-1} = \frac{\left(\sqrt{2}+1\right)^2}{\left(\sqrt{2}-1\right)\left(\sqrt{2}+1\right)}$$

$$= \frac{2+1+2\sqrt{2}}{2-1} = 3 + 2\sqrt{2}$$

$$\therefore \frac{\sqrt{2}-1}{\sqrt{2}+1} = 3-2\sqrt{2}$$

$\therefore$ Expression = $2 + \sqrt{3} + 3 + 2\sqrt{2} + 2 - \sqrt{3} + 3 - 2\sqrt{2}$

$= 10$

60. (2) Expression

$$= \frac{3+\sqrt{6}}{5\sqrt{3}-2\sqrt{2\times2\times3}} -$$

$$\sqrt{2\times2\times2\times2\times2} + \sqrt{5\times5\times2}$$

$$= \frac{3+\sqrt{6}}{5\sqrt{3}-4\sqrt{3}-4\sqrt{2}+5\sqrt{2}}$$

$$= \frac{3+\sqrt{6}}{\sqrt{3}+\sqrt{2}}$$

$$= \frac{\sqrt{3}\left(\sqrt{3}+\sqrt{2}\right)}{\sqrt{3}+\sqrt{2}} = \sqrt{3}$$

61. (3) Expression

$$= \frac{1+\sqrt{2}}{\sqrt{5}+\sqrt{3}} + \frac{1-\sqrt{2}}{\sqrt{5}-\sqrt{3}}$$

$$= \frac{\left(1+\sqrt{2}\right)\left(\sqrt{5}-\sqrt{3}\right)+\left(\sqrt{5}+\sqrt{3}\right)\left(1-\sqrt{2}\right)}{\left(\sqrt{5}+\sqrt{3}\right)\left(\sqrt{5}-\sqrt{3}\right)}$$

$$= \frac{\sqrt{5}+\sqrt{10}-\sqrt{3}-\sqrt{6}+\sqrt{5}+\sqrt{3}-\sqrt{10}-\sqrt{6}}{5-3}$$

$$= \frac{2\sqrt{5}-2\sqrt{6}}{2} = \frac{2\left(\sqrt{5}-\sqrt{6}\right)}{2}$$

$$= \sqrt{5}-\sqrt{6}$$

62. (4)

$$(256)^{-\left(4^{\frac{-3}{2}}\right)} = (256)^{-\left(\frac{1}{4^{3/2}}\right)}$$

$$= (256)^{-\frac{1}{8}} = \frac{1}{(256)^{\frac{1}{8}}} = \frac{1}{(2^8)^{\frac{1}{8}}} = \frac{1}{2}$$

63. (1) $\left\{(-2)^{(-2)}\right\}^{(-2)} = \frac{1}{\left\{(-2)^{(-2)}\right\}^2}$

$$= \frac{1}{(-2)^{-4}} = (-2)^4 = 16$$

64. (3) Expression

$$= \sqrt{2} + \sqrt{7 - 2\sqrt{10}}$$

$$= \sqrt{2} + \sqrt{7 - 2 \times \sqrt{5} \times \sqrt{2}}$$

$$= \sqrt{2} + \sqrt{\left(\sqrt{5}\right)^2 + \left(\sqrt{2}\right)^2 - 2 \times \sqrt{5} \times \sqrt{2}}$$

$$= \sqrt{2} + \sqrt{\left(\sqrt{5} - \sqrt{2}\right)^2}$$

$$= \sqrt{2} + \sqrt{5} - \sqrt{2} = \sqrt{5}$$

65. (4) $(256)^{0.16} \times (4)^{0.36}$

$= (4^4)^{0.16} \times 4^{0.36} = 4^{0.64} \times 4^{0.36}$

$= (4)^{0.64 + 0.36} = 4$

66. (3) $? = 5\sqrt{7} - 2\sqrt{5} - 3\sqrt{7} + 4\sqrt{5}$

$$= 2\sqrt{7} + 2\sqrt{5} = 2\left(\sqrt{7} + \sqrt{5}\right)$$

67. (1) $\frac{\sqrt{7} - \sqrt{5}}{\sqrt{7} + \sqrt{5}} + \frac{\sqrt{7} + \sqrt{5}}{\sqrt{7} - \sqrt{5}}$

$$= \frac{\left(\sqrt{7} - \sqrt{5}\right)^2 + \left(\sqrt{7} + \sqrt{5}\right)^2}{\left(\sqrt{7} + \sqrt{5}\right)\left(\sqrt{7} - \sqrt{5}\right)}$$

$$= \frac{2\left[\left(\sqrt{7}\right)^2 + \left(\sqrt{5}\right)^2\right]}{\left(\sqrt{7}\right)^2 - \left(\sqrt{5}\right)^2}$$

$$= \frac{2(7+5)}{7-5} = 12$$

68. (4) $\frac{2}{\sqrt{6} + 2} = \frac{2}{\sqrt{6} + 2} \times \frac{\sqrt{6} - 2}{\sqrt{6} - 2}$

$$= \frac{2\left(\sqrt{6} - 2\right)}{6 - 4} = \sqrt{6} - 2$$

Similarly, $\frac{1}{\sqrt{7} + \sqrt{6}} = \sqrt{7} - \sqrt{6}$

and $\frac{1}{\sqrt{8} - \sqrt{7}} = \frac{\sqrt{8} + \sqrt{7}}{\left(\sqrt{8} - \sqrt{7}\right)\left(\sqrt{8} + \sqrt{7}\right)}$

$$= \frac{\sqrt{8} + \sqrt{7}}{8 - 7} = \sqrt{8} + \sqrt{7}$$

$$= 2\sqrt{2} + \sqrt{7}$$

$\therefore$ Expression $= \sqrt{6} - 2 + \sqrt{7} - \sqrt{6} + 2\sqrt{2} + \sqrt{7} + 2 - 2\sqrt{2} = 2\sqrt{7}$

69. (3) $\sqrt{12} + \sqrt{18}$

$= \sqrt{3 \times 2 \times 2} + \sqrt{2 \times 3 \times 3}$

$= 2\sqrt{3} + 3\sqrt{2}$

$\therefore$ Required difference

$= 2\sqrt{3} + 3\sqrt{2} - 2\sqrt{3} - 2\sqrt{2} = \sqrt{2}$

70. (2) $\frac{1}{\sqrt{2} + 1} = \frac{1}{\sqrt{2} + 1} \times \frac{\sqrt{2} - 1}{\sqrt{2} - 1}$

$$= \frac{\sqrt{2} - 1}{2 - 1} = \sqrt{2} - 1$$

$\therefore$ Expression

$= \sqrt{2} - 1 + \sqrt{3} - \sqrt{2} + \sqrt{4} - \sqrt{3} + \ldots\ldots + \sqrt{99} - \sqrt{98} + \sqrt{100} - \sqrt{99}$

$= \sqrt{100} - 1 = 10 - 1 = 9$

71. (1) $\left\{\left(\frac{-1}{2}\right)^2\right\}^{-2\times(-1)} = \left(\frac{-1}{2}\right)^{2\times 2}$

$$= \left(-\frac{1}{2}\right)^4 = \frac{1}{16}$$

72. (2) $2.\sqrt[3]{40} = 2.\sqrt[3]{2 \times 2 \times 2 \times 5}$

$= 4\sqrt[3]{5}$

$4.\sqrt[3]{320}$

$= 4.\sqrt[3]{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5}$

$= 16.\sqrt[3]{5}$

$3.\sqrt[3]{625}$

$= 3.\sqrt[3]{5 \times 5 \times 5 \times 5} = 15.\sqrt[3]{5}$

$\therefore$ Expression $= 4.\sqrt[3]{5} - 16\sqrt[3]{5} + 15.\sqrt[3]{5} - 3.\sqrt[3]{5}$

$= 19.\sqrt[3]{5} - 19.\sqrt[3]{5} = 0$

73. (2) $\sqrt[3]{0.000125}$

$= \sqrt[3]{0.05 \times 0.05 \times 0.05} = 0.05$

74. (3) Expression

$$= \frac{0.3555 \times 0.5555 \times 2.025}{0.225 \times 1.7775 \times 0.2222}$$

$$= \frac{3555 \times 5555 \times 2025}{225 \times 17775 \times 2222} = 4.5$$

75. (1)

$$? = \frac{0.06 \times 0.06 \times 0.06 - 0.05 \times 0.05 \times 0.05}{0.06 \times 0.06 + 0.06 \times 0.05 + 0.05 \times 0.05}$$

We know that

$$\frac{a^3 - b^3}{a^2 + ab + b^2} = a - b$$

[$\because a^3 - b^3 = (a-b)(a^2 + ab + b^2)$]

$\therefore$ Required answer

$= 0.06 - 0.05 = 0.01$

76. (3) Using the formula

$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

$$? = \frac{0.05 \times 0.05 \times 0.05 - 0.04 \times 0.04 \times 0.04}{0.05 \times 0.05 + 0.002 + 0.04 \times 0.04}$$

$$= \frac{(0.05)^3 - (0.04)^3}{(0.05)^2 + 0.05 \times 0.04 + (0.04)^2}$$

$= 0.05 - 0.04 = 0.01$

77. (2) $\frac{\left(x - \sqrt{24}\right)\left(\sqrt{75} + \sqrt{50}\right)}{\sqrt{75} - \sqrt{50}} = 1$

$$\Rightarrow \frac{\left(x - 2\sqrt{6}\right)\left(5\sqrt{3} + 5\sqrt{2}\right)}{5\sqrt{3} - 5\sqrt{2}} = 1$$

$$\Rightarrow \frac{\left(x - 2\sqrt{6}\right)\left(\sqrt{3} + \sqrt{2}\right)}{\sqrt{3} - \sqrt{2}} = 1$$

Now, $x - 2\sqrt{6} = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$

$$= \frac{\left(\sqrt{3} - \sqrt{2}\right)^2}{\left(\sqrt{3} + \sqrt{2}\right)\left(\sqrt{3} - \sqrt{2}\right)}$$

$$= 3 + 2 - 2\sqrt{6}$$

$\Rightarrow x - 2\sqrt{6} = 5 - 2\sqrt{6} \Rightarrow x = 5$

78. (3) $\sqrt{20}+\sqrt{12}+\sqrt[3]{729}$

$$-\frac{4}{\sqrt{5}-\sqrt{3}}-\sqrt{81}$$

$$=2\sqrt{5}+2\sqrt{3}+9-\frac{4}{\left(\sqrt{5}-\sqrt{3}\right)}\times$$

$$\frac{\left(\sqrt{5}+\sqrt{3}\right)}{\left(\sqrt{5}+\sqrt{3}\right)}-9$$

$$=2\sqrt{5}+2\sqrt{3}+9-\frac{4\left(\sqrt{5}+\sqrt{3}\right)}{5-3}-9$$

$$=2\sqrt{5}+2\sqrt{3}+9-2\sqrt{5}-2\sqrt{3}-9$$

$$=0$$

79. (1) $a=\frac{1}{2-\sqrt{3}}+\frac{1}{3-\sqrt{8}}+$

$$\frac{1}{4-\sqrt{15}}$$

$$=\frac{1}{2-\sqrt{3}}\times\frac{2+\sqrt{3}}{2+\sqrt{3}}+\frac{1}{3-\sqrt{8}}\times$$

$$\frac{3+\sqrt{8}}{3+\sqrt{8}}+\frac{1}{4-\sqrt{15}}\times\frac{4+\sqrt{15}}{4+\sqrt{15}}$$

$$=\frac{2+\sqrt{3}}{4-3}+\frac{3+\sqrt{8}}{9-8}+\frac{4+\sqrt{15}}{16-15}$$

$$=2+\sqrt{3}+3+2\sqrt{2}+4+\sqrt{15}$$

$$=9+\sqrt{3}+2\sqrt{2}+\sqrt{15}$$

$$=9<9+\sqrt{3}+2\sqrt{2}+\sqrt{15}<18$$

[Illustration : $\sqrt{3}=1.7$

$\sqrt{2}=1.4$

$\sqrt{15}=3.9$

$= 9 + 1.7 + 2.8 + 3.9 = 17.4<18$]

80. (1) $a\sqrt{2}+b\sqrt{3}$

$$=\sqrt{98}+\sqrt{108}-\sqrt{48}-\sqrt{72}$$

$$\Rightarrow a\sqrt{2}+b\sqrt{3}$$

$$=\sqrt{7\times7\times2}+\sqrt{2\times2\times3\times3\times3}$$

$$-\sqrt{2\times2\times2\times2\times3}-\sqrt{2\times2\times2\times3\times3}$$

$$\Rightarrow a\sqrt{2}+b\sqrt{3}$$

$$=7\sqrt{2}+6\sqrt{3}-4\sqrt{3}-6\sqrt{2}$$

$$=\sqrt{2}+2\sqrt{3}$$

$\therefore a = 1,\ b = 2$

81. (1) $\sqrt[3]{a}=\sqrt[3]{26}+\sqrt[3]{7}+\sqrt[3]{63}$

$$\Rightarrow \sqrt[3]{a}<\sqrt[3]{27}+\sqrt[3]{8}+\sqrt[3]{64}$$

$$\Rightarrow \sqrt[3]{a}<3+2+4$$

$$\Rightarrow \sqrt[3]{a}<9$$

$$\Rightarrow a<9^3=729$$

82. (4) $\frac{\sqrt{72}\times\sqrt{363}\times\sqrt{175}}{\sqrt{32}\times\sqrt{147}\times\sqrt{252}}$

$$=\frac{\sqrt{2\times2\times2\times3\times3}\times\sqrt{3\times11\times11}\times\sqrt{5\times5\times7}}{\sqrt{2\times2\times2\times2\times2}\times\sqrt{7\times7\times3}\times\sqrt{2\times2\times3\times3\times7}}$$

$$=\frac{6\sqrt{2}\times11\sqrt{3}\times5\sqrt{7}}{4\sqrt{2}\times7\sqrt{3}\times6\sqrt{7}}$$

$$=\frac{6\times11\times5}{4\times7\times6}=\frac{55}{28}$$

83. (3) Expression

$$=\frac{5.32\ (56+44))}{(7.66+2.34)\ (7.66-2.34)}$$

$$=\frac{532}{10\times5.32}=10$$

84. (4) Expression

$$=2+\frac{6}{\sqrt{3}}+\frac{1}{2+\sqrt{3}}+\frac{1}{\sqrt{3}-2}$$

$$=2+\frac{6}{\sqrt{3}}+\frac{1}{2+\sqrt{3}}-\frac{1}{2-\sqrt{3}}$$

$$=2+2\sqrt{3}+\left(\frac{2-\sqrt{3}-2-\sqrt{3}}{\left(2+\sqrt{3}\right)\left(2-\sqrt{3}\right)}\right)$$

$$=2+2\sqrt{3}-2\sqrt{3}=2$$

85. (3) $\sqrt{7+4\sqrt{3}}=\sqrt{7+2\times2\times\sqrt{3}}$

$$=\sqrt{4+3+2\times2\times\sqrt{3}}$$

$$=\sqrt{\left(2+\sqrt{3}\right)^2}=2+\sqrt{3}$$

$$\therefore \frac{4+3\sqrt{3}}{2+\sqrt{3}}=A+\sqrt{B}$$

$$\Rightarrow \frac{\left(4+3\sqrt{3}\right)\left(2-\sqrt{3}\right)}{\left(2+\sqrt{3}\right)\left(2-\sqrt{3}\right)}=A+\sqrt{B}$$

$$\Rightarrow \frac{8-4\sqrt{3}+6\sqrt{3}-9}{4-3}=A+\sqrt{B}$$

$$\Rightarrow 2\sqrt{3}-1=A+\sqrt{B}$$

$\Rightarrow A = -1$ and $\sqrt{B}=2\sqrt{3}$

$\Rightarrow B = 2\sqrt{3}\times2\sqrt{3}=12$

$\therefore B - A = 12 + 1 = 13$

86. (2) Expression

$$=2\sqrt{50}+\sqrt{18}-\sqrt{72}$$

$$=2\sqrt{2\times5\times5}+\sqrt{3\times3\times2}$$

$$-\sqrt{2\times2\times2\times3\times3}$$

$$=10\sqrt{2}+3\sqrt{2}-6\sqrt{2}$$

$= (10 \times 1.414) + (3 \times 1.414) - (6 \times 1.414) = 7 \times 1.414 = 9.8\ 98$

87. (2) $(6.5 \times 6.5 - 45.5 + 3.5 \times 3.5)$
$= [(6.5)^2 - 2 \times 6.5 \times 3.5 + (3.5)^2]$
$= (6.5 - 3.5)^2 = (3)^2 = 9$

88. (1) $? = (7.5 \times 7.5 + 37.5 + 2.5 \times 2.5)$
$= [(7.5)^2 + 2 \times 7.5 \times 2.5 + (2.5)^2]$
$= [7.5 + 2.5]^2 = (10)^2 = 100$

89. (3)

$$\frac{(1.5)^2+(4.7)^3+(3.8)^3-3\times1.5\times4.7\times3.8}{(1.5)^2+(4.7)^2+(3.8)^2-1.5\times4.7-4.7\times3.8-3.8\times1.5}$$

$$=\frac{(1.5+4.7+3.8)\begin{pmatrix}1.5^2+4.7^2+3.8^2-1.5\times4.7\\-4.7\times3.8-3.8\times1.5\end{pmatrix}}{(1.5)^2+(4.7)^2+(3.8)^2-1.5\times4.7-4.7\times3.8-3.8\times1.5}$$

$= 1.5 + 4.7 + 3.8 = 10$

90. (4) $\frac{(6.25)^{\frac{1}{2}}\times(0.0144)^{\frac{1}{2}}+1}{(0.027)^{\frac{1}{3}}\times(81)^{\frac{1}{4}}}$

$$=\frac{2.5\times0.12+1}{0.3\times3}=\frac{0.3+1}{0.9}=\frac{1.3}{0.9}$$

$= 1.4444 = 1.\overline{4}$

91. (2) Let 0.41 = x and 0.69 = y

$$\therefore \text{Expression}=\frac{\left(x^3+y^3\right)}{\left(x^2-xy+y^2\right)}$$

$$=\frac{(x+y)\left(x^2-xy+y^2\right)}{\left(x^2-xy+y^2\right)}$$

$= x + y = 0.41 + 0.69 = 1.10$

92. (3) Expression

$$= \frac{10.3 \times 10.3 \times 10.3 + 1 \times 1 \times 1}{10.3 \times 10.3 - 10.3 \times 1 + 1 \times 1}$$

Let 10.3 = a and 1 = b,
Then,

$$\text{Expression} = \frac{a^3 + b^3}{a^2 - ab + b^2}$$

$$= \frac{(a+b)(a^2 - ab + b^2)}{a^2 - ab + b^2}$$

= $a + b$ = 10.3 + 1 = 11.3

93. (3) Let, 1.49 = a and 0.51 = b

$$\therefore \frac{a^2 - b^2}{a - b}$$

$$= \frac{(a+b)(a-b)}{(a-b)} = a + b$$

$\therefore$ 1.49 + 0.51 = 2

94. (2) $(0.04)^{-1.5} = \frac{1}{(0.04)^{1.5}}$

$$= \frac{1}{\left[(0.2)^2\right]^{\frac{3}{2}}} = \frac{1}{(0.2)^{2\times\frac{3}{2}}} = \frac{1}{(0.2)^3}$$

$$= \frac{1}{0.008} = \frac{1000}{8} = 125$$

95. (3) Let 0.96 = a and 0.1 = b,
$\therefore$ Expression

$$= \frac{a^3 - b^3}{a^2 + ab + b^2} = \frac{(a-b)(a^2 + ab + b^2)}{a^2 + ab + b^2}$$

= $a - b$ = 0.96 – 0.1 = 0.86

96. (2) Expression

$$= \frac{(4)^3 - (0.2)^3}{(4)^2 + 4 \times 0.2 + (0.2)^2}$$

Let 4 = a, 0.2 = b
$\therefore$ Expression

$$= \frac{a^3 - b^3}{a^2 + ab + b^2}$$

$$= \frac{(a-b)(a^2 + ab + b^2)}{a^2 + ab + b^2}$$

= $a - b$ = 4 – 0.2 = 3.8

97. (4) Let 0.796 = a
and 0.204 = b

$$\therefore \text{Expression} = \frac{a \times a - b \times b}{a - b}$$

$$= \frac{a^2 - b^2}{a - b} = \frac{(a+b)(a-b)}{a-b}$$

= $a + b$ = 0.796 + 0.204 = 1

98. (1) Expression

$$= \frac{(2.3)^3 + (0.3)^3}{(2.3)^2 - 2.3 \times 0.3 + 0.3 \times 0.3}$$

Let 2.3 = a and 0.3 = b

$$\therefore \text{Expression} = \frac{a^3 + b^3}{a^2 - ab + b^2}$$

= $a + b$
= 2.3 + 0.3 = 2.6

99. (4) Let 5.71 = a and
2.79 = b
$\therefore$ Expression

$$= \frac{a^3 - b^3}{a^2 + ab + b^2}$$

$$= \frac{(a-b)(a^2 + ab + b^2)}{a^2 + ab + b^2}$$

= $a - b$ = 5.71 – 2.79 = 2.92

100. (3) Let 1.5 = a, 4.7 = b, 3.8 = c
$\therefore$ Expression

$$= \frac{a^3 + b^3 + c^3 - 3abc}{a^2 + b^2 + c^2 - ab - bc - ca}$$

= $a + b + c$
= 1.5 + 4.7 + 3.8 = 10

101. (1) Let 0.73 = a and 0.27 = b
$\therefore$ Expression

$$= \frac{a^3 + b^3}{a^2 + b^2 - ab}$$

$$= \frac{(a+b)(a^2 + b^2 - ab)}{a^2 + b^2 - ab}$$

= $a + b$ = 0.73 + 0.27 = 1

102. (3) Expression
= 0.75 × 7.5 – 2 × 7.5 × 0.25 + 0.25 × 2.5
= 0.75 × 0.75 × 10 –2 × 0.75 × 0.25 × 10 + 0.25 × 0.25 ×10

$$= 10\left((0.75)^2 - 2 \times 0.75 \times 0.25 + (0.25)^2\right)$$

$=10(0.75–0.25)^2$ = 10 × 0.25 = 2.5

103. (2) Expression

$$= \frac{1}{1\times4} + \frac{1}{4\times7} + \frac{1}{7\times10} + \frac{1}{10\times13} + \frac{1}{13\times16}$$

$$= \frac{1}{3}\left(\left(\frac{3}{1\times4}\right) + \left(\frac{3}{4\times7}\right) + \left(\frac{3}{7\times10}\right) + \left(\frac{3}{10\times13}\right) + \left(\frac{3}{13\times16}\right)\right)$$

$$= \frac{1}{3}\left[\left(1 - \frac{1}{4}\right) + \left(\frac{1}{4} - \frac{1}{7}\right) + \left(\frac{1}{7} - \frac{1}{10}\right) + \left(\frac{1}{10} - \frac{1}{13}\right) + \left(\frac{1}{13} - \frac{1}{16}\right)\right]$$

$$= \frac{1}{3}\left(1 - \frac{1}{4} + \frac{1}{4} - \frac{1}{7} + \frac{1}{7} - \frac{1}{10} + \frac{1}{10} - \frac{1}{13} + \frac{1}{13} - \frac{1}{16}\right)$$

$$= \frac{1}{3}\left(1 - \frac{1}{16}\right) = \frac{1}{3}\left(\frac{16-1}{16}\right)$$

$$= \frac{1}{3} \times \frac{15}{16} = \frac{5}{16}$$

104. (3) Expression

$$= \frac{137 \times 137 + 133 \times 133 + 137 \times 133}{137 \times 137 \times 137 - 133 \times 133 \times 133}$$

[$\because$ 137×133=18221]
Let 137 = a and 133 = b

$$\therefore \text{Expression} = \frac{a^2 + b^2 + ab}{a^3 - b^3}$$

$$= \frac{a^2 + b^2 + ab}{(a-b)(a^2 + b^2 + ab)}$$

$$= \frac{1}{a-b} = \frac{1}{137 - 133} = \frac{1}{4}$$

105. (2) Let 2.75 = a
and 2.25 = b

$$\therefore \text{Expression} = \frac{a^3 - b^3}{a^2 + ab + b^2}$$

$$= \frac{(a-b)(a^2 + ab + b^2)}{a^2 + ab + b^2}$$

= $a - b$ = 2.75 – 2.25 = 0.5

106. (1) Let 5.624 = a
and 4.376 = b

$$\therefore \text{Given expression} = \frac{a^3 + b^3}{a^2 - ab + b^2}$$

$$= \frac{(a+b)(a^2 - ab + b^2)}{a^2 - ab + b^2}$$

= $a + b$ = 5.624 + 4.376 = 10

107. (1) Let 0.337 = a and 0.126 = b.
$\therefore$ Expression

$$= \frac{(a+b)^2 - (a-b)^2}{ab} = \frac{4ab}{ab} = 4$$

108. (2) Tricky approach

If 256 = a and 144 = b, then

Expression = $\frac{a^2 - b^2}{a - b}$

[$a - b$ = 256 – 144 = 112]

$= \frac{(a+b)(a-b)}{(a-b)} = a + b$

= 256 + 144 = 400

109. (4) Expression

$= (8.7 + 1.3)^2$

[$a^2 + 2ab + b^2 = (a + b)^2$]

$= 10^2 = 100$

110. (1) Let 3.06 = a and 1.98 = b

∴ Expression

$= \frac{a^3 - b^3}{a^2 + ab + b^2}$

$= \frac{(a-b)(a^2 + ab + b^2)}{a^2 + ab + b^2}$

$= a - b = 3.06 - 1.98 = 1.08$

111. (3) If 3.25 = a and 1.75 = b then,

Expression = $\frac{a^2 + b^2 - 2ab}{a^2 - b^2}$

$= \frac{(a-b)^2}{(a+b)(a-b)} = \frac{a-b}{a+b}$

$= \frac{3.25 - 1.75}{3.25 + 1.75} = \frac{1.5}{5} = 0.3$

112. (2) Let 0.05 = a ∴ 0.005 = $\frac{a}{10}$

0.41 = b ∴ 0.041 = $\frac{b}{10}$

and 0.073 = c ∴ 0.0073 = $\frac{c}{10}$

∴ Expression

$= \frac{a^2 + b^2 + c^2}{\left(\frac{a}{10}\right)^2 + \left(\frac{b}{10}\right)^2 + \left(\frac{c}{10}\right)^2}$

$= \frac{a^2 + b^2 + c^2}{\frac{1}{100}(a^2 + b^2 + c^2)} = 100$

113. (1) If 2.3 = a and 1 = b,

Expression = $\frac{a^3 - b^3}{a^2 + ab + b^2}$

$= a - b = 2.3 - 1 = 1.3$

114. (4)

$(0.98)^3 + (0.02)^3 + 3 \times 0.98 \times 0.2 - 1$

$= 0.941192 + 0.000008 + 0.0588 - 1$

$= 1 - 1 = 0$

115. (2) If 0.08 = a and 0.02 = b then

Expression = $\frac{a^3 + b^3}{a^2 - ab + b^2}$

$= \frac{(a+b)(a^2 - ab + b^2)}{a^2 - ab + b^2} = a + b$

$= 0.08 + 0.02 = 0.1$

116. (2) Expression = 0.65 × 0.65 + 0.35 × 0.35 + 2 × 0.35 × 0.65

$= (0.65 + 0.35)^2 = (1)^2 = 1$

[∵ $a^2 + b^2 + 2ab = (a + b)^2$]

117. (2) $\frac{2.4 \times 10^3}{8 \times 10^{-2}} = \frac{24 \times 10^3}{8 \times 10 \times 10^{-2}}$

$= \frac{24 \times 10^3 \times 10}{8} = 3 \times 10^4$

118. (3) Given expression

$= [3 - 4(3 - 4)^{-1}]^{-1}$

$= [3 - 4(-1)^{-1}]^{-1}$

$= \left[3 - \frac{4}{-1}\right]^{-1} = (3 + 4)^{-1}$

$= (7)^{-1} = \frac{1}{7}$

119. (4) Expression

$= \frac{\left[(998)^2 - (997)^2\right] - 45}{(98)^2 - (97)^2}$

$= \frac{(998 + 997)(998 - 997) - 45}{(98 + 97)(98 - 97)}$

$= \frac{1995 - 45}{195} = \frac{1950}{195} = 10$

120. (2) Expression = $\frac{\sqrt{24} + \sqrt{6}}{\sqrt{24} - \sqrt{6}}$

$= \frac{\sqrt{2 \times 2 \times 6} + \sqrt{6}}{\sqrt{2 \times 2 \times 6} - \sqrt{6}} = \frac{2\sqrt{6} + \sqrt{6}}{2\sqrt{6} - \sqrt{6}}$

$= \frac{\sqrt{6}(2+1)}{\sqrt{6}(2-1)} = 3$

121. (2) $a = 55$, $b = 17$, $c = -72$

$a + b + c = 55 + 17 - 72 = 0$

∴ $a^3 + b^3 + c^3 - 3abc = 0$

122. (4) Let 2.75 = a and 2.25 = b

∴ Expression = $\frac{a^3 - b^3}{a^2 + ab + b^2}$

$= \frac{(a-b)(a^2 + ab + b^2)}{a^2 + ab + b^2}$

$= a - b = 2.75 - 2.25$

$= 0.50 = \frac{1}{2}$

123. (2) Expression

$= \frac{(243)^{\frac{n}{5}} \times 3^{2n+1}}{9^n \times 3^{n-1}}$

$= \frac{(3^5)^{\frac{n}{5}} \times 3^{2n+1}}{(3^2)^n \times 3^{n-1}} = \frac{(3)^{5 \times \frac{n}{5}} \times 3^{2n+1}}{3^{2n} \times 3^{n-1}}$

$= \frac{3^n \times 3^{2n+1}}{3^{2n} \times 3^{n-1}} = \frac{3^{3n+1}}{3^{3n-1}}$

$= 3^{3n+1-3n+1} = 3^2 = 9$

[$a^m \times a^n = a^{m+n}$; $a^m \div a^n = a^{m-n}$; $(a^m)^n = a^{mn}$]

124. (3) Expression = $(\sqrt{3} + 1)(10 + \sqrt{12})(\sqrt{12} - 2)(5 - \sqrt{3})$

$= (\sqrt{3} + 1)(10 + 2\sqrt{3})(2\sqrt{3} - 2)(5 - \sqrt{3})$

$= (\sqrt{3} + 1) \times 2(5 + \sqrt{3}) \times 2(\sqrt{3} - 1)(5 - \sqrt{3})$

$= 4(\sqrt{3} + 1)(\sqrt{3} - 1)(5 + \sqrt{3})(5 - \sqrt{3})$

$= 4(3 - 1)(25 - 3)$

[$(a + b)(a - b) = a^2 - b^2$]

$= 4 \times 2 \times 22 = 176$

125. (2) Expression

$= (0.2)^3 \times 200 \div 2000$ of $(0.2)^2$

$= (0.2)^3 \times 200 \div (2000 \times 0.2 \times 0.2)$

$= \frac{0.2 \times 0.2 \times 0.2 \times 200}{2000 \times 0.2 \times 0.2}$

$= \frac{2 \times 2 \times 2 \times 200}{2000 \times 2 \times 2 \times 10}$

$= \frac{2}{100} = \frac{1}{50}$

126. (4) $\left(\sqrt{6} + \sqrt{10} - \sqrt{21} - \sqrt{35}\right)$

$\left(\sqrt{6} - \sqrt{10} + \sqrt{21} - \sqrt{35}\right)$

$= \left\{\left(\sqrt{6} - \sqrt{35}\right) + \left(\sqrt{10} - \sqrt{21}\right)\right\}$

$$\left\{\left(\sqrt{6}-\sqrt{35}\right)-\left(\sqrt{10}-\sqrt{21}\right)\right\}$$

$$=\left(\sqrt{6}-\sqrt{35}\right)^2-\left(\sqrt{10}-\sqrt{21}\right)^2$$

$$=\left(6+35-2\sqrt{210}\right)$$

$$-\left(10+21-2\sqrt{210}\right)$$

$= 41 - 2\sqrt{210} - 31 + 2\sqrt{210}$

$= 41 - 31 = 10$

127. (1) $\dfrac{1}{\sqrt{2}+1} = \dfrac{\sqrt{2}-1}{(\sqrt{2}+1)(\sqrt{2}-1)}$

$= \dfrac{\sqrt{2}-1}{2-1} = \sqrt{2} - 1$

Similarly, $\dfrac{1}{\sqrt{3}+\sqrt{2}}$

$= \dfrac{\sqrt{3}-\sqrt{2}}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$

$= \dfrac{\sqrt{3}-\sqrt{2}}{3-2}$

$= \sqrt{3} - \sqrt{2}$

$\therefore$ Expression $= \sqrt{2} - 1 + \sqrt{3} - \sqrt{2} + \sqrt{4} - \sqrt{3} + \sqrt{5} - \sqrt{4} + \sqrt{6} - \sqrt{5} + \sqrt{7} - \sqrt{6} + \sqrt{8} - \sqrt{7} + \sqrt{9} - \sqrt{8}$

$= \sqrt{9} - 1$

$= 3 - 1 = 2$

128. (4) $\dfrac{1}{\sqrt{7}-\sqrt{6}}$

$= \dfrac{\sqrt{7}+\sqrt{6}}{(\sqrt{7}-\sqrt{6})(\sqrt{7}+\sqrt{6})}$

(rationalising the denominator)

$= \dfrac{\sqrt{7}+\sqrt{6}}{7-6} = \sqrt{7} + \sqrt{6}$

Similarly,

$\dfrac{1}{\sqrt{6}-\sqrt{5}} = \sqrt{6} + \sqrt{5}$;

$\dfrac{1}{\sqrt{5}-2} = \sqrt{5} + 2$

$\dfrac{1}{\sqrt{8}-\sqrt{7}} = \sqrt{8} + \sqrt{7}$,

$\dfrac{1}{3-\sqrt{8}} = 3 + \sqrt{8}$

$\therefore$ Expression

$= \left(\sqrt{7}+\sqrt{6}\right) - \left(\sqrt{6}+\sqrt{5}\right) + \left(\sqrt{5}+2\right) - \left(\sqrt{8}+\sqrt{7}\right) + \left(3+\sqrt{8}\right)$

$= \sqrt{7} + \sqrt{6} - \sqrt{6} - \sqrt{5} + \sqrt{5} + 2 - \sqrt{8} - \sqrt{7} + 3 + \sqrt{8} = 2 + 3 = 5$

129. (1) $2 + x\sqrt{3}$

$= \dfrac{1}{2+\sqrt{3}} \times \dfrac{2-\sqrt{3}}{2-\sqrt{3}}$

(On rationalising the denominator)

$\Rightarrow 2 + x\sqrt{3} = 2 - \sqrt{3}$

$\Rightarrow x\sqrt{3} = -\sqrt{3} \Rightarrow x = -1$

130. (3) Expression

$= \sqrt{\dfrac{0.324 \times 0.081 \times 4.624}{1.5625 \times 0.0289 \times 72.9 \times 64}}$

$= \sqrt{\dfrac{324 \times 81 \times 4624}{15625 \times 289 \times 729 \times 64}}$

$= \dfrac{18 \times 9 \times 68}{125 \times 17 \times 27 \times 8} = 0.024$

131. (3) $\dfrac{\sqrt{7}-1}{\sqrt{7}+1} - \dfrac{\sqrt{7}+1}{\sqrt{7}-1} = a + \sqrt{7}\,b$

$\Rightarrow \dfrac{\left(\sqrt{7}-1\right)^2-\left(\sqrt{7}+1\right)^2}{\left(\sqrt{7}+1\right)\left(\sqrt{7}-1\right)} = a + \sqrt{7}\,b$

$\Rightarrow \dfrac{-4 \times \sqrt{7} \times 1}{7-1} = a + \sqrt{7}\,b$

$[\because (a-b)^2 - (a+b)^2 = -4ab]$

$\Rightarrow \dfrac{-4\sqrt{7}}{6} = a + \sqrt{7}\,b$

$\Rightarrow 0 - \dfrac{2}{3}\sqrt{7} = a + \sqrt{7}\,b$

$\Rightarrow a = 0,\ b = -\dfrac{2}{3}$

132. (3) $\dfrac{1}{\sqrt{2}+1} = \dfrac{\left(\sqrt{2}-1\right)}{\left(\sqrt{2}+1\right)\left(\sqrt{2}-1\right)}$

(Rationalising the denominator)

$= \dfrac{\sqrt{2}-1}{2-1} = \sqrt{2} - 1$

Similarly,

$\dfrac{1}{\sqrt{2}+\sqrt{3}} = \sqrt{3} - \sqrt{2}$;

$\dfrac{1}{\sqrt{4}+\sqrt{3}} = \sqrt{4} - \sqrt{3}$ .....;

$\dfrac{1}{\sqrt{8}+\sqrt{9}} = \sqrt{9} - \sqrt{8}$

$\therefore$ Expression

$= \sqrt{2} - 1 + \sqrt{3} - \sqrt{2} + \sqrt{4} - \sqrt{3} + \sqrt{5} - \sqrt{4} + \sqrt{6} - \sqrt{5} + \sqrt{7} - \sqrt{6} + \sqrt{8} - \sqrt{7} + \sqrt{9} - \sqrt{8} = \sqrt{9} - 1 = 3 - 1 = 2$

133. (4) $\dfrac{\sqrt{a+2b}+\sqrt{a-2b}}{\sqrt{a+2b}-\sqrt{a-2b}} = \dfrac{\sqrt{3}}{1}$

By componendo and dividendo,

$\dfrac{\sqrt{a+2b}+\sqrt{a-2b}+\sqrt{a+2b}-\sqrt{a-2b}}{\sqrt{a+2b}+\sqrt{a-2b}-\sqrt{a+2b}+\sqrt{a-2b}}$

$= \dfrac{\sqrt{3}+1}{\sqrt{3}-1}$

$\Rightarrow \dfrac{\sqrt{a+2b}}{\sqrt{a-2b}} = \dfrac{\sqrt{3}+1}{\sqrt{3}-1}$

On squaring,

$\dfrac{a+2b}{a-2b} = \dfrac{3+1+2\sqrt{3}}{3+1-2\sqrt{3}} = \dfrac{4+2\sqrt{3}}{4-2\sqrt{3}}$

$\Rightarrow \dfrac{a+2b}{a-2b} = \dfrac{2+\sqrt{3}}{2-\sqrt{3}}$

By componendo and dividendo,

$\dfrac{a+2b+a-2b}{a+2b-a+2b} = \dfrac{2+\sqrt{3}+2-\sqrt{3}}{2+\sqrt{3}+2+\sqrt{3}}$

$\Rightarrow \dfrac{2a}{4b} = \dfrac{4}{2\sqrt{3}} \Rightarrow \dfrac{a}{2b} = \dfrac{2}{\sqrt{3}}$

$\Rightarrow \dfrac{a}{b} = \dfrac{4}{\sqrt{3}} = 4 : \sqrt{3}$

134. (4) Expression

$$= \frac{(75.8)^2 - (35.8)^2}{40}$$

$$= \frac{(75.8 + 35.8)(75.8 - 35.8)}{40}$$

$$= \frac{111.6 \times 40}{40} = 111.6$$

135. (4) Let, 0.67 = a and 0.33 = b

$$\therefore \text{ Expression} = \frac{a^3 - b^3}{\left(a^2 + ab + b^2\right)}$$

$$= \frac{(a-b)(a^2 + ab + b^2)}{a^2 + ab + b^2}$$

$= a - b = 0.67 - 0.33 = 0.34$

136. (3) Expression

$$= \frac{1}{\left(1+\sqrt{3}\right)+\sqrt{2}} + \frac{1}{\left(1+\sqrt{3}\right)-\sqrt{2}}$$

$$= \frac{1+\sqrt{3}-\sqrt{2}+1+\sqrt{3}+\sqrt{2}}{\left(1+\sqrt{3}+\sqrt{2}\right)\left(1+\sqrt{3}-\sqrt{2}\right)}$$

$$= \frac{2+2\sqrt{3}}{\left(1+\sqrt{3}\right)^2 - \left(\sqrt{2}\right)^2}$$

$$= \frac{2\left(1+\sqrt{3}\right)}{1+3+2\sqrt{3}-2}$$

$$= \frac{2\left(1+\sqrt{3}\right)}{2\left(1+\sqrt{3}\right)} = 1$$

137. (3) $a = \dfrac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

$$= \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$$

(Rationalising the denominator)

$$= \frac{\left(\sqrt{3}-\sqrt{2}\right)^2}{\left(\sqrt{3}\right)^2 - \left(\sqrt{2}\right)^2}$$

$$= \frac{3+2-2\times\sqrt{3}\times\sqrt{2}}{3-2}$$

$= 5 - 2\sqrt{6}$

$$\therefore b = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} = 5 + 2\sqrt{6}$$

$\therefore a + b = 5 - 2\sqrt{6} + 5 + 2\sqrt{6}$
$= 10$ and

$$ab = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} = 1$$

$$\therefore \frac{a^2}{b} + \frac{b^2}{a} = \frac{a^3+b^3}{ab}$$

$= a^3 + b^3 = (a + b)^3 - 3ab\,(a + b)$
$= (10)^3 - 3 \times 10 = 1000 - 30$
$= 970$

138. (3) $1^3 + 2^3 + \ldots\ldots + 10^3 = 3025$
$\therefore\ 2^3 + 4^3 + \ldots\ldots + 20^3$
$= 2^3\,(1 + 2^3 + \ldots\ldots + 10^3)$
$= 8 \times 3025 = 24200$

139. (4) Expression

$$= \frac{(2.3)^3 + 0.027}{(2.3)^2 - 0.69 + 0.09}$$

$$= \frac{(2.3)^3 + (0.3)^3}{(2.3)^2 - 2.3 \times 0.3 + (0.3)^2}$$

If 2.3 = a and 0.3 = b, then Expression

$$= \frac{a^3+b^3}{a^2 - ab + b^2}$$

$$= \frac{(a+b)(a^2 - ab + b^2)}{a^2 - ab + b^2}$$

$= a + b = 2.3 + 0.3 = 2.6$

140. (3) Expression $= \left(1-\sqrt{2}\right) + \left(\sqrt{2}-\sqrt{3}\right) + \left(\sqrt{3}-\sqrt{4}\right) + \ldots + \left(\sqrt{15}-\sqrt{16}\right)$

$= 1 - \sqrt{2} + \sqrt{2} - \sqrt{3} + \sqrt{3} - \sqrt{4} + \ldots + \sqrt{15} - \sqrt{16}$

$= 1 - \sqrt{16} = 1 - 4 = -3$

141. (1) $\dfrac{1}{\sqrt{11-2\sqrt{30}}}$

$$= \frac{1}{\sqrt{6+5-2\times\sqrt{6}\times\sqrt{5}}}$$

$$= \frac{1}{\sqrt{(6)^2 + \left(\sqrt{5}\right)^2 - 2\times\sqrt{6}\times\sqrt{5}}}$$

$$= \frac{1}{\sqrt{\left(\sqrt{6}-\sqrt{5}\right)^2}}$$

$$= \frac{1}{\sqrt{6}-\sqrt{5}}$$

$$= \frac{\sqrt{6}+\sqrt{5}}{\left(\sqrt{6}-\sqrt{5}\right)\left(\sqrt{6}+\sqrt{5}\right)}$$

$= \sqrt{6} + \sqrt{5}$

$$\frac{3}{\sqrt{7-2\sqrt{10}}}$$

$$= \frac{3}{\sqrt{5+2-2\times\sqrt{5}\times\sqrt{2}}}$$

$$= \frac{3}{\sqrt{5}-\sqrt{2}}$$

$$= \frac{3\left(\sqrt{5}+\sqrt{2}\right)}{\left(\sqrt{5}-\sqrt{2}\right)\left(\sqrt{5}+\sqrt{2}\right)}$$

$$= \frac{3\left(\sqrt{5}+\sqrt{2}\right)}{5-2} = \sqrt{5}+\sqrt{2}$$

$$\frac{4}{\sqrt{8+4\sqrt{3}}} = \frac{4}{\sqrt{8+2\sqrt{12}}}$$

$$= \frac{4}{\sqrt{6+2+2\times\sqrt{6}\times\sqrt{2}}}$$

$$= \frac{4}{\sqrt{\left(\sqrt{6}+\sqrt{2}\right)^2}}$$

$$= \frac{4}{\sqrt{6}+\sqrt{2}} \times \frac{\sqrt{6}-\sqrt{2}}{\sqrt{6}-\sqrt{2}}$$

$$= \frac{4\left(\sqrt{6}-\sqrt{2}\right)}{6-2} = \sqrt{6} - \sqrt{2}$$

$\therefore$ Expression

$$= \left(\sqrt{6}+\sqrt{5}\right) - \left(\sqrt{5}+\sqrt{2}\right) - \left(\sqrt{6}-\sqrt{2}\right)$$

$= \sqrt{6} + \sqrt{5} - \sqrt{5} - \sqrt{2} - \sqrt{6} + \sqrt{2}$
$= 0$

142. (2) $\dfrac{(243)^{\frac{n}{5}} \times 3^{2n+1}}{9^n \times 3^{n-1}}$

$$= \frac{\left(3^5\right)^{\frac{n}{5}} \times 3^{2n+1}}{\left(3^2\right)^n \times 3^{n-1}}$$

$$= \frac{3^n \times 3^{2n+1}}{3^{2n} \times 3^{n-1}} = \frac{3^{n+2n+1}}{3^{2n+n-1}}$$

$$= \frac{3^{3n+1}}{3^{3n-1}}$$

$= 3^{3n+1-(3n-1)} = 3^2 = 9$

143. (2) $(d^{s+t} \div d^s) \div d^t$

$= d^{s+t-s} \div d^t$

$= d^t \div d^t = 1$

144. (3) $2^{51} + 2^{52} + 2^{53} + 2^{54} + 2^{55}$

$= 2^{51}(1 + 2 + 2^2 + 2^3 + 2^4)$

$= 2^{51}(1 + 2 + 4 + 8 + 16)$

$= 2^{51} \times 31$

$= 2^{49} \times 4 \times 31$

$= 2^{49} \times 124$

145. (3) $\dfrac{\sqrt{2+x}+\sqrt{2-x}}{\sqrt{2+x}-\sqrt{2-x}} = \dfrac{2}{1}$

By componendo and dividendo,

$$\frac{\sqrt{2+x}+\sqrt{2-x}+\sqrt{2+x}-\sqrt{2-x}}{\sqrt{2+x}+\sqrt{2-x}-\sqrt{2+x}+\sqrt{2-x}}$$

$$= \frac{2+1}{2-1}$$

$$\Rightarrow \frac{2\sqrt{2+x}}{2\sqrt{2-x}} = 3$$

On squaring,

$$\frac{2+x}{2-x} = 9 \Rightarrow 2 + x = 18 - 9x$$

$\Rightarrow 10x = 18 - 2 \Rightarrow 10x = 16$

$$\Rightarrow x = \frac{16}{10} = \frac{8}{5}$$

146. (1) Expression

$$= \frac{3 \times 9^{n+1} + 9 \times 3^{2n-1}}{9 \times 3^{2n} - 6 \times 9^{n-1}}$$

$$= \frac{3 \times (3^2)^{n+1} + 3^2 \times 3^{2n-1}}{3^2 \times 3^{2n} - 6 \times (3^2)^{n-1}}$$

$$= \frac{3^{2n+2+1} + 3^{2n-1+2}}{3^{2n+2} - 6 \times 3^{2n-2}}$$

$$= \frac{3^{2n+3} + 3^{2n+1}}{3^{2n+2} - 6 \times 3^{2n-2}}$$

$$= \frac{3^{2n+1}(3^2+1)}{3^{2n-2}(3^4-6)}$$

$$= 3^{2n+1-2n+2}\left(\frac{10}{75}\right)$$

$$= \frac{3^3 \times 10}{75} = \frac{27 \times 10}{75}$$

$$= \frac{18}{5} = 3\frac{3}{5}$$

147. (3) Expression

$$= \left(\frac{2+\sqrt{3}}{2-\sqrt{3}} - 4\sqrt{3}\right)^2$$

$$= \left\{\left(\frac{2+\sqrt{3}}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}}\right) - 4\sqrt{3}\right\}^2$$

$$= \left\{\frac{\left(2+\sqrt{3}\right)^2}{4-3} - 4\sqrt{3}\right\}^2$$

$$= \left(4 + 4\sqrt{3} + 3 - 4\sqrt{3}\right)^2$$

$= 7^2 = 49$

148. (2) Expression

$$= \sqrt[3]{-2197} \times \sqrt[3]{-125} \div \sqrt[3]{\frac{27}{512}}$$

$$= \sqrt[3]{-13 \times -13 \times -13} \times \sqrt[3]{-5 \times -5 \times -5}$$

$$\div \sqrt[3]{\frac{3 \times 3 \times 3}{8 \times 8 \times 8}}$$

$$= -13 \times -5 \div \frac{3}{8}$$

$$= \frac{65 \times 8}{3} = \frac{520}{3}$$

149. (2) $1 - \dfrac{1}{1+\sqrt{2}} + \dfrac{1}{1-\sqrt{2}}$

$$= 1 - \left(\frac{1}{1+\sqrt{2}} - \frac{1}{1-\sqrt{2}}\right)$$

$$= 1 - \left(\frac{1}{\sqrt{2}+1} + \frac{1}{\sqrt{2}-1}\right)$$

$$= 1 - \left(\frac{\sqrt{2}-1+\sqrt{2}+1}{\left(\sqrt{2}+1\right)\left(\sqrt{2}-1\right)}\right)$$

$$= 1 - \frac{2\sqrt{2}}{2-1} = 1 - 2\sqrt{2}$$

150. (2) Expression

$$= \frac{3\sqrt{8} - 2\sqrt{12} + \sqrt{20}}{3\sqrt{18} - 2\sqrt{27} + \sqrt{45}}$$

$$= \frac{3\sqrt{2\times2\times2} - 2\sqrt{2\times2\times3} + \sqrt{2\times2\times5}}{3\sqrt{3\times3\times2} - 2\sqrt{3\times3\times3} + \sqrt{3\times3\times5}}$$

$$= \frac{6\sqrt{2} - 4\sqrt{3} + 2\sqrt{5}}{9\sqrt{2} - 6\sqrt{3} + 3\sqrt{5}}$$

$$= \frac{2\left(3\sqrt{2} - 2\sqrt{3} + \sqrt{5}\right)}{3\left(3\sqrt{2} - 2\sqrt{3} + \sqrt{5}\right)} = \frac{2}{3}$$

151. (1) $\dfrac{3\sqrt{7}}{\sqrt{5}+\sqrt{2}}$

$$= \frac{3\sqrt{7}\left(\sqrt{5}-\sqrt{2}\right)}{\left(\sqrt{5}+\sqrt{2}\right)\left(\sqrt{5}-\sqrt{2}\right)}$$

(Rationalising the denominator)

$$= \frac{3\sqrt{7}\left(\sqrt{5}-\sqrt{2}\right)}{5-2}$$

$$= \sqrt{7}\left(\sqrt{5}-\sqrt{2}\right)$$

$$= \sqrt{35} - \sqrt{14}$$

Similarly,

$$\frac{5\sqrt{5}}{\sqrt{2}+\sqrt{7}} = \frac{5\sqrt{5}\left(\sqrt{7}-\sqrt{2}\right)}{\left(\sqrt{7}+\sqrt{2}\right)\left(\sqrt{7}-\sqrt{2}\right)}$$

$$= \frac{5\sqrt{5}\left(\sqrt{7}-\sqrt{2}\right)}{7-2}$$

$$= \sqrt{5}\left(\sqrt{7}-\sqrt{2}\right) = \sqrt{35} - \sqrt{10}$$

$$\frac{2\sqrt{2}}{\sqrt{7}+\sqrt{5}} = \frac{2\sqrt{2}\left(\sqrt{7}-\sqrt{5}\right)}{\left(\sqrt{7}+\sqrt{5}\right)\left(\sqrt{7}-\sqrt{5}\right)}$$

$$= \frac{2\sqrt{2}\left(\sqrt{7}-\sqrt{5}\right)}{7-5}$$

$= \sqrt{2}\left(\sqrt{7}-\sqrt{5}\right) = \sqrt{14}-\sqrt{10}$

$\therefore$ Expression

$= \left(\sqrt{35}-\sqrt{14}\right)-\left(\sqrt{35}-\sqrt{10}\right)+\left(\sqrt{14}-10\right)$

$= \sqrt{35}-\sqrt{14}-\sqrt{35}+\sqrt{10}+\sqrt{14}-\sqrt{10}$
$= 0$

152. (1) Let $0.73 = a$ and $0.27 = b$

$\therefore$ Expression $= \dfrac{a^3+b^3}{a^2-ab+b^2}$

$= \dfrac{(a+b)\left(a^2-ab+b^2\right)}{a^2-ab+b^2} = a+b$

$= 0.73 + 0.27 = 1$

153. (*) $\dfrac{\sqrt{3}-\sqrt{2}}{\sqrt{12}-\sqrt{18}} - \dfrac{1}{3}\times\sqrt{27} - \dfrac{1}{2}$
$\times \sqrt[3]{27}$

$= \dfrac{\sqrt{3}-\sqrt{2}}{\sqrt{4\times3}-\sqrt{3\times3\times2}} - \dfrac{1}{3}$

$\sqrt{3\times3\times3} - \dfrac{1}{2}\times\sqrt[3]{3\times3\times3}$

$= \dfrac{\sqrt{3}-\sqrt{2}}{2\sqrt{3}-3\sqrt{2}} - \dfrac{1}{3}\times3\sqrt{3} - \dfrac{1}{2}\times3$

$= \dfrac{\left(\sqrt{3}-\sqrt{2}\right)\left(2\sqrt{3}+3\sqrt{2}\right)}{\left(2\sqrt{3}-3\sqrt{2}\right)\left(2\sqrt{3}+3\sqrt{2}\right)} - \sqrt{3} - \dfrac{3}{2}$

$= \dfrac{2\times3-2\sqrt{6}+3\sqrt{6}-6}{\left(2\sqrt{3}\right)^2-\left(3\sqrt{2}\right)^2} - \sqrt{3} - \dfrac{3}{2}$

$= \dfrac{\sqrt{6}}{12-18} - \sqrt{3} - \dfrac{3}{2}$

$= \dfrac{\sqrt{6}}{-6} - \sqrt{3} - \dfrac{3}{2}$

$= \dfrac{-\sqrt{6}-6\sqrt{3}-9}{6}$

TYPE-II

1. (4) $\sqrt{3}, \sqrt[3]{2}, \sqrt{2}$ and $\sqrt[3]{4}$

LCM of 2 and 3 = 6

$\therefore \sqrt{3} = (3)^{\frac{1}{2}} = 3^{\frac{3}{6}} = \left(3^3\right)^{\frac{1}{6}} = \sqrt[6]{27}$

$\sqrt[3]{2} = \sqrt[6]{2^2} = \sqrt[6]{4}$

$\sqrt{2} = \sqrt[6]{2^3} = \sqrt[6]{8}$

$\sqrt[3]{4} = \sqrt[6]{4^2} = \sqrt[6]{16}$

2. (1) $\sqrt[3]{4} = \sqrt[12]{256}$, $\sqrt[4]{6} = \sqrt[12]{216}$,

$\sqrt[6]{15} = \sqrt[12]{225}$, $\sqrt[12]{245}$

3. (3) $(0.5)^2 = 0.25$

$\sqrt{0.49} = 0.7$

$\sqrt[3]{0.008} = 0.2$

$0.23 = 0.23$

$\therefore \sqrt{0.49} > (0.5)^2 > 0.23 > \sqrt[3]{0.008}$

4. (1) $\sqrt[3]{4}, \sqrt{2}, \sqrt[6]{3}, \sqrt[4]{5}$

L.C.M. of 3, 2, 6, 4, = 12

$\sqrt[3]{4} = (4)^{\frac{1}{3}} = (4)^{\frac{4}{12}}$

$= \left(4^4\right)^{\frac{1}{12}} = (256)^{\frac{1}{12}}$

$\sqrt{2} = (2)^{\frac{1}{2}} = (2)^{\frac{6}{12}}$

$= \left(2^6\right)^{\frac{1}{12}} = (64)^{\frac{1}{12}}$

$\sqrt[6]{3} = (3)^{\frac{1}{6}} = (3)^{\frac{2}{12}} = \left(3^2\right)^{\frac{1}{12}}$

$= (9)^{\frac{1}{12}}$

$\sqrt[4]{5} = (5)^{\frac{1}{4}} = (5)^{\frac{3}{12}} = \left(5^3\right)^{\frac{1}{12}}$

$= (125)^{\frac{1}{12}}$

$\therefore (256)^{\frac{1}{12}} > (125)^{\frac{1}{12}} > (64)^{\frac{1}{12}} > (9)^{\frac{1}{12}}$

or, $\sqrt[3]{4} > \sqrt[4]{5} > \sqrt{2} > \sqrt[6]{3}$

5. (3) $(2.89)^{0.5} = (2.89)^{\frac{5}{10}}$

$= \sqrt{2.89} = 1.7$
$= 2 - (0.5)^2 = 2 - 0.25 = 1.75$

$1 + \dfrac{0.5}{1-\frac{1}{2}} = 1 + \dfrac{0.5}{\frac{1}{2}}$

$= 1 + \dfrac{0.5}{0.5} = 1 + 1 = 2$

$\sqrt{3} = 1.732$

6. (1) LCM of 2, 3, 4, 3 = 12

Thus $\sqrt{2} = \left(2^6\right)^{\frac{1}{12}} = \sqrt[12]{64}$

$\sqrt[3]{3} = \left(3^4\right)^{\frac{1}{12}} = \sqrt[12]{81}$

$\sqrt[4]{5} = \sqrt[12]{5^3} = \sqrt[12]{125}$

$\sqrt[3]{2} = \sqrt[12]{2^4} = \sqrt[12]{16}$

Obviously, $\sqrt[4]{5}$ is the greatest

$= 0.05$

7. (2) $(2.89)^{0.5} = (2.89)^{\frac{1}{2}} = 1.7$,

$2 - (0.5)^2 = 2 - 0.25 = 1.75$,

$\sqrt{3} = 1.732$

and $\sqrt[3]{0.008}$

$= \sqrt[3]{0.2\times0.2\times0.2} = 0.2$

Obviously,
$0.2 < 1.7 < 1.732 < 1.75$

$\therefore \sqrt[3]{0.008} < (2.89)^{0.5} < \sqrt{3} < 2-(0.5)^2$

8. (2) $\sqrt{2}, \sqrt[3]{3}, \sqrt[6]{6}, \sqrt[5]{5}$

LCM of 2, 3, 6 & 5 = 30

$2^{\frac{1}{2}} = 2^{\frac{15}{30}} = \sqrt[30]{2^{15}} = 32768$

$3^{1/3} = 3^{\frac{10}{30}} = \sqrt[30]{3^{10}} = 59049$

$6^{1/6} = 6^{5/30} = \sqrt[30]{6^5} = 7776$

$5^{1/5} = 5^{6/30} = \sqrt[30]{5^5} = 15625$

Therefore, $\sqrt[3]{3}$ is the greatest.

9. (4) Here, $\left(\sqrt{8}+\sqrt{5}\right)^2$

$= \left(\sqrt{8}\right)^2 + \left(\sqrt{5}\right)^2 + 2\times\sqrt{8}\times\sqrt{5}$

$= 8 + 5 + 2\times\sqrt{8\times5}$

$= 13 + 2\sqrt{40}$

Similarly,

$\left(\sqrt{7}+\sqrt{6}\right)^2 = 7 + 6 + 2\times\sqrt{7\times6}$

$= 13 + 2\sqrt{42}$,

$\left(\sqrt{10}+\sqrt{3}\right)^2$

$= 10 + 3 + 2\times\sqrt{10\times3}$

$= 13 + 2\sqrt{30}$,

Similarly, $\left(\sqrt{11}+\sqrt{2}\right)^2$

$= 11 + 2 + 2\sqrt{11\times2}$

$= 13 + 2\sqrt{22}$

Clearly, $13 + 2\sqrt{22}$ is the smallest among these.

$\therefore \sqrt{11}+\sqrt{2}$ is the smallest.

10. (2) LCM of 2, 3, 4 and 6 = 12

$\therefore\ \sqrt{2} = (2)^{\frac{1}{2}} = (2)^{\frac{6}{12}}$

$= \left(2^6\right)^{\frac{1}{12}} = \sqrt[12]{2^6} = \sqrt[12]{64}$

$\sqrt[3]{3} = \sqrt[12]{3^4} = \sqrt[12]{81}$

$\sqrt[4]{4} = \sqrt[12]{4^4} = \sqrt[12]{64}$

$\sqrt[6]{6} = \sqrt[12]{6^2} = \sqrt[12]{36}$

11. (4) $\sqrt{19} - \sqrt{17}$

$= \dfrac{\left(\sqrt{19} - \sqrt{17}\right) \times \left(\sqrt{19} \times \sqrt{17}\right)}{\sqrt{19} + \sqrt{17}}$

$= \dfrac{19 - 17}{\sqrt{19} + \sqrt{17}} = \dfrac{2}{\sqrt{19} + \sqrt{17}}$

Similarly, $\sqrt{13} - \sqrt{11}$

$= \dfrac{2}{\sqrt{13} + \sqrt{11}}$,

$\sqrt{7} - \sqrt{5} = \dfrac{2}{\sqrt{7} + \sqrt{5}}$

$\sqrt{5} - \sqrt{3} = \dfrac{2}{\sqrt{5} + \sqrt{3}}$

Clearly, $\sqrt{5} - \sqrt{3}$ is the greatest.

(Smaller the denominator, greater the no.)

12. (3) LCM of 3 and 2 = 6.

$\therefore\ \sqrt[3]{2} = \sqrt[6]{2^2} = \sqrt[6]{4};$

$\sqrt{3} = \sqrt[6]{27}; \sqrt[3]{5} = \sqrt[6]{25}$

$1.5 = \sqrt{2.25} = \sqrt[6]{(2.25)^3}$

13. (3) LCM of 2, 6, 3, 4 = 12

$\therefore\ \sqrt{2} = \sqrt[12]{2^6} = \sqrt[12]{64}$

$\sqrt[6]{3} = \sqrt[12]{3^2} = \sqrt[12]{9}$

$\sqrt[3]{4} = \sqrt[12]{4^4} = \sqrt[12]{256}$

$\sqrt[4]{5} = \sqrt[12]{5^3} = \sqrt[12]{125}$

Clearly,

$\sqrt[12]{9} < \sqrt[12]{64} < \sqrt[12]{125} < \sqrt[12]{256}$

$\therefore\ \sqrt[6]{3} < \sqrt{2} < \sqrt[4]{5} < \sqrt[3]{4}$

14. (1)

$\sqrt{3} = (3)^{\frac{1}{2}\times\frac{6}{6}} = \left(3^6\right)^{\frac{1}{12}} = (729)^{\frac{1}{12}}$

$\sqrt[3]{4} = (4)^{\frac{1}{3}\times\frac{4}{4}} = \left(4^4\right)^{\frac{1}{12}} = (256)^{\frac{1}{12}}$

$\sqrt[4]{6} = (6)^{\frac{1}{4}\times\frac{3}{3}} = \left(6^3\right)^{\frac{1}{12}} = (216)^{\frac{1}{12}}$

$\sqrt[6]{8} = (8)^{\frac{1}{6}\times\frac{2}{2}} = \left(8^2\right)^{\frac{1}{12}} = (64)^{\frac{1}{12}}$

Now, it is clear that $\sqrt{3}$ is the greatest.

15. (2) $\dfrac{1}{\sqrt{7} - \sqrt{5}}$

$= \dfrac{\sqrt{7} + \sqrt{5}}{(\sqrt{7} - \sqrt{5})(\sqrt{7} + \sqrt{5})}$

$= \dfrac{\sqrt{7} + \sqrt{5}}{7 - 5} = \dfrac{\sqrt{7} + \sqrt{5}}{2}$,

$\dfrac{1}{\sqrt{5} - \sqrt{3}} = \dfrac{\sqrt{5} + \sqrt{3}}{(\sqrt{5} - \sqrt{3})(\sqrt{5} + \sqrt{3})}$

$= \dfrac{\sqrt{5} + \sqrt{3}}{5 - 3} = \dfrac{\sqrt{5} + \sqrt{3}}{2}$

Similarly,

$\dfrac{1}{\sqrt{9} - \sqrt{7}} = \dfrac{\sqrt{9} + \sqrt{7}}{2}$

$\dfrac{1}{\sqrt{11} - \sqrt{9}} = \dfrac{\sqrt{11} + \sqrt{9}}{2}$

Clearly, $\dfrac{\sqrt{5} + \sqrt{3}}{2}$ is the smallest.

$\therefore\ \dfrac{1}{\sqrt{5} - \sqrt{3}}$ is the smallest.

$\therefore\ \sqrt{5} - \sqrt{3}$ is the greatest.

16. (1) The orders of the given surds are 3, 2, 4 and 6.
Their LCM = 12
Now we convert each surd into a surd of order 12.

$\sqrt[3]{9} = (9)^{\frac{1}{3}} = (9)^{\frac{4}{12}} = (9^4)^{\frac{1}{12}}$

$= \sqrt[12]{6561}$

Similarly,

$\sqrt{3} = \sqrt[12]{3^6} = \sqrt[12]{729}$

$\sqrt[4]{16} = \sqrt[12]{16^3} = \sqrt[12]{4096}$

$\sqrt[6]{80} = \sqrt[12]{80^2} = \sqrt[12]{6400}$

Clearly,

$\sqrt[12]{729} < \sqrt[12]{4096} < \sqrt[12]{6400} < \sqrt[12]{6561}$

$\therefore\ \sqrt[3]{9}$ is the greatest number.

17. (3) The orders of the surds are 2, 4, 2 and 2. Their LCM = 4
We convert each surd into a surd of order 4.

$2\sqrt{3} = \sqrt{4 \times 3} = \sqrt{12} = \sqrt[4]{(12)^2} = \sqrt[4]{144}$

$2\sqrt[4]{5} = \sqrt[4]{2^4 \times 5} = \sqrt[4]{80}$

$3\sqrt{2} = \sqrt{18} = \sqrt[4]{(18)^2} = \sqrt[4]{324}$

$\sqrt{8} = \sqrt[4]{64}$

Hence, the least number $= \sqrt{8}$

18. (3)

```
 9 | 0.90 00 | 0.94
   |   81    |
 9 |  900    |
184|  736    |
 4 |  164    |
188|         |
```

$\therefore\ \sqrt{0.9} = 0.94 \approx 0.9$

19. (2) $2^{60} = \left(2^5\right)^{12} = (32)^{12}$

$5^{24} = \left(5^2\right)^{12} = (25)^{12}$

$\therefore\ 2^{60} > 5^{24}$

$3^{48} = \left(3^4\right)^{12} = (81)^{12}$

$\therefore\ 3^{48} > 2^{60}$

$4^{36} = \left(4^3\right)^{12} = (64)^{12}$

$\therefore\ 3^{48}$ is the largest number.

20. (4) LCM of orders 2,3,4, 6 = 12

$\therefore\ (2)^{\frac{1}{2}} = 2^{\frac{6}{12}} = \sqrt[12]{2^6} = \sqrt[12]{64}$

$\sqrt[3]{3} = \sqrt[12]{3^4} = \sqrt[12]{81}$

$\sqrt[4]{5} = \sqrt[12]{5^3} = \sqrt[12]{125}$

$\sqrt[6]{6} = \sqrt[12]{6^2} = \sqrt[12]{36}$

The greatest number = $\sqrt[4]{5}$

21. (4) LCM of indices of surds = LCM of 6, 3, 4 and 2 = 12

$\therefore \sqrt[6]{12} = \sqrt[12]{12^2} = \sqrt[12]{144}$

$\sqrt[3]{4} = \sqrt[12]{4^4} = \sqrt[12]{256}$

$\sqrt[4]{5} = \sqrt[12]{5^3} = \sqrt[12]{125}$

$\sqrt{3} = \sqrt[12]{3^6} = \sqrt[12]{729}$

$\therefore$ The smallest surd = $\sqrt[4]{5}$

22. (4) $(0.9)^2 = 0.81$;

$\sqrt{0.9} = 0.95$

$0.\overline{9} = \frac{9}{9} = 1$

23. (2) $(16)^{\frac{1}{4}} = \left(2^4\right)^{\frac{1}{4}} = 2$

$\sqrt[5]{32} = (32)^{\frac{1}{5}} = \left(2^5\right)^{\frac{1}{5}} = 2$

$\sqrt[3]{9} > 2, \sqrt{2} < 2$

24. (2) LCM of indices of surds = 20

$\therefore \sqrt[4]{3} = \sqrt[20]{3^5} = \sqrt[20]{243}$

$\sqrt[5]{4} = \sqrt[20]{4^4} = \sqrt[20]{256}$

$\sqrt[10]{12} = \sqrt[20]{144}$

25. (3) $3\sqrt{2} = 3 \times 1.4 = 4.2$

$3\sqrt{7} = 3 \times 2.6 = 7.8$

$6\sqrt{5} = 6 \times 2.2 = 13.2$

$2\sqrt{20} = 2 \times 4.5 = 9$

26. (4) $\sqrt{0.09} = 0.3$; $\sqrt[3]{0.064}$ = 0.4; 0.5;

$\frac{3}{5} = 0.6$

Clearly, $\sqrt{0.09} < \sqrt[3]{0.064} < 0.5 < \frac{3}{5}$

27. (2) LCM of power of surds = 12

$\therefore \sqrt{2} = (2)^{\frac{1}{2}} = (2^6)^{\frac{1}{12}}$

$= \sqrt[12]{2^6} = \sqrt[12]{64}$

$\sqrt[3]{3} = \sqrt[12]{3^4} = \sqrt[12]{81}$

$\sqrt[4]{4} = \sqrt[12]{4^3} = \sqrt[12]{64}$

$\because$ Since 81 is the largest, hence, $\sqrt[3]{3}$ is the largest number.

28. (2) $\sqrt{0.16} = 0.4$; $(0.16)^2$ = 0.0256

Clearly,

$0.0256 < 0.04 < 0.16 < \sqrt{0.16}$

29. (2) $2^{250} = (2^5)^{50} = (32)^{50}$

$3^{150} = (3^3)^{50} = (27)^{50}$

$5^{100} = (5^2)^{50} = (25)^{50}$

$4^{200} = (4^4)^{50} = (256)^{50}$

$\therefore$ The smallest number = $(5)^{100}$

30. (4) LCM of 2, 4, 5 and 10 = 20

$\therefore \sqrt[2]{8} = \sqrt[20]{8^{10}}$; $\sqrt[4]{13} = \sqrt[20]{13^5}$

$\sqrt[5]{16} = \sqrt[20]{16^4}$; $\sqrt[10]{41} = \sqrt[20]{41^2}$

Clearly, $\sqrt[2]{8}$ is the largest.

31. (3) $\sqrt[3]{2} = 2^{\frac{1}{3}} = 2^{\frac{2}{6}} = \sqrt[6]{4}$

$\sqrt{3} = 3^{\frac{1}{2}} = 3^{\frac{3}{6}} = \sqrt[6]{27}$

32. (1) LCM of indices = LCM of 3, 6, 4 and 2 = 12

$\therefore \sqrt[3]{4} = (4)^{\frac{1}{3}} = (4)^{\frac{1}{12}} = \sqrt[12]{4^4}$

$= \sqrt[12]{256}$

$\sqrt{2} = (2)^{\frac{1}{2}} = \sqrt[12]{2^6} = \sqrt[12]{64}$

$\sqrt[6]{3} = \sqrt[12]{3^2} = \sqrt[12]{9}$

$\sqrt[4]{5} = \sqrt[12]{5^3} = \sqrt[12]{125}$

Clearly, $\sqrt[3]{4} > \sqrt[4]{5} > \sqrt{2} > \sqrt[6]{3}$

33. (4) Decimal equivalents of fractions :

$\frac{4}{9} = 0.44$; $\sqrt{\frac{9}{49}} = \frac{3}{7} = 0.43$;

$(0.7)^2 = 0.49$

34. (2) $3^{50} = (3^5)^{10} = (243)^{10}$

$4^{40} = (4^4)^{10} = (256)^{10}$

$5^{30} = (5^3)^{10} = (125)^{10}$

$6^{20} = (6^2)^{10} = (36)^{10}$

$\therefore$ Largest number = 4^{40}

35. (3) $\sqrt{5}$,

$3\sqrt{7} = \sqrt{9 \times 7} = \sqrt{63}$

$4\sqrt{13} = \sqrt{4 \times 4 \times 13} = \sqrt{208}$

Clearly, $\sqrt{5} < 3\sqrt{7} < 4\sqrt{13}$

36. (4) Making each surd of the same order :

LCM of 3, 4 and 6 = 12

$\therefore \sqrt[3]{9} = (9)^{\frac{1}{3}} = (9)^{\frac{4}{12}} = \left(9^4\right)^{\frac{1}{12}}$

$= \sqrt[12]{9^4} = \sqrt[12]{6561}$

$\sqrt[4]{20} = \sqrt[12]{20^3} = \sqrt[12]{8000}$

$\sqrt[6]{25} = \sqrt[12]{25^2} = \sqrt[12]{625}$

$\therefore \sqrt[12]{625} < \sqrt[12]{6561} < \sqrt[12]{8000}$

$\Rightarrow \sqrt[6]{25} < \sqrt[3]{9} < \sqrt[4]{20}$

TYPE-III

1. (1) $\sqrt{8} + 2\sqrt{32} - 3\sqrt{128} + 4\sqrt{50}$

$= 2\sqrt{2} + 8\sqrt{2} - 3 \times 8\sqrt{2} + 4 \times 5\sqrt{2}$

$= 2\sqrt{2} + 8\sqrt{2} - 24\sqrt{2} + 20\sqrt{2}$

$= (2 + 8 - 24 + 20)\sqrt{2}$

$= 6\sqrt{2} = 6 \times 1.414 = 8.484$

2. (1) $\sqrt{15} = 3.88$ (Given)

Now, $\sqrt{\frac{5}{3}} = \sqrt{\frac{5 \times 3}{3 \times 3}} = \frac{\sqrt{15}}{3}$

$= \frac{3.88}{3} = 1.29\overline{3}$

3. (3)

$$\frac{4 + 3\sqrt{3}}{\sqrt{7 + 4\sqrt{3}}} = \frac{4 + 3\sqrt{3}}{\sqrt{4 + 3 + 2 \times 2 \times \sqrt{3}}}$$

$$= \frac{4 + 3\sqrt{3}}{\sqrt{\left(2 + \sqrt{3}\right)^2}} = \frac{4 + 3\sqrt{3}}{2 + \sqrt{3}}$$

$$= \frac{\left(4 + 3\sqrt{3}\right)\left(2 - \sqrt{3}\right)}{\left(2 + \sqrt{3}\right)\left(2 - \sqrt{3}\right)}$$

$= 8 - 4\sqrt{3} + 6\sqrt{3} - 9$

$= 2\sqrt{3} - 1 = 2 \times 1.732 - 1$

$= 3.464 - 1 = 2.464$

4. (4) Expression

$$= \frac{3+\sqrt{6}}{5\sqrt{3}-2\sqrt{12}-\sqrt{32}+\sqrt{50}}$$

$$= \frac{3+\sqrt{6}}{5\sqrt{3}-2\sqrt{2\times2\times3}-\sqrt{2\times2\times2\times2\times2}+\sqrt{2\times5\times5}}$$

$$= \frac{3+\sqrt{6}}{5\sqrt{3}-4\sqrt{3}-4\sqrt{2}+5\sqrt{2}}$$

$$= \frac{3+\sqrt{6}}{\sqrt{3}+\sqrt{2}} = \frac{(3+\sqrt{6})\,(\sqrt{3}-\sqrt{2})}{(\sqrt{3}+\sqrt{2})\,(\sqrt{3}-\sqrt{2})}$$

[On rationalising the denominator]

$$= \frac{3\sqrt{3}+\sqrt{18}-3\sqrt{2}-\sqrt{12}}{3-2}$$

$$= 3\sqrt{3}+3\sqrt{2}-3\sqrt{2}-2\sqrt{3}$$

$$= \sqrt{3} = 1.732$$

5. (2) Expression $= \frac{1}{\sqrt{5}+\sqrt{3}}$

$$= \frac{1}{\sqrt{5}+\sqrt{3}} \times \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}-\sqrt{3}}$$

(Rationalising the denominator)

$$= \frac{\sqrt{5}-\sqrt{3}}{5-3} = \frac{2.236-1.732}{2}$$

$$= \frac{0.504}{2} = 0.252$$

6. (2) Expression

$$= \frac{3\sqrt{5}}{2\sqrt{5}-0.48}$$

$$= \frac{3\times2.24}{2\times2.24-0.48} = \frac{6.72}{4.48-0.48}$$

$$= \frac{6.72}{4} = 1.68$$

7. (1) Expression

$$= \frac{1}{\sqrt{2}+1} = \frac{\sqrt{2}-1}{(\sqrt{2}+1)(\sqrt{2}-1)}$$

$$= \frac{\sqrt{2}-1}{2-1} = \sqrt{2}-1$$

$= 1.414 - 1 = 0.414$

8. (1) Expression

$$= 16\sqrt{\frac{3\times4}{4\times4}} - 9\sqrt{\frac{4\times3}{3\times3}}$$

$$= \frac{16\sqrt{12}}{4} - \frac{9\sqrt{12}}{3}$$

$$= 4\sqrt{12} - 3\sqrt{12}$$

$$= \sqrt{12} = 3.46$$

9. (2) Expression

$$= 2\sqrt{2}+\sqrt{2}+\frac{1}{2+\sqrt{2}}+\frac{1}{\sqrt{2}-2}$$

$$= 2\sqrt{2}+\sqrt{2}+\left(\frac{1}{2+\sqrt{2}}-\frac{1}{2-\sqrt{2}}\right)$$

$$= 2\sqrt{2}+\sqrt{2}+\left(\frac{2-\sqrt{2}-2-\sqrt{2}}{(2+\sqrt{2})(2-\sqrt{2})}\right)$$

$$= 2\sqrt{2}+\sqrt{2}+\frac{-2\sqrt{2}}{4-2}$$

$= 2\sqrt{2}+\sqrt{2}-\sqrt{2} = 2\sqrt{2}$

$= 2 \times 1.4142 = 2.8284$

10. (2) Expression

$$= \frac{2+\sqrt{3}}{2-\sqrt{3}} = \frac{(2+\sqrt{3})(2+\sqrt{3})}{(2-\sqrt{3})(2+\sqrt{3})}$$

[On rationalising the denominator]

$$= \frac{(2+\sqrt{3})^2}{4-3} = (2+\sqrt{3})^2$$

$$= 2^2 + (\sqrt{3})^2 + 2\times2\times\sqrt{3}$$

$= 4 + 3 + 4\sqrt{3}$

$= 7 + 4 \times 1.732 = 7 + 6.928$

$= 13.928$

11. (1) $\frac{7}{3+\sqrt{2}} = \frac{7(3-\sqrt{2})}{(3+\sqrt{2})(3-\sqrt{2})}$

[Rationalising the denominator]

$$= \frac{7(3-\sqrt{2})}{9-2} \quad [(a+b)\,(a-b) = a^2-b^2]$$

$= 3-\sqrt{2}$

$= 3 - 1.4142 = 1.5858$

$= 1.59$ (correct to two decimal places)

12. (3) $\sqrt{5329} = 73$

$\therefore \sqrt{5329} + \sqrt{53.29} + \sqrt{0.5329} + \sqrt{0.005329} + \sqrt{0.00005329}$

$= 73 + 7.3 + 0.73 + 0.073 + 0.0073$

$= 81.1103$

13. (2) $\sqrt{33} = 5.745$ (Given)

$$\therefore \sqrt{\frac{3}{11}} = \sqrt{\frac{3\times11}{11\times11}} = \frac{\sqrt{33}}{11}$$

$$= \frac{5.745}{11}$$

≈ 0.5223

14. (4) $\frac{1}{\sqrt{28}} = \frac{1}{2\sqrt{7}}$

$$= \frac{\sqrt{7}}{2\sqrt{7}\times\sqrt{7}} = \frac{\sqrt{7}}{14}$$

$$= \frac{2.646}{14} = 0.189$$

15. (2) $\frac{\sqrt{5}}{2} + \frac{5}{3\sqrt{5}} - \sqrt{45}$

$$= \frac{\sqrt{5}}{2} + \frac{5\times\sqrt{3}}{3\times5} - 3\sqrt{5}$$

$$= \frac{\sqrt{5}}{2} + \frac{\sqrt{5}}{3} - 3\sqrt{5}$$

$$= \frac{3\sqrt{5}+2\sqrt{5}-18\sqrt{5}}{6}$$

$$= \frac{-13\sqrt{5}}{6} = \frac{-13\times2.236}{6}$$

$$= \frac{-29.068}{6} = -4.845$$

16. (2) Expression $= \frac{9+2\sqrt{3}}{\sqrt{3}}$

$$= \frac{(9+2\sqrt{3})\times\sqrt{3}}{\sqrt{3}\times\sqrt{3}}$$

$$= \frac{9\sqrt{3}+6}{3} = 3\sqrt{3}+2$$

$= 3 \times 1.732 + 2 = 5.196 + 2$

$= 7.196$

TYPE-IV

1. (4) $3\sqrt{3} \times \sqrt{3} = 3 \times 3 = 9$

$\therefore$ Required rationalising factor is $\sqrt{3}$.

2. (2) $\sqrt[3]{9} - \sqrt[3]{3} + 1 = (3)^{\frac{2}{3}} - (3)^{\frac{1}{3}} + (1)^{\frac{2}{3}}$

$\therefore \left(\sqrt[3]{3}+1\right)\left(\sqrt[3]{9} - \sqrt[3]{3} + 1\right) = (3^{\frac{1}{3}})^3 + 1$

$= 3 + 1 = 4$

$[\therefore a^3 + b^3 = (a + b)(a^2 - ab + b^2)]$

$\therefore$ Rationalising factor $= \sqrt[3]{3} + 1$

3. (3) $4^{10} \times 7^3 \times 16^2 \times 11 \times 10^2$

$= (2^2)^{10} \times (7)^3 \times (2^4)^2 \times 11 \times (2 \times 5)^2$

$= 2^{20} \times 7^3 \times 2^8 \times 11 \times 2^2 \times 5^2$

$= (2)^{20+8+2} \times 5^2 \times 7^3 \times 11^1$

$= (2)^{30} \times 5^2 \times 7^3 \times 11^1$

$\therefore$ Total number of prime factors

$= 30 + 2 + 3 + 1 = 36$

4. (1) $(6)^{333} \times (7)^{222} \times (8)^{111}$

$\therefore (2 \times 3)^{333} \times (7)^{222} \times (2^3)^{111}$

$\therefore 2^{333} \times 3^{333} \times 7^{222} \times 2^{333}$

$\therefore 2^{666} \times 3^{333} \times 7^{222}$

$\therefore$ Number of prime factors

$= 666 + 333 + 222 = 1221$

5. (1) Expression $= \dfrac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

Rationalising the denominator,

$$= \frac{\left(\sqrt{3}+\sqrt{2}\right)\left(\sqrt{3}+\sqrt{2}\right)}{\left(\sqrt{3}-\sqrt{2}\right)\left(\sqrt{3}+\sqrt{2}\right)}$$

$$= \frac{\left(\sqrt{3}+\sqrt{2}\right)^2}{3-2} = \left(\sqrt{3}+\sqrt{2}\right)^2$$

$$\therefore \sqrt{\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}} = \sqrt{\left(\sqrt{3}+\sqrt{2}\right)^2}$$

$= \sqrt{3} + \sqrt{2}$

6. (1) $x = \dfrac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$

$$= \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}} \times \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}}$$

$$= \frac{\left(\sqrt{5}+\sqrt{3}\right)^2}{5-3} = \frac{5+3+2\sqrt{15}}{2}$$

$$= \frac{8+2\sqrt{15}}{2} = 4 + \sqrt{15}$$

$$\therefore y = \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}} = 4 - \sqrt{15}$$

$\therefore x + y$

$= 4 + \sqrt{15} + 4 - \sqrt{15} = 8$

7. (4) Expression $= \dfrac{5+\sqrt{11}}{3-2\sqrt{11}}$

$$= \frac{(5+\sqrt{11})(3+2\sqrt{11})}{(3-2\sqrt{11})(3+2\sqrt{11})}$$

(On rationalising the denominator)

$$= \frac{15+22+10\sqrt{11}+3\sqrt{11}}{9-4\times 11}$$

$$= \frac{37+13\sqrt{11}}{-35}$$

$$\therefore x + y\sqrt{11} = \frac{-37}{35} - \frac{13}{35}\sqrt{11}$$

$$\therefore x = \frac{-37}{35},$$

$$y = -\frac{13}{35}$$

TYPE-V

1. (2) $\left[\sqrt[3]{\sqrt[6]{5^9}}\right]^4 \left[\sqrt[6]{\sqrt[3]{5^9}}\right]^4$

$$= \left[5^{9\times\frac{1}{6}\times\frac{1}{3}}\right]^4 \left[5^{9\times\frac{1}{6}\times\frac{1}{3}}\right]^4$$

$$= \left[5^{\frac{1}{2}\times 4}\right]\left[5^{\frac{1}{2}\times 4}\right] = 5^2 \times 5^2 = 5^4$$

2. (1) $27^{2x-1} = (243)^3$

$\Rightarrow (3^3)^{2x-1} = (3^5)^3$

$\Rightarrow (3)^{3(2x-1)} = (3)^{5\times 3}$

$\Rightarrow 3(2x - 1) = 5 \times 3$

or $2x - 1 = 5 \therefore x = 3$

3. (4) $3^{x+8} = 3^{3(2x+1)}$

$\Rightarrow x + 8 = 6x + 3$

$\Rightarrow 5x = 5$

$\therefore x = 1$

4. (4) $(36)^{\frac{1}{6}} = \left(6^2\right)^{\frac{1}{6}}$

$= (6)^{\frac{2}{6}} = (6)^{\frac{1}{3}} = \sqrt[3]{6}$

5. (1) $\left(\dfrac{8}{125}\right)^{-\frac{4}{3}} = \left(\dfrac{2^3}{5^3}\right)^{-\frac{4}{3}}$

$$= \left[\left(\frac{2}{5}\right)^3\right]^{-\frac{4}{3}} = \left(\frac{2}{5}\right)^{-\frac{4}{3}\times 3}$$

$$= \left(\frac{5}{2}\right)^4 = \frac{625}{16}$$

6. (4) $(125)^{2/3} \times (625)^{-1/4} = 5^x$

$\Rightarrow 5^{3\times\frac{2}{3}} \times 5^{4\times -\frac{1}{4}} = 5^x$

$\Rightarrow 5^2 \times 5^{-1} = 5^x$

$\Rightarrow 5^1 = 5^x \Rightarrow x = 1$

7. (1) $(2000)^{10} = 1.024 \times 10^k$

$\Rightarrow (2 \times 10^3)^{10} = \dfrac{1024}{1000} \times 10^k$

$\Rightarrow 2^{10} \times 10^{30} = 1024 \times 10^{k-3}$

$\Rightarrow 2^{10} \times 10^{30} = 2^{10} \times 10^{k-3}$

$\Rightarrow 30 = k - 3 \Rightarrow k = 33$

8. (3) $0.42 \times 100^k = 42$

$\Rightarrow \dfrac{42}{100} \times 100^k = 42$

$\Rightarrow 100^k = \dfrac{42 \times 100}{42} = 100^1$

$\Rightarrow k = 1$

9. (3) $3^{x+y} = 81$

$\Rightarrow 3^{x+y} = 3^4$

$\Rightarrow x + y = 4$ ...(i)

and $81^{x-y} = 3$

$\Rightarrow (3^4)^{x-y} = 3$

$\Rightarrow 3^{4x-4y} = 3^1 \Rightarrow 4x - 4y = 1$ ...(ii)

By equation (i) × 4 + (ii) we have,

$$\begin{array}{l} 4x + 4y = 16 \\ 4x - 4y = 1 \\ \hline 8x \quad\quad = 17 \end{array} \Rightarrow x = \frac{17}{8}$$

10. (1) $2^x = 3^y = 6^{-z} = k$

$\Rightarrow 2 = k^{\frac{1}{x}}; 3 = k^{\frac{1}{y}}; 6 = k^{-\frac{1}{z}}$

$\because 2 \times 3 = 6$

$\Rightarrow k^{\frac{1}{x}} \times k^{\frac{1}{y}} = k^{-\frac{1}{z}}$

$\Rightarrow k^{\frac{1}{x}+\frac{1}{y}} = k^{-\frac{1}{z}}$

$\Rightarrow \dfrac{1}{x} + \dfrac{1}{y} = -\dfrac{1}{z} \Rightarrow \dfrac{1}{x} + \dfrac{1}{y} + \dfrac{1}{z} = 0$

11. (2) $a = 7 - 4\sqrt{3}$

$\therefore \frac{1}{a} = \frac{1}{7-4\sqrt{3}}$

$= \frac{1}{7-4\sqrt{3}} \times \frac{7+4\sqrt{3}}{7+4\sqrt{3}}$

$= 7 + 4\sqrt{3}$

$\therefore \left(\sqrt{a} + \frac{1}{\sqrt{a}}\right)^2 = a + \frac{1}{a} + 2$

$= 7 - 4\sqrt{3} + 7 + 4\sqrt{3} + 2 = 16$

$\Rightarrow \sqrt{a} + \frac{1}{\sqrt{a}} = 4$

12. (3) $\left(\frac{3}{4}\right)^3 \times \left(\frac{4}{3}\right)^{-7} = \left(\frac{3}{4}\right)^{2x}$

$\Rightarrow \left(\frac{3}{4}\right)^3 \times \left(\frac{3}{4}\right)^7 = \left(\frac{3}{4}\right)^{2x}$

$\Rightarrow \left(\frac{3}{4}\right)^{10} = \left(\frac{3}{4}\right)^{2x}$

$\Rightarrow 2x = 10 \Rightarrow x = 5$

13. (4) $x^2 - \sqrt{3} = 0$

$\Rightarrow x^2 - (3)^{\frac{1}{2}} = 0$

$\Rightarrow x^2 - \left(3^{\frac{1}{4}}\right)^2 = 0$

$\Rightarrow \left(x + 3^{\frac{1}{4}}\right)\left(x - 3^{\frac{1}{4}}\right) = 0$

$\therefore x = 3^{\frac{1}{4}}$ or $-3^{\frac{1}{4}}$

$\therefore$ Product of roots

$= 3^{\frac{1}{4}} \times -3^{\frac{1}{4}} = -\sqrt{3}$

Note : Product of the roots of $ax^2 + bx + c = 0$ is $\frac{c}{a}$

$\therefore$ Product of the roots of $x^2 - b.0 - \sqrt{3} = 0$ is $-\sqrt{3}$

14. (4) $2^{x-1} + 2^{x+1} = 320$

$\Rightarrow 2^{x-1}\left(1 + 2^2\right) = 320$

$\Rightarrow 2^{x-1} \times 5 = 320$

$\Rightarrow 2^{x-1} = \frac{320}{5} = 64 \Rightarrow 2^{x-1} = 2^6$

$\Rightarrow x - 1 = 6 \Rightarrow x = 7$

15. (1) $4^{61} + 4^{62} + 4^{63} + 4^{64}$

$= 4^{61}(1 + 4 + 4^2 + 4^3)$

$= 4^{61}(1 + 4 + 16 + 64)$

$= 4^{61} \times 85$ which is divisible by 17.

16. (1) $5\sqrt{5} \times 5^3 \div 5^{-\frac{3}{2}} = 5^{a+2}$

$\Rightarrow 5 \times 5^{\frac{1}{2}} \times 5^3 \div 5^{-\frac{3}{2}} = 5^{a+2}$

$\Rightarrow 5^{1+\frac{1}{2}+3+\frac{3}{2}} = 5^{a+2}$

$\Rightarrow 5^6 = 5^{a+2} \Rightarrow a + 2 = 6$

$\Rightarrow a = 6 - 2 = 4$

$[a^m \times a^n = a^{m+n}]$

$[a^m \div a^n = a^{m-n}]$

17. (1) $(3 + 2\sqrt{2})(3 - 2\sqrt{2})$

$= (3)^2 - (2\sqrt{2})^2 = 9 - 8 = 1$

$\therefore 3 + 2\sqrt{2} = \frac{1}{3 - 2\sqrt{2}}$

$(x + y)^3 + (x - y)^3 = x^3 + y^3 + 3x^2y + 3xy^2 + x^3 - y^3 - 3x^2y + 3xy^2$

$= 2x^3 + 6xy^2$

$\therefore (3 + 2\sqrt{2})^{-3} + (3 - 2\sqrt{2})^{-3}$

$= \left(\frac{1}{3+2\sqrt{2}}\right)^3 + \left(\frac{1}{3-2\sqrt{2}}\right)^3$

$= (3 - 2\sqrt{2})^3 + (3 + 2\sqrt{2})^3$

$= 2 \times (3)^3 + 6 \times 3 \times (2\sqrt{2})^2$

$= 2 \times 27 + 18 \times 8$

$= 54 + 144 = 198$

18. (4) $3^x - 3^{x-1} = 486$

$\Rightarrow 3^{x-1}(3 - 1) = 486$

$\Rightarrow 3^{x-1} \times 2 = 486$

$\Rightarrow 3^{x-1} = \frac{486}{2} = 243$

$\Rightarrow 3^{x-1} = 3^5 \Rightarrow x - 1 = 5$

$\Rightarrow x = 5 + 1 = 6$

19. (2) $L = 2 - 2^t$

At the start, $t = 0$

$\therefore L = 2 - 2^0 = 2 - 1 = 1$ cm

20. (1) $3^{34} = (3^2)^{17} = 9^{17}$

$2^{51} = (2^3)^{17} = 8^{17}$

$7^{17} = 7^{17}$

Clearly, $9^{17} > 8^{17} > 7^{17}$

i.e., $3^{34} > 2^{51} > 7^{17}$

21. (3) $3^{2x-y} = 3^{x+y} = \sqrt{27} = (3)^{\frac{3}{2}}$

$\Rightarrow 2x - y = \frac{3}{2}$

$\Rightarrow 4x - 2y = 3$ ....(i)

and, $3^{x+y} = (3)^{\frac{3}{2}}$

$\Rightarrow x + y = \frac{3}{2}$

$\Rightarrow 2x + 2y = 3$ ....(ii)

From equations (i) and (ii)

$4x - 2y + 2x + 2y = 3 + 3$

$\Rightarrow 6x = 6 \Rightarrow x = 1$

From equation (i),

$4 - 2y = 3$

$\Rightarrow 2y = 1 \Rightarrow y = \frac{1}{2}$

$\therefore 3^{x-y} = 3^{1-\frac{1}{2}} = \sqrt{3}$

22. (3) Expression

$= [(0.87)^2 + (0.13)^2 + 0.87 \times 0.26]^{2013}$

$= (0.87 + 0.13)^{2013} = 1^{2013} = 1$

$[\because (a + b)^2 = a^2 + b^2 + 2ab]$

23. (2) Sum of the cubes of first n natural numbers

$= \left(\frac{n(n+1)}{2}\right)^2$

Their average $= \frac{n(n+1)^2}{4}$

$\therefore$ Required average when $n = 7$,

$= \frac{7(7+1)^2}{4} = \frac{7 \times 8 \times 8}{4} = 112$

24. (1) $7^1 = 7$, $7^2 = 49$, $7^3 = 343$, $7^4 = 2401$, $7^5 = 16807$

i.e. after index 4, the unit's digit is repeated.

$\therefore$ On dividing 153 by 4, remainder = 1

$\therefore$ Unit's digit in the expansion of $(2467)^{153}=7^1=7$ and unit's digit in the expansion of $(341)^{72} = 1$

$\therefore$ Required unit's digit

$= 7 \times 1 = 7$

25. (4) Expression $= \sqrt{\sqrt{2} \times \sqrt{3}}$

$$= \left(\sqrt{2} \times \sqrt{3}\right)^{\frac{1}{2}} = \left(2^{\frac{1}{2}} \times 3^{\frac{1}{2}}\right)^{\frac{1}{2}}$$

$$= (6)^{\frac{1}{2}\times\frac{1}{2}} = (6)^{\frac{1}{4}}$$

26. (4) Expression $= \dfrac{(10)^{100}}{(5)^{75}}$

$$= \frac{(2 \times 5)^{100}}{(5)^{75}}$$

$$= \frac{(2)^{100} \times (5)^{100}}{(5)^{75}}$$

$$= 2^{100} \times 5^{25}$$

$$= 2^{25} \times 5^{25} \times 2^{75}$$

$$= (10)^{25} \times 2^{75}$$

27. (1) $m^n = 169 = 13^2$

$\Rightarrow m = 13,\ n = 2$

$\therefore (m + 1)^{n-1} = (13 + 1)^{2-1} = 14$

28. (1) $a = (b)^p$ and

$b = (c)^q$

$\therefore c = a^r = (b^p)^r = (b)^{pr} = (c^q)^{pr}$

$= c^{pqr}$

$\Rightarrow pqr = 1$

29. (4) $35 = 5 \times 7$

$175 = 5 \times 5 \times 7$

$1225 = 5 \times 5 \times 7 \times 7$

$735 = 5 \times 7 \times 7 \times 3$

Clearly, 735 is not a factor of 5^p7^q.

30. (3) Unit's digit in the expansion of $(252)^{126}$

$= 2^2 = 4$ ($\because$ Remainder on dividing 126 by 4 = 2)

Unit's digit in the expansion of $(244)^{152} = 6$

$\therefore$ Unit's digit in the expansion of $252^{126} + 244^{152} = 0$

$\therefore$ Required remainder = 0

31. (1) $x = (3)^{\frac{1}{3}} - (3)^{-\frac{1}{3}}$

On cubing both sides,

$$x^3 = \left(3^{\frac{1}{3}} - (3)^{-\frac{1}{3}}\right)^3$$

$$= \left((3)^{\frac{1}{3}}\right)^3 - \left(3^{-\frac{1}{3}}\right)^3 - 3 \times 3^{\frac{1}{3}} \times 3^{-\frac{1}{3}}\left(3^{\frac{1}{3}} - 3^{-\frac{1}{3}}\right)$$

$= 3 - 3^{-1} - 3 \times x$

$$= 3 - \frac{1}{3} - 3x$$

$$\Rightarrow x^3 + 3x = 3 - \frac{1}{3} = \frac{9-1}{3}$$

$$\Rightarrow x^3 + 3x = \frac{8}{3}$$

$$\Rightarrow 3x^3 + 9x = \frac{8}{3} \times 3 = 8$$

32. (2) $3^{10} \times 27^2 = 9^2 \times 3^n$

$\Rightarrow 3^{10} \times (3^3)^2 = (3^2)^2 \times 3^n$

$\Rightarrow 3^{10} \times 3^6 = 3^4 \times 3^n$

$\Rightarrow 3^{10+6} = 3^4 \times 3^n$

$\Rightarrow 3^{16} = 3^{4+n}$

$\Rightarrow 4 + n = 16$

$\Rightarrow n = 16 - 4 = 12$

33. (4) $2^{x+4} - 2^{x+2} = 3$

$\Rightarrow 2^{x+2}(2^2 - 1) = 3$

$\Rightarrow 2^{x+2} \times 3 = 3$

$\Rightarrow 2^{x+2} = 1 = 2^\circ$

$\Rightarrow x + 2 = 0 \Rightarrow x = -2$

34. (2) $\sqrt{3^n} = 2187$

$$\Rightarrow 3^{\frac{n}{2}} = (3)^7$$

$$\Rightarrow \frac{n}{2} = 7$$

$\Rightarrow n = 2 \times 7 = 14$

35. (2) $x + \dfrac{1}{x} = 2$

$$\Rightarrow \frac{x^2+1}{x} = 2$$

$\Rightarrow x^2 + 1 = 2x$

$\Rightarrow x^2 - 2x + 1 = 0$

$\Rightarrow (x - 1)^2 = 0 \Rightarrow x - 1 = 0$

$\Rightarrow x = 1$

$$\therefore x^{99} + \frac{1}{x^{99}} - 2 = 1 + 1 - 2 = 0$$

36. (4) $(a + b)(a^2 - ab + b^2) = a^3 + b^3$

$$\therefore \left(x^{\frac{1}{3}} + x^{-\frac{1}{3}}\right)\left(x^{\frac{2}{3}} - 1 + x^{-\frac{2}{3}}\right)$$

$$= \left(x^{\frac{1}{3}} + x^{-\frac{1}{3}}\right)$$

$$\left(\left(x^{\frac{1}{3}}\right)^2 - x^{\frac{1}{3}}.x^{-\frac{1}{3}} + \left(x^{-\frac{1}{3}}\right)^2\right)$$

$$= \left(x^{\frac{1}{3}}\right)^3 + \left(x^{-\frac{1}{3}}\right)^3$$

$$= x + x^{-1} = x + \frac{1}{x}$$

37. (4) $\left(2^3\right)^2 = \left(2^2\right)^x$

$\Rightarrow 2^6 = 2^{2x} \Rightarrow 2x = 6$

$$\Rightarrow x = \frac{6}{2} = 3$$

$\therefore 3^x = 3^3 = 3 \times 3 \times 3 = 27$

38. (4) $x = 3^{\frac{1}{3}} - 3^{-\frac{1}{3}}$

On cubing both sides,

$$x^3 = \left((3)^{\frac{1}{3}}\right)^3 - \left((3)^{-\frac{1}{3}}\right)^3 - 3 \times 3^{\frac{1}{3}} \times 3^{-\frac{1}{3}}$$

$$\left(3^{\frac{1}{3}} - 3^{-\frac{1}{3}}\right)$$

$\Rightarrow x^3 = 3 - 3^{-1} - 3x$

$$\Rightarrow x^3 + 3x = 3 - \frac{1}{3}$$

$$\Rightarrow x^3 + 3x = \frac{9-1}{3} = \frac{8}{3}$$

$\Rightarrow 3x^3 + 9x = 8$

TYPE-VI

1. (3) Let $x = \sqrt{1+\sqrt{1+\sqrt{1+.....}}}$

On squaring both sides

$$x^2 = 1+\sqrt{1+\sqrt{1+\sqrt{1+.....}}}$$

$\Rightarrow x^2 = 1 + x$

$\Rightarrow x^2 - x - 1 = 0$

$\Rightarrow x = \frac{+1 \pm \sqrt{1+4}}{2} = \frac{+1 \pm \sqrt{5}}{2}$

But sum of + ve numbers can't be negative.

$\therefore x = \frac{1+\sqrt{5}}{2} = \frac{1+2.236}{2}$

$= \frac{3.236}{2} = 1.618$

Thus $1 < 1.618 < 2$

2. (3) Let $x = \sqrt{2+\sqrt{2+\sqrt{2+}}}.....$

$\therefore x^2 = 2+\sqrt{2+\sqrt{2+}}....$

$\Rightarrow x^2 = 2 + x$

$\Rightarrow x^2 - x - 2 = 0$

$\Rightarrow x^2 - 2x + x - 2 = 0$

$\Rightarrow x(x-2) + 1(x-2) = 0$

$\Rightarrow (x-2)(x+1) = 0$

$\Rightarrow x = 2$ or -1

But sum of positive numbers can't be negative.

$\therefore x = 2$

3. (2) Let $x = \sqrt{12+\sqrt{12+\sqrt{12+....}}}$

On squaring both sides,

$$x^2 = 12 + \sqrt{12+\sqrt{12+\sqrt{12+....}}}$$

$\Rightarrow x^2 = 12 + x$

$\Rightarrow x^2 - x - 12 = 0$

$\Rightarrow x^2 - 4x + 3x - 12 = 0$

$\Rightarrow x(x-4) + 3(x-4) = 0$

$\Rightarrow (x-4)(x+3) = 0$

$\Rightarrow x = 4, -3$

$\because$ The given expression is positive.

$\therefore x = 4$

Aliter :

Using Rule 25

$$\sqrt{12+\sqrt{12+\sqrt{12}}} = 4$$

It is because

$12 = 3 \times 4 = n(n+1)$

4. (1) Let $x = \sqrt{6+\sqrt{6+\sqrt{6+}}}....$

Squaring on both sides,

$x^2 = 6+\sqrt{6+\sqrt{6+}}....$

$\Rightarrow x^2 = 6 + x$

$\Rightarrow x^2 - x - 6 = 0$

$\Rightarrow x^2 - 3x + 2x - 6 = 0$

$\Rightarrow x(x-3) + 2(x-3) = 0$

$\Rightarrow (x+2)(x-3) = 0$

$\therefore x = 3$ because $x \neq -2$

Aliter :

$$\sqrt{6+\sqrt{6+\sqrt{6+.....}}} = 3$$

It is because

$6 = 2 \times 3 = n(n+1)$

5. (2) Let $x = \sqrt{3\sqrt{3\sqrt{3.....}}}$

Squaring both sides,

$$x^2 = 3\sqrt{3\sqrt{3\sqrt{3.....}}} = 3x$$

$\Rightarrow x^2 - 3x = 0$

$\Rightarrow x(x-3) = 0$

$\therefore x = 3$ because $x \neq 0$

Aliter :

Using Rule 23

$$\sqrt{3+\sqrt{3+\sqrt{3+.....\infty}}} = 3$$

It is because, here

$n = \infty$ and $x = 3$

$$\sqrt{3+\sqrt{3+\sqrt{3+.....\infty}}} = 3^{\left(1-\frac{1}{3\infty}\right)}$$

$= 3^{(1-0)}$ $\quad \because \frac{\text{something}}{\infty} = 0$

$= 3$

6. (3) Let $x = \sqrt{30+\sqrt{30+\sqrt{30+.....}}}$

On squaring both sides,

$$x^2 = 30 + \sqrt{30+\sqrt{30+\sqrt{30+.....}}}$$

$\Rightarrow x^2 = 30 + x$

$\Rightarrow x^2 - x - 30 = 0$

$\Rightarrow x^2 - 6x + 5x - 30 = 0$

$\Rightarrow x(x-6) + 5(x-6) = 0$

$\Rightarrow (x-6)(x+5) = 0$

$\Rightarrow x = 6$ because $x \neq -5$

Aliter :

Using Rule 25

$$\sqrt{30+\sqrt{30+\sqrt{30+.....}}} = 6$$

It is because

$30 = 5 \times 6 = n(n+1)$

7. (1) $x = \sqrt{2\sqrt[3]{4\sqrt{2\sqrt[3]{4.....}}}}$

On squaring

$$x^2 = 2\sqrt[3]{4\sqrt{2\sqrt[3]{4}}} .....$$

On cubing,

$x^6 = 8 \times 4x$

$\Rightarrow x^5 = 32 = 2^5 \Rightarrow x = 2$

8. (4) $m = \sqrt{5+\sqrt{5+\sqrt{5+.....}}}$

On squaring both sides,

$m^2 = 5 + m \Rightarrow m^2 - m = 5$ ....(i)

Again,

$n = \sqrt{5-\sqrt{5-\sqrt{5.....}}}$

On squaring both sides,

$n^2 = 5 - n$

$\Rightarrow n^2 + n = 5$ .....(ii)

$\therefore m^2 - m = n^2 + n$

$\Rightarrow (m^2 - n^2) = m + n$

$\Rightarrow (m+n)(m-n) - (m+n) = 0$

$\Rightarrow (m+n)(m-n-1) = 0$

9. (1) $x = \sqrt{72+\sqrt{72+\sqrt{72+.....}}}$

On squaring both sides,

$$x^2 = 72 + \sqrt{72+\sqrt{72+\sqrt{72+.....}}}$$

$\Rightarrow x^2 = 72 + x$

$\Rightarrow x^2 - x - 72 = 0$

$\Rightarrow x^2 - 9x + 8x - 72 = 0$

$\Rightarrow x(x-9) + 8(x-9) = 0$

$\Rightarrow (x+8)(x-9) = 0$

$\Rightarrow x = 9$ because $x \neq -8$

Aliter :

Using Rule 25

$$\sqrt{72+\sqrt{72+\sqrt{72+....}}} = 9$$

It is because $72 = 8 \times 9 = n(n+1)$

10. (2)

$$? = \frac{\sqrt{10+\sqrt{25+\sqrt{108+\sqrt{154+15}}}}}{\sqrt[3]{2 \times 2 \times 2}}$$

$$= \frac{\sqrt{10+\sqrt{25+\sqrt{108+\sqrt{169}}}}}{2}$$

$$= \frac{\sqrt{10+\sqrt{25+\sqrt{108+13}}}}{2}$$

$$= \frac{\sqrt{10+\sqrt{25+\sqrt{121}}}}{2}$$

$$= \frac{\sqrt{10+\sqrt{25+11}}}{2}$$

$$= \frac{\sqrt{10+\sqrt{36}}}{2} = \frac{\sqrt{10+6}}{2}$$

$$= \frac{\sqrt{16}}{2} = \frac{4}{2} = 2$$

11. (2) Let, $x = \sqrt{6+\sqrt{6+\sqrt{6+\ldots\infty}}}$

On squaring,

$x^2 = 6 + \sqrt{6+\sqrt{6+\sqrt{6+\ldots\infty}}}$

$\Rightarrow x^2 = 6 + x$

$\Rightarrow x^2 - x - 6 = 0$

$\Rightarrow x^2 - 3x + 2x - 6 = 0$

$\Rightarrow x(x-3) + 2(x-3) = 0$

$\Rightarrow (x+2)(x-3) = 0$

$\Rightarrow x = 3$ because $x \neq -2$

Aliter :

Using Rule 25

$\sqrt{6+\sqrt{6+\sqrt{6+\ldots}}} = 3$

It is because, $6 = 2 \times 3 = n(n+1)$

12. (4) $x = \sqrt{12+\sqrt{12+\sqrt{12+\ldots}}}$

On squaring both sides,

$x^2 = 12 + \sqrt{12+\sqrt{12+\sqrt{12+\ldots}}}$

$\Rightarrow x^2 = 12 + x$

$\Rightarrow x^2 - x - 12 = 0$

$\Rightarrow x^2 - 4x + 3x - 12 = 0$

$\Rightarrow x(x-4) + 3(x-4) = 0$

$\Rightarrow (x-4)(x+3) = 0$

$\Rightarrow x = 4$ because $x \neq -3$

13. (4) Expression

$$= \sqrt{10+\sqrt{25+\sqrt{108+\sqrt{154+15}}}}$$

$$= \sqrt{10+\sqrt{25+\sqrt{108+\sqrt{169}}}}$$

$$= \sqrt{10+\sqrt{25+\sqrt{108+13}}}$$

$$= \sqrt{10+\sqrt{25+\sqrt{121}}}$$

$$= \sqrt{10+\sqrt{25+11}}$$

$$= \sqrt{10+6} = \sqrt{16} = 4$$

14. (1) Expression

$$= \sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{7+4\sqrt{3}}}}$$

$$= \sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{4+3+2\times2\times\sqrt{3}}}}$$

$$= \sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{(2)^2+(\sqrt{3})^2+2\times2\times\sqrt{3}}}}$$

$$= \sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{(2+\sqrt{3})^2}}}$$

$$= \sqrt{-\sqrt{3}+\sqrt{3+16+8\sqrt{3}}}$$

$$= \sqrt{-\sqrt{3}+\sqrt{(4)^2+(\sqrt{3})^2+2\times4\times\sqrt{3}}}$$

$$= \sqrt{-\sqrt{3}+\sqrt{(4+\sqrt{3})^2}}$$

$$= \sqrt{-\sqrt{3}+4+\sqrt{3}} = \sqrt{4} = 2$$

15. (2) Expression

$$= \sqrt{9+2\sqrt{16}+\sqrt[3]{512}}$$

$$= \sqrt{9+2\sqrt{4\times4}+\sqrt[3]{8\times8\times8}}$$

$$= \sqrt{9+2\times4+8}$$

$$= \sqrt{25} = 5$$

TYPE-VII

1. (3) $\sqrt{3} = 1.732$

$\therefore \frac{173}{100} = 1.73 \approx 1.732$

2. (1) $a = \frac{\sqrt{3}}{2}$

$\therefore \sqrt{1+a} + \sqrt{1-a}$

$$= \sqrt{1+\frac{\sqrt{3}}{2}} + \sqrt{1-\frac{\sqrt{3}}{2}}$$

$$= \frac{\sqrt{2+\sqrt{3}}}{\sqrt{2}} + \frac{\sqrt{2-\sqrt{3}}}{\sqrt{2}}$$

$$= \frac{\sqrt{4+2\sqrt{3}}}{\sqrt{2}\times\sqrt{2}} + \frac{\sqrt{4-2\sqrt{3}}}{\sqrt{2}\times\sqrt{2}}$$

$$= \frac{\sqrt{(\sqrt{3}+1)^2}}{2} + \frac{\sqrt{(\sqrt{3}-1)^2}}{2}$$

$$= \frac{\sqrt{3}+1}{2} + \frac{\sqrt{3}-1}{2}$$

$$= \frac{\sqrt{3}+1+\sqrt{3}-1}{2} = \frac{2\sqrt{3}}{2} = \sqrt{3}$$

3. (2) It is given that

$a = \frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $b = \frac{\sqrt{5}-1}{\sqrt{5}+1}$

Now, $a + b = \frac{\sqrt{5}+1}{\sqrt{5}-1} + \frac{\sqrt{5}-1}{\sqrt{5}+1}$

$$= \frac{(\sqrt{5}+1)^2+(\sqrt{5}-1)^2}{(\sqrt{5}-1)(\sqrt{5}+1)}$$

$$= \frac{2\left[(\sqrt{5})^2+(1)^2\right]}{(\sqrt{5})^2-(1)^2}$$

$[\because (a+b)^2 + (a-b)^2 = 2(a^2+b^2)]$

$$= \frac{2(5+1)}{5-1} = \frac{2\times6}{4} = 3$$

and $a.\ b = \frac{\sqrt{5}+1}{\sqrt{5}-1} \times \frac{\sqrt{5}-1}{\sqrt{5}+1} = 1$

Expression $= \frac{a^2+ab+b^2}{a^2-ab+b^2}$

$$= \frac{(a+b)^2-ab}{(a+b)^2-3ab} = \frac{(3)^2-1}{(3)^2-3\times1}$$

$$= \frac{9-1}{9-3} = \frac{8}{6} = \frac{4}{3}$$

4. (1) $x = 1 + \sqrt{2} + \sqrt{3}$ (Given)

$\therefore x + \frac{1}{x} = 1 + \sqrt{2} + \sqrt{3} + \frac{1}{\sqrt{2}+\sqrt{3}}$

$$=1+\sqrt{2}+\sqrt{3}+\frac{\sqrt{3}-\sqrt{2}}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$$

$$=1+\sqrt{2}+\sqrt{3}+\frac{\sqrt{3}-\sqrt{2}}{(3-2)}$$

$$=1+\sqrt{2}+\sqrt{3}+\sqrt{3}-\sqrt{2}$$

$$=1+2\sqrt{3}$$

5. (3) $x+\frac{1}{x}=-2$ ...(i)

$$\therefore \left(x-\frac{1}{x}\right)^2=\left(x+\frac{1}{x}\right)^2-4$$

$= (-2)^2 - 4 = 0$

$\Rightarrow x-\frac{1}{x}=0$ ...(ii)

Solving equations (i) and (ii), we have

$\therefore x = -1$

$$\therefore x^{2n+1}+\frac{1}{x^{2n+1}}$$

$$=(-1)^{2n+1}+\frac{1}{(-1)^{2n+1}}$$

$= -1-1 = -2$

6. (4) $m^n = 121 = (11)^2$

$\Rightarrow m = 11,\ n = 2$

$\therefore (m-1)^{n+1} = (11-1)^{2+1}$

$= 10^3$

$= 1000$

7. (3) Required number

$$=\frac{\sqrt{12}+\sqrt{18}}{\sqrt{3}+\sqrt{2}}$$

$$=\frac{\sqrt{2\times2\times3}+\sqrt{3\times3\times2}}{\sqrt{3}+\sqrt{2}}$$

$$=\frac{2\sqrt{3}+3\sqrt{2}}{\sqrt{3}+\sqrt{2}}\times\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$$

(Rationalising the denominator)

$$=\frac{2\sqrt{3}\times\sqrt{3}+3\sqrt{2}\times\sqrt{3}-2\sqrt{3}\times\sqrt{2}-3\sqrt{2}\times\sqrt{2}}{3-2}$$

$= 6 + 3\sqrt{6} - 2\sqrt{6} - 6 = \sqrt{6}$

8. (2) All multiples of 7 upto 50

$\Rightarrow$ 7, 14, 21, 28, 35, 42 and 49

$\Rightarrow$ 7, 2 × 7 , 3 × 7, 4 × 7, 5 × 7, 6 × 7 and 7 × 7

$\therefore 7^n = 7^8 \Rightarrow n = 8$

9. (2) $9\sqrt{x} = \sqrt{12} + \sqrt{147}$

$\Rightarrow 9\sqrt{x} = 2\sqrt{3} + 7\sqrt{3}$

$= \sqrt{3}\ (2 + 7)$

$\Rightarrow 9\sqrt{x} = 9\sqrt{3} \Rightarrow x = 3$

10. (2) $43^2 < \sqrt{1896} < 44^2$

$\therefore 44 \times 44 = 1936$

$\therefore x = 44$

11. (4) $\left(\sqrt{6}+\sqrt{2}\right)^2$

$= 6 + 2 + 2\sqrt{12}$

$= 8 + 2\sqrt{12}$

$\left(\sqrt{5}+\sqrt{3}\right)^2 = 5 + 3 + 2\sqrt{15}$

$= 8 + 2\sqrt{15}$

Clearly, $\sqrt{15} > \sqrt{12}$

Hence, $\sqrt{6} + \sqrt{2} < \sqrt{5} + \sqrt{3}$

12. (2) $x = \frac{1}{\sqrt{2}+1}$

$$=\frac{1}{\sqrt{2}+1}\times\frac{\sqrt{2}-1}{\sqrt{2}-1}=\frac{\sqrt{2}-1}{2-1}$$

$= \sqrt{2} - 1$

$\therefore x + 1 = \sqrt{2} - 1 + 1$

$= \sqrt{2}$

13. (1) $p = 5+2\sqrt{6}$

$= 5+2\times\sqrt{3}\times\sqrt{2}$

$= 3+2+2\times\sqrt{3}\times\sqrt{2}$

$= \left(\sqrt{3}+\sqrt{2}\right)^2$

$$\therefore \sqrt{p} = \sqrt{\left(\sqrt{3}+\sqrt{2}\right)^2}$$

$= \sqrt{3}+\sqrt{2}$

$$\therefore \frac{\sqrt{p}-1}{\sqrt{p}}=\frac{\sqrt{3}+\sqrt{2}-1}{\sqrt{3}+\sqrt{2}}$$

$$=\frac{(\sqrt{3}+\sqrt{2}-1)(\sqrt{3}-\sqrt{2})}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$$

$$=\frac{3+\sqrt{6}-\sqrt{3}-\sqrt{6}-2+\sqrt{2}}{3-2}$$

$= 1+\sqrt{2}-\sqrt{3}$

14. (2) $\sqrt{x}-\sqrt{y} = 1,$

$\sqrt{x}+\sqrt{y} = 17$

$\therefore \left(\sqrt{x}+\sqrt{y}\right)^2-\left(\sqrt{x}-\sqrt{y}\right)^2$

$= 17^2 - 1$

$\Rightarrow 4\sqrt{xy} = 289 - 1 = 288$

$\Rightarrow 4\sqrt{xy} = 288$

$\Rightarrow \sqrt{xy} = \frac{288}{4} = 72$

15. (3) Given,

$x = \sqrt{3}+\frac{1}{\sqrt{3}}$

$\Rightarrow x-\sqrt{3} = \frac{1}{\sqrt{3}}$ or, $x-\frac{1}{\sqrt{3}}$

$= \sqrt{3}$

Expression

$$=\left(x-\frac{\sqrt{126}}{\sqrt{42}}\right)\left(x-\frac{1}{x-\frac{2\sqrt{3}}{3}}\right)$$

$$=\left(x-\frac{\sqrt{42\times3}}{\sqrt{42}}\right)\left(x-\frac{1}{x-\frac{2}{\sqrt{3}}}\right)$$

$$=(x-\sqrt{3})\left(x-\frac{1}{\sqrt{3}+\frac{1}{\sqrt{3}}-\frac{2}{\sqrt{3}}}\right)$$

$$=\frac{1}{\sqrt{3}}\left(x-\frac{1}{\sqrt{3}-\frac{1}{\sqrt{3}}}\right)$$

$= \frac{1}{\sqrt{3}}\left(x - \frac{\sqrt{3}}{3-1}\right)$

$= \frac{1}{\sqrt{3}}\left(x - \frac{\sqrt{3}}{2}\right)$

$= \frac{1}{\sqrt{3}}\left(\sqrt{3} + \frac{1}{\sqrt{3}} - \frac{\sqrt{3}}{2}\right)$

$= \frac{1}{\sqrt{3}}\left(\frac{6+2-3}{2\sqrt{3}}\right)$

$= \frac{1}{\sqrt{3}} \times \frac{5}{2\sqrt{3}} = \frac{5}{6}$

16. (1) Given,

$4x = \sqrt{5} + 2$

$\Rightarrow 16x = 4\left(\sqrt{5}+2\right)$

$= 4\sqrt{5} + 8$

$\therefore \frac{1}{16x} = \frac{1}{4\sqrt{5}+8}$

$\Rightarrow \frac{1}{16x} = \frac{4\sqrt{5}-8}{\left(4\sqrt{5}+8\right)\left(4\sqrt{5}-8\right)}$

[Rationalising the denominator]

$= \frac{4\sqrt{5}-8}{80-64} = \frac{4\sqrt{5}-8}{16}$

$= \frac{4\left(\sqrt{5}-2\right)}{16} = \frac{\sqrt{5}-2}{4}$

$\therefore x - \frac{1}{16x} = \frac{\sqrt{5}+2}{4} - \frac{\sqrt{5}-2}{4}$

$= \frac{\sqrt{5}+2-\sqrt{5}+2}{4} = \frac{4}{4} = 1$

17. (2) $x^3 = 1.5^3 - 0.9^3 - 2.43$

$= (1.5)^3 - (0.9)^3 - 3 \times 1.5 \times 0.9$ $(1.5 - 0.9)$

$= (1.5 - 0.9)^3 = (0.6)^3$

$\Rightarrow x = 0.6$

18. (1) $\left(\frac{1}{5}\right)^{3y} = 0.008 = \frac{8}{1000}$

$\Rightarrow \left(\frac{1}{5}\right)^{3y} = \frac{1}{125} = \left(\frac{1}{5}\right)^3$

$\Rightarrow 3y = 3 \Rightarrow y = 1$

$\therefore (0.25)^y = 0.25$

19. (2) $x = 1 + \sqrt{2} + \sqrt{3}$

$\Rightarrow x - 1 = \sqrt{2} + \sqrt{3}$

On squaring both sides,

$(x-1)^2 = \left(\sqrt{2}+\sqrt{3}\right)^2$

$\Rightarrow x^2 - 2x + 1 = 2 + 3 + 2\sqrt{6}$

$\Rightarrow x^2 - 2x + 4 = 5 + 2\sqrt{6} + 3$

$\Rightarrow x^2 - 2x + 4 = 8 + 2\sqrt{6}$

$= 2\left(4+\sqrt{6}\right)$

20. (4) $x = \sqrt{2} + 1$

$\therefore \frac{1}{x} = \frac{1}{\sqrt{2}+1}$

$= \frac{\sqrt{2}-1}{\left(\sqrt{2}+1\right)\left(\sqrt{2}-1\right)}$

$= \frac{\sqrt{2}-1}{2-1} = \sqrt{2} - 1$

$\therefore x^2 = \left(\sqrt{2}+1\right)^2 = 2 + 1 + 2\sqrt{2}$

$= 3 + 2\sqrt{2}$ and $\frac{1}{x^2} = \left(\sqrt{2}-1\right)^2$

$= 2 + 1 - 2\sqrt{2} = 3 - 2\sqrt{2}$

$\therefore x^4 - \frac{1}{x^4}$

$= \left(x^2 + \frac{1}{x^2}\right)\left(x^2 - \frac{1}{x^2}\right)$

$= \left(3 + 2\sqrt{2} + 3 - 2\sqrt{2}\right)$

$\left(3 + 2\sqrt{2} - 3 + 2\sqrt{2}\right)$

$= 6 \times 4\sqrt{2} = 24\sqrt{2}$

21. (3) $\because \frac{1}{\sqrt{a}} - \frac{1}{\sqrt{b}} = 0$

$\Rightarrow \frac{\sqrt{b}-\sqrt{a}}{\sqrt{ab}} = 0$

$\Rightarrow \sqrt{b} - \sqrt{a} = 0$

On squaring,

$\left(\sqrt{b}-\sqrt{a}\right)^2 = 0$

$\Rightarrow b + a - 2\sqrt{ab} = 0$

$\Rightarrow b + a = 2\sqrt{ab}$

On dividing by ab,

$\frac{b+a}{ab} = \frac{2\sqrt{ab}}{ab}$

$\Rightarrow \frac{b}{ab} + \frac{a}{ab} = \frac{2}{\sqrt{ab}}$

$\Rightarrow \frac{1}{a} + \frac{1}{b} = \frac{2}{\sqrt{ab}}$

22. (3) $x = (0.25)^{\frac{1}{2}} = (0.5)^{2\times\frac{1}{2}} = 0.5$

$y = (0.4)^2 = 0.16$

$z = (0.216)^{\frac{1}{3}} = \left(0.6^3\right)^{\frac{1}{3}} = 0.6$

Clearly, $z > x > y$

23. (4) $a + \frac{1}{a} = 2 \Rightarrow a^2 + 1 = 2a$

$\Rightarrow a^2 - 2a + 1 = 0$

$\Rightarrow (a-1)^2 = 0$

$\Rightarrow a - 1 = 0 \Rightarrow a = 1$

$\therefore a^5 + \frac{1}{a^5} = 1 + 1 = 2$

24. (4) $x = 2 + \sqrt{3}$

$\therefore x^2 = \left(2+\sqrt{3}\right)^2 = 4 + 3 + 4\sqrt{3}$

$= 7 + 4\sqrt{3}$

$\therefore \frac{x^2 - x + 1}{x^2 + x + 1}$

$= \frac{7 + 4\sqrt{3} - \left(2+\sqrt{3}\right) + 1}{7 + 4\sqrt{3} + 2 + \sqrt{3} + 1}$

$= \frac{8 + 4\sqrt{3} - 2 - \sqrt{3}}{10 + 5\sqrt{3}}$

$= \frac{6 + 3\sqrt{3}}{10 + 5\sqrt{3}}$

$$= \frac{3\left(2+\sqrt{3}\right)}{5\left(2+\sqrt{3}\right)} = \frac{3}{5}$$

OR

$x = 2 + \sqrt{3}$

$$\therefore \frac{1}{x} = \frac{1}{2+\sqrt{3}}$$

$$= \frac{1}{2+\sqrt{3}} \times \frac{2-\sqrt{3}}{2-\sqrt{3}}$$

$$= \frac{2-\sqrt{3}}{4-3} = 2 - \sqrt{3}$$

$$\therefore \frac{x^2 - x + 1}{x^2 + x + 1} = \frac{x\left(x - 1 + \frac{1}{x}\right)}{x\left(x + 1 + \frac{1}{x}\right)}$$

$$= \frac{\left(x+\frac{1}{x}\right)-1}{x+\frac{1}{x}+1} = \frac{2+\sqrt{3}+2-\sqrt{3}-1}{2+\sqrt{3}+2-\sqrt{3}+1}$$

$$= \frac{3}{5}$$

25. (1) $3a = 4b = 6c$

$$\Rightarrow \frac{3a}{12} = \frac{4b}{12} = \frac{6c}{12}$$

$$\Rightarrow \frac{a}{4} = \frac{b}{3} = \frac{c}{2} = k$$

$\Rightarrow a = 4k;\ b = 3k;\ c = 2k$

$\therefore a + b + c = 27\sqrt{29}$

$\Rightarrow 4k + 3k + 2k = 27\sqrt{29}$

$\Rightarrow 9k = 27\sqrt{29}$

$\Rightarrow k = 3\sqrt{29}$

$\therefore \sqrt{a^2 + b^2 + c^2}$

$= \sqrt{16k^2 + 9k^2 + 4k^2}$

$= \sqrt{29\ k^2} = \sqrt{29}\,k$

$= \sqrt{29} \times 3\sqrt{29} = 29 \times 3 = 87$

26. (3) $\left(\sqrt{3}+1\right)^2 = x + \sqrt{3}\,y$

$\Rightarrow 3 + 1 + 2\sqrt{3} = x + \sqrt{3}\,y$

$\Rightarrow 4 + 2\sqrt{3} = x + \sqrt{3}\,y$

$\Rightarrow x = 4;\ y = 2$

$\therefore x + y = 4 + 2 = 6$

27. (2) $p = 9,\ q = \sqrt{17}$

$\therefore p^2 - q^2 = (9)^2 - \left(\sqrt{17}\right)^2$

$= 81 - 17 = 64$

$$\therefore \left(p^2 - q^2\right)^{\frac{-1}{3}} = \frac{1}{\left(p^2 - q^2\right)^{\frac{1}{3}}}$$

$$= \frac{1}{(64)^{\frac{1}{3}}} = \frac{1}{\left(4^3\right)^{\frac{1}{3}}} = \frac{1}{4}$$

28. (4) $\sqrt{1+\frac{x}{144}} = \frac{13}{12}$

On squaring both sides,

$$1+\frac{x}{144} = \left(\frac{13}{12}\right)^2 = \frac{169}{144}$$

$$\Rightarrow \frac{x}{144} = \frac{169}{144} - 1$$

$$\Rightarrow \frac{x}{144} = \frac{169-144}{144} = \frac{25}{144}$$

$\Rightarrow x = 25$

29. (2) $a = \sqrt{2} + 1$

$\therefore a + 1 = \sqrt{2} + 2$

Again, $b = \sqrt{2} - 1$

$\therefore b + 1 = \sqrt{2} - 1 + 1 = \sqrt{2}$

$$\therefore \frac{1}{a+1} + \frac{1}{b+1}$$

$$= \frac{1}{\sqrt{2}+2} + \frac{1}{\sqrt{2}}$$

$$= \frac{\sqrt{2}+\sqrt{2}+2}{\sqrt{2}\left(\sqrt{2}+2\right)} = \frac{2+2\sqrt{2}}{2+2\sqrt{2}} = 1$$

30. (3) $x = \frac{1}{\sqrt{2}+1}$

$$= \frac{\sqrt{2}-1}{\left(\sqrt{2}+1\right)\left(\sqrt{2}-1\right)} = \sqrt{2} - 1$$

$\therefore x + 1 = \sqrt{2}$

$\Rightarrow x^2 + 2x + 1 = 2$

$\therefore x^2 + 2x - 1 = x^2 + 2x + 1 - 2$

$= 2 - 2 = 0$

31. (3) $x + \frac{1}{x} = \sqrt{13}$

$$\therefore \left(x - \frac{1}{x}\right)^2 = \left(x + \frac{1}{x}\right)^2 - 4$$

$= 13 - 4 = 9$

$$\therefore x - \frac{1}{x} = \sqrt{9} = 3$$

$$\therefore \text{Expression} = \frac{3x}{x^2 - 1}$$

$$= \frac{3x}{x\left(x - \frac{1}{x}\right)} = \frac{3}{3} = 1$$

32. (2) $a = \sqrt{2} + 1$

$\Rightarrow a + 1 = \sqrt{2} + 2$

$b = \sqrt{2} - 1$

$\Rightarrow b + 1 = \sqrt{2}$

$$\therefore \frac{1}{a+1} + \frac{1}{b+1}$$

$$= \frac{1}{\sqrt{2}+2} + \frac{1}{\sqrt{2}}$$

$$= \frac{\sqrt{2}+\sqrt{2}+2}{\sqrt{2}\left(\sqrt{2}+2\right)} = \frac{2+2\sqrt{2}}{2+2\sqrt{2}} = 1$$

33. (1) $x + \sqrt{5} = 5 + \sqrt{y}$

$\Rightarrow x = 5;\ y = 5$

$$\therefore \frac{\sqrt{x}+y}{x+\sqrt{y}} = \frac{\sqrt{5}+5}{5+\sqrt{5}} = 1$$

34. (1) $c + \frac{1}{c} = \sqrt{3}$ (Given)

On cubing both sides,

$$\left(c + \frac{1}{c}\right)^3 = \left(\sqrt{3}\right)^3$$

$$\Rightarrow c^3 + \frac{1}{c^3} + 3\left(c + \frac{1}{c}\right) = 3\sqrt{3}$$

$$\Rightarrow c^3 + \frac{1}{c^3} + 3\sqrt{3} = 3\sqrt{3}$$

$$\Rightarrow c^3 + \frac{1}{c^3} = 3\sqrt{3} - 3\sqrt{3} = 0$$

□□□

TEST YOURSELF

1. If $x = 1-\sqrt{2}$, find the value of $\left(x-\frac{1}{x}\right)^3$.

(1) 12 (2) 16
(3) 6 (4) 8

2. If $a = 7-4\sqrt{3}$, find the value of $\sqrt{a}+\frac{1}{\sqrt{a}}$.

(1) –6 (2) 6
(3) 4 (4) –4

3. If both a and b are rational numbers, find the values of a and b in the following equation :

$$\frac{\sqrt{3}-1}{\sqrt{3}+1} = a+b\sqrt{3}$$

(1) $a = 2,\ b = -1$
(2) $a = -2,\ b = 1$
(3) $a = -3,\ b = 1$
(4) $a = 3,\ b = -1$

4. Find the value of a and b in the following equaton.

$$\frac{5+\sqrt{3}}{7-4\sqrt{3}} = 47a+\sqrt{3}\,b$$

(1) $a = -27,\ b = 47$
(2) $a = -47,\ b = -27$
(3) $a = 47,\ b = 27$
(4) $a = 27,\ b = 47$

5. Simplify the following equation :

$$\frac{4+\sqrt{5}}{4-\sqrt{5}}+\frac{4-\sqrt{5}}{4+\sqrt{5}}$$

(1) $\frac{42}{11}$ (2) $\frac{-42}{11}$

(3) $\frac{-43}{22}$ (4) 11

6. $\frac{\sqrt{5}-2}{\sqrt{5}+2}+\frac{\sqrt{5}+2}{\sqrt{5}-2} = ?$

(1) $8\sqrt{5}$ (2) $-8\sqrt{5}$

(3) $8\sqrt{3}$ (4) $-8\sqrt{2}$

7. $\frac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}}+\frac{\sqrt{12}}{\sqrt{3}-\sqrt{2}} = ?$

(1) 11 (2) –11
(3) 12 (4) –12

8. $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{80}+\sqrt{48}-\sqrt{45}-\sqrt{27}} = ?$

(1) –2 (2) 2
(3) –1 (4) 1

9. Simplify :

$$\frac{6}{2\sqrt{3}-\sqrt{6}}+\frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}}-\frac{4\sqrt{3}}{\sqrt{6}-\sqrt{2}}$$

(1) 2 (2) –1
(3) 0 (4) 1

10. Simplify :

$$\frac{4\sqrt{18}}{\sqrt{12}}-\frac{8\sqrt{75}}{\sqrt{32}}+\frac{9\sqrt{2}}{\sqrt{3}}$$

(1) 0 (2) –1
(3) 1 (4) 2

11. If

$$\frac{7+\sqrt{5}}{7-\sqrt{5}}-\frac{7-\sqrt{5}}{7+\sqrt{5}} = a+7\sqrt{5}\,b,$$

determine the rational number.

(1) $a = -2,\ b = \frac{2}{11}$

(2) $a = 0,\ b = \frac{1}{11}$

(3) $a = -1,\ b = \frac{1}{11}$

(4) $a = -2,\ b = -11$

12. $2\times\frac{16\times 2^{n+1}-4\times 2^{n}}{16\times 2^{n+2}-2\times 2^{n+2}} = ?$

(1) 1 (2) $\frac{1}{3}$

(3) 2 (4) $\frac{1}{2}$

13. Evaluate :

$$\frac{1}{1+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}$$

$$+\frac{1}{\sqrt{4}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{6}}+\frac{1}{\sqrt{6}+\sqrt{7}}$$

$$+\frac{1}{\sqrt{7}+\sqrt{8}}+\frac{1}{\sqrt{8}+\sqrt{9}}$$

(1) 4 (2) 0
(3) 2 (4) –2

14. Given

$\sqrt{2} = 1.4142$, find correct to three places of decimal the value of

$$\frac{4}{3\sqrt{3}-2\sqrt{2}}+\frac{3}{3\sqrt{3}+2\sqrt{2}}.$$

(1) 2.063 (2) 2.036
(3) 2.306 (4) 2.36

15. Evaluate

$$\frac{15}{\sqrt{10}+\sqrt{20}+\sqrt{40}-\sqrt{5}-\sqrt{80}}$$

it being given that

$\sqrt{5} = 2.236$ and $\sqrt{10} = 3.162$.

(1) 5.938 (2) 5.398
(3) 5.893 (4) 5.839

16. If $x = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ and

$y = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ find the value of

$x^3 + y^3$

(1) 807 (2) 907
(3) 970 (4) 870

17. If $x = \frac{\sqrt{3}+1}{\sqrt{3}-1}$ and $y = \frac{\sqrt{3}-1}{\sqrt{3}+1}$

find the value of $x^2 + xy - y^2$.

(1) $8\sqrt{2}+1$ (2) $8\sqrt{3}+1$

(3) $7\sqrt{3}+1$ (4) $8\sqrt{3}+2$

18. If $x = \frac{\sqrt{a+2b}+\sqrt{a-2b}}{\sqrt{a+2b}-\sqrt{a-2b}}$, then

find the value of $bx^2 - ax + b$.

(1) 2 (2) 1
(3) 0 (4) 6

19. If $a = \frac{1}{3+2\sqrt{2}}$,

$b = \frac{1}{3-2\sqrt{2}}$ then $a^2b + ab^2 = ?$

(1) –5 (2) 5
(3) –6 (4) 6

20. If $x=\sqrt{\frac{5+2\sqrt{6}}{5-2\sqrt{6}}}$ find the value of $x^2\left(x-10\right)^2$.

(1) 1 (2) –1
(3) 2 (4) –2

21. If $x=5-\sqrt{24}$, find the value of

$$\left(x^3+\frac{1}{x^3}\right)-10\left(x^2+\frac{1}{x^2}\right)+4\left(x+\frac{1}{x}\right)-30$$

(1) 1 (2) 0
(3) –1 (4) 2

22. a, b, c, p are rational numbers where p is a not a perfect cube.

If $a+bp^{\frac{1}{3}}+cp^{\frac{2}{3}}=0$, which of the following relations is correct ?

(1) $a = b = c = 2$
(2) $a \neq b = c$
(3) $a = b = c = 0$
(4) $a \neq b \neq c \neq 0$

23. Simplify : $\sqrt{3\sqrt{3\sqrt{3\sqrt{3\sqrt{3}}}}}$

(1) $3^{15/16}$ (2) $3^{33/32}$
(3) $3^{21/32}$ (4) $3^{31/32}$

24. If $\sqrt{\sqrt[3]{0.000001\times x}}=0.5$ then find the value of x.

(1) 15625 (2) 15.625
(3) 16625 (4) 16.625

25. If $x=\sqrt{5+\sqrt{5+\sqrt{5+....\infty}}}$ and $y=\sqrt{5-\sqrt{5-\sqrt{5-....\infty}}}$, then find the value of x.

(1) $-y$
(2) $y + 1$
(3) $-y$ or $y + 1$
(4) None of these

26. If $x=\frac{1}{2-\sqrt{3}}$ find the value of $x^3 - 2x^2 - 7x + 5$.

(1) 2 (2) 8
(3) 4 (4) 3

27. Find the square root of $5+2\sqrt{6}$.

(1) $\sqrt{3}+\sqrt{2}$ (2) $\sqrt{3}+2$
(3) $2+\sqrt{3}$ (4) $\sqrt{3}-\sqrt{2}$

28. Find the positive square root of $14\sqrt{5}-30$.

(1) $\sqrt{5}(3-\sqrt{5})$
(2) $\sqrt[4]{5}(3-\sqrt{5})$
(3) $\sqrt{3}+2\sqrt{5}$
(4) $\sqrt{3}-2\sqrt{5}$

29. Evaluate : $\frac{2\left(\sqrt{2}+\sqrt{6}\right)}{3\sqrt{2+\sqrt{3}}}$

(1) 21 (2) $-\frac{4}{3}$
(3) $\frac{4}{3}$ (4) $\frac{1}{3}$

30. Simplify : $\sqrt{\left(\frac{6+2\sqrt{3}}{33-19\sqrt{3}}\right)}$

(1) $5-2\sqrt{3}$ (2) $5+2\sqrt{3}$
(3) $5-3\sqrt{3}$ (4) $5+3\sqrt{3}$

31. Find the value of

$$\frac{\sqrt{\sqrt{5}+2}+\sqrt{\sqrt{5}-2}}{\sqrt{\sqrt{5}+1}}-\sqrt{3-2\sqrt{2}}$$

(1) 1 (2) –1
(3) 2 (4) –2

32. Simplify :

$$\frac{4\sqrt{3}}{2-\sqrt{2}}-\frac{30}{4\sqrt{3}-\sqrt{18}}-\frac{\sqrt{18}}{3-2\sqrt{3}}$$

(1) $2\sqrt{6}$ (2) $4\sqrt{6}$
(3) $3\sqrt{6}$ (4) $-4\sqrt{6}$

33. Show that

$$\frac{1}{\sqrt{11-2\sqrt{30}}}-\frac{3}{\sqrt{7-2\sqrt{10}}}-\frac{4}{\sqrt{8+4\sqrt{3}}}=0$$

(1) –2 (2) 2
(3) 0 (4) –1

34. Simplify : $\frac{\sqrt{4-\sqrt{7}}}{\sqrt{8+3\sqrt{7}}-2\sqrt{2}}$

(1) 1 (2) 2
(3) –2 (4) 3

35. Find the value of

$$\left(28+10\sqrt{3}\right)^{\frac{1}{2}}-\left(7-4\sqrt{3}\right)^{-\frac{1}{2}}.$$

(1) –3 (2) 3
(3) 2 (4) 4

36. Evaluate

$$(28-10\sqrt{3})^{\frac{1}{2}}-(7+4\sqrt{3})^{-\frac{1}{2}}+\frac{\sqrt{7}}{\sqrt{16+6\sqrt{7}}-\sqrt{16-6\sqrt{7}}}$$

(1) $4\frac{1}{2}$ (2) $2\frac{1}{2}$
(3) $3\frac{1}{2}$ (4) 3

37. Evaluate :

$$\frac{26-15\sqrt{3}}{\left[5\sqrt{2}-\sqrt{38+5\sqrt{3}}\right]^2}+\frac{\sqrt{10}+\sqrt{18}}{\sqrt{8}+\sqrt{\left(\sqrt{3}-\sqrt{5}\right)}}$$

(1) $4\frac{1}{2}$ (2) $2\frac{1}{4}$
(3) $3\frac{1}{2}$ (4) $2\frac{1}{3}$

38. Simplify :

$$\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{7+4\sqrt{3}}}}$$

(1) 2 (2) –2
(3) 3 (4) –3

39. Simplify :

$$\left(\frac{81}{16}\right)^{-\frac{3}{4}}\times\left\{\left(\frac{25}{9}\right)^{-\frac{3}{2}}\div\left(\frac{5}{2}\right)^{-3}\right\}$$

(1) 1 (2) 2
(3) 0 (4) 4

40. Simplify :

$$\left(\frac{1}{4}\right)^{-2} - 3(8)^{\frac{2}{3}}(4)^0 + \left(\frac{9}{16}\right)^{\frac{-1}{2}}$$

(1) $4\frac{1}{3}$ (2) $5\frac{1}{3}$
(3) $2\frac{1}{3}$ (4) $6\frac{1}{3}$

41. $\dfrac{(25)^{\frac{3}{2}} \times (243)^{\frac{3}{5}}}{(16)^{\frac{5}{4}} \times (8)^{\frac{4}{3}}} = ?$

(1) $\frac{512}{3375}$ (2) $\frac{512}{3275}$
(3) $\frac{3375}{512}$ (4) $\frac{3475}{512}$

42. $\dfrac{16 \times 2^{n+1} - 4 \times 2^n}{16 \times 2^{n+2} - 2 \times 2^{n+2}} = ?$

(1) $\frac{4}{5}$ (2) $\frac{3}{4}$
(3) $\frac{2}{3}$ (4) $\frac{1}{2}$

43. Simplify :

$$\frac{\left(x^{a+b}\right)^2\left(x^{b+c}\right)^2\left(x^{c+a}\right)^2}{\left(x^a x^b x^c\right)^4}$$

(1) $2x$ (2) 0
(3) 1 (4) $a + b + c$

44. If $25^{x-1} = 5^{2x-1} - 100$, find the value of x.

(1) 4 (2) 2
(3) 1 (4) 0

45. If $\dfrac{9^n \times 3^2 \times \left(3^{\frac{-n}{2}}\right)^{-2} - (27)^n}{3^{3m} \times 2^3} = \dfrac{1}{27}$, then $m - n = ?$

(1) 2 (2) 0
(3) 1 (4) 4

46. $\dfrac{a^{-1}}{a^{-1}+b^{-1}} + \dfrac{a^{-1}}{a^{-1}-b^{-1}} = ?$

(1) $\frac{b^2}{b^2-a^2}$ (2) $\frac{b^2}{b^2+a^2}$
(3) $\frac{2b^2}{b^2+a^2}$ (4) $\frac{2b^2}{b^2-a^2}$

47. Assuming that x is a positive real number and a, b, c are rational numbers, then

$$\left(\frac{x^a}{x^b}\right)^{\frac{1}{ab}}\left(\frac{x^b}{x^c}\right)^{\frac{1}{bc}}\left(\frac{x^c}{x^a}\right)^{\frac{1}{ac}} = ?$$

(1) 1 (2) 2
(3) 0 (4) 4

48. $\left(\frac{x^a}{x^b}\right)^{a+b}\left(\frac{x^b}{x^c}\right)^{b+c}\left(\frac{x^c}{x^a}\right)^{c+a} = ?$

(1) $\frac{1}{2}$ (2) 2
(3) 0 (4) 1

49. $\left(\frac{x^a}{x^b}\right)^{a^2+ab+b^2}\left(\frac{x^b}{x^c}\right)^{b^2+bc+c^2}\left(\frac{x^c}{x^a}\right)^{c^2+ca+a^2} = ?$

(1) 3 (2) 2
(3) 1 (4) 0

50. If x, y, z are positive real numbers, then

$$\sqrt{x^{-1}y}.\sqrt{y^{-1}z}.\sqrt{z^{-1}x} = ?$$

(1) 1 (2) 0
(3) –1 (4) –2

51. Find the simplest value of

$$\frac{4\sqrt{3}}{2-\sqrt{2}} - \frac{30}{4\sqrt{3}-3\sqrt{2}} - \frac{3\sqrt{2}}{3-2\sqrt{3}}.$$

(1) $4\sqrt{2}$ (2) $4\sqrt{3}$
(3) $4\sqrt{6}$ (4) $5\sqrt{6}$

52. Find the value of n, if

$(10^{12} + 25)^2 - (10^{12} - 25)^2 = 10^n$

(1) 12 (2) 13
(3) 14 (4) 15

53. Find the value of

$$\frac{15}{\sqrt{10}+\sqrt{20}+\sqrt{40}-\sqrt{5}-\sqrt{80}}$$

if $\sqrt{5} = 2.236$ and $\sqrt{10} = 3.162$.

(1) 5.498 (2) 5.398
(3) 6.398 (4) 3.498

54. $\left(28-10\sqrt{3}\right)^{1/2} - \left(7+4\sqrt{3}\right)^{-1/2}$ is equal to

(1) 4 (2) 5
(3) 3 (4) 4.3

SHORT ANSWERS

1. (4)	**2.** (3)	**3.** (1)	**4.** (3)
5. (1)	**6.** (2)	**7.** (1)	**8.** (4)
9. (3)	**10.** (1)	**11.** (2)	**12.** (1)
13. (3)	**14.** (1)	**15.** (2)	**16.** (3)
17. (2)	**18.** (3)	**19.** (4)	**20.** (1)
21. (2)	**22.** (3)	**23.** (4)	**24.** (1)
25. (3)	**26.** (4)	**27.** (1)	**28.** (2)
29. (3)	**30.** (4)	**31.** (1)	**32.** (2)
33. (3)	**34.** (1)	**35.** (2)	**36.** (3)
37. (4)	**38.** (1)	**39.** (1)	**40.**(2)
41. (3)	**42.** (4)	**43.** (3)	**44.** (2)
45. (3)	**46.** (4)	**47.** (1)	**48.** (4)
49. (3)	**50.** (1)	**51.** (3)	**52.** (3)
53. (2)	**54.** (3)		

EXPLANATIONS

1. (4) Here, $x = 1-\sqrt{2}$

$$\therefore \frac{1}{x} = \frac{1}{1-\sqrt{2}}$$

$$= \frac{1}{1-\sqrt{2}} \times \frac{1+\sqrt{2}}{1+\sqrt{2}}$$

$$= \frac{1+\sqrt{2}}{1-2} = -\left(1+\sqrt{2}\right)$$

$$\therefore x - \frac{1}{x} = \left(1-\sqrt{2}\right) - \left\{-\left(1+\sqrt{2}\right)\right\}$$

$$= 1-\sqrt{2}+1+\sqrt{2} = 2$$

$$\therefore \left(x-\frac{1}{x}\right)^3 = 2^3 = 8$$

2. (3) We have $a = 7-4\sqrt{3}$

$$\therefore \frac{1}{a} = \frac{1}{7-4\sqrt{3}} \times \frac{7+4\sqrt{3}}{7+4\sqrt{3}}$$

$$= \frac{7+4\sqrt{3}}{(7)^2-\left(4\sqrt{3}\right)^2} = \frac{7+4\sqrt{3}}{49-48}$$

$$= 7+4\sqrt{3}$$

Now, $\left(\sqrt{a}+\frac{1}{\sqrt{a}}\right)^2 = a+\frac{1}{a}+2$

$$= 7-4\sqrt{3}+7+4\sqrt{3}+2 = 16$$

$$\therefore \sqrt{a}+\frac{1}{\sqrt{a}} = 4$$

3. (1) Multiplying the numerator and denominator by the conjugate of $\sqrt{3}+1$, we have

$$\frac{\sqrt{3}-1}{\sqrt{3}+1}$$

$$\frac{\sqrt{3}-1}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1} = \frac{\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}\right)^2-(1)^2}$$

$$= \frac{\left(\sqrt{3}\right)^2+1-2\sqrt{3}}{3-1}$$

$$= \frac{4-2\sqrt{3}}{2} = 2-\sqrt{3}$$

$$\therefore \frac{\sqrt{3}-1}{\sqrt{3}+1} = a+b\sqrt{3}$$

$$\Rightarrow 2-\sqrt{3} = a+b\sqrt{3}$$

$$\Rightarrow a+b\sqrt{3} = 2+(-1)\sqrt{3}$$

On equating rational and irrational parts

$a = 2$ and $b = -1$

4. (3) Multiplying the numerator and denominator by the conjugate of $7-4\sqrt{3}$, we have

$$\frac{5+\sqrt{3}}{7-4\sqrt{3}}$$

$$= \frac{5+\sqrt{3}}{7-4\sqrt{3}} \times \frac{7+4\sqrt{3}}{7+4\sqrt{3}}$$

$$= \frac{35+5\times4\sqrt{3}+7\times\sqrt{3}+\sqrt{3}\times4\sqrt{3}}{7^2-\left(4\sqrt{3}\right)^2}$$

$$= \frac{35+20\sqrt{3}+7\sqrt{3}+4\left(\sqrt{3}\right)^2}{49-16\left(\sqrt{3}\right)^2}$$

$$= \frac{35+27\sqrt{3}+12}{49-48} = 47+27\sqrt{3}$$

$$\therefore \frac{5+\sqrt{3}}{7-4\sqrt{3}} = a+b\sqrt{3}$$

$$\Rightarrow 47+27\sqrt{3} = a+b\sqrt{3}$$

On equating rational and irrational parts.

$a = 47$ and $b = 27$

5. (1) Rationalising the denominator of each term, we have

$$\frac{4+\sqrt{5}}{4-\sqrt{5}}+\frac{4-\sqrt{5}}{4+\sqrt{5}}$$

$$= \frac{4+\sqrt{5}}{4-\sqrt{5}} \times \frac{4+\sqrt{5}}{4+\sqrt{5}} + \frac{4-\sqrt{5}}{4+\sqrt{5}} \times \frac{4-\sqrt{5}}{4-\sqrt{5}}$$

$$= \frac{\left(4+\sqrt{5}\right)^2}{\left(4-\sqrt{5}\right)\left(4+\sqrt{5}\right)} + \frac{\left(4-\sqrt{5}\right)^2}{\left(4+\sqrt{5}\right)\left(4-\sqrt{5}\right)}$$

$$= \frac{\left(4+\sqrt{5}\right)^2}{16-5} + \frac{\left(4-\sqrt{5}\right)^2}{16-5}$$

$$= \frac{\left(4+\sqrt{5}\right)^2+\left(4-\sqrt{5}\right)^2}{11}$$

$$= \frac{2\left[(4)^2+\left(\sqrt{5}\right)^2\right]}{11}$$

$[\because (a+b)^2+(a-b)^2 = 2(a^2+b^2)]$

$$= \frac{2(16+5)}{11} = \frac{42}{11}$$

6. (2) $\frac{\sqrt{5}-2}{\sqrt{5}+2}-\frac{\sqrt{5}+2}{\sqrt{5}-2}$

$$= \frac{\sqrt{5}-2}{\sqrt{5}+2} \times \frac{\sqrt{5}-2}{\sqrt{5}-2} - \frac{\sqrt{5}+2}{\sqrt{5}-2} \times \frac{\sqrt{5}+2}{\sqrt{5}+2}$$

$$= \frac{\left(\sqrt{5}-2\right)^2}{\left(\sqrt{5}+2\right)\left(\sqrt{5}-2\right)} - \frac{\left(\sqrt{5}+2\right)^2}{\left(\sqrt{5}-2\right)\left(\sqrt{5}+2\right)}$$

$$= \frac{\left(\sqrt{5}\right)^2+2^2-2\times2\times\sqrt{5}}{\left(\sqrt{5}\right)^2-2^2}$$

$$-\frac{\left(\sqrt{5}\right)^2+2^2+2\times2\times\sqrt{5}}{\left(\sqrt{5}\right)^2-2^2}$$

$$= \frac{5+4-4\sqrt{5}}{5-4} - \frac{5+4+4\sqrt{5}}{5-4}$$

$$= \left(9-4\sqrt{5}\right)-\left(9+4\sqrt{5}\right)$$

$$= 9-4\sqrt{5}-9-4\sqrt{5} = -8\sqrt{5}$$

7. (1) 1st term $= \frac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}}$

Rationalising the denominator, we have

$$\frac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}}$$

$$= \frac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}} \times \frac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{2}-2\sqrt{3}}$$

$$= \frac{\left(3\sqrt{2}-2\sqrt{3}\right)^2}{\left(3\sqrt{2}\right)^2-\left(2\sqrt{3}\right)^2}$$

$$= \frac{\left(3\sqrt{2}\right)^2+\left(2\sqrt{3}\right)^2-2\times3\sqrt{2}\times2\sqrt{3}}{18-12}$$

$$= \frac{18+12-12\sqrt{6}}{6} = \frac{30-12\sqrt{6}}{6}$$

$$= \frac{6\left(5-2\sqrt{6}\right)}{6} = 5-2\sqrt{6}$$

2nd term

$$= \frac{\sqrt{12}}{\sqrt{3}-\sqrt{2}} = \frac{\sqrt{4\times3}}{\sqrt{3}-\sqrt{2}} = \frac{2\sqrt{3}}{\sqrt{3}-\sqrt{2}}$$

$$= \frac{2\sqrt{3}}{\sqrt{3}-\sqrt{2}} \times \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}}$$

[Rationalising the denominator]

$$= \frac{2\sqrt{3}\left(\sqrt{3}+\sqrt{2}\right)}{\left(\sqrt{3}\right)^2-\left(\sqrt{2}\right)^2}$$

$$= \frac{6+2\sqrt{6}}{3-2} = 6+2\sqrt{6}$$

$$\therefore \frac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}} + \frac{\sqrt{12}}{\sqrt{3}-\sqrt{2}}$$

$$= 5-2\sqrt{6}+6+2\sqrt{6} = 11$$

8. (4) $\dfrac{\sqrt{5}+\sqrt{3}}{\sqrt{80}+\sqrt{48}-\sqrt{45}-\sqrt{27}}$

$$= \frac{\sqrt{5}+\sqrt{3}}{\sqrt{16\times5}+\sqrt{16\times3}-\sqrt{9\times5}-\sqrt{9\times3}}$$

$$= \frac{\sqrt{5}+\sqrt{3}}{4\sqrt{5}+4\sqrt{3}-3\sqrt{5}-3\sqrt{3}}$$

$$= \frac{\sqrt{5}+\sqrt{3}}{(4-3)\sqrt{5}+(4-3)\sqrt{3}}$$

$$= \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}} = 1$$

9. (3) Rationalising the denominator of each term, we have

1st term

$$= \frac{6}{2\sqrt{3}-\sqrt{6}} \times \frac{2\sqrt{3}+\sqrt{6}}{2\sqrt{3}+\sqrt{6}}$$

$$= \frac{6\left(2\sqrt{3}+\sqrt{6}\right)}{\left(2\sqrt{3}\right)^2-\left(\sqrt{6}\right)^2}$$

$$= \frac{6\left(2\sqrt{3}+\sqrt{6}\right)}{12-6}$$

$$= \frac{6\left(2\sqrt{3}+\sqrt{6}\right)}{6} = 2\sqrt{3}+\sqrt{6}$$

2nd term

$$= \frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$$

$$= \frac{\sqrt{18}-\sqrt{12}}{\left(\sqrt{3}\right)^2-\left(\sqrt{2}\right)^2}$$

$$= \frac{\sqrt{9\times2}-\sqrt{4\times3}}{3-2} = 3\sqrt{2}-2\sqrt{3}$$

3rd term

$$= \frac{4\sqrt{3}}{\sqrt{6}-\sqrt{2}} \times \frac{\sqrt{6}+\sqrt{2}}{\sqrt{6}+\sqrt{2}}$$

$$= \frac{4\sqrt{18}+4\sqrt{6}}{\left(\sqrt{6}\right)^2-\left(\sqrt{2}\right)^2}$$

$$= \frac{4\left(\sqrt{9\times2}+\sqrt{6}\right)}{6-2} = 3\sqrt{2}+\sqrt{6}$$

$\therefore$ Given expression =

$$2\sqrt{3}+\sqrt{6}+3\sqrt{2}-2\sqrt{3}-3\sqrt{2}-\sqrt{6}$$

$= 0$

10. (1) $\dfrac{4\sqrt{18}}{\sqrt{12}} - \dfrac{8\sqrt{75}}{\sqrt{32}} + \dfrac{9\sqrt{2}}{\sqrt{3}}$

$$= \frac{4\sqrt{9\times2}}{\sqrt{4\times3}} - \frac{8\sqrt{25\times3}}{\sqrt{16\times2}} + \frac{9\sqrt{2}}{\sqrt{3}}$$

$$= \frac{12\sqrt{2}}{2\sqrt{3}} - \frac{40\sqrt{3}}{4\sqrt{2}} + \frac{9\sqrt{2}}{\sqrt{3}}$$

$$= \frac{6\sqrt{2}}{\sqrt{3}} - \frac{10\sqrt{3}}{\sqrt{2}} + \frac{9\sqrt{2}}{\sqrt{3}}$$

Now rationalising the denominator of each term, we have

$$= \frac{6\sqrt{2}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} - \frac{10\sqrt{3}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} + \frac{9\sqrt{2}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{6\sqrt{6}}{3} - \frac{10\sqrt{6}}{2} + \frac{9\sqrt{6}}{3}$$

$$= 2\sqrt{6}-5\sqrt{6}+3\sqrt{6} = 0$$

11. (2) Rationalising the denominator of each term, we get

$$\text{L.H.S.} = \frac{7+\sqrt{5}}{7-\sqrt{5}} - \frac{7-\sqrt{5}}{7+\sqrt{5}}$$

$$= \frac{7+\sqrt{5}}{7-\sqrt{5}} \times \frac{7+\sqrt{5}}{7+\sqrt{5}} - \frac{7-\sqrt{5}}{7+\sqrt{5}} \times \frac{7-\sqrt{5}}{7-\sqrt{5}}$$

$$= \frac{\left(7+\sqrt{5}\right)^2}{7^2-\left(\sqrt{5}\right)^2} - \frac{\left(7-\sqrt{5}\right)^2}{7^2-\left(\sqrt{5}\right)^2}$$

$$= \frac{7^2+\left(\sqrt{5}\right)^2+2\times7\times\sqrt{5}}{49-5} - \frac{7^2+\left(\sqrt{5}\right)^2-2\times7\times\sqrt{5}}{49-5}$$

$$= \frac{49+5+14\sqrt{5}}{44} - \frac{49+5-14\sqrt{5}}{44}$$

$$= \frac{54+14\sqrt{5}-54+14\sqrt{5}}{44}$$

$$= \frac{28\sqrt{5}}{44} = \frac{7\sqrt{5}}{11}$$

Now $\dfrac{7+\sqrt{5}}{7-\sqrt{5}} - \dfrac{7-\sqrt{5}}{7+\sqrt{5}}$

$$= a+7\sqrt{5}\,b$$

$$\Rightarrow \frac{7\sqrt{5}}{11} = a+7\sqrt{5}\,b$$

$$\Rightarrow 0+7\sqrt{5}.\frac{1}{11} = a+7\sqrt{5}\,b$$

$$\Rightarrow a = 0 \text{ and } b = \frac{1}{11}$$

12. (1) $\dfrac{16\times2^{n+1}-4\times2^n}{16\times2^{n+2}-2\times2^{n+2}}$

$$= \frac{2^4\times2^{n+1}-2^2\times2^n}{2^4\times2^{n+2}-2\times2^{n+2}}$$

$$= \frac{2^{n+5}-2^{n+2}}{2^{n+6}-2^{n+3}}$$

$$= \frac{2^{n+5}-2^{n+2}}{2(2^{n+5}-2^{n+2})} = \frac{1}{2}$$

$\therefore$ Expression $= 2 \times \dfrac{1}{2} = 1$

13. (3) Rationalising the denominator of each term, the given expression becomes

$$= \frac{1-\sqrt{2}}{1-2} + \frac{\sqrt{2}-\sqrt{3}}{2-3} + \frac{\sqrt{3}-\sqrt{4}}{3-4}$$

$$+ \frac{\sqrt{4}-\sqrt{5}}{4-5} + \ldots + \frac{\sqrt{8}-\sqrt{9}}{8-9}$$

$$= -1 + \sqrt{2} - \sqrt{2} + \sqrt{3} - \sqrt{3} + \sqrt{4}$$

$$- \sqrt{4} + \sqrt{5} - \sqrt{5} + \sqrt{6} - \sqrt{6}$$

$$+ \sqrt{7} - \sqrt{7} + \sqrt{8} - \sqrt{8} + \sqrt{9}$$

$$= -1 + \sqrt{9} = -1 + 3 = 2$$

14. (1) Rationalising the denominator of each term, we have

$$= \frac{4}{3\sqrt{3}-2\sqrt{2}} \times \frac{3\sqrt{3}+2\sqrt{2}}{3\sqrt{3}+2\sqrt{2}}$$

$$+ \frac{3}{3\sqrt{3}+2\sqrt{2}} \times \frac{3\sqrt{3}-2\sqrt{2}}{3\sqrt{3}-2\sqrt{2}}$$

$$= \frac{4\left(3\sqrt{3}+2\sqrt{2}\right)}{\left(3\sqrt{3}\right)^2-\left(2\sqrt{2}\right)^2} + \frac{3\left(3\sqrt{3}-2\sqrt{2}\right)}{\left(3\sqrt{3}\right)^2-\left(2\sqrt{2}\right)^2}$$

$$= \frac{12\sqrt{3}+8\sqrt{2}+9\sqrt{3}-6\sqrt{2}}{27-8}$$

$$= \frac{(12+9)\sqrt{3}+(8-6)\sqrt{2}}{19}$$

$$= \frac{21}{19}\sqrt{3} + \frac{2}{19}\sqrt{2}$$

$$= \frac{21}{19} \times 1.7321 + \frac{2}{19} \times 1.4142$$

$$= \frac{1}{19}(21 \times 1.7321 + 2 \times 1.4142)$$

$$= \frac{1}{19}(36.3741 + 2.8284)$$

$$= \frac{39.2025}{19} = 2.0632 = 2.063$$

Method 2 :

$$\frac{4}{3\sqrt{3}-2\sqrt{2}} + \frac{3}{3\sqrt{3}+2\sqrt{2}}$$

$$= \frac{4\left(3\sqrt{3}+2\sqrt{2}\right)+3\left(3\sqrt{3}-2\sqrt{2}\right)}{\left(3\sqrt{3}-2\sqrt{2}\right)\left(3\sqrt{3}+2\sqrt{2}\right)}$$

$$= \frac{12\sqrt{3}+8\sqrt{2}+9\sqrt{3}-6\sqrt{2}}{\left(3\sqrt{3}\right)^2-\left(2\sqrt{2}\right)^2}$$

$$= \frac{21\sqrt{3}+2\sqrt{2}}{27-8}$$

$$= \frac{21}{19}\sqrt{3} + \frac{2}{19}\sqrt{2}$$

$$= \frac{21}{19} \times 1.7321 + \frac{2}{19} \times 1.4142$$

$$= \frac{1}{19}(21 \times 1.7321 + 2 \times 1.4142)$$

$$= \frac{1}{19}(36.3741 + 2.8284)$$

$$= \frac{39.2028}{19} = 2.0632 = 2.063$$

15. (2) We have

$$\sqrt{10} + \sqrt{20} + \sqrt{40} - \sqrt{5} - \sqrt{80}$$

$$= \sqrt{10} + \sqrt{2^2 \times 5} + \sqrt{2^2 \times 10}$$

$$- \sqrt{5} - \sqrt{2^4 \times 5}$$

$$= \sqrt{10} + 2\sqrt{5} + 2\sqrt{10} - \sqrt{5} - 4\sqrt{5}$$

$$= (1+2)\sqrt{10} + (2-1-4)\sqrt{5}$$

$$= 3\sqrt{10} - 3\sqrt{5} = 3\left(\sqrt{10} - \sqrt{5}\right)$$

$$\therefore \frac{15}{\sqrt{10}+\sqrt{20}+\sqrt{40}-\sqrt{5}-\sqrt{80}}$$

$$= \frac{15}{3\left(\sqrt{10}-\sqrt{5}\right)} = \frac{15}{\sqrt{10}-\sqrt{5}}$$

$$= \frac{5\left(\sqrt{10}+\sqrt{5}\right)}{\left(\sqrt{10}-\sqrt{5}\right)\left(\sqrt{10}+\sqrt{5}\right)}$$

$$= \frac{5\left(\sqrt{10}+\sqrt{5}\right)}{10-5}$$

$$= \sqrt{10} + \sqrt{5} = 3.162 + 2.236 = 5.398$$

16. (3) Rationalising the denominators, we have

$$x = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$$

$$= \frac{\left(\sqrt{3}-\sqrt{2}\right)^2}{\left(\sqrt{3}\right)^2-\left(\sqrt{2}\right)^2}$$

$$= \frac{3+2-2\sqrt{3}\times\sqrt{2}}{3-2} = 5-2\sqrt{6}$$

and, $y = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} \times \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

$$= \frac{\left(\sqrt{3}+\sqrt{2}\right)^2}{\left(\sqrt{3}\right)^2-\left(\sqrt{2}\right)^2}$$

$$= \frac{3+2+2\sqrt{3}\times\sqrt{2}}{3-2} = 5+2\sqrt{6}$$

$\therefore x + y$

$$= 5-2\sqrt{6}+5+2\sqrt{6} = 10$$

and, $xy = \left(5-2\sqrt{6}\right)\left(5+2\sqrt{6}\right)$

$$= 5^2 - \left(2\sqrt{6}\right)^2 = 25 - 24 = 1$$

$x^3 + y^3 = (x + y)^3 - 3xy\,(x + y)$
$= 10^3 - 3 \times 10 = 1000 - 30 = 970$

17. (2) We have

$$x = \frac{\sqrt{3}+1}{\sqrt{3}-1} = \frac{\sqrt{3}+1}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$= \frac{\left(\sqrt{3}+1\right)^2}{\left(\sqrt{3}\right)^2-(1)^2} = \frac{3+1+2\sqrt{3}}{3-1}$$

$$= \frac{4+2\sqrt{3}}{2} = 2+\sqrt{3}$$

Similarly, $y = 2-\sqrt{3}$

$\therefore x + y = 2+\sqrt{3}+2-\sqrt{3} = 4$

$x - y$

$$= \left(2+\sqrt{3}\right)-\left(2-\sqrt{3}\right) = 2\sqrt{3}$$

$xy = \left(2+\sqrt{3}\right)\left(2-\sqrt{3}\right)$

$= 4 - 3 = 1$

Hence, $x^2 + xy - y^2$

$= x^2 - y^2 + xy$

$= (x + y)(x - y) + xy$

$= 4 \times 2\sqrt{3} + 1 = 8\sqrt{3} + 1$

18. (3) We have

$$x = \frac{\sqrt{a+2b}+\sqrt{a-2b}}{\sqrt{a+2b}-\sqrt{a-2b}} \times \frac{\sqrt{a+2b}+\sqrt{a-2b}}{\sqrt{a+2b}+\sqrt{a-2b}}$$

$$= \frac{\left(\sqrt{a+2b}+\sqrt{a-2b}\right)^2}{\left(\sqrt{a+2b}\right)^2-\left(\sqrt{a-2b}\right)^2}$$

$$= \frac{a+2b+a-2b+2\sqrt{a+2b}\sqrt{a-2b}}{(a+2b)-(a-2b)}$$

$$= \frac{2a+2\sqrt{a^2-4b^2}}{4b}$$

$$\therefore x = \frac{a+\sqrt{a^2-4b^2}}{2b}$$

$\Rightarrow 2bx = a + \sqrt{a^2 - 4b^2}$

$\Rightarrow 2bx - a = \sqrt{a^2 - 4b^2}$

$\Rightarrow (2bx - a)^2 = \left(\sqrt{a^2-4b^2}\right)^2$

[On squaring both sides]

$\Rightarrow 4b^2x^2 + a^2 - 4abx$
$= a^2 - 4b^2$

$\Rightarrow 4b^2x^2 - 4abx + 4b^2 = 0$

$\Rightarrow 4b(bx^2 - ax + b) = 0$

$\Rightarrow bx^2 - ax + b = 0$

19. (4) $a = \dfrac{1}{3+2\sqrt{2}}$

$$= \frac{1}{3+2\sqrt{2}} \times \frac{3-2\sqrt{2}}{3-2\sqrt{2}}$$

$$= \frac{3-2\sqrt{2}}{(3)^2-\left(2\sqrt{2}\right)^2}$$

$$= \frac{3-2\sqrt{2}}{9-8} = 3-2\sqrt{2}$$

$$b = \frac{1}{3-2\sqrt{2}} \times \frac{3+2\sqrt{2}}{3+2\sqrt{2}}$$

$$= \frac{3+2\sqrt{2}}{(3)^2-\left(2\sqrt{2}\right)^2}$$

$$= \frac{3+2\sqrt{2}}{9-8} = 3+2\sqrt{2}$$

Now, $a^2b + ab^2 = ab(a + b)$

$\therefore a + b$

$= 3 - 2\sqrt{2} + 3 + 2\sqrt{2} = 6$

and, $ab = \left(3-2\sqrt{2}\right)\left(3+2\sqrt{2}\right)$

$= 9 - 8 = 1$

Hence, $a^2b + ab^2 = ab(a + b)$

$= 1 \times 6 = 6$

20. (1) $x = \sqrt{\dfrac{5+2\sqrt{6}}{5-2\sqrt{6}}}$

On rationalising, we have

$$x = \sqrt{\frac{5+2\sqrt{6}}{5-2\sqrt{6}} \times \frac{5+2\sqrt{6}}{5+2\sqrt{6}}}$$

$$= \sqrt{\frac{\left(5+2\sqrt{6}\right)^2}{(5)^2-\left(2\sqrt{6}\right)^2}}$$

$$= \sqrt{\frac{\left(5+2\sqrt{6}\right)^2}{25-24}} = 5+2\sqrt{6}$$

$\therefore x^2 (x - 10)^2$

$$= \left(5+2\sqrt{6}\right)^2\left(5+2\sqrt{6}-10\right)^2$$

$$= \left(5+2\sqrt{6}\right)^2\left(2\sqrt{6}-5\right)^2$$

$$= \left(25+24+20\sqrt{6}\right)\left(24+25-20\sqrt{6}\right)$$

$$= \left(49+20\sqrt{6}\right)\left(49-20\sqrt{6}\right)$$

$$= (49)^2 - \left(20\sqrt{6}\right)^2$$

$= 2401 - 2400 = 1$

21. (2) Here, $x = 5 - \sqrt{24}$

$$\therefore \frac{1}{x} = \frac{1}{5-\sqrt{24}}$$

$$= \frac{1}{5-\sqrt{24}} \times \frac{5+\sqrt{24}}{5+\sqrt{24}}$$

$$= \frac{5+\sqrt{24}}{25-24} = 5+\sqrt{24}$$

$$\therefore x^3 + \frac{1}{x^3}$$

$$= \left(x+\frac{1}{x}\right)^3 - 3\left(x+\frac{1}{x}\right)$$

$$= \left(5-\sqrt{24}+5+\sqrt{24}\right)^3$$

$$-3\left(5-\sqrt{24}+5+\sqrt{24}\right)$$

$= 10^3 - 3 \times 10$

$= 1000 - 30 = 970$

$$x^2 + \frac{1}{x^2} = \left(x+\frac{1}{x}\right)^2 - 2$$

$$= \left(5-\sqrt{24}+5+\sqrt{24}\right)^2 - 2$$

$= 100 - 2 = 98$

$$x + \frac{1}{x}$$

$$= 5-\sqrt{24}+5+\sqrt{24} = 10$$

$\therefore$ The given expression

$= 970 - 10 \times 98 + 4 \times 10 - 30$

$= 970 - 980 + 40 - 30 = 0$

22. (3) $a + bp^{\frac{1}{3}} + cp^{\frac{2}{3}} = 0$ --(i)

On multiplying both sides by $p^{\frac{1}{3}}$,

$ap^{\frac{1}{3}} + bp^{\frac{2}{3}} + cp = 0$ ...(ii)

Equation (i) $\times b$ – (ii) $\times c$,

$$\left(ab + b^2p^{\frac{1}{3}} + bc\,p^{\frac{2}{3}}\right) -$$

$$\left(acp^{\frac{1}{3}} + bc\,p^{\frac{2}{3}} + c^2p\right) = 0$$

$$\Rightarrow \left(b^2 - ac\right)p^{\frac{1}{3}} + ab - c^2p = 0$$

$\Rightarrow b^2 - ac = 0$ and $ab - c^2p = 0$

$\Rightarrow b^2 = ac$ and $ab = c^2p$

$\Rightarrow b^2 = ac$ and $a^2b^2 = c^4p^2$

$\Rightarrow a^2(ac) = c^4p^2$

$\Rightarrow a^3c - p^2c^4 = 0$

$\Rightarrow (a^3 - p^2c^3)\,c = 0$

$\Rightarrow a^3 - p^2c^3 = 0$ or $c = 0$

$a^3 - p^2c^3 = 0$

$$p^2 = \frac{a^3}{c^3} \Rightarrow \left(p^2\right)^{\frac{1}{3}} = \frac{a}{c}$$

$$\Rightarrow \left(p^{\frac{1}{3}}\right)^{\frac{1}{2}} = \frac{a}{c}$$, which is impossible as $(p)^{\frac{1}{3}}$ is irrational.

$\therefore\ c = 0$

Putting $c = 0$ in $b^2 = ac$,

$b = 0$

$$\therefore\ a + bp^{\frac{1}{3}} + cp^{\frac{2}{3}} = 0$$

$\Rightarrow a = 0$

$\therefore\ a = b = c = 0$

23. (4) Let $x = \sqrt{3\sqrt{3\sqrt{3\sqrt{3\sqrt{3}}}}}$

On squaring both sides, we have,

$$\Rightarrow x^2 = 3\sqrt{3\sqrt{3\sqrt{3\sqrt{3}}}}$$

On squaring again,

$$\Rightarrow x^4 = 3^2 \times 3\sqrt{3\sqrt{3\sqrt{3}}}$$

On squaring again,

$$\Rightarrow x^8 = 3^4 \times 3^2 \times 3\sqrt{3\sqrt{3}}$$

On squaring again, $\Rightarrow x^{16}$

$$= 3^8 \times 3^4 \times 3^2 \times 3\sqrt{3}$$

On squaring again

$\Rightarrow x^{32} = 3^{16} \times 3^8 \times 3^4 \times 3^2 \times 3$

$x^{32} = 3^{16+8+4+2+1}$

$\Rightarrow x^{32} = 3^{31}$

$$\Rightarrow x = \left(3^{31}\right)^{\frac{1}{32}} = 3^{\frac{31}{32}}$$

24. (1) The given expression

$$\sqrt{\sqrt[3]{0.000001 \times x}} = 0.5$$

$$\Rightarrow \left(\sqrt[3]{0.000001 \times x}\right)^{\frac{1}{2}} = 0.5$$

$$\Rightarrow \left(0.000001 \times x\right)^{\frac{1}{2}\times\frac{1}{3}} = 0.5$$

$$\Rightarrow \left(0.000001 \times x\right)^{\frac{1}{6}} = 0.5$$

$$\Rightarrow \left(10^{-6} \times x\right)^{\frac{1}{6}} = 0.5$$

$$\Rightarrow 10^{-1} \times x^{\frac{1}{6}} = 0.5$$

$$\Rightarrow x^{\frac{1}{6}} = \frac{0.5}{0.1} = 5$$

$\Rightarrow x = 5^6 = 15625$

25. (3) Here,

$$x = \sqrt{5 + \sqrt{5 + \sqrt{5 + \ldots\infty}}}$$

On squaring we have $x^2 = 5 + x$ ....(*i*)

and, $y = \sqrt{5 - \sqrt{5 - \sqrt{5 - \ldots\infty}}}$

$\therefore\ y^2 = 5 - y$ ...(*ii*)

From equations (*i*) and (*ii*)

$x^2 - x = y^2 + y$

$\Rightarrow x^2 - y^2 = x + y$

$\Rightarrow (x + y)(x - y) = (x + y)$

$\Rightarrow (x + y)(x - y) - (x + y) = 0$

$\Rightarrow (x + y)(x - y - 1) = 0$

Thus, either $x + y = 0$ or, $(x - y - 1) = 0$

or, $x = -y$ or, $x = y + 1$

26. (4) We have

$$x = \frac{1}{2 - \sqrt{3}}$$

$$= \frac{1}{2 - \sqrt{3}} \times \frac{2 + \sqrt{3}}{2 + \sqrt{3}}$$

$$= \frac{2 + \sqrt{3}}{2^2 - \left(\sqrt{3}\right)^2}$$

$$= \frac{2 + \sqrt{3}}{4 - 3} = 2 + \sqrt{3}$$

Now, $x = 2 + \sqrt{3}$

$\Rightarrow x - 2 = \sqrt{3}$

$\Rightarrow (x - 2)^2 = \left(\sqrt{3}\right)^2$

$\Rightarrow x^2 - 4x + 4 = 3$

$\Rightarrow x^2 - 4x + 1 = 0$ ....(*i*)

Now,

$x^2 - 4x + 1\ \big)\ x^3 - 2x^2 - 7x + 5\ \big(x + 2$

$x^3 - 4x + x$

$-\quad +\quad -$

$2x^2 - 8x + 5$

$2x^2 - 8x + 2$

$-\quad +\quad -$

3

$\therefore\ x^3 - 2x^2 - 7x + 5 = (x + 2)(x^2 - 4x + 1) + 3$

$= (x + 2) \times 0 + 3 = 3$

27. (1) $5 + 2\sqrt{6} = 3 + 2 + 2\sqrt{3}\sqrt{2}$

$$= \left(\sqrt{3}\right)^2 + \left(\sqrt{2}\right)^2 + 2 \times \sqrt{3} \times \sqrt{2}$$

$$= \left(\sqrt{3} + \sqrt{2}\right)^2$$

$$\therefore\ \sqrt{5 + 2\sqrt{6}}$$

$$= \sqrt{\left(\sqrt{3} + \sqrt{2}\right)^2} = \sqrt{3} + \sqrt{2}$$

Note : Express the given number in the form of

$x + y + 2\sqrt{xy}$

$$= \left(\sqrt{x}\right)^2 + \left(\sqrt{y}\right)^2 + 2\sqrt{x} \times \sqrt{y}$$

$$= \left(\sqrt{x} + \sqrt{y}\right)^2$$

28. (2) $14\sqrt{5} - 30$

$$= \sqrt{5}\left(14 - 6\sqrt{5}\right)$$

$$= \sqrt{5}\left(14 - 2 \times 3 \times \sqrt{5}\right)$$

$$= \sqrt{5}\left(9 + 5 - 2 \times \sqrt{9} \times \sqrt{5}\right)$$

$$= \sqrt{5}\left[\left(\sqrt{9}\right)^2 + \left(\sqrt{5}\right)^2 - 2\sqrt{9}\sqrt{5}\right]$$

$$= \sqrt{5}\left(3-\sqrt{5}\right)^2$$

$$\therefore \sqrt{14\sqrt{5}-30}$$

$$= \sqrt{\sqrt{5}\left(3-\sqrt{5}\right)^2} = \sqrt[4]{5}\left(3-\sqrt{5}\right)$$

29. (3) Let the required value be x, i.e.,

$$x = \frac{2\left(\sqrt{2}+\sqrt{6}\right)}{3\sqrt{2+\sqrt{3}}} \text{ then,}$$

$$x^2 = \left[\frac{2\left(\sqrt{2}+\sqrt{6}\right)}{3\sqrt{2+\sqrt{3}}}\right]^2$$

$$x^2 = \frac{4\left(\sqrt{2}+\sqrt{6}\right)^2}{\left(3\sqrt{2+\sqrt{3}}\right)^2}$$

$$\Rightarrow x^2 = \frac{4\left(\sqrt{2}+\sqrt{6}\right)^2}{9\left(2+\sqrt{3}\right)}$$

$$x^2 = \frac{4\left(2+6+2\times\sqrt{2}\times\sqrt{6}\right)}{9\left(2+\sqrt{3}\right)}$$

$$\Rightarrow x^2 = \frac{4\left(8+2\sqrt{12}\right)}{9\left(2+\sqrt{3}\right)}$$

$$x^2 = \frac{4\left(8+2\sqrt{2^2\times 3}\right)}{9\left(2+\sqrt{3}\right)}$$

$$\Rightarrow x^2 = \frac{4\left(8+4\sqrt{3}\right)}{9\left(2+\sqrt{3}\right)}$$

$$x^2 = \frac{16\left(2+\sqrt{3}\right)}{9\left(2+\sqrt{3}\right)} = \frac{16}{9}$$

$$\Rightarrow x = \frac{4}{3}$$

30. (4) $\sqrt{\left(\frac{6+2\sqrt{3}}{33-19\sqrt{3}}\right)}$

$$= \sqrt{\frac{\sqrt{3}\left(2\sqrt{3}+2\right)}{\sqrt{3}\left(11\sqrt{3}-19\right)}}$$

$$= \sqrt{\frac{2\left(\sqrt{3}+1\right)\left(11\sqrt{3}+19\right)}{\left(11\sqrt{3}-19\right)\left(11\sqrt{3}+19\right)}}$$

$$= \sqrt{\frac{2\left(33+19\sqrt{3}+11\sqrt{3}+19\right)}{\left(11\sqrt{3}\right)^2-(19)^2}}$$

$$= \sqrt{\frac{2\left(52+30\sqrt{3}\right)}{363-361}}$$

$$= \sqrt{52+30\sqrt{3}}$$

$$= \sqrt{52+2\times 15\times\sqrt{3}}$$

$$= \sqrt{52+2\times\sqrt{225}\times\sqrt{3}}$$

$$= \sqrt{52+2\times\sqrt{225\times 3}}$$

$$= \sqrt{52+2\times\sqrt{25\times 9\times 3}}$$

$$= \sqrt{25+27+2\times\sqrt{25}\times\sqrt{27}}$$

$$= \sqrt{\left(\sqrt{25}+\sqrt{27}\right)^2}$$

$$= \sqrt{25}+\sqrt{27} = 5+3\sqrt{3}$$

31. (1) It will be convenient to solve this problem part-wise.

Let, $x = \dfrac{\sqrt{\sqrt{5}+2}+\sqrt{\sqrt{5}-2}}{\sqrt{\sqrt{5}+1}}$

Then,

$$x^2 = \left[\frac{\sqrt{\sqrt{5}+2}+\sqrt{\sqrt{5}-2}}{\sqrt{\sqrt{5}+1}}\right]^2$$

$$= \frac{\left[\sqrt{\sqrt{5}+2}+\sqrt{\sqrt{5}-2}\right]^2}{\left[\sqrt{\sqrt{5}+1}\right]^2}$$

$$= \frac{\sqrt{5}+2+\sqrt{5}-2+2\sqrt{\sqrt{5}+2}\sqrt{\sqrt{5}-2}}{\sqrt{5}+1}$$

$$= \frac{2\sqrt{5}+2\sqrt{\left(\sqrt{5}\right)^2-(2)^2}}{\sqrt{5}+1}$$

$$= \frac{2\sqrt{5}+2\sqrt{5-4}}{\sqrt{5}+1}$$

$$= \frac{2\sqrt{5}+2}{\sqrt{5}+1} = \frac{2\left(\sqrt{5}+1\right)}{\sqrt{5}+1} = 2$$

$x^2 = 2$

$\therefore x = \sqrt{2}$

Also,

$$\sqrt{3-2\sqrt{2}}$$

$$= \sqrt{2+1-2\times\sqrt{2}\times 1}$$

$$= \sqrt{\left(\sqrt{2}\right)^2+(1)^2-2\times\sqrt{2}\times 1}$$

$$= \sqrt{\left(\sqrt{2}-1\right)^2} = \sqrt{2}-1$$

Hence,

$$\frac{\sqrt{\sqrt{5}+2}+\sqrt{\sqrt{5}-2}}{\sqrt{\sqrt{5}+1}} - \sqrt{3-2\sqrt{2}}$$

$$= \sqrt{2}-\left(\sqrt{2}-1\right) = 1$$

32. (2)

$$\frac{4\sqrt{3}}{2-\sqrt{2}} - \frac{30}{4\sqrt{3}-\sqrt{18}} - \frac{\sqrt{18}}{3-2\sqrt{3}}$$

On rationalising the denominators of each term, we get

$$= \frac{4\sqrt{3}\left(2+\sqrt{2}\right)}{\left(2-\sqrt{2}\right)\left(2+\sqrt{2}\right)}$$

$$-\frac{30\left(4\sqrt{3}+\sqrt{18}\right)}{\left(4\sqrt{3}-\sqrt{18}\right)\left(4\sqrt{3}+\sqrt{18}\right)}$$

$$-\frac{\sqrt{18}\left(3+2\sqrt{3}\right)}{\left(3-2\sqrt{3}\right)\left(3+2\sqrt{3}\right)}$$

$$=\frac{4\sqrt{3}\left(2+\sqrt{2}\right)}{(2)^2-\left(\sqrt{2}\right)^2}-\frac{30\left(4\sqrt{3}+\sqrt{18}\right)}{\left(4\sqrt{3}\right)^2-\left(\sqrt{18}\right)^2}$$

$$-\frac{\sqrt{18}\left(3+2\sqrt{3}\right)}{(3)^2-\left(2\sqrt{3}\right)^2}$$

$[\because (a+b)(a-b)=a^2-b^2]$

$$=\frac{4\sqrt{3}\left(2+\sqrt{2}\right)}{4-2}$$

$$-\frac{30\left(4\sqrt{3}+\sqrt{18}\right)}{48-18}-\frac{\sqrt{18}\left(3+2\sqrt{3}\right)}{9-12}$$

$$=\frac{4\sqrt{3}\left(2+\sqrt{2}\right)}{2}-\frac{30\left(4\sqrt{3}+\sqrt{9\times2}\right)}{30}$$

$$-\frac{\sqrt{9\times2}\left(3+2\sqrt{3}\right)}{-3}$$

$$=2\sqrt{3}\left(2+\sqrt{2}\right)-\left(4\sqrt{3}+3\sqrt{2}\right)$$

$$-\frac{3\sqrt{2}\left(3+2\sqrt{3}\right)}{-3}$$

$$=\frac{4\sqrt{3}\left(2+\sqrt{2}\right)}{2}-\frac{30\left(4\sqrt{3}+\sqrt{9\times2}\right)}{30}$$

$$-\frac{\sqrt{9\times2}\left(3+2\sqrt{3}\right)}{-3}$$

$$=2\sqrt{3}\left(2+\sqrt{2}\right)-\left(4\sqrt{3}+3\sqrt{2}\right)$$

$$-\frac{3\sqrt{2}\left(3+2\sqrt{3}\right)}{-3}$$

$$=4\sqrt{3}+2\sqrt{6}-4\sqrt{3}-3\sqrt{2}+3\sqrt{2}+2\sqrt{6}$$

$$=2\sqrt{6}+2\sqrt{6}=4\sqrt{6}$$

33. (3) The given expression consists of three parts. Now, we solve each part separately.

Part I $=\dfrac{1}{\sqrt{11-2\sqrt{30}}}$

or $\sqrt{\dfrac{1}{\left(11-2\sqrt{30}\right)}}$

On rationalising the denominator by its conjugate we have expression

$$=\sqrt{\frac{1\times\left(11+2\sqrt{30}\right)}{\left(11-2\sqrt{30}\right)\left(11+2\sqrt{30}\right)}}$$

$$=\sqrt{\frac{11+2\sqrt{30}}{(11)^2-\left(2\sqrt{30}\right)^2}}$$

$[\because (a+b)(a-b)=a^2-b^2]$

$$=\sqrt{\frac{11+2\sqrt{30}}{121-120}}$$

$$=\sqrt{11+2\sqrt{30}}$$

$$=\sqrt{11+2\times\sqrt{6}\times\sqrt{5}}$$

$$=\sqrt{6+5+2\times\sqrt{6}\times\sqrt{5}}$$

$$=\sqrt{\left(\sqrt{6}\right)^2+\left(\sqrt{5}\right)^2+2\times\sqrt{6}\times\sqrt{5}}$$

$$=\sqrt{\left(\sqrt{6}+\sqrt{5}\right)^2}=\sqrt{6}+\sqrt{5}$$

$[\because a^2+b^2+2ab=(a+b)^2]$

Part II

$$=\frac{3}{\sqrt{7-2\sqrt{10}}}=\sqrt{\frac{9}{7-2\sqrt{10}}}$$

$$=\sqrt{\frac{9\times\left(7+2\sqrt{10}\right)}{\left(7-2\sqrt{10}\right)\left(7+2\sqrt{10}\right)}}$$

$$=\sqrt{\frac{9\times\left(7+2\sqrt{10}\right)}{7^2-\left(2\sqrt{10}\right)^2}}$$

$$=\sqrt{\frac{9\times\left(7+2\sqrt{10}\right)}{49-40}}$$

$$=\sqrt{\frac{9\times\left(7+2\sqrt{10}\right)}{9}}$$

$$=\sqrt{7+2\sqrt{10}}$$

$$=\sqrt{7+2\times\sqrt{5}\times\sqrt{2}}$$

$$=\sqrt{5+2+2\times\sqrt{5}\times\sqrt{2}}$$

$$=\sqrt{\left(\sqrt{5}\right)^2+\left(\sqrt{2}\right)^2+2\times\sqrt{5}\times\sqrt{2}}$$

$$=\sqrt{\left(\sqrt{5}+\sqrt{2}\right)^2}=\sqrt{5}+\sqrt{2}$$

Part III

$$=\frac{4}{\sqrt{8+4\sqrt{3}}}=\sqrt{\frac{16}{8+4\sqrt{3}}}$$

$$=\sqrt{\frac{16\times\left(8-4\sqrt{3}\right)}{\left(8+4\sqrt{3}\right)\left(8-4\sqrt{3}\right)}}$$

$$=\sqrt{\frac{16\times\left(8-4\sqrt{3}\right)}{8^2-\left(4\sqrt{3}\right)^2}}$$

$$=\sqrt{\frac{16\times\left(8-4\sqrt{3}\right)}{64-48}}$$

$$=\sqrt{\frac{16\times\left(8-4\sqrt{3}\right)}{16}}$$

$$=\sqrt{8-4\sqrt{3}}$$

$$=\sqrt{8-2\times2\times\sqrt{3}}$$

$$=\sqrt{8-2\times\sqrt{2\times2\times3}}$$

$$=\sqrt{8-2\times\sqrt{6}\times\sqrt{2}}$$

$$=\sqrt{6+2-2\times\sqrt{6}\times\sqrt{2}}$$

$$=\sqrt{\left(\sqrt{6}\right)^2+\left(\sqrt{2}\right)^2-2\times\sqrt{6}\times\sqrt{2}}$$

$$=\sqrt{\left(\sqrt{6}-\sqrt{2}\right)^2}=\sqrt{6}-\sqrt{2}$$

Hence, the given expression
= Part I – Part II – Part III

$$=\left(\sqrt{6}+\sqrt{5}\right)-\left(\sqrt{5}+\sqrt{2}\right)-\left(\sqrt{6}-\sqrt{2}\right)$$

$$=\sqrt{6}+\sqrt{5}-\sqrt{5}-\sqrt{2}-\sqrt{6}+\sqrt{2}=0$$

34. (1) $\dfrac{\sqrt{4-\sqrt{7}}}{\sqrt{8+3\sqrt{7}}-2\sqrt{2}}$

$$=\frac{\sqrt{8-2\sqrt{7}}}{\sqrt{16+6\sqrt{7}-4}}$$

[On Multiplying Numerator and Denominator by $\sqrt{2}$]

$$=\frac{\sqrt{7+1-2\times\sqrt{7}\times1}}{\sqrt{16+2\times3\times\sqrt{7}-4}}$$

$$=\frac{\sqrt{\left(\sqrt{7}\right)^2+1-2\times\sqrt{7}\times1}}{\sqrt{9+7+2\times3\times\sqrt{7}-4}}$$

$$=\frac{\sqrt{\left(\sqrt{7}-1\right)^2}}{\sqrt{\left(3+\sqrt{7}\right)^2-4}}$$

$$=\frac{\sqrt{7}-1}{3+\sqrt{7}-4}=\frac{\sqrt{7}-1}{\sqrt{7}-1}=1$$

35. (2) It will be convenient to solve the given problem part-wise.

Part I $=\left(28+10\sqrt{3}\right)^{\frac{1}{2}}$

$$=\left(28+2\times5\times\sqrt{3}\right)^{\frac{1}{2}}$$

$$=\left(28+2\times\sqrt{25}\times\sqrt{3}\right)^{\frac{1}{2}}$$

$$=\left(25+3+2\times\sqrt{25}\times\sqrt{3}\right)^{\frac{1}{2}}$$

$$=\left[(5)^2+\left(\sqrt{3}\right)^2+2\times\sqrt{25}\times\sqrt{3}\right]^{\frac{1}{2}}$$

$$=\left[\left(5+\sqrt{3}\right)^2\right]^{\frac{1}{2}}=5+\sqrt{3}$$

Part II

$$=\left(7-4\sqrt{3}\right)^{-\frac{1}{2}}$$

$$=\left(7-2\times2\times\sqrt{3}\right)^{-\frac{1}{2}}$$

$$=\left(4+3-2\times2\times\sqrt{3}\right)^{-\frac{1}{2}}$$

$$=\left[(2)^2+\left(\sqrt{3}\right)^2-2\times2\times\sqrt{3}\right]^{-\frac{1}{2}}$$

$$=\left[\left(2-\sqrt{3}\right)^2\right]^{-\frac{1}{2}}$$

$$=\left(2-\sqrt{3}\right)^{2\times-\frac{1}{2}}$$

$$=\left(2-\sqrt{3}\right)^{-1}=\frac{1}{\left(2-\sqrt{3}\right)}$$

$$=\frac{1\times\left(2+\sqrt{3}\right)}{\left(2-\sqrt{3}\right)\left(2+\sqrt{3}\right)}$$

$$=\frac{\left(2+\sqrt{3}\right)}{4-3}=2+\sqrt{3}$$

Hence, our given expression
= Part I – Part II

$$=\left(5+\sqrt{3}\right)-\left(2+\sqrt{3}\right)$$

$$=5+\sqrt{3}-2-\sqrt{3}=3$$

36. (3) Part I = $(28-10\sqrt{3})^{\frac{1}{2}}$

$$=\left(25+3-2\times5\times\sqrt{3}\right)^{\frac{1}{2}}$$

$$=\left[\left(5-\sqrt{3}\right)^2\right]^{\frac{1}{2}}=5-\sqrt{3}$$

Part II $=(7+4\sqrt{3})^{-\frac{1}{2}}$

$$=\left(\frac{1}{7+4\sqrt{3}}\right)^{\frac{1}{2}}$$

$$=\left(\frac{1}{4+3+2\times2\times\sqrt{3}}\right)^{\frac{1}{2}}$$

$$=\left[\frac{1}{\left(2+\sqrt{3}\right)^2}\right]^{\frac{1}{2}}=\frac{1}{2+\sqrt{3}}$$

$$=\frac{1\times\left(2-\sqrt{3}\right)}{\left(2+\sqrt{3}\right)\left(2-\sqrt{3}\right)}$$

(on Rationalising)

$$=\frac{2-\sqrt{3}}{4-3}=2-\sqrt{3}$$

Part III

$$=\frac{\sqrt{7}}{\sqrt{16+6\sqrt{7}}-\sqrt{16-6\sqrt{7}}}$$

$$=\frac{\sqrt{7}\left(\sqrt{16+6\sqrt{7}}+\sqrt{16-6\sqrt{7}}\right)}{\left(\sqrt{16+6\sqrt{7}}-\sqrt{16-6\sqrt{7}}\right)}$$

$$\left(\sqrt{16+6\sqrt{7}}+\sqrt{16-6\sqrt{7}}\right)$$

$$=\frac{\sqrt{7}\left(\sqrt{16+6\sqrt{7}}+\sqrt{16-6\sqrt{7}}\right)}{\left(16+6\sqrt{7}\right)-\left(16-6\sqrt{7}\right)}$$

$$=\frac{\sqrt{7}\left(\begin{array}{l}\sqrt{9+7+2\times3\times\sqrt{7}}\\+\sqrt{9+7-2\times3\times\sqrt{7}}\end{array}\right)}{16+6\sqrt{7}-16+6\sqrt{7}}$$

$$=\frac{\sqrt{7}\left(\sqrt{\left(3+\sqrt{7}\right)^2}+\sqrt{\left(3-\sqrt{7}\right)^2}\right)}{12\sqrt{7}}$$

$$=\frac{3+\sqrt{7}+3-\sqrt{7}}{12}=\frac{1}{2}$$

Hence the given expression = Part I – Part II + Part III

$$=\left(5-\sqrt{3}\right)-\left(2-\sqrt{3}\right)+\frac{1}{2}$$

$$= 5-\sqrt{3}-2+\sqrt{3}+\frac{1}{2}$$

$$= 5-2+\frac{1}{2} = 3+\frac{1}{2} = 3\frac{1}{2}$$

37. (4) Part I

$$= \frac{26-15\sqrt{3}}{\left[5\sqrt{2}-\sqrt{38+5\sqrt{3}}\right]^2}$$

$$= \frac{26-15\sqrt{3}}{\left(5\sqrt{2}\right)^2+\left(\sqrt{38+5\sqrt{3}}\right)^2-}$$

$$2\times 5\sqrt{2}\times\sqrt{38+5\sqrt{3}}$$

$[\because (a-b)^2 = a^2+b^2-2ab]$

$$= \frac{26-15\sqrt{3}}{50+38+5\sqrt{3}-10\sqrt{76+10\sqrt{3}}}$$

$$= \frac{26-15\sqrt{3}}{88+5\sqrt{3}-10\sqrt{76+10\sqrt{3}}}$$

$$= \frac{26-15\sqrt{3}}{88+5\sqrt{3}-10\sqrt{75+1+2\times 5\sqrt{3}\times 1}}$$

$$= \frac{26-15\sqrt{3}}{88+5\sqrt{3}-10\sqrt{\left(5\sqrt{3}+1\right)^2}}$$

$$= \frac{26-15\sqrt{3}}{88+5\sqrt{3}-10\left(5\sqrt{3}+1\right)}$$

$$= \frac{26-15\sqrt{3}}{88+5\sqrt{3}-50\sqrt{3}-10}$$

$$= \frac{26-15\sqrt{3}}{78-45\sqrt{3}}$$

$$= \frac{26-15\sqrt{3}}{3\left(26-15\sqrt{3}\right)} = \frac{1}{3}$$

Part II

$$= \frac{\sqrt{10}+\sqrt{18}}{\sqrt{8}+\sqrt{\left(\sqrt{3}-\sqrt{5}\right)}}$$

[Rationalising the denominator]

$$= \frac{\left(\sqrt{10}+\sqrt{18}\right)\left(\sqrt{8}-\sqrt{3-\sqrt{5}}\right)}{\left(\sqrt{8}+\sqrt{3-\sqrt{5}}\right)\left(\sqrt{8}-\sqrt{3-\sqrt{5}}\right)}$$

$$= \frac{\left(\sqrt{10}+\sqrt{18}\right)\left(\sqrt{8}-\sqrt{3-\sqrt{5}}\right)}{\left(\sqrt{8}\right)^2-\left(\sqrt{3-\sqrt{5}}\right)^2}$$

$$= \frac{\sqrt{80}+\sqrt{8\times 18-\sqrt{30-10\sqrt{5}}} - \sqrt{54-18\sqrt{5}}}{8-3+\sqrt{5}}$$

$$= \frac{\sqrt{16\times 5}+\sqrt{12\times 12} - \sqrt{25+5-2\times 5\times\sqrt{5}} - \sqrt{9\left(6-2\sqrt{5}\right)}}{5+\sqrt{5}}$$

$$= \frac{4\sqrt{5}+12-\sqrt{(5)^2+\left(\sqrt{5}\right)^2-2\times 5\times\sqrt{5}} - 3\sqrt{5+1-2\times\sqrt{5}\times 1}}{5+\sqrt{5}}$$

$$= \frac{4\sqrt{5}+12-\sqrt{\left(5-\sqrt{5}\right)^2} - 3\sqrt{\left(\sqrt{5}-1\right)^2}}{5+\sqrt{5}}$$

$$= \frac{4\sqrt{5}+12-\left(5-\sqrt{5}\right)-3\left(\sqrt{5}-1\right)}{5+\sqrt{5}}$$

$$= \frac{4\sqrt{5}+12-5+\sqrt{5}-3\sqrt{5}+3}{5+\sqrt{5}}$$

$$= \frac{10+2\sqrt{5}}{5+\sqrt{5}} = \frac{2\left(5+\sqrt{5}\right)}{\left(5+\sqrt{5}\right)} = 2$$

Hence the given expression = Part I + Part II

$$= \frac{1}{3}+2 = 2\frac{1}{3}$$

38. (1) The given expression

$$= \sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{7+4\sqrt{3}}}}$$

$$= \sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{(2)^2+\left(\sqrt{3}\right)^2+2\times 2\times\sqrt{3}}}}$$

$$= \sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{\left(2+\sqrt{3}\right)^2}}}$$

$$= \sqrt{-\sqrt{3}+\sqrt{3+8\left(2+\sqrt{3}\right)}}$$

$$= \sqrt{-\sqrt{3}+\sqrt{3+16+8\sqrt{3}}}$$

$$= \sqrt{-\sqrt{3}+\sqrt{19+8\sqrt{3}}}$$

$$= \sqrt{-\sqrt{3}+\sqrt{16+3+2\times 4\times\sqrt{3}}}$$

$$= \sqrt{-\sqrt{3}+\sqrt{(4)^2+\left(\sqrt{3}\right)^2+2\times 4\times\sqrt{3}}}$$

$$= \sqrt{-\sqrt{3}+\sqrt{\left(4+\sqrt{3}\right)^2}}$$

$$= \sqrt{-\sqrt{3}+4+\sqrt{3}} = \sqrt{4} = 2$$

39. (1)

$$\left(\frac{81}{16}\right)^{-\frac{3}{4}}\times\left\{\left(\frac{25}{9}\right)^{-\frac{3}{2}}\div\left(\frac{5}{2}\right)^{-3}\right\}$$

$$= \left(\frac{16}{81}\right)^{\frac{3}{4}}\times\left\{\left(\frac{9}{25}\right)^{\frac{3}{2}}\div\left(\frac{2}{5}\right)^{3}\right\}$$

$$= \left\{\left(\frac{2}{3}\right)^{4}\right\}^{\frac{3}{4}}\times\left\{\left(\frac{3}{5}\right)^{2\times\frac{3}{2}}\div\left(\frac{2}{5}\right)^{3}\right\}$$

$$= \left(\frac{2}{3}\right)^{4\times\frac{3}{4}}\times\left\{\left(\frac{3}{5}\right)^{3}\div\left(\frac{2}{5}\right)^{3}\right\}$$

$$=\left(\frac{2}{3}\right)^3\times\left(\frac{3^3}{5^3}\times\frac{5^3}{2^3}\right)$$

$$=\frac{2^3}{3^3}\times\frac{3^3}{2^3}=1$$

40. (2)

$$\left(\frac{1}{4}\right)^{-2}-3\,(8)^{\frac{2}{3}}(4)^0+\left(\frac{9}{16}\right)^{\frac{-1}{2}}$$

$$=\left[\left(\frac{1}{2}\right)^2\right]^{-2}-3\left[(2)^3\right]^{\frac{2}{3}}\times 1+\left[\left(\frac{3}{4}\right)^2\right]^{\frac{-1}{2}}$$

$$=\left(\frac{1}{2}\right)^{-4}-3\times 2^2+\left(\frac{3}{4}\right)^{-1}$$

$$=16-12+\frac{4}{3}$$

$$=\frac{48-36+4}{3}=\frac{16}{3}=5\frac{1}{3}$$

41. (3) $\dfrac{(25)^{\frac{3}{2}}\times(243)^{\frac{3}{5}}}{(16)^{\frac{5}{4}}\times(8)^{\frac{4}{3}}}$

$$=\frac{\left(5^2\right)^{\frac{3}{2}}\times\left(3^5\right)^{\frac{3}{5}}}{\left(2^4\right)^{\frac{5}{4}}\times\left(2^3\right)^{\frac{4}{3}}}$$

$$=\frac{5^{2\times\frac{3}{2}}\times 3^{5\times\frac{3}{5}}}{2^{4\times\frac{5}{4}}\times 2^{3\times\frac{4}{3}}}=\frac{5^3\times 3^3}{2^5\times 2^4}$$

$$=\frac{125\times 27}{32\times 16}=\frac{3375}{512}$$

42. (4) $\dfrac{16\times 2^{n+1}-4\times 2^n}{16\times 2^{n+2}-2\times 2^{n+2}}$

$$=\frac{2^4\times 2^{n+1}-2^2\times 2^n}{2^4\times 2^{n+2}-2\times 2^{n+2}}$$

$$=\frac{2^{n+5}-2^{n+2}}{2^{n+6}-2^{n+3}}$$

$$=\frac{2^{n+5}-2^{n+2}}{2\times 2^{n+5}-2\times 2^{n+2}}$$

$$=\frac{2^{n+5}-2^{n+2}}{2\left(2^{n+5}-2^{n+2}\right)}=\frac{1}{2}$$

43. (3) $\dfrac{\left(x^{a+b}\right)^2\left(x^{b+c}\right)^2\left(x^{c+a}\right)^2}{\left(x^a x^b x^c\right)^4}$

$$=\frac{x^{2(a+b)}.x^{2(b+c)}.x^{2(c+a)}}{(x^a)^4(x^b)^4(x^c)^4}$$

$$=\frac{x^{2a+2b}.x^{2b+2c}.x^{2c+2a}}{x^{4a}.x^{4b}.x^{4c}}$$

$$=\frac{x^{2a+2b+2b+2c+2c+2a}}{x^{4a+4b+4c}}$$

$$=\frac{x^{4a+4b+4c}}{x^{4a+4b+4c}}=1$$

44. (2) $25^{x-1}=5^{2x-1}-100$

$\Rightarrow (5^2)^{x-1}=5^{2x-1}-100$

$\Rightarrow 5^{2x-2}-5^{2x-1}=-100$

$\Rightarrow 5^{2x-2}-5^{2x-2}\times 5^1=-100$

$\Rightarrow 5^{2x-2}(1-5)=-100$

$\Rightarrow 5^{2x-2}\times -4=-100$

$\Rightarrow 5^{2x-2}=25$

$\Rightarrow 5^{2x-2}=5^2$

On equating the indices, we have,

$\Rightarrow 2x-2=2$

$\Rightarrow 2x=2+2$

$\Rightarrow 2x=4$

$\therefore x=2$

45. (3) $\dfrac{9^n\times 3^2\times\left(3^{\frac{-n}{2}}\right)^{-2}-(27)^n}{3^{3m}\times 2^3}$

$$=\frac{1}{27}$$

$$\Rightarrow\frac{\left(3^2\right)^n\times 3^2\times 3^{-\frac{n}{2}\times -2}-\left(3^3\right)^n}{3^{3m}\times 2^3}$$

$$=\frac{1}{27}$$

$$\Rightarrow\frac{3^{2n}\times 3^2\times 3^n-3^{3n}}{3^{3m}\times 2^3}=\frac{1}{27}$$

$$\Rightarrow\frac{3^{2n+2+n}-3^{3n}}{3^{3m}\times 2^3}=\frac{1}{27}$$

$$\Rightarrow\frac{3^{3n+2}-3^{3n}}{3^{3m}\times 2^3}=\frac{1}{27}$$

$$\Rightarrow\frac{3^{3n}\left(3^2-1\right)}{3^{3m}\times 2^3}=\frac{1}{27}$$

$$\Rightarrow\frac{3^{3n}\times 8}{3^{3m}\times 8}=\frac{1}{27}$$

$$\Rightarrow 3^{3n-3m}=\frac{1}{3^3}$$

$\Rightarrow 3^{3n-3m}=3^{-3}$

(On equating the exponents)

$\Rightarrow 3n-3m=-3$

$\Rightarrow n-m=-1$

$\Rightarrow m-n=1$

46. (4) $\dfrac{a^{-1}}{a^{-1}+b^{-1}}+\dfrac{a^{-1}}{a^{-1}-b^{-1}}$

$$=\frac{\frac{1}{a}}{\frac{1}{a}+\frac{1}{b}}+\frac{\frac{1}{a}}{\frac{1}{a}-\frac{1}{b}}$$

$$=\frac{\frac{1}{a}}{\frac{b+a}{ab}}+\frac{\frac{1}{a}}{\frac{b-a}{ab}}$$

$$=\frac{1}{a}.\frac{ab}{b+a}+\frac{1}{a}.\frac{ab}{b-a}$$

$$=\frac{b}{b+a}+\frac{b}{b-a}$$

$$=\frac{b(b-a)+b(b+a)}{(b+a)(b-a)}$$

$$=\frac{b^2-ba+b^2+ab}{b^2-a^2}$$

$$=\frac{2b^2}{b^2-a^2}$$

47. (1) $\left(\frac{x^a}{x^b}\right)^{\frac{1}{ab}}\left(\frac{x^b}{x^c}\right)^{\frac{1}{bc}}\left(\frac{x^c}{x^a}\right)^{\frac{1}{ac}}$

$= \left(x^{a-b}\right)^{\frac{1}{ab}}.\left(x^{b-c}\right)^{\frac{1}{bc}}.\left(x^{c-a}\right)^{\frac{1}{ac}}$

$= x^{(a-b)/ab}.x^{(b-c)/bc}.x^{(c-a)/ac}$

$= x^{\frac{1}{b}-\frac{1}{a}}.x^{\frac{1}{c}-\frac{1}{b}}.x^{\frac{1}{a}-\frac{1}{c}}$

$= x^{\frac{1}{b}-\frac{1}{a}+\frac{1}{c}-\frac{1}{b}+\frac{1}{a}-\frac{1}{c}} = x^0 = 1$

48. (4) $\left(\frac{x^a}{x^b}\right)^{a+b}\left(\frac{x^b}{x^c}\right)^{b+c}\left(\frac{x^c}{x^a}\right)^{c+a}$

$= \left(x^{a-b}\right)^{a+b}\left(x^{b-c}\right)^{b+c}\left(x^{c-a}\right)^{c+a}$

$= x^{(a-b)(a+b)}.x^{(b-c)(b+c)}.x^{(c-a)(c+a)}$

$= x^{a^2-b^2}.x^{b^2-c^2}.x^{c^2-a^2}$

$= x^{a^2-b^2+b^2-c^2+c^2-a^2} = x^0 = 1$

49. (3)

$\left(\frac{x^a}{x^b}\right)^{a^2+ab+b^2}\left(\frac{x^b}{x^c}\right)^{b^2+bc+c^2}$

$\left(\frac{x^c}{x^a}\right)^{c^2+ca+a^2}$

$= \left(x^{a-b}\right)^{a^2+ab+b^2}.\left(x^{b-c}\right)^{b^2+bc+c^2}$

$\left(x^{c-a}\right)^{c^2+ca+a^2}$

$= x^{(a-b)\left(a^2+ab+b^2\right)}.x^{(b-c)\left(b^2+bc+c^2\right)}$

$.x^{(c-a)\left(c^2+ca+a^2\right)}$

$= x^{a^3-b^3}.x^{b^3-c^3}.x^{c^3-a^3}$

$= x^{a^3-b^3+b^3-c^3+c^3-a^3} = x^0 = 1$

50. (1) The given expression

$= \sqrt{x^{-1}y}.\sqrt{y^{-1}z}.\sqrt{z^{-1}x}$

$= \sqrt{\frac{y}{x}}.\sqrt{\frac{z}{y}}.\sqrt{\frac{x}{z}}$

$= \left(\frac{y}{x}\right)^{\frac{1}{2}}.\left(\frac{z}{y}\right)^{\frac{1}{2}}.\left(\frac{x}{z}\right)^{\frac{1}{2}}$

$= \left(\frac{y}{x}\times\frac{z}{y}\times\frac{x}{z}\right)^{\frac{1}{2}} = 1$

51. (3) $\frac{4\sqrt{3}}{2-\sqrt{2}} = \frac{4\sqrt{3}(2+\sqrt{2})}{(2-\sqrt{2})(2+\sqrt{2})}$

$= \frac{4\sqrt{3}(2+\sqrt{2})}{4-2}$

$= 2\sqrt{3}(2+\sqrt{2}) = 4\sqrt{3}+2\sqrt{6}$

$\frac{30}{4\sqrt{3}-3\sqrt{2}}$

$= \frac{30(4\sqrt{3}+3\sqrt{2})}{(4\sqrt{3}-3\sqrt{2})(4\sqrt{3}+\sqrt{2})}$

$= \frac{30(4\sqrt{3}+3\sqrt{2})}{48-18}$

$= 4\sqrt{3}+3\sqrt{2}$

$\frac{3\sqrt{2}}{3-2\sqrt{3}} = \frac{3\sqrt{2}(3+2\sqrt{3})}{(3-2\sqrt{3})(3+2\sqrt{3})}$

$= \frac{3\sqrt{2}(3+2\sqrt{3})}{9-12}$

$= -3\sqrt{2}-2\sqrt{6}$

$\therefore$ Expression

$= 4\sqrt{3}+2\sqrt{6}-4\sqrt{3}-3\sqrt{2}+3\sqrt{2}$

$+ 2\sqrt{6}$

$= 4\sqrt{6}$

52. (3) $(10^{12}+25)^2-(10^2-25)^2 = 10^n$

$\because (a+b)^2-(a-b)^2 = 4ab$

$\therefore 4\times10^{12}\times25 = 10^n$

$\Rightarrow 10^{14} = 10^n$

$\Rightarrow n = 14$

53. (2) $\sqrt{10}+\sqrt{20}+\sqrt{40}-\sqrt{5}$

$-\sqrt{80}$

$= \sqrt{10}+\sqrt{4\times5}+\sqrt{4\times10}-$

$\sqrt{5}-\sqrt{16\times5}$

$= \sqrt{10}+2\sqrt{5}+2\sqrt{10}-\sqrt{5}-$

$4\sqrt{5}$

$= 3\sqrt{10}+\sqrt{5}-4\sqrt{5}$

$= 3\sqrt{10}-3\sqrt{5} = 3\left(\sqrt{10}-\sqrt{5}\right)$

$\therefore$ Expression $= \frac{15}{3\left(\sqrt{10}-\sqrt{5}\right)}$

$= \frac{5}{\sqrt{10}-\sqrt{5}}$

$= \frac{5\left(\sqrt{10}+\sqrt{5}\right)}{\left(\sqrt{10}-\sqrt{5}\right)\left(\sqrt{10}+\sqrt{5}\right)}$

Rationalising the denominator

$= \frac{5\left(\sqrt{10}+\sqrt{5}\right)}{10-5}$

$= \sqrt{10}+\sqrt{5} = 3.162+2.236$

$= 5.398$

54. (3) Let $\sqrt{28-10\sqrt{3}} = \sqrt{x}-\sqrt{y}$

$\Rightarrow 28-10\sqrt{3} = x+y-2\sqrt{xy}$

$\Rightarrow x+y = 28,\ xy = 75$

$\therefore (x-y)^2 = (x+y)^2-4xy$

$= 784-300=484$

$\Rightarrow x-y = 22$

$\therefore x = 25,\ y = 3$

$\Rightarrow 28-10\sqrt{3} = \sqrt{25}-\sqrt{3}$

Again, let $\sqrt{7+4\sqrt{3}} = \sqrt{x}+\sqrt{y}$

$\Rightarrow 7+4\sqrt{3} = x+y+2\sqrt{xy}$

$\Rightarrow x+y = 7,\ xy=12$

$\therefore x-y = (7)^2-4\times12=1$

$\Rightarrow x = 4,\ y = 3$

$\therefore \sqrt{7+4\sqrt{3}} = \sqrt{4}+\sqrt{3}$

Now,

$\left(28-10\sqrt{3}\right)^{\frac{1}{2}}-\left(7+4\sqrt{3}\right)^{-\frac{1}{2}}$

$= \sqrt{25}-\sqrt{3}-\frac{1}{\sqrt{4}+\sqrt{3}}$

$= \sqrt{25}-\sqrt{3}-\frac{\sqrt{4}-\sqrt{3}}{1}$

$= \sqrt{25}-\sqrt{4} = 5-2 = 3$

❑❑❑

5 AVERAGE

Importance : Concept of average is a basic concept of arithmetic and is important to solve many chapters. Specially 'average' questions are regularly asked in different competitive exams.

Scope of questions : Asked questions include Average age, Average income, Average marks/distance, arithmetic means of numbers, increase/decrease in average, minimum/maximum scope/quantity/number for certain average. Tabulation based/frequency based arithmetic means are also asked.

Way to success : Complete practice, Full concentration, Accuracy, speed and Rechecking are must for 'Average' formulae. Do calculations with care.

Rule 1 : Average of two or more numbers/quantities is called the mean of these numbers, which is given by

$$\text{Average(A)} = \frac{\text{Sum of observation / quantities}}{\text{No. of observation / quantities}}$$

$\therefore$ S = A × n

OR

$$\text{Average of numbers} = \frac{x_1 + x_2 + \ldots\ldots\ldots + x_n}{n}$$

$$\text{or, Average} = \frac{\sum_{i=1}^{n} x_i}{n}$$

Rule 2 : If the given observations (x) are occuring with certain frequency (A) then,

$$\text{Average} = \frac{A_1x_1 + A_2x_2 + \ldots\ldots + A_nx_n}{x_1 + x_2 + \ldots\ldots\ldots + x_n}$$

where, A_1, A_2, A_3. ..... A_n are frequencies

Rule 3 : The average of 'n' consecutive natural numbers starting from 1 i.e. Average of 1,2,3, ...n = $\frac{n+1}{2}$

Rule 4 : The average of squares of 'n' consecutive natural numbers starting from 1 i.e.

Average of 1^2, 2^2, 3^2, 4^2 ..... x^2 = $\frac{(n+1)(2n+1)}{6}$

Rule 5 : The average of cubes of first 'n' consecutive natural numbers i.e. Average of 1^3, 2^3, 3^3 ..... n^3 = $\frac{n(n+1)^2}{4}$

Rule 6 : The average of first 'n' consecutive even natural numbers i.e. Average of 2, 4, 6, ... 2n = (n + 1)

Rule 7 : The average of first 'n' consecutive odd natural numbers i.e. 1, 3, 5, ... (2n – 1) = n

Rule 8 : The average of certain consecutive numbers a, b, c, ... n is $\frac{a+n}{2}$

Rule 9 : The average of 1st 'n' multiples of certain numbers x = $\frac{x(1+n)}{2}$

Rule 10 : If the average of 'n_1' numbers is a_1 and the average of 'n_2' numbers is a_2, then average of total numbers n_1 and n_2 is Average = $\frac{n_1a_1 + n_2a_2}{n_1 + n_2}$

Rule 11 : If A goes from P to Q with speed x km/h and returns from Q to P with speed y km/h, then the average speed of total journey is

$$\text{Average speed} = \frac{2xy}{x+y} = \frac{\text{total distance}}{\text{total time taken}}$$

Rule 12 : If a distance is travelled with three different speeds a km/h, b km/h and c km/h, then

$$\text{Average speed of total journey} = \frac{3abc}{ab+bc+ca} \text{ km/h}$$

Rule 13 : If the average of m numbers is x and out of these 'm' numbers the average of n numbers is y. (or vice versa) then the average of remaining numbers will be

(i) Average of remaining numbers

$$= \frac{mx - ny}{m - n} \text{ (if } m > n)$$

(ii) Average of remaining numbers

$$= \frac{ny - mx}{n - m} \text{ (if } n > m)$$

Rule 14 : In three numbers, if 1st number is 'a' times of 2nd number and 'b' times of 3rd number and the average of all three numbers is x, then 1st number = $\frac{3ab}{a+b+ab}x$.

Rule 15 : From three numbers, first number is 'a' times of 2nd number, 2nd number is 'b' times of 3rd number and the average of all three numbers is x, then,

First number = $\frac{3ab}{1+b+ab}x$

Second number = $\frac{3b}{1+b+ab}x$

Third number = $\frac{3b}{1+b+ab}x$

Rule 16 : If from (n + 1) numbers, the average of first n numbers is 'F' and the average of last n numbers is 'L', and the first number is 'f' and the last number is 'l' then $f - l = n(F - L)$

Rule 17 : 't' years before, the average age of N members of a family was 'T' years. If during this period 'n' children increased in the family but average age (present) remains same, then,

Present age of n children = n.T – N.t

Rule 18 : If in the group of N persons, a new person comes at the place of a person of 'T' years, so that average age, increases by 't' years

Then, the age of the new person = T + N.t

If the average age decreases by 't' years after entry of new person, then the age of the new person = T – N.t

Rule 19 : The average age of a group of N students is 'T' years. If 'n' students join, the average age of the group increases by 't' years, then Average age of new students

$$= T + \left(\frac{N}{n} + 1\right)t$$

If the average age of the group decreases by 't' years, then

Average age of new students = $T - \left(\frac{N}{n} + 1\right)t$

Rule 20 : If the average of 'n' observations is 'x' and from these the average of 1st 'm' observations is 'y' and the average of last 'm' observations is 'z' then

mth observation = m(y + z) – nx

(m + 1)th observation = nx – m(y + z)

Rule 21 : If the average age (height) of 'n' persons is x year (cms) and from them 'm' persons went out whose average age (height) is 'y' years (cms) and same number of persons joined whose average age (height) is 'z' years (cms) then what is the average age (height) of n persons ?

$$\therefore \text{ Average age} = \left\{x - \frac{m(y-z)}{n}\right\} \text{ years (cms).}$$

Rule 22 : Average of bowler = $\frac{\text{Total runs}}{\text{No. of wickets}}$

∴ Total runs = Average (A). y, where y = Number of wickets.

Rule 23 : If in a group, one member is replaced by a new member, then,

Age of new member = (age of replaced member) ± xn

where, x = increase (+) or decrease (–) in average n = Number of members.

Rule 24 : If a new member is added in a group then.

age (or income) of added member = Average (or income) ± x (n + 1)

where x = increase (+) or decrease (–) in average age (or income) n = Number of members.

Rule 25 : If a member leaves the group, then

income (or age) of left member = Average income (or age) ± x (n – 1)

where, x = increase (+) or decrease (–) in average income (or age) n = Number of members.

Rule 26 : If average of n numbers is m later on it was found that a number 'a' was misread as 'b'. The correct average will be = $m + \frac{(a-b)}{n}$

Rule 27 : If the average of n numbers is m later on it was found that two numbers a and b misread as p and q.

The correct average = $m + \frac{(a+b-p-q)}{n}$

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE-I

1. A student was asked to find the arithmetic mean of the following 12 numbers :

3, 11, 7, 9, 15, 13, 8, 19, 17, 21, 14 and x

He found the mean to be 12. The value of x will be :

(1) 3 (2) 7
(3) 17 (4) 31

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The average of the marks obtained in an examination by 8 students was 51 and by 9 other students was 68. The average marks of all 17 students was :

(1) 59 (2) 59.5
(3) 60 (4) 60.5

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

3. If the average marks of three batches of 55, 60 and 45 students respectively is 50, 55 and 60, then the average marks of all the students is

(1) 54.68 (2) 53.33
(3) 55 (4) None of these

(SSC CPO S.I. Exam. 12.01.2003

4. The average of 30 results is 20 and the average of other 20 results is 30. What is the average of all the results ?

(1) 24 (2) 48
(3) 25 (4) 50

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

5. If the average weight of 6 students is 50 kg; that of 2 students is 51 kg; and that of other 2 students is 55 kg; then the average weight of all students is

(1) 61 kg (2) 51.5 kg
(3) 52 kg (4) 51.2 kg

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

6. The average of 10 numbers is 7. If each number is multiplied by 12, then the average of the new set of numbers will be

(1) 7 (2) 19
(3) 82 (4) 84

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

7. The average income of 40 persons is ₹ 4200 and that of another 35 persons is ₹ 4000. The average income of the whole group is :

(1) ₹ 4100 (2) ₹ $4106\frac{1}{3}$
(3) ₹ $4106\frac{2}{3}$ (4) ₹ $4108\frac{1}{3}$

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

8. The average weight of five persons sitting in a boat is 38 kg. The average weight of the boat and the persons sitting in the boat is 52kg. What is the weight of the boat ?

(1) 228 kg (2) 122 kg
(3) 232 kg (4) 242 kg

FCI Assistant Grade-III Exam.05.02.2012 (Paper-I) East Zone (IInd Sitting)

9. The average marks of 32 boys of section A of class X is 60 whereas the average marks of 40 boys of section B of class X is 33. The average marks for both the sections combined together is

(1) 44 (2) 45
(3) $46\frac{1}{2}$ (4) $45\frac{1}{2}$

(SSC Data Entry Operator Exam. 02.08.2009)

10. Total weekly emoluments of the workers of a factory is ₹ 1534. Average weekly emolument of a worker is ₹ 118. The number of workers in the factory is :

(1) 16 (2) 14
(3) 13 (4) 12

(SSC CHSL DEO & LDC Exam. 27.11.2010)

11. 12 kg of rice costing ₹ 30 per kg is mixed with 8 kg of rice costing ₹ 40 per kg.The average per kg price of mixed rice is

(1) ₹ 38 (2) ₹ 37
(3) ₹ 35 (4) ₹ 34

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

12. If average of 20 observations x_1, x_2, ..., x_{20} is y, then the average of $x_1 - 101$, $x_2 - 101$, $x_3 - 101$, ..., $x_{20} - 101$ is

(1) $y - 20$ (2) $y - 101$
(3) $20y$ (4) $101y$

(SSC CISF Constable (GD) Exam. 05.06.2011)

13. The average of x numbers is y and average of y numbers is x. Then the average of all the numbers taken together is

(1) $\frac{x+y}{2xy}$ (2) $\frac{2xy}{x+y}$
(3) $\frac{x^2+y^2}{x+y}$ (4) $\frac{xy}{x+y}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

14. The average of x numbers is y^2 and the average of y numbers is x^2. So the average of all the numbers taken together is

(1) $\frac{x^3+y^3}{x+y}$ (2) xy
(3) $\frac{x^2+y^2}{x+y}$ (4) $xy^2 + yx^2$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

15. The average of n numbers x_1, x_2, ... x_n is $\bar{x}$. Then the value of $\sum_{i=1}^{n}(x_i - \bar{x})$ is equal to

(1) n (2) 0
(3) $n\bar{x}$ (4) $\bar{x}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

16. A man bought 13 articles at ₹ 70 each, 15 at ₹ 60 each and 12 at ₹ 65 each. The average price per article is

(1) ₹ 60.25 (2) ₹ 64.75
(3) ₹ 65.75 (4) ₹ 62.25

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

17. A library has an average number of 510 visitors on Sunday and 240 on other days. The average number of visitors per day in a month of 30 days beginning with Sunday is :

(1) 285 (2) 295
(3) 300 (4) 290

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

18. The average of 30 numbers is 40 and that of other 40 numbers is 30. The average of all the numbers is

(1) $34\frac{2}{7}$ (2) 35
(3) 34 (4) 34.5

(SSC CHSL DEO & LDC Exam. 20.10.2013)

19. The average of 20 numbers is 15 and the average of first five is 12. The average of the rest is

(1) 16 (2) 15
(3) 14 (4) 13

(SSC Graduate Level Tier-I Exam. 19.05.2013)

20. The average monthly expenditure of a family is ₹2,200 during first three months, ₹2,550 during next four months and ₹3,120 during last five months of the year. If the total savings during the year was ₹1,260, what is the average monthly income ?

(1) ₹ 1,260 (2) ₹ 1,280
(3) ₹ 2,805 (4) ₹ 2,850

(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

21. Find the average of 1.11, 0.01, 0.101, 0.001, 0.11

(1) 0.2664 (2) 0.2554
(3) 0.1264 (4) 0.1164

(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

22. 4 boys and 3 girls spent ₹ 120 on the average, of which boys spent ₹ 150 on the average. Then the average amount spent by the girls is

(1) ₹ 80 (2) ₹ 60
(3) ₹ 90 (4) ₹ 100

(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

23. Six tables and twelve chairs were bought for ₹ 7,800. If the average price of a table is ₹ 750, then the average price of a chair would be

(1) ₹ 250 (2) ₹ 275
(3) ₹ 150 (4) ₹ 175

(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

24. Out of 20 boys, 6 are each of 1 m 15 cm height, 8 are of 1 m 10 cm and rest of 1 m 12 cm. The average height of all of them is

(1) 1 m 12.1 cm
(2) 1 m 21.1 cm
(3) 1 m 21 cm
(4) 1 m 12 cm

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

25. There are two groups A and B of a class, consisting of 42 and 28 students respectively. If the average weight of group A is 25 kg and that of group B is 40 kg, find the average weight of the whole class.

(1) 69 kg (2) 31 kg
(3) 70 kg (4) 30 kg

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

26. The average monthly salary of all the employees in an industry is ₹ 12,000. The average salary of male employees is ₹ 15,000 and that of female employees is ₹ 8,000. What is the ratio of male employees to female employees ?

(1) 5 : 2 (2) 3 : 4
(3) 4 : 3 (4) 2 : 5

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

27. The mean of 9 observations is 16. One more observation is included and the new mean becomes 17. The 10th observation is

(1) 9 (2) 16
(3) 26 (4) 30

(SSC CISF ASI Exam 29.08.2010 (Paper-1)

28. The average of 8 numbers is 27. If each of the numbers is multiplied by 8, find the average of new set of numbers.

(1) 1128 (2) 938
(3) 316 (4) 216

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

29. The average of 100 numbers is 44. The average of these 100 numbers and 4 other new numbers is 50. The average of the four new numbers will be

(1) 800 (2) 200
(3) 176 (4) 24

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

30. The average of 30 numbers is 15. The average of the first 18 numbers is 10 and that of the next 11 numbers is 20. The last number is

(1) 56 (2) 52
(3) 60 (4) 50

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

31. The arithmetic mean of the following numbers

1, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5, 5, 6, 6, 6, 6, 6, 6 and 7, 7, 7, 7, 7, 7, 7 is

(1) 4 (2) 5
(3) 14 (4) 20

(SSC CGL Tier-II Exam. 21.09.2014)

32. The average of all the numbers between 6 and 50 which are divisible by 5 is

(1) 27.5 (2) 30
(3) 28.5 (4) 22

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

33. There are 100 students in 3 sections A, B and C of a class. The average marks of all the 3 sections was 84. The average of B and C was 87.5 and the average marks of A is 70. The number of students in A was

(1) 30 (2) 35
(3) 20 (4) 25

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

34. The average weight of first 11 persons among 12 persons is 95 kg. The weight of 12th person is 33 kg more than the average weight of all the 12 persons. The weight of the 12th person is

(1) 128.75 kg (2) 128 kg
(3) 131 kg (4) 97.45 kg

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

35. The average weight of A, B and C is 45 kg. If the average weight of A and B be 40 kg and that of B and C be 43 kg, then the weight (in kg) of B is

(1) 20 (2) 26
(3) 31 (4) 17

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

36. The average of some natural numbers is 15. If 30 is added to first number and 5 is subtracted from the last number the average becomes 17.5 then the number of natural number is

(1) 15 (2) 30
(3) 20 (4) 10

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

37. The average weight of 3 men A, B and C is 84 kg. Another man D joins the group and the average now becomes 80 kg. If another man E whose weight is 3 kg more then that of D, replaces A, then the average weight of B, C, D and E becomes 79 kg. Then weight of A is

(1) 72 kg. (2) 74 kg.
(3) 75 kg. (4) 76 kg.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting and SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

38. The average weight of 15 oarsmen in a boat is increased by 1.6 kg when one of the crew, who weighs 42 kg is replaced by a new man. Find the weight of the new man (in kg).

(1) 67 (2) 65
(3) 66 (4) 43

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

39. A librarian purchased 50 story–books for his library. But he saw that he could get14 more books by spending Rs. 76 more and the average price per book would be reduced by Re. 1. The average price (in Rs.) of each book he bought, was :

(1) 15 (2) 10
(3) 25 (4) 20

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

40. The average of 1, 3, 5, 7, 9, 11, ... to 25 terms is

(1) 125 (2) 25
(3) 625 (4) 50

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

41. Six friends have an average height of 167 cms. A boy with height 162 cm leaves the group. Find the new average height.

(1) 168 cm (2) 166 cm
(3) 169 cm (4) 167 cm

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

42. The average weight of 8 persons increases by 2.5 kg when a new person comes in place of one of them weighing 65 kg. The weight of the new person is

(1) 84 kg (2) 85 kg
(3) 76 kg (4) 76.5 kg

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

43. Three Science classes A, B and C take a Life Science test. The average score of class A is 83. The average score of class B is 76. The average score of class C is 85. The average score of class A and B is 79 and average score of class B and C is 81. Then the average score of classes A, B and C is

(1) 81.5 (2) 81
(3) 80.5 (4) 80

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

44. The mean high temperature of the first four days of a week is 25°C whereas the mean of the last four days is 25.5°C. If the mean temperature of the whole week is 25.2°C then the temperature on the 4th day is

(1) 25.5°C (2) 25°C
(3) 25.2°C (4) 25.6° C

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

45. The average marks of 50 students in a class is 72. The average marks of boys and girls in that subject are 70 and 75 respectively. The number of boys in the class is

(1) 20 (2) 35
(3) 25 (4) 30

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

46. The average marks obtained by a class of 60 students is 65. The average marks of half of the students is found to be 85. The average marks of the remaining students is

(1) 35 (2) 45
(3) 55 (4) 65

(SSC CGL Tier-I (CBE) Exam.10.09.2016)

47. The average of marks obtained by 100 candidates in a certain examination is 30. If the average marks of passed candidates is 35 and that of the failed candidates is 10, what is the number of candidates who passed the examination?

(1) 60 (2) 70
(3) 80 (4) 90

(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

48. The average weight of A, B and C is 45 kg. If the average weight of A and B be 40 kg and that of B and C be 43 kg, then the weight of B is :

(1) 31 kg. (2) 32 kg.
(3) 29.5 kg. (4) 35 kg.

(SSC CGL Tier-II Online Exam.01.12.2016)

49. The average of 25 results is 20. The average of first 12 results is 15 and that of the last 12 results is 18. Then, the 13th result is :

(1) 100 (2) 101
(3) 104 (4) 103

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

50. The average of 100 observations was calculated as 35. It was found later, that one of the observations was misread as 83 instead of 53. The correct average is :

(1) 32.7 (2) 34.7
(3) 35.7 (4) 36.7

(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

51. If the difference between the average of x, y and y, z is 12, then the difference between x and z is :

(1) 24 (2) 48
(3) 12 (4) 6

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

52. The average of the first 7 integers in a series of 13 consecutive odd integers is 37. What is the average of the entire series?

(1) 37 (2) 39
(3) 41 (4) 43

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

53. The average marks of a class of 35 children is 35. The marks of one of the students, who got 35, was incorrectly entered as 65. What is the correct average of the class?
(1) 33.76 (2) 34.14
(3) 35.24 (4) 36.50
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

54. The average height of 30 boys out of a class of 50 is 160 cm. If the average height of the remaining boys is 165 cm, the average height of the whole class (in cm) is :
(1) 161 (2) 162
(3) 163 (4) 164
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

55. The average of makrs of 17 students in an examination was calculated as 71. But it was later found that the mark of one student had been wrongly entered as 65 instead of 56 and another as 24 instead of 50. The correct average is
(1) 70 (2) 71
(3) 72 (4) 73
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

56. The average of 12 numbers is 9. If each number is multiplied by 2 and added to 3, the average of the new set of numbers is
(1) 9 (2) 18
(3) 21 (4) 27
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

57. The average of 20 numbers is calculated as 35. It is discovered later on that while calculating the average, one number, namely 85, was mis read as 45. The correct average is :
(1) 36 (2) 36.5
(3) 37 (4) 37.5
(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (IST Sitting)

58. The average of a, b and c is 20 and that of b, c and d is 25. If $d = 30$, then the value of a is :
(1) 25 (2) 45
(3) 30 (4) 15
(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (IST Sitting)

59. In a class, average height of all students is 'a' cms. Among them, average height of 10 students is 'b' cms and the average height of the remaining students is 'c' cms. Find the number of students in the class. (Here $a > c$ and $b > c$)
(1) $\frac{(a(b-c))}{(a-c)}$ (2) $\frac{(b-c)}{(a-c)}$
(3) $\frac{(b-c)}{10(a-c)}$ (4) $\frac{10\ (b-c)}{(a-c)}$
(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

60. Nine students of a class contribute a certain sum of money. Seven of them gave Rs. 50 each and the other two gave respectively Rs. 50 and Rs. 90 more than the others. The average contribution of the class of 9 students is :
(1) Rs. 70 (2) Rs. 50
(3) Rs. 100 (4) Rs. 120
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

61. The average temperature for Monday, Tuesday, Wednesday and Thursday was 48° . The average temperature for Tuesday, Wednesday, Thursday and Friday was 52°, If the temperature on Monday was 42°, then the temperature on Friday was (in degrees)
(1) 58 (2) 56
(3) 52 (4) 50
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

62. If the arithmetic mean of 7, 5, 13, x and 9 is 10, then the value of x is :
(1) 10 (2) 12
(3) 14 (4) 16
(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

63. The average revenues of 7 consecutive years of a company is Rs. 75 lakhs. If the average of first 4 years is Rs. 70 lakhs and that of last 4 years is Rs. 82 lakhs, what will be the revenue for the 4th year ?
(1) Rs. 85 lakhs (2) Rs. 83 lakhs
(3) Rs. 81 lakhs (4) Rs. 79 lakhs
(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

30. In an examination the average marks obtained by John in English, Maths, Hindi and Drawing were 50. His average marks in Maths, Science, Social Studies and Craft were 70. If the average marks in all seven subjects is 58, his score in maths was
(1) 50 (2) 52
(3) 60 (4) 74
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

41. The average of prime numbers between 1 and 20 is
(1) 9 (2) $9\frac{5}{8}$
(3) $10\frac{1}{8}$ (4) 8
(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE-II

1. The average of 9 numbers is 30. The average of first 5 numbers is 25 and that of the last 3 numbers is 35. What is the 6th number?
(1) 20 (2) 30
(3) 40 (4) 50
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. The average of 15 numbers is 7. If the average of the first 8 numbers be 6.5 and the average of last 8 numbers be 9.5, then the middle number is
(1) 20 (2) 21
(3) 23 (4) 18
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

3. The average of 8 numbers is 20. The average of first two numbers is $15\frac{1}{2}$ and that of the next three is $21\frac{1}{3}$. If the sixth number be less than the seventh and eighth numbers by 4 and 7 respectively, then the eighth number is :
(1) 18 (2) 22
(3) 25 (4) 27
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

4. The average of 20 numbers is 12. The average of the first 12 numbers is 11 and that of the next 7 numbers is 10. The last number is :
(1) 40 (2) 38
(3) 48 (4) 50
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

5. Out of seven given numbers, the average of the first four numbers is 4 and that of the last four numbers is also 4. If the average of all the seven numbers is 3, fourth number is
(1) 3 (2) 4
(3) 7 (4) 11
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

6. The average temperature of the first 4 days of a week was 37°C and that of the last 4 days of the week was 41°C. If the average temperature of the whole week was 39°C, the temperature of the fourth day was
(1) 38°C (2) 38.5°C
(3) 39°C (4) 40°C
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

7. In a certain year, the average monthly income of a person was ₹ 3,400. For the first eight months of the year, his average monthly income was ₹ 3,160 and for the last five months, it was ₹ 4,120. His income in the eighth month of the year was
(1) ₹ 3,160 (2) ₹ 5,080
(3) ₹ 15,520 (4) ₹ 5,520
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

8. The average of 30 numbers is 12. The average of the first 20 of them is 11 and that of the next 9 is 10. The last number is
(1) 60 (2) 45
(3) 40 (4) 50
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

9. The average of 11 results is 50. If the average of the first six results is 49 and that of the last six is 52, the sixth no. is
(1) 48 (2) 50
(3) 52 (4) 56
(SSC Graduate Level Tier-II Exam. 29.09.2013

10. The average of eight successive numbers is 6.5. The average of the smallest and the greatest numbers among them will be :
(1) 4 (2) 6.5
(3) 7.5 (4) 9
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

11. The average of three numbers is 135. The largest number is 195 and the difference between the other two is 20. The smallest number is
(1) 65 (2) 95
(3) 105 (4) 115
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011, 22.02.2011)

12. Out of four numbers, the average of the first three is 18 and that of the last three is 16. If the last number is 19, the first is
(1) 19 (2) 18
(3) 20 (4) 25
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

13. The mean of 11 numbers is 35. If the mean of first 6 numbers is 32 and that of the last 6 numbers is 37, find the sixth number.
(1) 28 (2) 29
(3) 30 (4) 27
(SSC CHSL DEO & LDC Exam. 28.10.2012

14. Out of four numbers, the average of the first three is 15 and that of the last three is 16. If the last number is 19, the first is
(1) 19 (2) 15
(3) 16 (4) 18
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

15. The average of nine numbers is 50. The average of the first five numbers is 54 and that of the last three numbers is 52. Then the sixth number is
(1) 30 (2) 34
(3) 24 (4) 44
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

16. The average of 11 numbers is 63. If the average of first six numbers is 60 and the last six numbers is 65, then the 6th number is
(1) 57 (2) 60
(3) 62 (4) 64
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

17. Three numbers are such that the average of first two numbers is 2, the average of the last two numbers is 3 and the average of the first and the last numbers is 4, then the average of three numbers is equal to
(1) 2 (2) 3.5
(3) 3 (4) 2.5
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

18. The average of the largest and smallest 3 digit numbers formed by 0, 2 and 4 would be
(1) 312 (2) 213
(3) 222 (4) 303
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

19. The average of six numbers is 3.95. The average of two of them is 3.4, while the average of the other two is 3.85. The average of the remaining two numbers is
(1) 4.6 (2) 4.5
(3) 4.8 (4) 4.7
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

20. Out of four numbers the average of the first three is 16 and that of the last three is 15. If the last number is 20 then the first number is
(1) 23 (2) 25
(3) 28 (4) 21
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

21. Average of n numbers is a. The first number is increased by 2, second one is increased by 4, the third one is increased by 8 and so on. The average of the new numbers is
(1) $a + \frac{2^{n-1}-1}{n}$ (2) $a + 2\frac{2^n-1}{n}$
(3) $a + \frac{2^{n-1}}{n}$ (4) $a + \frac{2^n-1}{n}$
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

22. The average of 12 numbers is 15 and the average of the first two is 14. What is the average of the rest?
(1) 15 (2) $15\frac{1}{5}$
(3) 14 (4) $14\frac{1}{5}$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

23. The average of 8 numbers is 21. If each of the numbers is mulitiplied by 8, the average of the new set of numbers is :
(1) 21 (2) 29
(3) 8 (4) 168
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

24. The average of 13 results is 70. The average of first seven is 65 and that of the last seven is 75, the seventh result is :
(1) 67 (2) 70
(3) 68 (4) 70.5
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

25. The average of two numbers is 8 and the average of other three numbers is 3. The average of the five numbers is :
(1) 2 (2) 3
(3) 5 (4) 6
(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

26. The average of 15 numbers is 7. If the average of the first 8 numbers is 6.5 and the average of the last 8 numbers is 8.5, then the middle number is :
(1) 10 (2) 23
(3) 13 (4) 15
(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

TYPE-III

1. The average of 7 consecutive numbers is 20. The largest of these numbers is :
(1) 24 (2) 23
(3) 22 (4) 20
(SSC CGL Prelim Exam. 27.02.2000 (Ist Sitting) and SSC Constable (GD) & Rifleman (GD) Exam. 24.04.2012 (Ist Sitting)

2. The average of first nine prime numbers is
(1) 9 (2) 11
(3) $11\frac{2}{9}$ (4) $11\frac{1}{9}$
(SSC CPO S.I. Exam. 12.01.2003)

3. The average of 5 consecutive natural numbers is m. If the next three natural numbers are also included, how much more than m will the average of these 8 numbers be?
(1) 2 (2) 1
(3) 1.4 (4) 1.5
(SSC CPO S.I. Exam. 03.09.2006)

4. The average of the first 100 positive integers is
(1) 100 (2) 51
(3) 50.5 (4) 49.5
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

5. The average of odd numbers upto 100 is
(1) 50.5 (2) 50
(3) 49.5 (4) 49
(SSC Data Entry Operator Exam. 02.08.2009 & SSC CGL Tier-I Exam. 16.05.2010 (IInd Sitting)

6. The average of the squares of first ten natural numbers is
(1) 35.5 (2) 36
(3) 37.5 (4) 38.5
(SSC SAS Exam 26.06.2010 (Paper-1)

7. The arithmetic mean (average) of the first 10 whole numbers is
(1) 5 (2) 4
(3) 5.5 (4) 4.5
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

8. The average of three consecutive odd numbers is 12 more than one third of the first of these numbers. What is the last of the three numbers ?
(1) 15
(2) 17
(3) 19
(4) Data inadequate
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

9. The average of nine consecutive odd numbers is 53. The least odd number is
(1) 22 (2) 27
(3) 35 (4) 45
(SSC Data Entry Operator Exam. 31.08.2008)

10. The average of the first nine integral multiples of 3 is
(1) 21 (2) 12
(3) 15 (4) 18
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

11. The average of seven consecutive positive integers is 26. The smallest of these integers is :
(1) 21 (2) 23
(3) 25 (4) 26
(SSC CHSL DEO & LDC Exam. 27.11.2010)

12. a, b, c, d, e, f, g are consecutive even numbers. j, k, l, m, n are consecutive odd numbers. The average of all the numbers is
(1) $3\left(\frac{a+n}{2}\right)$
(2) $\left(\frac{l+d}{2}\right)$
(3) $\frac{a+b+m+n}{4}$
(4) $\frac{j+c+n+g}{4}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

13. If the average of 6 consecutive even numbers is 25, the difference between the largest and the smallest number is
(1) 8 (2) 10
(3) 12 (4) 14
(SSC Graduate Level Tier-II Exam. 29.09.2013

14. The average of 5 consecutive integers starting with 'm' is n. What is the average of 6 consecutive integers starting with $(m + 2)$?
(1) $\frac{2n+5}{2}$ (2) (n +2)
(3) (n + 3) (4) $\frac{2n+9}{2}$
(SSC Graduate Level Tier-II Exam.16.09.2012)

15. Eight consecutive numbers are given. If the average of the two numbers that appear in the middle is 6, then the sum of the eight given numbers is
(1) 54 (2) 64
(3) 36 (4) 48
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

16. The average of four consecutive even numbers is 15. The 2nd highest number is
(1) 12 (2) 18
(3) 14 (4) 16
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

17. Average of first five odd multiples of 3 is
(1) 12 (2) 16
(3) 15 (4) 21
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

18. The average of nine consecutive numbers is n. If the next two numbers are also included the new average will
(1) increase by 2
(2) remain the same
(3) increase by 1.5
(4) increase by 1
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

19. The average of four consecutive even numbers is 9. Find the largest number.
(1) 12 (2) 6
(3) 8 (4) 10
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

20. If a, b, c, d, e are five consecutive odd numbers, their average is

(1) $5(a + 4)$

(2) $\frac{abcde}{5}$

(3) $5(a + b + c + d + e)$

(4) $a + 4$

(SSC Graduate Level Tier-I Exam. 19.05.2013 & SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

21. Average of first five prime numbers is

(1) 5.3 (2) 5.6

(3) 5 (4) 3.6

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

22. What is the average of the first six (positive) odd numbers each of which is divisible by 7?

(1) 42 (2) 43

(3) 47 (4) 49

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

23. The average of first ten prime numbers is

(1) 10.1 (2) 10

(3) 12.9 (4) 13

(SSC Constable (GD) Exam. 12.05.2013)

24. If the average of eight consecutive even numbers be 93, then the greatest number among them is

(1) 100 (2) 86

(3) 102 (4) 98

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

25. The average of 6 consecutive natural numbers is K. If the next two natural numbers are also included, how much more than K will the average of these 8 numbers be?

(1) 1.3 (2) 1

(3) 2 (4) 1.8

(SSC CGL Tier-I Re-Exam, 30.08.2015)

26. The average of five consecutive positive integers is n. If the next two integers are also included, the average of all these integers will

(1) increase by 1.5

(2) increase by 1

(3) remain the same

(4) increase by 2

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

27. The average of all the odd integers between 2 and 22 is:

(1) 14 (2) 12

(3) 13 (4) 11

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

28. The sum of three consecutive even numbers is 28 more than the average of these three numbers. Then the smallest of these three numbers is

(1) 6 (2) 12

(3) 14 (4) 16

(SSC CGL Tier-II Online Exam.01.12.2016)

29. The average of 7 consecutive numbers is 20. The largest of these numbers is

(1) 20 (2) 23

(3) 24 (4) 26

(SSC CGL Tier-II Online Exam.01.12.2016)

30. The average of 25 consecutive odd integers is 55. The highest of these integers is

(1) 79 (2) 105

(3) 155 (4) 109

(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

TYPE-IV

1. The average monthly income of A and B is ₹ 14000, that of B and C is ₹ 15600 and A and C is ₹ 14400. The monthly income of C is

(1) ₹ 16000 (2) ₹ 15000

(3) ₹ 14000 (4) ₹ 15500

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

2. The average monthly income of X and Y is ₹ 5050. The average monthly income of Y and Z is ₹ 6250 and the average monthly income of X and Z is ₹ 5200. The monthly income of X is :

(1) ₹ 4050 (2) ₹ 3500

(3) ₹ 4000 (4) ₹ 5000

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting) and SSC SAS Exam 26.06.2010 (Paper-1)

3. The average expenditure of a man for the first five months is ₹ 1200 and for the next seven months is ₹ 1300. If he saves ₹ 2900 in that year, his monthly average income is :

(1) ₹ 1500 (2) ₹ 1600

(3) ₹ 1700 (4) ₹ 1400

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

4. The average per day income of A, B and C is ₹ 450. If the average per day income of A and B be ₹ 400 and that of B and C be ₹ 430, the per day income of B is

(1) ₹ 300 (2) ₹ 310

(3) ₹ 415 (4) ₹ 425

(SSC Data Entry Operator Exam. 31.08.2008)

5. The average salary, per head, of all the workers of an institution is ₹ 60. The average salary of 12 officers is ₹ 400; the average salary, per head, of the rest is ₹ 56. The total number of workers in the institution is

(1) 1030 (2) 1035

(3) 1020 (4) 1032

(SSC CGL Tier-I Exam. 26.10.2014)

6. The average monthly expenditure of a family for the first four months is ₹ 2570, for the next three months ₹ 2490 and for the last five months ₹ 3030. If the family saves ₹ 5320 during the whole year, the average monthly income of the family during the year is

(1) ₹ 3000 (2) ₹ 3185

(3) ₹ 3200 (4) ₹ 3580

(SSC CGL Tier-II Exam. 21.09.2014)

7. A man spends ₹ 1800 monthly on an average for the first four months and ₹ 2000 monthly for the next eight months and saves ₹ 5600 a year. His average monthly income is

(1) ₹ 2000 (2) ₹ 2200

(3) ₹ 2400 (4) ₹ 2600

(SSC CGL Tier-II Exam. 21.09.2014)

8. The average monthly income of P and Q is ₹ 5, 050. The average monthly income of Q and R is ₹ 6, 250 and the average monthly income of P and R is ₹ 5,200. The monthly income of P is

(1) ₹ 3, 500 (2) ₹ 4, 000

(3) ₹ 4, 050 (4) ₹ 5, 000

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

9. The average salary of all the workers in a workshop is ₹ 8,000. The average salary of 7 technicians is ₹ 12,000 and the average salary of the rest is ₹ 6,000. The total number of workers in the workshop is

(1) 20 (2) 21

(3) 22 (4) 23

(SSC CHSL DEO & LDC Exam. 9.11.2014)

10. Average income of 'A' and 'B' is ₹ 200 and average income of 'C' and 'D' is ₹ 250. The average income of A, B, C and D is
(1) ₹ 106.25 (2) ₹ 125
(3) ₹ 200 (4) ₹ 225
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

11. The average daily income of 7 men, 11 women and 2 boys is Rs. 257.50. If the average daily income of the men is Rs.10 more than that of women and the average daily income of the women is Rs.10 more than that of boys, the average daily income of a man is
(1) Rs. 277.5 (2) Rs. 250
(3) Rs. 265 (4) Rs. 257
(SSC CGL Tier-II Online Exam.01.12.2016)

12. The average salary of all the associates in a team is Rs. 16000. The average salary of 7 senior associates is Rs. 24000 and the average salary of the rest is Rs. 12000. How many associates work in that team?
(1) 21 (2) 22
(3) 23 (4) 24
(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

13. The average monthly salary of 19 members of a group is Rs. 16000. If one more member whose monthly salary is Rs. 20000 joins the group, then the average salary of the group is
(1) Rs. 18250 (2) Rs. 16200
(3) Rs. 18000 (4) Rs. 16250
(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

14. The average salary of all workers in a workshop is Rs.12000. The average salary of 7 technicians is Rs.15000 and the average salary of the rest is Rs. 9000. The total number of workers in the workshop is :
(1) 12 (2) 13
(3) 14 (4) 15
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

15. A man spends in 8 months as much as he earns in 6 months. He saves Rs. 6000 in a year. His average monthly income is :
(1) Rs. 2400 (2) Rs. 2000
(3) Rs. 2150 (4) Rs. 1800
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

TYPE-V

1. Of the three numbers whose average is 60, the first is one fourth of the sum of the others. The first number is :
(1) 30 (2) 36
(3) 42 (4) 45
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. Of the three numbers, second is twice the first and also thrice the third. If the average of the three numbers is 44, the largest number is :
(1) 24 (2) 72
(3) 36 (4) 108
(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting)

3. The average of first three numbers is thrice the fourth number. If the average of all the four numbers is 5, then find the fourth number.
(1) 4.5 (2) 5
(3) 2 (4) 4
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) and SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

4. Of the three numbers, first is twice the second and second is twice the third. The average of three numbers is 21. The smallest of the three numbers is
(1) 9 (2) 6
(3) 12 (4) 18
(SSC CPO S.I. Exam. 12.01.2003)

5. Of the three numbers, the first is 3 times the second and the third is 5 times the first. If the average of the three numbers is 57, the difference between the largest and the smallest number is
(1) 9 (2) 18
(3) 126 (4) 135
(SSC CPO S.I. Exam. 12.01.2003)

6. Of the three numbers, the first is twice the second and the second is 3 times the third. If their average is 100, the largest of the three numbers is :
(1) 120 (2) 150
(3) 180 (4) 300
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

7. Of the three numbers, the first is twice the second and the second is thrice the third. If the average of the three numbers is 10, the largest number is :
(1) 12 (2) 15
(3) 18 (4) 30
(SSC CPO S.I. Exam. 12.01.2003)

8. The average of first three numbers is double of the fourth number. If the average of all the four numbers is 12, find the 4th number.
(1) 16 (2) $\frac{48}{7}$
(3) 20 (4) $\frac{18}{7}$
(SSC Graduate Level Tier-II Exam. 29.09.2013

9. The average of three numbers is 77. The first number is twice the second and the second number is twice the third. The first number is :
(1) 33 (2) 66
(3) 77 (4) 132
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

10. Out of three numbers, the first is twice the second and is half of the third. If the average of the three numbers is 56, then difference of first and third number is
(1) 12 (2) 20
(3) 24 (4) 48
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

11. The average of three numbers is 28, the first number is half of the second, the third number is twice the second, then the third number is
(1) 48 (2) 36
(3) 24 (4) 18
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

12. The average of three numbers is 40. The first number is twice the second and the second one is thrice the third number. The difference between the largest and the smallest numbers is
(1) 30 (2) 36
(3) 46 (4) 60
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

13. Among three numbers, the first is twice the second and thrice the third. If the average of the three numbers is 49.5, then the difference between the first and the third number is

(1) 54 (2) 28
(3) 39.5 (4) 41.5

(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

14. Out of 4 numbers, whose average is 60, the first one is one-fourth of the sum of the last three. The first number is

(1) 15 (2) 45
(3) 48 (4) 60

(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

15. Of the three numbers, the first number is twice of the second and the second is thrice of the third number. If the average of these 3 numbers is 20, then the sum of the largest and smallest numbers is

(1) 24 (2) 42
(3) 54 (4) 60

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

16. If the arithmetic mean of $3a$ and $4b$ is greater than 50, and a is twice b, then the smallest possible integer value of a is

(1) 20 (2) 18
(3) 21 (4) 19

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

17. Of three numbers, the first is 4 times the second and 3 times the third. If the average of all the three numbers is 95, what is the third number ?

(1) 76 (2) 60
(3) 130 (4) 57

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

18. Among three numbers, second is twice the first and also thrice the third. If the average of the three numbers is 33, then the largest number is :

(1) 36 (2) 54
(3) 62 (4) 72

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

TYPE-VI

1. The average of marks of 14 student was calculated as 71. But it was later found that the marks of one student had been wrongly entered as 42 instead of 56 and of another as 74 instead of 32. The correct average is :

(1) 67 (2) 68
(3) 69 (4) 71

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. The average weight of three men A, B and C is 84 kg. D joins them and the average weight of the four becomes 80 kg. If E whose weight is 3 kg more than that of D, replaces A, the average weight of B, C, D and E becomes 79 kg. The weight of A is

(1) 65 kg. (2) 70 kg.
(3) 75 kg. (4) 80 kg.

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

3. The average of a collection of 20 measurements was calculated to be 56 cm. But later it was found that a mistake had occurred in one of the measurements which was recorded as 64 cm., but should have been 61 cm. The correct average must be

(1) 53 cm (2) 54.5 cm
(3) 55.85 cm (4) 56.15 cm

(SSC CPO S.I. Exam. 07.09.2003)

4. The average of marks in Mathematics for 5 students was found to be 50. Later, it was discovered that in the case of one student the marks 48 were misread as 84. The correct average is :

(1) 40.2 (2) 40.8
(3) 42.8 (4) 48.2

(SSC CPO S.I. Exam. 26.05.2005)

5. The average weight of 15 students in a class increases by 1.5kg when one of the students weighing 40 kg is replaced by a new student. What is the weight (in kg) of the new student ?

(1) 64.5 kg. (2) 56 kg.
(3) 60 kg. (4) 62.5 kg.

(SSC CPO S.I. Exam. 06.09.2009)

6. The average marks of 100 students were found to be 40. Later on it was discovered that a score of 53 was misread as 83. Find the correct average corresponding to the correct score.

(1) 38.7 (2) 39
(3) 39.7 (4) 41

(SSC CPO S.I. Exam. 06.09.2009)

7. The average weight of a group of 20 boys was calculated to be 89.4 kg and it was later discovered that one weight was misread as 78 kg. instead of 87kg. The correct average weight is

(1) 88.95 kg (2) 89.25 kg
(3) 89.55 kg (4) 89.85 kg

(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

8. The average of 18 observations is recorded as 124. Later it was found that two observations with values 64 and 28 were entered wrongly as 46 and 82. Find the correct average of the 18 observations.

(1) $111\frac{7}{9}$ (2) 122
(3) 123 (4) $137\frac{3}{9}$

(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

9. The mean of 50 numbers is 30. Later it was discovered that two entries were wrongly entered as 82 and 13 instead of 28 and 31. Find the correct mean.

(1) 36.12 (2) 30.66
(3) 29.28 (4) 38.21

(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

10. The average of 25 observations is 13. It was later found that an observation 73 was wrongly entered as 48. The new average is

(1) 12.6 (2) 14
(3) 15 (4) 13.8

(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

11. Mean of 10 numbers is 30. Later on it was observed that numbers 15, 23 are wrongly taken as 51, 32. The correct mean is

(1) 25.5 (2) 32
(3) 30 (4) 34·5

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

12. The mean of 50 observations was 36. It was found later that an observation 48 was wrongly taken as 23. The corrected (new) mean is

(1) 35.2 (2) 36.1
(3) 36.5 (4) 39.1

(SSC CGL Prelim Exam.11.05.2003 (Second Sitting)

13. While finding the average of 10 given numbers, a student, by mistake, wrote 64 in place of a number 46 and got his correct average 50. The correct average of the given numbers is :

(1) 48.2 (2) 48.3
(3) 49.1 (4) 49.3

(SSC CHSL DEO & LDC Exam. 27.11.2010)

14. The average of 10 numbers is calculated as 15. It is discovered later on that while calculating the average one number, namely 36, was wrongly read as 26. The correct average is

(1) 20 (2) 18
(3) 16 (4) 14

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

15. A student finds the average of ten 2-digit numbers. While copying numbers, by mistake, he writes one number with its digits interchanged. As a result his answer is 1.8 less than the correct answer. The difference of the digits of the number, in which he made mistake, is

(1) 2 (2) 3
(3) 4 (4) 6

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

16. The average of 27 numbers is 60. If one number is changed from 28 to 82, the average is

(1) 56 (2) 58
(3) 62 (4) 64

(SSC CISF Constable (GD) Exam. 05.06.2011)

17. A tabulator while calculating the average marks of 100 students of an examination, by mistake enters 68, instead of 86 and obtained the average as 58; the actual average marks of those students is

(1) 58.18 (2) 57.82
(3) 58.81 (4) 57.28

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

18. The mean of 20 items is 47. Later it is found that the item 62 is wrongly written as 26. Find the correct mean.

(1) 48·8 (2) 47·7
(3) 49·9 (4) 46·6

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

19. The mean value of 20 observations was found to be 75, but later on it was detected that 97 was misread as 79. Find the correct mean.

(1) 75.7 (2) 75.8
(3) 75.9 (4) 75.6

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

20. The mean of 100 items was 46. Later on it was discovered that an item 16 was misread as 61 and another item 43 was misread as 34. It was also found that the number of items were 90 and not 100. Then what is the correct mean ?

(1) 50 (2) 50.7
(3) 52 (4) 52.7

(SSC Graduate Level Tier-II Exam.16.09.2012)

21. The average of seven numbers is 18. If one of the number is 17 and if it is replaced by 31, then the average becomes :

(1) 21.5 (2) 19.5
(3) 20 (4) 21

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

22. In an exam, the average marks obtained by the students was found to be 60. After omission of computational errors, the average marks of 100 candidates had to be changed from 60 to 30 and the average with respect to all the examinees came down to 45 marks. The total number of candidates who took the exam, was

(1) 200 (2) 210
(3) 240 (4) 180

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

23. In an examination, the average of marks was found to be 50. For deducting marks for computational errors, the marks of 100 candidates had to be changed from 90 to 60 each and so the average of marks came down to 45. The total number of candidates, who appeared at the examination, was

(1) 600 (2) 300
(3) 200 (4) 150

(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

24. The average of l0 items was found to be 80 but while calculating, one of the items was counted as 60 instead of 50. Then the correct average would have been :

(1) 69 (2) 79.25
(3) 79 (4) 79.5

(SSC Multi-Tasking Staff Exam. 10.03.2013)

25. The average of 9 integers is found to be 11. But after the calculation, it was detected that, by mistake, the integer 23 was copied as 32, while calculating the average. After the due correction is made, the new average will be

(1) 10 (2) 9
(3) 10.1 (4) 9.5

(SSC Constable (GD) Exam. 12.05.2013)

26. The average weight of 20 students in a class is increased by 0.75 kg when one of the students weighing 30 kg is replaced by a new student. Weight of the new student (in kg) is :

(1) 35 (2) 40
(3) 45 (4) 50

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

27. Average weight of 25 persons is increased by 1 kg when one man weighing 60 kg is replaced by a new person. Weight of new person is :

(1) 50 kg (2) 61 kg
(3) 86 kg (4) 85 kg

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

28. There are 50 students in a class. One of them weighing 50 kg goes away and a new student joins. By this the average weight of the class increases by $\frac{1}{2}$ kg. The weight of the new student is :

(1) 70 kg (2) 72 kg
(3) 75 kg (4) 76 kg

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

29. The average weight of the 8 oarsmen in boat is increased by $1\frac{1}{2}$ kg when one of the crew who weighs 60kg is replaced by a new man. The weight of the new man (in kg) is

(1) 70 kg (2) 68 kg
(3) 71 kg (4) 72 kg

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

30. The average weight of 12 crewmen in a boat is increased by $\frac{1}{3}$ kg, when one of the crewmen whose weight is 55kg is replaced by a new man. What is the weight of that new man?

(1) 58 kg (2) 60 kg
(3) 57 kg (4) 59 kg

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

31. The average marks obtained by 22 candidates in an examination are 45. The average marks of the first 10 candidates are 55 and those of the last eleven are 40. The number of marks obtained by the eleventh candidate is

(1) 45 (2) 0
(3) 50 (4) 47.5

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

32. The mean of 20 items is 55. If two items 45 and 30 are removed, the new mean of the remaining items is

(1) 65.1 (2) 65.3
(3) 56.9 (4) 56

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

33. The average marks obtained by 40 students of a class is 86. If the 5 highest marks are removed, the average reduces by one mark. The average marks of the top 5 students is

(1) 92 (2) 96
(3) 93 (4) 97

(SSC CGL Tier-I Exam. 19.10.2014)

34. The average of 50 numbers is 38. If two numbers, namely 45 and 55 are discarded, the average of the remaining numbers is

(1) 37.5 (2) 37.9
(3) 36.5 (4) 37.0

(SSC CGL Tier-I Exam. 26.10.2014)

35. The average of six numbers is 20. If one number is removed, the average becomes 15. What is the number removed ?

(1) 5 (2) 35
(3) 112 (4) 45

(SSC CGL Tier-II Exam. 21.09.2014)

36. The average marks secured by 36 students was 52. But it was discovered that an item 64 was misread as 46. What is the correct mean of marks ?

(1) 54 (2) 53.5
(3) 53 (4) 52.5

(SSC CHSL DEO & LDC Exam. 16.11.2014)

37. A boy found that the average of 20 numbers is 35 when he writes a number '61' instead of '16'. The correct average of 20 numbers is

(1) 32.75 (2) 37.25
(3) 34.75 (4) 34.25

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

38. The average of 20 numbers is calculated as 35. It is dicovered later, that while calculating the average, one number, namely 85, was read as 45. The correct average is

(1) 36.5 (2) 37
(3) 37.5 (4) 36

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

39. The average marks obtained by a student in 6 subjects is 88. On subsequent verification it was found that the marks obtained by him in a subject was wrongly copied as 86 instead of 68. The correct average of the marks obtained by him is

(1) 87 (2) 85
(3) 84 (4) 86

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

40. The average of 100 items was found to be 30. If at the time of calculation, two items were wrongly taken as 32 and 12 instead of 23 and 11, then the correct average is :

(1) 29.8 (2) 29
(3) 29.9 (4) 29.5

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

41. A student, by mistake, wrote 64 in place of 46 as a number at the time of finding the average of 10 given numbers and got the average as 50. The correct average of the numbers is :

(1) 48.2 (2) 48
(3) 48.1 (4) 49

(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

42. The average of 9 observations was found to be 35. Later on, it was detected that an observation 81 was misread as 18. The correct average of the observations is :

(1) 28 (2) 42
(3) 32 (4) 45

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

TYPE-VII

1. A cricketer whose bowling average is 24.85, runs per wicket, takes 5 wickets for 52 runs and thereby decreases his average by 0.85. The number of wickets taken by him till the last match was :

(1) 64 (2) 72
(3) 80 (4) 96

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. The average of runs of a cricket player of 10 innings was 32. How many runs must he make in his next inning so as to increase his average of runs by 4 ?

(1) 76 (2) 70
(3) 4 (4) 2

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

3. The bowling average of a cricketer was 12.4. He improves his bowling average by 0.2 points when he takes 5 wickets for 26 runs in his last match. The number of wickets taken by him before the last match was

(1) 125 (2) 150
(3) 175 (4) 200

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

4. A cricketer had a certain average of runs for his 64 innings. In his 65th innings, he is bowled out for no score on his part. This brings down his average by 2 runs. His new average of runs is

(1) 130 (2) 128
(3) 70 (4) 68

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

5. A cricketer has a certain average of runs for his 8 innings. In the ninth innings, he scores 100 runs, thereby increases his average by 9 runs. His new average of runs is
(1) 20 (2) 24
(3) 28 (4) 32
(SSC CPO S.I. Exam. 09.11.2008)

6. The average of runs scored by a player in 10 innings is 50. How many runs should he score in the 11th innings so that his average is increased by 2 runs ?
(1) 80 runs (2) 72 runs
(3) 60 runs (4) 54 runs
(SSC CPO S.I. Exam. 05.09.2004)

7. A cricket batsman had a certain average of runs for his 11 innings. In the 12th innings, he made a score of 90 runs and thereby his average of runs was decreased by 5. His average of runs after 12th innings is :
(1) 155 (2) 150
(3) 145 (4) 140
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting)

8. The batting average for 40 innings of a cricket player is 50 runs. His highest score exceeds his lowest score by 172 runs. If these two innings are excluded, the average of the remaining 38 innings is 48 runs. The highest score of the player is
(1) 165 runs (2) 170 runs
(3) 172 runs (4) 174 runs
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

9. The batting average of a cricket player for 64 innings is 62 runs. His highest score exceeds his lowest score by 180 runs. Excluding these two innings, the average of remaining innings becomes 60 runs. His highest score was
(1) 180 runs (2) 209 runs
(3) 212 runs (4) 214 runs
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

10. A cricket player after playing 10 tests scored 100 runs in the 11th test. As a result, the average of his runs is increased by 5. The present average of runs is
(1) 45 (2) 40
(3) 50 (4) 55
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

11. A cricketer has a mean score of 60 runs in 10 innings. Find out how many runs are to be scored in the eleventh innings to raise the mean score to 62?
(1) 83 (2) 82
(3) 80 (4) 81
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

12. In a 20 over match, the required run rate to win is 7.2. If the run rate is 6 at the end of the 15th over, the required run rate to win the match is
(1) 1.2 (2) 13.2
(3) 10.8 (4) 12
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

13. A batsman in his 12th innings makes a score of 63 runs and there by increases his average scores by 2. What is his average after the 12th innings?
(1) 13 (2) 39
(3) 49 (4) 87
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

14. The batting average for 30 innings of a cricket player is 40 runs. His highest score exceeds his lowest score by 100 runs. If these two innings are not included, the average of the remaining 28 innings is 38 runs. The lowest score of the player is :
(1) 15 (2) 18
(3) 20 (4) 12
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

15. Sachin Tendulkar has a certain average for 11 innings. In the 12th innings he scores 120 runs and thereby increases his average by 5 runs. His new average is
(1) 60 (2) 62
(3) 65 (4) 66
(SSC Graduate Level Tier-II Exam. 29.09.2013)

16. A cricketer whose bowling average is 12.4 runs per wicket, takes 5 wickets for 26 runs and thereby decreases his average by 0.4. The number of wickets taken by him till the last match was
(1) 64 (2) 72
(3) 80 (4) 85
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

17. The average run of a player is 32 out of 10 innings. How many runs must he make in the next innings so as to increase his average by 6 ?
(1) 38 (2) 40
(3) 6 (4) 98
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

18. A batsman makes a score of 87 runs in the 17th innings and thus increased his average by 3. Find his average after 17th innings.
(1) 39 (2) 87
(3) 90 (4) 84
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

19. The batting average for 40 innings of a cricket player is 50 runs. His highest score exceeds his lowest score by 172 runs. If these two innings are excluded, the average of the remaining 38 innings is 48 runs. The highest score of the player is
(1) 165 (2) 170
(3) 172 (4) 174
(SSC CGL Tier-II Online Exam.01.12.2016)

20. The average of runs of a cricket player of 20 innings was 32. How many runs must he make in his next innings so as to increase his average of runs by 4?
(1) 116 (2) 114
(3) 170 (4) 76
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

21. A batsman in his 12th innings makes a score of 120, and thereby increases his average by 5. The average score after 12th innings is
(1) 60 (2) 55
(3) 65 (4) 70
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

22. The averages of runs scored by a cricket player in 11 innings is 63 and the average of his first six innings is 60 and the average of last six innings is 65. Find the runs scored by him in the sixth innings.
(1) 60 (2) 54
(2) 67 (4) 57
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

23. Average runs scored by 11 players of a cricket team is 23. If the first player scored 113 runs. Find the average runs of the remaining players.
(1) 8 runs (2) 12 runs
(3) 14 runs (4) 27 runs
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

24. The average of runs scored by a cricketer in his 99 innings is 99. How many runs will he have to score in his 100th innings so that his average of runs in 100 innings may be 100?
(1) 100 (2) 99
(3) 199 (4) 101
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

25. In the first 10 overs of a cricket game, the run rate was only 3.2. The run rate in the remaining 40 overs to reach the target of 282 runs is
(1) 6.4 (2) 6.3
(3) 6.25 (4) 6.5
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

26. A cricketer, whose bowling average was 12.4 runs/wicket takes 5 wickets for 22 runs in a match, thereby decreases his average by 0.4. The number of wickets, taken by him before this match was :
(1) 78 (2) 87
(3) 95 (4) 105
(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

27. A batsman has a certain average of runs for 12 innings. In the 13th innings he scores 96 runs thereby increasing his average by 5 runs. What will be his average after 13th innings?
(1) 28 (2) 32
(3) 36 (4) 42
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE-VIII

1. The average of five numbers is 27. If one number is excluded, the average becomes 25. The excluded number is :
(1) 25 (2) 27
(3) 30 (4) 35
(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC SO (Commercial Audit) Exam. 16.11.2003)

2. The average of marks of 28 students in Mathematics was 50; 8 students left the school, then this average increased by 5. What is the average of marks obtained by the students who left the school ?
(1) 50.5 (2) 37.5
(3) 42.5 (4) 45
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

3. The average weight of 12 parcels is 1.8 kg. Addition of another new parcel reduces the average weight by 50 g. What is the weight of the new parcel ?
(1) 1.50 kg (2) 1.10 kg
(3) 1.15 kg (4) 1.01 kg
(SSC CPO S.I. Exam. 07.09.2003)

4. The average of 50 numbers is 38. If two numbers namely 45 and 55 are discarded, the average of the remaining numbers is :
(1) 35 (2) 32.5
(3) 37.5 (4) 36
(SSC Graduate Level Tier-I Exam. 21.04.2013 (Ist Sitting)

5. There are 50 students in a class. Their average weight is 45 kg. When one student leaves the class the average weight reduces by 100g. What is the weight of the student who left the class ?
(1) 45 kg (2) 47.9 kg
(3) 49.9 kg (4) 50.1 kg
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

6. Average weight of 25 students of a class is 50 kg. If the weight of the class teacher is included, the average is increased by 1 kg. The weight of the teacher is
(1) 76 kg (2) 77 kg
(3) 74 kg (4) 75 kg
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

7. There were 35 students in a hostel. If the number of students is increased by 7 the expenditure on food increases by ₹ 42 per day while the average expenditure of students is reduced by ₹ 1. What was the initial expenditure on food per day ?
(1) ₹ 400 (2) ₹ 432
(3) ₹ 442 (4) ₹ 420
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

8. The average of 6 observations is 45.5. If one new observation is added to the previous observations, then the new average becomes 47. The new observation is
(1) 58 (2) 56
(3) 50 (4) 46
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

9. The average of five numbers is 140. If one number is excluded, the average of the remaining four numbers is 130. The excluded number is :
(1) 135 (2) 134
(3) 180 (4) 150
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

10. The average of five numbers is 7. When three new numbers are included, the average of the eight numbers becomes 8.5. The average of the three new numbers is
(1) 9 (2) 10.5
(3) 11 (4) 11.5
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

11. The average of six numbers is 32. If each of the first three numbers is increased by 2 and each of the remaining three numbers is decreased by 4, then the new average is
(1) 35 (2) 34
(3) 31 (4) 30
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

12. The mean weight of 34 students of a school is 42 kg. If the weight of the teacher be included, the mean rises by 400 grams. Find the weight of the teacher (in kg).
(1) 55 kg (2) 57 kg
(3) 66 kg (4) 56 kg
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

13. If the mean of 4 observations is 20, when a constant 'C' is added to each observation, the mean becomes 22. The value of C is :
(1) 6 (2) –2
(3) 2 (4) 4
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

14. The average weight of 40 children of a class is 36.2 kg. When three more children with weight 42.3 kg, 39.7 kg and 39.5 kg join the class, the average weight of the 43 children in the class is
(1) 39.2 kg (2) 36.5 kg
(3) 38.35 kg (4) 37.3 kg
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

15. In a class, the average score of girls in an examination is 73 and that of boys is 71. The average score for the whole class is 71.8. Find the percentage of girls.

(1) 40% (2) 50%
(3) 55% (4) 60%

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

16. A student finds the average of 10, 2 – digit numbers. If the digits of one of the numbers is interchanged, the average increases by 3.6. The difference between the digits of the 2-digit numbers is

(1) 4 (2) 3
(3) 2 (4) 5

(SSC CGL Tier-I Exam. 19.10.2014)

17. The average of five numbers is 7. If three new numbers would be added, then the new average comes out to be 8.5. What is the average of those three new numbers?

(1) 9 (2) 10.5
(3) 11 (4) 11.5

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

TYPE–IX

1. The average age of 14 girls and their teacher's age is 15 years. If the teacher's age is excluded, the average reduces by 1. What is the teacher's age?

(1) 35 years (2) 32 years
(3) 30 years (4) 29 years

(SSC CGL Prelim Exam. 27.02.2000 (Ist Sitting) & SSC CGL Tier I, Exam. 24.04.2013)

2. The average age of four brothers is 12 years. If the age of their mother is also included, the average is increased by 5 years. The age of the mother (in years) is :

(1) 37 years (2) 43 years
(3) 48 years (4) 53 years

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

3. The average age of 8 persons is increased by 2 years, when one of them, whose age is 24 years is replaced by a new person. The age of the new person is :

(1) 42 years (2) 40 years
(3) 38 years (4) 45 years

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. The average age of 8 men is increased by 2 years when two of them whose age are 21 and 23 years replaced by two new men. The average age of the two new men is

(1) 22 years (2) 24 years
(3) 28 years (4) 30 years

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. The average age of eleven players of a cricket team decreases by 2 months when two new players are included in the team replacing two players of age 17 years and 20 years. The average age of new player is

(1) 17 years 1 month
(2) 17 years 7 months
(3) 17 years 11 months
(4) 18 years 3 months

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & SSC CGL Exam. 13.11.2005 (IInd sitting)

6. The average age of 20 boys in a class is 12 years. 5 new boys are admitted to the class whose average age is 7 years. The average age of the boys in the class becomes

(1) 8.2 years (2) 9.5 years
(3) 12.5 years (4) 11 years

(SSC CPO S.I. Exam. 07.09.2003)

7. There are 30 students in a class. The average age of first 10 students is 12.5 years. The average age of the remaining 20 students is 13.1 years. The average age (in years) of the students of the whole class is

(1) 12.5 years (2) 12.7 years
(3) 12.8 years (4) 12.9 years

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

8. The average age of 5 boys is 12 years. The average age of 3 others is 16 years. The average age of all the 8 boys is :

(1) $13\frac{1}{2}$ years (2) 14 years
(3) $12\frac{1}{2}$ years (4) 13 years

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

9. Out of 10 teachers of a school, one teacher retires and at his place a new teacher of age 25 years joins. As a result of it, the average age of the teachers is reduced by 3 years. The age of the retired teacher is

(1) 60 years (2) 58 years
(3) 56 years (4) 55 years

(SSC CPO S.I. Exam. 05.09.2004 & SSC CGL Tier-I Exam. 21.04.2013 (Ist sitting)

10. The average age of 40 students of a class is 15 years. When 10 new students are admitted, the average is increased by 0.2 year. The average age of the new students is :

(1) 15.2 years (2) 16 years
(3) 16.2 years (4) 16.4 years

(SSC CPO S.I. Exam. 26.05.2005 & 09.11.2008)

11. The present average age of a family of four members is 36 years. If the present age of the youngest member of the family be 12 years, the average age of the family at the birth of the youngest member was

(1) 48 years (2) 40 years
(3) 32 years (4) 24 years

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

12. The average age of 40 students of a class is 18 years. When 20 new students are admitted to the same class, the average age of the students of the class is increased by 6 months. The average age of newly admitted student is

(1) 19 years
(2) 19 years 6 months
(3) 20 years
(4) 20 years 6 months

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

13. The average age of group of 20 girls is 15 years and that of another group of 25 boys it is 24 years. The average age of the two groups mixed together is

(1) 19.5 years (2) 20 years
(3) 21 years (4) 21.5 years

(SSC Data Entry Operator Exam. 31.08.2008)

14. The average age of 11 players of a cricket team is increased by 2 months when two of them aged 18 years and 20 years are replaced by two new players. The average age of the new players is

(1) 19 years 1 month
(2) 19 years 6 months
(3) 19 years 11 months
(4) 19 years 5 months

(SSC CGL Exam. 13.11.2005 (Ist sitting) & SSC CGL Tier-1 Exam. 26.06.2011 (IInd Sitting)

15. Average age of 8 men is increased by 3 years when two of them whose age are 30 and 34 years are replaced by 2 persons. What is the average age of the 2 persons ?

(1) 24 years (2) 32 years
(3) 44 years (4) 48 years

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

16. The average age of a family of 10 members is 20 years. If the age of the youngest member of the family is 10 years, then the average age of the members of the family just before the birth of the youngest member was approximately

(1) 27.14 years (2) 12.5 years
(3) 14.28 years (4) $11\frac{1}{9}$ years

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

17. The average age of four boys A, B, C and D is 5 years and the average age of A, B, D, E is 6 years. C is 8 years old. The age of E is (in years)

(1) 12 (2) 13
(3) 14 (4) 15

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

18. 5 years ago, the average age of P and Q was 15 years. Average age of P, Q and R today is 20 years. How old will R be after 10 years?

(1) 35 years (2) 40 years
(3) 30 years (4) 50 years

(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

19. The average age of a husband and his wife was 23 years at the beginning of their marriage. After five years they have a one-year old child. The average age of the family of three, when the child was born, was

(1) 23 years (2) 24 years
(3) 18 years (4) 20 years

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

20. Two years ago the average age of a family of 8 members was 18 years. After the addition of a baby, the average age of the family is same today. What is the age of the baby ?

(1) 2 years (2) $1\frac{1}{2}$ years
(3) 1 year (4) $2\frac{1}{2}$ years

(SSC Constable (GD) Exam. 12.05.2013)

21. From a class of 42 boys, a boy aged 10 years goes away and in his place, a new boy is admitted. If on account of this change, the average age of the boys in that class increases by 2 months, the age of the newcomer is :

(1) 19 years
(2) 17 years
(3) 10 years 6 months
(4) 12 years 2 months

(SSC Multi-Tasking Staff Exam. 10.03.2013)

22. The average age of Ram and his two children is 17 years and the average age of Ram's wife and the same children is 16 years. If the age of Ram is 33 years, the age of his wife is (in years):

(1) 31 (2) 32
(3) 35 (4) 30

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

23. The average age of A and B is 20 years. If A is to be replaced by C, the average would be 19 years. The average age of C and A is 21 years. The ages of A, B and C in order (in years) are

(1) 18, 22, 20 (2) 18, 20, 22
(3) 22, 18, 20 (4) 22, 20, 18

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

24. In a family of 5 members, the average age at present is 33 years. The youngest member is 9 years old. The average age of the family just before the birth of the youngest member was

(1) 30 years (2) 29 years
(3) 25 years (4) 24 years

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

25. The average age of 12 players of a team is 25 years. If the captain's age is included, the average age increases by 1 year. The age of the captain is :

(1) 25 yrs. (2) 38 yrs.
(3) 36 yrs. (4) 26 yrs.

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

26. In a class, there are 40 boys and their average age is 16 years. One boy, aged 17 years, leaving the class and another joining, the average age becomes 15.875 years. The age of the new boy is :

(1) 12 years (2) 14.5 years
(3) 15 years (4) 17 years

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

27. The average age of 30 boys in a class is 15 years. One boy, aged 20 years, left the class, but two new boys came in his place whose age differ by 5 years. If the average age of all the boys now in the class becomes 15 years, the age of the younger newcomer is :

(1) 20 years (2) 15 years
(3) 10 years (4) 8 years

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

28. In a class there are 30 boys and their average age is 17 years. On one boy aged 18 years leaving the class and another joining, the average age becomes 16.9 years. The age of new boy is

(1) 25 years (2) 11 years
(3) 13 years (4) 15 years

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

29. Average age of 6 sons of a family is 8 years. Average age of sons together with their parents is 22 years. If the father is older than the mother by 8 years, the age of mother (in years) is :

(1) 44 (2) 52
(3) 60 (4) 68

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

30. Out of 10 teachers of a school, one teacher retires and in his place, a new teacher of age 25 years joins. As a result, average age of teachers reduces by 3 years. The age of the retired teacher is
(1) 50 years (2) 55 years
(3) 58 years (4) 60 years
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

31. 3 years ago, the average age of a family of 5 members was 17 years. A baby having been born, the average age of the family is the same today. The present age of the baby is :
(1) 3 years (2) 2 years
(3) $1\frac{1}{2}$ years (4) 1 year
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

32. The average age of 45 persons is decreased by $\frac{1}{9}$ year when one of them of 60 years is replaced by a new comer. Then the age of the new comer is :
(1) 45 years (2) 55 years
(3) 59 years (4) 49 years
(SSCCHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

33. When the average age of a husband and wife and their son was 42 years, the son got married and a child was born just one year after the marriage. When child turned to be five years then the average age of family became 36 years. What was the age of daughter-in-law at the time of marriage ?
(1) 26 years (2) 25 years
(3) 24 years (4) 23 years
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

34. The average age of 30 boys in a class is 15 years. One boy aged 20 years, left the class, but two new boys came in his place whose ages differ by 5 years. If the average age of all the boys now in the class still remains 15 years, the age of the younger newcomer is :
(1) 20 years (2) 15 years
(3) 10 years (4) 8 years
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

35. The average age of 24 boys and their teacher is 15 years. When the teacher's age is excluded, the average age decreases by 1 year. The age of the teacher is
(1) 38 years (2) 39 years
(3) 40 years (4) 41 years
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

36. There were 24 students in a class. One of them, who was 18 years old, left the class and his place was filled up by a newcomer. If the average of the class thereby, was lowered by one month, the age of the newcomer is
(1) 14 years (2) 15 years
(3) 16 years (4) 17 years
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

37. The average age of 30 students is 9 years. If the age of their teacher is included, the average age becomes 10 years. The age of the teacher (in years) is
(1) 27 (2) 31
(3) 35 (4) 40
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

38. From a class of 24 boys, a boy, aged 10 years, leaves the class and in his place a new boy is admitted. As a result, the average age of the class is increased by 2 months. What is the age of the new boy ?
(1) 12 years (2) 15 years
(3) 14 years (4) 13 years
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

39. 5 years ago, the average age of A, B, C and D was 45 years. With E joining them now, the average age of all the five is 49 years. How old is E ?
(1) 25 years (2) 40 years
(3) 45 years (4) 64 years
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

40. In a family, the average age of a father and a mother is 35 years. The average age of the father, mother and their only son is 27 years. What is the age of the son ?
(1) 12 years (2) 11 years
(3) 10.5 years (4) 10 years
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

41. The average age of 9 students and their teacher is 16 years. The average age of the first four students is 19 years and that of the last five is 10 years. The teacher's age is
(1) 36 years (2) 34 years
(3) 30 years (4) 28 years
(SSC (South Zone) Investigator Exam 12.09.2010)

42. Five years ago, the average age of P, Q and R was 25 years and seven years ago, the average age of Q and R was 20 years. The present age of P is
(1) 36 years (2) 29 years
(3) 24 years (4) 21 years
(SSC Data Entry Operator Exam. 31.08.2008)

43. The average age of eleven cricket players is 20 years. If the age of the coach is also included, the average age increases by 10%. The age of the coach is
(1) 48 years (2) 44 years
(3) 40 years (4) 36 years
(SSC Data Entry Operator Exam. 02.08.2009)

44. The average age of a husband and a wife was 27 years when they married 4 years ago. The average age of the husband, the wife and a new-born child is 21 years now. The present age of the child is
(1) 4 years (2) 3 years
(3) 2 years (4) 1 year
(SSC Data Entry Operator Exam. 02.08.2009)

45. The average age of a husband and wife, who were married 4 years ago, was 25 years at the time of their marriage. The average age of the family consisting of husband, wife and a child, born during the interval is 20 years today. The age of the child is
(1) 1 year (2) 2 years
(3) 2.5 years (4) 3 years
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

46. Five years ago, the average age of P and Q was 25. The average age of P, Q and R today is 25. Age of R after 5 years will be
(1) 15 years (2) 20 years
(3) 40 years (4) 35 years
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

47. In a school, the average age of students is 6 years, and the average age of 12 teachers is 40 years. If the average age of the combined group of all the teachers and students is 7 years, then the number of students is :
(1) 396 (2) 400
(3) 408 (4) 416
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

48. In a school with 600 students, the average age of the boys is 12 years and that of the girls is 11 years. If the average age of the school is 11 years and 9 months, then the number of girls in the school is
(1) 450 (2) 150
(3) 250 (4) 350
(SSC Graduate Level Tier-II Exam.16.09.2012)

49. If out of 10 selected students for an examination, 3 were of 20 years, age, 4 of 21 and 3 of 22 years, the average age of the group is
(1) 22 years (2) 21 years
(3) 21.5 years (4) 20 years
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

50. 3 years ago, the average age of a family of 5 members was 17 years. A baby having been born, the average age of the family is same today. The present age of the baby is
(1) 1 year (2) $1\frac{1}{2}$ year
(3) 2 years (4) 3 years
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

51. A man had 7 children. When their average age was 12 years, a child aged 6 years died. The average age of remaining six children is
(1) 13 years (2) 10 years
(3) 11 years (4) 14 years
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

52. The average age of a cricket team of 11 players is the same as it was 3 years back because 3 of the players whose current average age of 33 years were replaced by 3 youngsters. The average age of the newcomers is
(1) 23 years (2) 21 years
(3) 22 years (4) 20 years
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

53. The frequency distribution data is given below. If the average age is 17 years, the value of m is

Age (in years) :	8	20	26	29
Number of people :	3	2	m	1

(1) 1 (2) 2
(3) 3 (4) 4
(SSC CGL Tier-II Exam. 21.09.2014)

54. After replacing an old member by a new member, it was found that the average age of five members of a club is the same as it was 3 years ago. The difference between the ages of the replaced and the new members is
(1) 2 years (2) 4 years
(3) 8 years (4) 15 years
(SSC CGL Tier-II Exam. 21.09.2014)

55. Three years ago, the average age of a family of 5 members was 17 years. A baby having been born the average age of the family is the same today. The present age of the baby (in years) is
(1) 2 (2) 2.4
(3) 3 (4) 1.5
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

56. 3 years ago the average age of a family of 5 members was 17 years. A baby having been born, the average age of the family is the same today. The present age of the baby is
(1) 1 year (2) $1\frac{1}{2}$ years
(3) 2 years (4) 3 years
(SSC CHSL DEO & LDC Exam. 9.11.2014)

57. Three years ago the average age of a family of 5 members was 17 years. A baby having been born, the average age of the family remains the same today. The age of the baby today is
(1) 3 years (2) 2 years
(3) 1 year (4) 1.5 years
(SSC CHSL DEO & LDC Exam. 16.11.2014)

58. The average age of P, Q and R is 5 years more than R's age. If the total ages of P and Q together is 39 years, then R's age is
(1) 12 years (2) 24 years
(3) 16 years (4) 14 years
(SSC CHSL DEO Exam. 16.11.2014) (Ist Sitting)

59. Three years ago, the average age of a family of 5 members was 17 years. A baby having been born, the average age of the family is the same today. The present age of the baby (in year/s) is
(1) 1 (2) $1\frac{1}{2}$
(3) 2 (4) 3
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

60. The average age of a husband and his wife was 23 years at the time of their marriage. After five years they have a one year old child. The average age of the family now is
(1) 29.3 years (2) 19 years
(3) 23 years (4) 28.5 years
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

61. The average age of 30 students of a class is 14 years 4 months. After admission of 5 new students in the class the average becomes 13 years 9 months. The youngest one of the five new students is 9 years 11 months old. The average age of the remaining 4 new students is
(1) 11 years 2 months
(2) 13 years 6 months
(3) 12 years 4 months
(4) 10 years 4 months
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

62. Out of 10 teachers of a school, one teacher retires and in place of him a new teacher 25 years old joins. As a result of it average age of the teachers reduces by 3 years. Age of the retired teacher (in years) is :
(1) 55 (2) 60
(3) 58 (4) 56
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

63. The average age of mother and her six children is 12 years, which is reduced by 5 years if the age of the mother is excluded. The age of the mother (in years) is :
(1) 50 (2) 40
(3) 48 (4) 42
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

64. The average age of a family with 5 members is 28 years. If one of the members of age 20 years is excluded, the average age of the family becomes

(1) 25 years (2) 20 years
(3) 30 years (4) 24 years

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

65. The average age of husband, wife and their child 3 years ago was 27 years and that of wife and the child 5 years ago was 20 years. The present age of the husband is :

(1) 50 years
(2) 40 years
(3) 35 years
(4) None of the options

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

66. Pushpa is twice as old as Rita was 2 years ago. If difference between their ages is 2 years, how old is Pushpa today?

(1) 6 years (2) 8 years
(3) 10 years (4) 12 years

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

67. The average age of 10 children is 9 years 9 months. The average age of 9 children is 8 years 11 months. What is the age of the tenth child ?

(1) 17 years 3 months
(2) 18 years 4 months
(3) 17 years 5 months
(4) 18 years 3 months

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

68. The sum of the ages of mother and her daughter is 60 years. 12 years ago the mother was eight times as old as her daughter. How old is the daughter at present?

(1) 20 years (2) 28 years
(3) 16 years (4) 12 years

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

69. The average age of eight teachers in a school is 40 years. A teacher among them died at the age of 55 years whereas another teacher whose age was 39 years joins them. The average age of the teachers in the school now is (in years)

(1) 35 (2) 36
(3) 38 (4) 39

(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

70. If the average age of four children is 12 years and the average age of these children and their father is 20 years, what is the age of the father ?

(1) 52 years (2) 48 years
(3) 62 years (4) 54 years

(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

71. The average age of 36 students in a group is 14 years. When the teacher's age is included in it, the average increases by one. The teacher's age in years is

(1) 31 (2) 51
(3) 36 (4) 50

(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

72. The average age of 30 boys in a class is 10 years. If the age of their teacher is also included, the average increases by one year. The teacher's age in years is

(1) 38 (2) 40
(3) 30 (4) 41

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

73. Ram is 20 years younger than Shyam. 5 years ago, the ratio of their ages was 3 : 5. The sum of their present ages is :

(1) 75 years (2) 80 years
(3) 90 years (4) 95 years

(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

74. Three years ago, the average age of a family of 5 members was 17 years. A baby having been born, the average age of the family is the same today. The present age of the baby is :

(1) 2 years (2) 2.4 years
(3) 3 years (4) 1.5 years

(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

75. Seven years ago, the average age of A, B and C was 51 years. If A is 3 years older than B and B is 3 years older than C then the present ages of A, B and C are (in years)

(1) 61, 58 and 55
(2) 54, 51, and 48
(3) 55, 58, and 61
(4) 48, 51 and 54

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

76. Numbers of boys and girls are 'x' and 'y' respectively. Ages of a girl and a boy are 'a' years and 'b' years respectively. The average age (in years) of all boys and girls is

(1) $\frac{x+y}{bx+ay}$ (2) $\frac{bx+ay}{x+y}$

(3) $\frac{ax+by}{x+y}$ (4) $\frac{x+y}{ax+by}$

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

77. The average age of a class of 39 students is 15 years. If the age of the teacher is included, then the average increases by 3 months. Find the age of the teacher.

(1) 30 years (2) 25 years
(3) 35 years (4) 40 years

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

78. The average age of 3 friends is 23 years. Even if the age of 4th friend is added, the average age remains the same. Then the age of the fourth friend is :

(1) 20 years (2) 21 years
(3) 22 years (4) 23 years

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

79. The average age of the boys in a class is 18 years. The average age of the girls in that class is 12 years. If the ratio of the number of boys and girls in that class is 3 : 2, then the average age of the class is :

(1) 15. 6 years (2) 16. 5 years
(3) 15 years (4) 16 years

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

TYPE-X

1. A company produces an average of 4000 items per month for the first 3 months. How much items, it must produce on an average per month over the next 9 months to average 4375 items per month over the whole year?

(1) 4500 (2) 4600
(3) 4680 (4) 4710

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. There are in all, 10 balls; some of them are red and the others white. The average cost of all balls is ₹ 28. If the average cost of red balls is ₹ 25 and that of white balls is ₹ 30, the number of white balls is :

(1) 3 (2) 5
(3) 6 (4) 7

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

3. The arithmetic mean of the scores of a group of students in a test was 52. The brightest 20% of them secured a mean score of 80 and the dullest 25% a mean score of 31.The mean score of remaining 55% is :

(1) 45% (2) 50%
(3) 51.4% approx.
(4) 54.6% approx.

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. The average of marks obtained by 120 candidates in a certain examination is 35. If the average marks obtained by passed candidates are 39 and those of the failed candidates are 15, what is the number of candidates who passed the examination ?

(1) 100 (2) 120
(3) 150 (4) 140

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. A man's pension on retirement from service is equal to half the average salary during last 3 years of his service. His salary from 1-1-1983 is ₹ 380 per month with increment of ₹ 40 due on 1-10-83, 1-10-84 and 1-10-85, If he retires on 1-1-86, what pension does he draw per month?

(1) ₹ 205 (2) ₹ 215
(3) ₹ 225 (4) ₹ 230

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

6. The average salary of all the workers in a workshop is ₹ 8000. The average salary of 7 technicians is ₹ 12000 and the average salary of the rest is ₹ 6000. The total number of workers in the workshop is

(1) 20 (2) 21
(3) 23 (4) 22

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

7. The average age of 15 students of a class is 15 years. Out of these the average age of 5 students is 14 years and that of the other 9 students is 16 years. The age of the 15th student is

(1) 11 years (2) 15 years
(3) $15\frac{2}{7}$ years (4) 14 years

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

8. In a family of 8 adults and some minors, the average consumption of rice per head per month is 10.8 kg; while the average consumption for adults is 15 kg per head and for minors it is 6 kg per head. The number of minors in the family is :

(1) 8 (2) 6
(3) 7 (4) 9

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

9. The average monthly income (in ₹) of certain agricultural workers is S and that of other workers is T. The number of agricultural workers is 11 times that of other workers. Then, the average monthly income (in ₹) of all the workers is :

(1) $\frac{S+11T}{12}$ (2) $\frac{S+T}{12}$
(3) $\frac{11S+T}{12}$ (4) $\frac{1}{11S}+T$

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

10. The average of marks scored by the students of a class is 68. The average of marks of the girls in the class is 80 and that of boys is 60. What is the percentage of boys in the class ?

(1) 40 % (2) 60 %
(3) 65 % (4) 70 %

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

11. The average monthly salary of the workers in a workshop is Rs. 8,500. If the average monthly salary of 7 technicians is Rs. 10,000 and average monthly salary of the rest is Rs. 7,800, the total number of workers in the workshop is

(1) 18 (2) 20
(3) 22 (4) 24

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

12. The average pocket money of 3 friends A, B, C is ₹80 in a particular month. If B spends double and C spends triple of what A spends during that month and if the average of their unspent pocket money is ₹ 60, then A spends (in ₹)

(1) ₹ 10 (2) ₹ 20
(3) ₹ 30 (4) ₹ 40

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

13. The average score of a-class of boys and girls in an examination is A. The ratio of boys and girls in the class is 3 :1. If the average score of the boys is A + 1, the average score of the girls is

(1) A + 1 (2) A – 1
(3) A + 3 (4) A – 3

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

14. If the average of m numbers is n^2 and that of n numbers is m^2, then average of $(m + n)$ numbers is

(1) $\frac{m}{n}$ (2) $m + n$
(3) mn (4) $m - n$

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

15. The average of the three numbers x, y and z is 45. x is greater than the average of y and z by 9. The average of y and z is greater than y by 2. Then the difference of x and z is

(1) 3 (2) 5
(3) 7 (4) 11

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

16. The average expenditure of a man for the first five months of a year is ₹ 5,000 and for the next seven months it is ₹ 5,400. He saves ₹ 2,300 during the year. His average monthly income is :

(1) ₹ 5,425 (2) ₹ 5,500
(3) ₹ 5,446 (4) ₹ 5,600

(SSC CPO S.I. Exam. 16.12.2007)

17. The average of eight numbers is 20. If the sum of first two numbers is 31, the average of the next three numbers is $21\frac{1}{3}$ and the seventh and eighth numbers exceed the sixth number by 4 and 7 respectively, then the eighth number is

(1) 20 (2) 25
(3) 21.6 (4) 25.3

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

18. 30 pens and 75 pencils altogether were purchased for ₹ 510. If the average price of a pencil was ₹ 2, what was the average price of a pen ?

(1) ₹ 9 (2) ₹ 10
(3) ₹ 11 (4) ₹ 12

(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

19. The average mathematics marks of two Sections A and B of Class IX in the annual examination is 74. The average marks of Section A is 77.5 and that of Section B is 70. The ratio of the number of students of Section A and B is

(1) 7 : 8 (2) 7 : 5
(3) 8 : 7 (4) 8 : 5

(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

20. In a prep school, the average weight of 30 girls in a class among 50 students is 16 kg and that of the remaining students is 15.5 kg. What is the average weight of all the students in the class ?

(1) 15.2 kg. (2) 15.8 kg.
(3) 15.4 kg. (4) 15.6 kg.

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

21. The average salary of all staff of a school is ₹ 10,000. The average salary of 20 teaching staff is ₹ 12,000 and that of non-teaching staff is ₹ 5000, the number of non-teaching staff will be

(1) 7 (2) 8
(3) 10 (4) 12

(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

22. B was born when A was 4 years 7 months old and C was born when B was 3 years 4 months old. When C was 5 years 2 months old, then their average age was

(1) 8 years 9 months
(2) 7 years 3 months
(3) 8 years 7 months
(4) 8 years 11 months

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

23. If the average of x and $\frac{1}{x}$ $(x \neq 0)$ is M, then the average of x^2 and $\frac{1}{x^2}$ is :

(1) $1 - M^2$ (2) $1 - 2M$
(3) $2M^2 - 1$ (4) $2M^2 + 1$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

24. 5 members of a team are weighed consecutively and their average weight calculated after each member is weighed. If the average weight increases by one kg each time, how much heavier is the last player than the first one ?

(1) 4 kg (2) 20 kg
(3) 8 kg (4) 5 kg

(SSC Graduate Level Tier-II Exam.16.09.2012)

25. Out of nine persons, 8 persons spent ₹ 30 each for their meals. The ninth one spent ₹ 20 more than the average expenditure of all the nine. The total money spent by all of them was

(1) ₹ 260 (2) ₹ 290
(3) ₹ 292.50 (4) ₹ 400.50

(SSC Graduate Level Tier-II Exam.16.09.2012)

26. In the afternoon, a student read 100 pages at the rate of 60 pages per hour. In the evening, when she was tired, she read 100 more pages at the rate of. 40 pages per hour. What was her average rate of reading, in pages per hour ?

(1) 60 (2) 70
(3) 48 (4) 50

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

27. Ram aims to score an average of 80 marks in quarterly and half yearly exams. But his average in quarterly is 3 marks less than his target and that in half yearly is 2 marks more than his aim. The difference between the total marks scored in both the exams is 25. Total marks aimed by Ram is :

(1) 400 (2) 410
(3) 420 (4) 380

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

28. While purchasing one item costing ₹400, one has to pay sales tax at 7% and on another costing ₹ 6400, the sales tax was 9%. The per cent of sales tax one has to pay, taking these items together on an average is :

(1) $8\frac{13}{17}$ (2) $8\frac{15}{17}$
(3) $8\frac{1}{2}$ (4) 8

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

29. On mixing two classes A and B of students having average marks 25 and 40 respectively, the overall average obtained is 30. Find the ratio of the students in the classes A and B.

(1) 2 : 1 (2) 5 :8
(3) 5 : 6 (4) 3 : 4

(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

30. A man purchases milk for three consecutive years. In the first year, he purchases milk at the rate of ₹ 7.50 per litre, in the second year, at the rate of ₹ 8.00 per litre and in the third year, at ₹ 8.50 per litre. If he purchases milk worth ₹ 4,080 each year, the average price of milk per litre for the three years is

(1) ₹ 7.68 (2) ₹ 7.98
(3) ₹ 7.54 (4) ₹ 7.83

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

31. A fruit seller sold big, medium and small sized apples for ₹ 15, ₹ 10 and ₹ 5 respectively. The total number of apples sold were in the ratio 3 : 2 : 5. Find the average cost of an apple.

(1) 8 (2) 10
(3) 9 (4) 7

(SSC CHSL DEO & LDC Exam. 21.10.2012, IInd Sitting)

32. A man purchased 7 bags of rice at the rate of ₹ 800 each, 8 bags of rice at ₹ 1000 each and 5 bags of rice at the rate of ₹ 1200 each. What is the average cost of one bag of rice ?

(1) ₹ 1000 (2) ₹ 980
(3) ₹ 1120 (4) ₹ 1050

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

33. The average (arithmetic mean) of 3^{30}, 3^{60} and 3^{90} is
(1) $3^{27} + 3^{57} + 3^{87}$
(2) 3^{60}
(3) $3^{29} + 3^{59} + 3^{89}$
(4) 3^{177}
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

34. In a team of 10 persons, nine persons spent ₹ 40 each for their meal and the remaining one spent ₹ 9 more than the average expenditure of all the 10 persons. The total expenditure for their meal was
(1) ₹ 510 (2) ₹ 310
(3) ₹ 410 (4) ₹ 610
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

35. In an examination average marks obtained by the girls of a class is 85 and the average marks obtained by the boys of the same class is 87. If the girls and boys are in the ratio 4 : 5, average marks of the whole class (approximately) is closest to
(1) 85.9 (2) 86.1
(3) 86.4 (4) 86.5
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

36. A shop of electronic goods is closed on Monday. The average sales per day for remaining six days of a week is ₹ 15640 and the average sale on Tuesday to Saturday is ₹ 14124. The sales on Sunday is
(1) ₹ 21704 (2) Data inadequate
(3) ₹ 23220 (4) ₹ 20188
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

37. Fifteen movie theatres average 600 customers per theatre per day. If six of the theatres close down but the total theatre attendance stays the same, then the average daily attendance per theatre among the remaining theatres is
(1) 900 (2) 1000
(3) 1100 (4) 1200
(SSC CGL Tier-II Online Exam.01.12.2016)

38. Last year, 5 companies had an average of 16 non working days each. This year, 3 companies had 10 more non working days each, and 2 companies had 5 fewer non working days each. What was the average number of non working days given by the same companies this year ?
(1) 12 (2) 18
(3) 20 (4) 22
(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

39. On 24th May, 2008 the maximum temperature of Delhi, Kolkata and Mumbai were recorded as 35°C, 33°C and 34°C respectively. What was the maximum temperature of Chennai so that the average maximum temperature of those cities would be 35°?
(1) 34° C (2) 35° C
(3) 36° C (4) 38° C
(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

40. Eight members of a club donate Rs. 100 each towards a Relief Fund and the President of the club donates Rs. 50 more than the average donation of all (including President) of them. Then the contribution of the president is
(1) Rs.106.25 (2) Rs. 156.25
(3) Rs. 56.25 (4) Rs. 206.25
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

41. A and B have their annual average income Rs. 80,000.
B and C have their annual average income Rs. 75,000.
C and A have their annual average income Rs. 78,000.
The annual income of A is
(1) Rs. 81000 (2) Rs. 82000
(3) Rs. 83000 (4) Rs. 84000
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

42. The average (arithmetic mean) amount of savings of ten students is Rs. 600. Three of the students have no savings at all and each of the others have at least Rs. 250 including Nihar, who has exactly Rs. 1300. The largest amount, in Rs., that any one student could have saved is
(1) Rs. 3250 (2) Rs. 3450
(3) Rs. 3650 (4) Rs. 3850
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

43. An army of 12000 consists of Europeans and Indians. The average height of a European is 5ft 10 inches and that of an Indian is 5ft 9 inches and that of the whole army is 5ft $9\frac{3}{4}$ inches. Then the number of Indians in the army is
(1) 3000 (2) 4000
(3) 5500 (4) 2700
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

44. The mean of 100 observations was calculated as 40. It was found later on that one of the observations was misread as 83 instead of 53. The correct mean is :
(1) 39 (2) 39.7
(3) 40.3 (4) 42.7
(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

45. Visitors to a show were charged Rs. 15 each on the first day, Rs. 7.50 on the second day, Rs. 2.50 on the third day and total attendance on three days were in the ratio 2 : 5 : 13 respectively. The average charge per person for the entire three days is
(1) Rs. 5 (2) Rs. 5.50
(3) Rs. 6 (4) Rs. 7
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

46. The average weight of 10 parcels is 1.7 kg. Addition of another new parcel reduces the average weight by 60 gram. What is the weight in kg. of the new parcel?
(1) 1.04 (2) 1.08
(3) 1.4 (4) 1.8
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

47. The average temperature of Monday, Tuesday , Wednesday and Thursday is 60°. The average temperature for Tuesday, Wednesday, Thursday and Friday is 63°. If the ratio of temperature for Monday and Friday is 21 : 25, then what is the temperature of Friday ?
(1) 70° (2) 73°
(3) 75° (4) 78°
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

48. A team of 8 persons joins in a shooting competition. The best marksman scored 85 points. If he had scored 92 points, the average score for the team would have been 84. The number of points the team scored was
(1) 672 (2) 665
(3) 645 (4) 588
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

49. A librarian purchased 60 story books for his library. But he found that he could get 4 extra books by spending Rs. 336 more and then the overall average price per book would be reduced by Re 1. The previous average price of each book was
(1) Rs. 84 (2) Rs. 83
(3) Rs. 68 (4) Rs. 100
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

50. The average weight of 3 men A, B and C is 84 kg. Another man D joins the group and the average now becomes 80 kg. If another man E whose weight is 3 kg more than that of D, replaces A then the average weight of B, C, D and E becomes 79 kg. What is the weight of A?

(1) 70 kg. (2) 72 kg.
(3) 75 kg. (4) 80 kg.

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

SHORT ANSWERS

TYPE-I

1. (2)	**2.** (3)	**3.** (1)	**4.** (1)
5. (4)	**6.** (4)	**7.** (3)	**8.** (2)
9. (2)	**10.** (3)	**11.** (4)	**12.** (2)
13. (2)	**14.** (2)	**15.** (2)	**16.** (2)
17. (1)	**18.** (1)	**19.** (1)	**20.** (3)
21. (1)	**22.** (1)	**23.** (2)	**24.** (1)
25. (2)	**26.** (3)	**27.** (3)	**28.** (4)
29. (2)	**30.** (4)	**31.** (2)	**32.** (1)
33. (3)	**34.** (3)	**35.** (3)	**36.** (4)
37. (3)	**38**. (3)	**39.** (2)	**40.** (2)
41. (1)	**42.** (2)	**43.** (1)	**44.** (4)
45. (4)	**46.** (2)	**47.** (3)	**48.** (1)
49. (3)	**50.** (2)	**51.** (1)	**52.** (4)
53. (2)	**54.** (2)	**55.** (3)	**56.** (3)
57. (3)	**58.** (4)	**59.** (4)	**60.** (1)
61. (1)	**62.** (4)	**63.** (2)	**64.** (4)
65. (2)			

TYPE-II

1. (3)	**2**. (3)	**3.** (3)	**4.** (2)
5. (4)	**6.** (3)	**7.** (2)	**8.** (4)
9. (4)	**10.** (2)	**11.** (2)	**12.** (4)
13. (2)	**14.** (3)	**15.** (3)	**16.** (1)
17. (3)	**18.** (1)	**19.** (1)	**20.** (1)
21. (2)	**22.** (2)	**23.** (4)	**24.** (2)
25. (3)	**26.** (4)		

TYPE-III

1. (2)	**2.** (4)	**3.** (4)	**4.** (3)
5. (2)	**6.** (4)	**7.** (4)	**8.** (3)
9. (4)	**10.** (3)	**11.** (2)	**12.** (2)
13. (2)	**14.** (1)	**15.** (4)	**16.** (4)
17. (3)	**18.** (4)	**19.** (1)	**20.** (4)
21. (2)	**22.** (1)	**23.** (3)	**24.** (1)
25. (2)	**26.** (2)	**27.** (2)	**28.** (2)
29. (2)	**30.** (1)		

TYPE-IV

1. (1)	**2.** (3)	**3.** (1)	**4.** (2)
5. (4)	**6.** (2)	**7.** (3)	**8.** (2)
9. (2)	**10.** (4)	**11.** (3)	**12.** (1)
13. (2)	**14.** (3)	**15.** (2)	

TYPE-V

1. (2)	**2.** (2)	**3.** (3)	**4.** (1)
5. (3)	**6.** (3)	**7.** (3)	**8.** (2)
9. (4)	**10.** (4)	**11.** (1)	**12.** (4)
13. (1)	**14.** (3)	**15.** (2)	**16.** (3)
17. (2)	**18.** (2)		

TYPE-VI

1. (3)	**2.** (3)	**3.** (3)	**4.** (3)
5. (4)	**6.** (3)	**7.** (4)	**8.** (2)
9. (3)	**10.** (2)	**11.** (1)	**12.** (3)
13. (1)	**14.** (3)	**15.** (1)	**16.** (3)
17. (1)	**18.** (1)	**19.** (3)	**20.** (2)
21. (3)	**22.** (1)	**23.** (1)	**24.** (3)
25. (1)	**26.** (3)	**27.** (4)	**28.** (3)
29. (4)	**30.** (4)	**31.** (2)	**32.** (3)
33. (3)	**34.** (1)	**35.** (4)	**36.** (4)
37. (1)	**38**. (2)	**39.** (2)	**40.** (3)
41. (1)	**42.** (2)		

TYPE-VII

1. (3)	**2.** (1)	**3.** (3)	**4.** (2)
5. (3)	**6.** (2)	**7.** (3)	**8.** (4)
9. (4)	**10**. (3)	**11.** (2)	**12.** (3)
13. (2)	**14.** (2)	**15.** (3)	**16.** (4)
17. (4)	**18.** (1)	**19.** (4)	**20.** (1)
21. (3)	**22.** (4)	**23.** (3)	**24.** (3)
25. (3)	**26.** (3)	**27.** (3)	

TYPE-VIII

1. (4)	**2.** (2)	**3.** (3)	**4.** (3)
5. (3)	**6.** (1)	**7.** (4)	**8.** (2)
9. (3)	**10.** (3)	**11.** (3)	**12.** (4)
13. (3)	**14.** (2)	**15.** (1)	**16.** (1)
17. (3)			

TYPE-IX

1. (4)	**2.** (1)	**3.** (2)	**4.** (4)
5. (2)	**6.** (4)	**7.** (4)	**8.** (1)
9. (4)	**10.** (2)	**11.** (3)	**12.** (2)
13. (2)	**14.** (3)	**15.** (3)	**16.** (4)
17. (1)	**18.** (3)	**19.** (3)	**20.** (1)
21. (2)	**22.** (4)	**23.** (3)	**24.** (1)
25. (2)	**26.** (1)	**27.** (2)	**28.** (4)
29. (3)	**30.** (2)	**31.** (2)	**32.** (2)
33. (3)	**34.** (2)	**35.** (2)	**36.** (3)
37. (4)	**38**. (3)	**39.** (3)	**40.** (2)
41. (2)	**42.** (1)	**43.** (2)	**44.** (4)
45. (2)	**46.** (2)	**47.** (1)	**48.** (2)
49. (2)	**50.** (3)	**51.** (1)	**52.** (3)
53. (1)	**54.** (4)	**55.** (1)	**56.** (3)
57. (2)	**58.** (1)	**59.** (3)	**60.** (2)
61. (4)	**62.** (1)	**63.** (4)	**64.** (3)
65. (2)	**66.** (2)	**67.** (1)	**68.** (3)
69. (3)	**70.** (1)	**71.** (2)	**72.** (4)
73. (3)	**74.** (1)	**75.** (1)	**76.** (3)
77. (2)	**78.** (4)	**79.** (1)	

TYPE-X

1. (1)	**2.** (3)	**3.** (3)	**4.** (1)
5. (2)	**6.** (2)	**7.** (1)	**8.** (3)
9. (3)	**10.** (2)	**11.** (3)	**12.** (1)
13. (4)	**14.** (3)	**15.** (3)	**16.** (1)
17. (2)	**18.** (4)	**19.** (3)	**20.** (2)
21. (2)	**22.** (4)	**23.** (3)	**24.** (3)
25. (3)	**26.** (3)	**27.** (1)	**28.** (2)
29. (1)	**30.** (2)	**31.** (3)	**32.** (2)
33. (3)	**34.** (3)	**35.** (2)	**36.** (3)
37. (2)	**38.** (3)	**39.** (4)	**40.** (2)
41. (3)	**42.** (2)	**43.** (1)	**44.** (2)
45. (1)	**46.** (1)	**47.** (3)	**48.** (2)
49. (4)	**50.** (3)		

EXPLANATIONS

TYPE-I

1. (2) Using Rule 1,
Mean

$$= \frac{3+11+9+7+15+13+8+19+17+21+14+x}{12}$$

According to question,

$$\frac{137+x}{12} = 12$$

$\therefore$ 137 + x = 144

$\therefore$ x = 144 – 137 = 7

2. (3) Sum of total number of 8 students in exam
= 8 × 51 = 408
Sum of total number of 9 students in exam
= 9 × 68 = 612
$\therefore$ Required average

$$= \frac{408+612}{17} = \frac{1020}{17} = 60$$

Aliter : Using Rule 10,
Here, n_1 = 8, a_1 = 51
n_2 = 9, a_2 = 68

$$\therefore \text{ Average} = \frac{n_1a_1+n_2a_2}{n_1+n_2}$$

$$= \frac{8\times51+9\times68}{8+9}$$

$$= \frac{408+612}{17} = \frac{1020}{17}$$

= 60 marks.

3. (1) Using Rule 10,
The required average marks

$$= \frac{55\times50+60\times55+45\times60}{55+60+45}$$

$$= \frac{2750+3300+2700}{160}$$

$$= \frac{8750}{160} = 54.68$$

4. (1) Using Rule 10,
Required average

$$= \frac{20\times30+20\times30}{30+20}$$

$$= \frac{600+600}{50} = \frac{1200}{50} = 24$$

5. (4) Using Rule 10,
Required average weight

$$\frac{(50\times6+51\times2+55\times2)}{10}$$

$$= \frac{300+102+110}{10} = \frac{512}{10}$$

= 51.2 kg.

6. (4) If each number is multiplied by a certain number, then the average is also multiplied by that number.
$\therefore$ Required average =7×12 = 84

7. (3) Using Rule 2,
Average income of whole group

$$= \frac{4200\times40+4000\times35}{75}$$

$$= \frac{168000+140000}{75}$$

$$= \frac{308000}{75} = ₹\ 4106\ \frac{2}{3}$$

8. (2) Weight of the boat
= 6 × 52 – 5 × 38
= 312 – 190 = 122 kg

9. (2) Required average

$$= \frac{32\times60+33\times40}{72}$$

$$= \frac{1920+1320}{72} = \frac{3240}{72} = 45$$

10. (3) Using Rule 1,
Number of workers in the factory

$$= \frac{1534}{118} = 13$$

11. (4) Total cost price of 20kg of mixed rice
₹ (12 × 30 + 8 × 40)
= ₹ 680
$\therefore$ Average per kg price

$$= \frac{680}{20} = ₹\ 34$$

Aliter : Using Rule 2,
x_1 = 12, A_1 = 30
x_2 = 8, A_2 = 40

$$\therefore \text{ Average} = \frac{A_1x_1+A_2x_2}{x_1+x_2}$$

$$= \frac{30\times12+40\times8}{12+8}$$

$$= \frac{360+320}{20}$$

$$= \frac{680}{20} = \text{Rs. } 34$$

12. (2) Using Rule 2,
Required average

$$\frac{x_1+x_2+\ldots+x_{20}}{20} - \frac{101\times20}{20}$$

= y – 101

13. (2) Sum of x numbers = xy
Sum of y numbers = xy
$\therefore$ Required average

$$= \frac{xy+xy}{x+y} = \frac{2xy}{x+y}$$

Aliter : Using Rule 10,
Here, n_1 = x, a_1= y
n_2 = y, a_2 = x

$$\therefore \text{ Average} = \frac{n_1a_1+n_2a_2}{n_1+n_2}$$

$$= \frac{xy+yx}{x+y} = \frac{2xy}{x+y}$$

14. (2) Total sum of x numbers = xy^2
Total sum of y numbers = yx^2
$\therefore$ Required average

$$= \frac{xy^2+yx^2}{x+y}$$

$$= \frac{xy(y+x)}{x+y} = xy$$

Aliter : Using Rule 10,
Here, n_1 = x, a_1 = y^2
n_2 = y, a_2 = x^2

$$\therefore \text{ Average} = \frac{n_1a_1+n_2a_2}{n_1+n_2}$$

$$= \frac{xy^2+yx^2}{x+y}$$

$$= xy\left(\frac{x+y}{x+y}\right) = xy$$

15. (2) Using Rule 1,

$$\frac{x_1+x_2+\ldots x_n}{n} = \bar{x}$$

$$\therefore \sum_{i=1}^{n}(x_i-\bar{x})$$

$$= (x_1-\bar{x}) + (x_2-\bar{x}) + \ldots + (x_n-\bar{x})$$

$$= (x_1+x_2+\ldots+x_n) - n.\bar{x}$$

$$= n.\left(\frac{x_1+x_2+\ldots+x_n}{n}\right) - n.\bar{x}$$

$$= n\bar{x} - n\bar{x} = 0$$

16. (2) Using Rule 2,
Required average price

$$= \frac{13 \times 70 + 15 \times 60 + 12 \times 65}{13 + 15 + 12}$$

$$= \frac{910 + 900 + 780}{40} = \frac{2590}{40}$$

= ₹ 64.75

17. (1) That month will have 5 sundays.
∴ Required average

$$= \frac{5 \times 510 + 25 \times 240}{30}$$

$$= \frac{2550 + 6000}{30}$$

$$= \frac{8550}{30} = 285$$

Aliter : Using Rule 10,
Here, $n_1 = 5$, $a_1 = 510$
$n_2 = 25$, $a_2 = 240$

18. (1) Average of all numbers

$$= \frac{30 \times 40 + 40 \times 30}{70}$$

$$= \frac{240}{7} = 34\frac{2}{7}$$

Aliter : Using Rule 10,
Here, $n_1 = 30$, $a_1 = 40$
$n_2 = 40$, $a_2 = 30$

$$\therefore \text{Average} = \frac{n_1a_1 + n_2a_2}{n_1 + n_2}$$

19. (1) If the average of remaining numbers be x, then
$20 \times 15 = 5 \times 12 + 15x$
$\Rightarrow 300 = 60 + 15x$
$\Rightarrow 15x = 300 - 60 = 240$

$$\Rightarrow x = \frac{240}{15} = 16$$

Aliter : Using Rule 13,
Here, m = 20, x = 15
n = 5, y = 12
Average of remaining

$$\text{Numbers} = \left(\frac{mx - ny}{m - n}\right)$$

$$= \left(\frac{20 \times 15 - 5 \times 12}{20 - 5}\right)$$

$$= \left(\frac{300 - 60}{15}\right) = \frac{240}{15} = 16$$

20. (3) Using Rule 1,
Total expenditure of the year
= ₹ (3 × 2200 + 4 × 2550 + 5 × 3120)
= ₹ (6600 + 10200 + 15600)
= ₹ 32400
∴ Total income of the year
= ₹ (32400 + 1260)
= ₹ 33660
∴ Average monthly income

$$= ₹\ \frac{33660}{12} = ₹\ 2805$$

21. (1) Using Rule 1,
Required average

$$= \frac{1.11 + 0.01 + 0.101 + 0.001 + 0.11}{5}$$

$$= \frac{1.332}{5} = 0.2664$$

22. (1) Total expenditure
= 120 × 7 = Rs. 840
Total expenditure of 4 boys
= 150 × 4
= ₹ 600
Total expenditure of 3 girls
= 840 – 600 = ₹ 240
∴ Their average expenditure

$$= \frac{240}{3} = ₹\ 80$$

23. (2) Average cost of a chair
= ₹ x, then
$x \times 12 + 6 \times 750 = 7800$
$\Rightarrow 12x = 7800 - 4500 = 3300$

$$\Rightarrow x = \frac{3300}{12} = ₹\ 275$$

24. (1) Using Rule 2,
Average height

$$= \frac{6 \times 1.15 + 8 \times 1.1 + 6 \times 1.12}{20}$$

$$= \frac{6.9 + 8.8 + 6.72}{20} = \frac{22.42}{20}$$

= 1 metre 12.1 cm

25. (2) Required average weight

$$= \frac{42 \times 25 + 28 \times 40}{42 + 28}$$

$$= \frac{1050 + 1120}{70} = \frac{2170}{70} = 31 \text{ kg}$$

Aliter : Using Rule 10,
Here, $n_1 = 42$, $a_1 = 25$
$n_2 = 28$, $a_2 = 40$

$$\text{Average} = \frac{n_1a_1 + n_2a_2}{n_1 + n_2}$$

26. (3) Male employees = x
Female employees = y
$\therefore (x + y)\ 12000 = x \times 15000 + y \times 8000$
$\Rightarrow (x + y) \times 12 = 15x + 8y$
$\Rightarrow 12x + 12y = 15x + 8y$
$\Rightarrow 3x = 4y$

$$\Rightarrow \frac{x}{y} = \frac{4}{3} \Rightarrow x : y = 4 : 3$$

27. (3) Mean of Ten observations – Mean of nine observations
Tenth observation
= 10 × 17 – 16 × 9
= 170 – 144 = 26
Aliter : Using Rule 19,
Here, N = 9, T = 16
n = 1, t = 1
10th observation

$$= T + \left(\frac{N}{n} + 1\right)t$$

$$= 16 + \left(\frac{9}{1} + 1\right) \times 1$$

= 16 + 10 = 26

28. (4) If each item is multiplied by 8, their average gets multiplied by 8.
∴ Required average
= 8 × 27 = 216

29. (2) Sum of 4 new numbers
= 50 ×104 – 100 × 44
= 5200 – 4400 = 800

$$\therefore \text{Average} = \frac{800}{4} = 200$$

Aliter : Using Rule 19,
Here, N = 100, T = 44
n = 4, y = 50 – 44 = 6
∴ Average of new numbers

$$= T + \left(\frac{N}{n} + 1\right)$$

$$= 44 + \left(\frac{100}{4} + 1\right) \times 6$$

= 44 + 26 × 6
= 44 + 156 = 200

30. (4) Let the last number be x.
According to the question,
$18 \times 10 + 11 \times 20 + x$
$= 30 \times 15$
$\Rightarrow 180 + 220 + x = 450$
$\Rightarrow 400 + x = 450$
$\Rightarrow x = 450 - 400 = 50$

31. (2) Using Rule 2,
Required mean

$$= \frac{1\times1+2\times2+3\times3+4\times4+5\times5+6\times6+7\times7}{1+2+3+4+5+6+7}$$

$$= \frac{1+4+9+16+25+36+49}{28}$$

$$= \frac{140}{28} = 5$$

32. (1) Using Rule 1,
Numbers are : 10, 15, 20, 25, 30, 35, 40, 45
Sum = 220

$$\text{Average} = \frac{220}{8} = 27.5$$

33. (3) Number of students in section A = x
∴ Number of students in sections B and C
= $(100 - x)$
∴ $x \times 70 + (100 - x) \times 87.5$
$= 84 \times 100$
$\Rightarrow 70x + 87.5 \times 100 - 87.5x$
$= 8400$
$\Rightarrow 8750 - 17.5x = 8400$
$\Rightarrow 17.5x = 8750 - 8400 = 350$

$$\Rightarrow x = \frac{350}{17.5} = 20$$

34. (3) Weight of 12th person
= x kg (let).
∴ Average weight of 12 persons

$$= \left(\frac{11\times95+x}{12}\right) \text{ kg}$$

According to the question,

$$\frac{11\times95+x}{12} + 33 = x$$

$\Rightarrow 1045 + x + 396 = 12x$
$\Rightarrow 1441 = 11x$

$$\Rightarrow x = \frac{1441}{11} = 131 \text{ kg.}$$

35. (3) Weight of B = (A + B)'s weight + (B + C)'s weight − (A + B + C)'s weight
$= 40 \times 2 + 43 \times 2 - 45 \times 3$
$= 80 + 86 - 135$
$= 166 - 135 = 31$ kg.

36. (4) Number of natural numbers = x
∴ Their sum = $15x$
According to the question,
$15x + 30 - 5 = x \times 17.5$
$\Rightarrow 17.5x - 15x = 25$
$\Rightarrow 2.5x = 25$

$$\Rightarrow x = \frac{25}{2.5} = 10$$

37. (3) D's weight $= 80 \times 4 - 84 \times 3$
$= 320 - 252 = 68$ kg.
E's weight $= 68 + 3 = 71$ kg.
Total weight of (A + B + C + D + E)
$= 84 \times 3 + 68 + 71$
$= 252 + 68 + 71 = 391$ kg.
Total weight of (B + C + D + E)
$= 79 \times 4 = 316$ kg.
∴ A's weight= $391 - 316 = 75$ kg.

38. (3) Using Rule 18,
Here, N = 15, T = 42, t = 1.6
Weight of new oarsman
$= (42 + 15 \times 1.6)$ kg.
$= (42 + 24)$ kg. $= 66$ kg.

39. (2) Let the average cost of each book bought (of 64 books) be ₹x.
According to the question,
$64 \times x - 50(x + 1) = 76$
$\Rightarrow 64x - 50x - 50 = 76$
$\Rightarrow 14x = 76 + 50 = 126$

$$\Rightarrow x = \frac{126}{14} = 9$$

∴ Required average price
= 9 + 1 = ₹ 10

40. (2) Sum of first n odd natural numbers = n^2

$$\therefore \text{Their average} = \frac{n^2}{n} = n$$

∴ Required average = 25
because n = 25
Aliter : Using Rule 7,
Average = 25

41. (1) Total height of 5 friends
$= (6 \times 167 - 162)$ cm.
$= (1002 - 162)$ cm.
$= 840$ cm.

$$\therefore \text{Required average} = \frac{840}{5}$$

$= 168$ cm.

42. (2) Weight of new person
$= (65 + 8 \times 2.5)$ kg
$= (65 + 20)$ kg
$= 85$ kg
Aliter : Using Rule 23,
Here, x = 2.5, n = 8
Weight of new person
= weight of replaced boy + $x \times n$

43. (1) Using Rule 10,
Students in class A $\Rightarrow x$
Students in class B $\Rightarrow y$
Students in class C $\Rightarrow z$
For classes A and B,

$$\frac{83x+76y}{x+y} = 79$$

$\Rightarrow 83x + 76y = 79x + 79y$
$\Rightarrow 83x - 79x = 79y - 76y$
$\Rightarrow 4x = 3y$
For classes B and C

$$\frac{76y+85z}{y+z} = 81$$

$\Rightarrow 76y + 85z = 81y + 81z$
$\Rightarrow 5y = 4z$
$\therefore 20x = 15y = 12z$

$$\Rightarrow \frac{20x}{60} = \frac{15y}{60} = \frac{12z}{60}$$

$$\Rightarrow \frac{x}{3} = \frac{y}{4} = \frac{z}{5}$$

∴ Required average

$$= \frac{83\times3+76\times4+85\times5}{3+4+5}$$

$$= \frac{249+304+425}{12} = \frac{978}{12}$$

$= 81.5$

44. (4) Temperature on 4th day
$= (4 \times 25 + 4 \times 25.5 - 25.2 \times 7)°C$
$= (100 + 102 - 176.4)°C$
$= 25.6°C$

45. (4) Number of students in the class = x (let)
∴ Number of girls $= 50 - x$
According to the question,
$x \times 70 + (50 - x) \times 75$
$= 50 \times 72$
$\Rightarrow 70x + 3750 - 75x = 3600$
$\Rightarrow 3750 - 5x = 3600$
$\Rightarrow 5x = 3750 - 3600 = 150$

$$\Rightarrow x = \frac{150}{5} = 30$$

46. (2) Let average marks of remaining 30 students be x.

$$\therefore 65 = \frac{30\times85+30\times x}{60}$$

$\Rightarrow 65 \times 60 = 2550 + 30x$
$\Rightarrow 3900 = 2550 + 30x$
$\Rightarrow 30x = 3900 - 2550 = 1350$

$$\Rightarrow x = \frac{1350}{30} = 45.$$

47. (3) Number of successful students in the exam = x
$\therefore$ Number of unsuccessful students = $100 - x$
According to the question,

$$30 = \frac{35x + 10(100 - x)}{100}$$

$\Rightarrow 3000 = 35x + 1000 - 10x$
$\Rightarrow 3000 = 25x + 1000$
$\Rightarrow 25x = 3000 - 1000 = 2000$

$$\Rightarrow x = \frac{2000}{25} = 80$$

48. (1) B's weight = (A + B)'s weight + (B + C)'s weight – (A + B + C)'s weight
= (40 × 2 + 2 × 43 – 45 × 3) kg.
= (80 + 86 – 135) kg.
= 31 kg.

49. (3) Value of 13th result
= 25 × 20 – 12 × 15 – 12 × 18
= 500 – 180 – 216 = 104

50. (2) Difference
= 83 – 53 = 30
Incorrect observation > Correct observation
$\therefore$ Required average

$$= 35 - \frac{30}{100} = 35 - 0.3 = 34.7$$

51. (1) According to the question,

$$\frac{x+y}{2} - \frac{y+z}{z} = 12$$

$$\Rightarrow \frac{x-z}{2} = 12$$

$\Rightarrow x - z = 2 \times 12 = 24$

52. (4) Average of 7 consecutive odd integers = 37
$\therefore$ Fourth odd number = 37
$\therefore$ First odd number = 31
13th odd number = 31 + 24 = 55
$\therefore$ Required average

$$= \frac{31+55}{2} = \frac{86}{2} = 43$$

53. (2) Total correct marks of 35 children = 35 × 35 + 35 – 65
= 1225 – 30 = 1195

$$\text{Required average} = \frac{1195}{35} = 34.14$$

OR

Diffference = –65 + 35 = –30

$$\text{Required average} = 35 - \frac{30}{35}$$

= 35 – 0.857 = 34.143

54. (2) Average height of whole class

$$= \left(\frac{30 \times 160 + 20 \times 165}{50}\right) \text{ cm}$$

$$= \left(\frac{4800 + 3300}{50}\right) \text{ cm}$$

$$= \left(\frac{8100}{50}\right) \text{ cm} = 162 \text{ cm}$$

55. (3) Total correct marks of 17 students
= 17 × 71 – 65 – 24 + 56 + 50
= 1207 – 89 + 106 = 1224
$\therefore$ Required correct average

$$= \frac{1224}{17} = 72$$

56. (3) If each number of a set be multiplied by x, the average gets multiplied by x.
If each number of a set be increased by y, the average gets increased by y.
$\therefore$ Required average
= 2 × 9 + 3 = 21

57. (3) Correct sum of 20 numbers
= 20 × 35 – 45 + 85
= 700 + 40 = 740
$\therefore$ Required average

$$= \frac{740}{20} = 37$$

58. (4) According to the question,
$a + b + c = 3 \times 20 = 60$ ...(i)
$b + c + d = 3 \times 25 = 75$ ...(ii)
By equation (i) – (ii),
$a - d = 60 - 75$
$\Rightarrow a - 30 = -15$
$\Rightarrow a = 30 - 15 = 15$

59. (4) Let the total number of students in the class be x.
According to the question,
$ax = 10 \times b + (x - 10)\, c$
$\Rightarrow ax = 10b + xc - 10c$
$\Rightarrow ax - cx = 10b - 10c$
$\Rightarrow x(a - c) = 10(b - c)$

$$\Rightarrow x = \frac{10(b-c)}{a-c}$$

60. (1) Average contribution of 9 students of the class
= Rs. x (let).
According to the question,

$$\frac{7 \times 50 + x + 50 + x + 90}{9} = x$$

$\Rightarrow 350 + 2x + 140 = 9x$
$\Rightarrow 9x - 2x = 490$
$\Rightarrow 7x = 490$

$$\Rightarrow x = \frac{490}{7} = \text{Rs. } 70$$

61. (1) Monday + Tuesday + Wednesday + Thursday
= 4 × 48° = 192° ..... (i)
Tuesday + Wednesday + Thursday + Friday = 4 × 52°
= 208° ..... (ii)
By equation (ii) – (i),
Friday – Monday = 208° – 192°
= 16
$\Rightarrow$ Friday = 16 + 42 = 58°

62. (4) According to the question,
7 + 5 + 13 + x + 9 = 10 × 5
$\Rightarrow 34 + x = 50$
$\Rightarrow x = 50 - 34 = 16$

63. (2) Revenue of fourth year
= Rs. (4 × 82 + 4 × 70 – 7 × 75) lakhs
= Rs. (328 + 280 – 525) lakhs
= Rs. 83 lakhs

64. (4) Marks in Maths
= 50 × 4 + 70 × 4 – 58 × 7
= 200 + 280 – 406
= 480 – 406 = 74

65. (2) Prime numbers between 1 and 20
$\Rightarrow$ 2, 3, 5, 7, 11, 13, 17, 19
Sum = 2 + 3 + 5 + 7 + 11 + 13 + 17 + 19 = 77
$\therefore$ Required average

$$= \frac{77}{8} = 9\frac{5}{8}$$

TYPE-II

1. (3) Using Rule 1,
According to question,
The average of 9 numbers = 30
Now,The total of 9 numbers
= 30 × 9 = 270
The average of first 5 numbers
= 25
$\therefore$ The total of first 5 numbers = 25 × 5 = 125
and Total of last 3 numbers
= 3 × 35 = 105
Hence, required answer
= 270 – (125 + 105)
= 270 – 230 = 40

2. (3) Using Rule 1,
The middle number
= 8 × 6.5 + 8 × 9.5 – 15 × 7
= 52 + 76 – 105
= 128 – 105 = 23

3. (3) Using Rule 1,
Sum of 8 numbers
= 20 × 8 = 160
Sum of the first two numbers

$$= \frac{31}{2} \times 2 = 31$$

Sum of next three numbers

$$= \frac{64}{3} \times 3 = 64$$

Sum of the remaining three numbers = 160 – (31 + 64) = 160 –

95 = 65
Let 6th number = x
$\therefore$ 7th number = $x + 4$,
8th number = $x + 7$
$\Rightarrow x + x + 4 + x + 7 = 65$
$\Rightarrow 3x = 65 - 11$
$\Rightarrow x = \frac{54}{3} = 18$
$\therefore$ Eighth number
= 18 + 7 = 25

4. (2) Using Rule 1,
Last number = Sum of 20 numbers – sum of first 12 numbers – sum of next 7 numbers
= 20 × 12 – 11 × 12 – 7 × 10
= 240 – 132 – 70 = 38

5. (4) Using Rule 1,
Fourth number
= (4×4+4×4 – 3×7)
= (16 +16-21) = 11

6. (3) Using Rule 1,
M + T + W + TH = 4 × 37
= 148°C ..... (i)
TH + F + S + S = 4 × 41
= 164°C ..... (ii)
M + T +....+ S + S = 7 × 39
= 273°C ..... (iii)
$\therefore$ The temperature of the fourth day
= 148 + 164 – 273 = 39°C

7. (2) Using Rule 1,
Person's income in the eighth month
= ₹ (3160 × 8 + 5 × 4120 – 12 × 3400)
= ₹ (25280 + 20600 – 40800)
= ₹ 5080

8. (4) Using Rule 1,
Last number
= 30 × 12 – 20 × 11 – 9 × 10
= 360 – 220 – 90
= 360 – 310 = 50

9. (4) Using Rule 1,
Sixth result = 6 × 49 + 6 × 52 – 11 × 50
= 294 + 312 – 550 = 56

10. (2) Using Rule 1,
$x + x + 1 + x + 2 + x + 3 + x + 4 + x + 5 + x + 6 + x + 7$
= 6.5 × 8 = 52
$\Rightarrow 8x + 28 = 52$
$\Rightarrow 8x = 52 - 28 = 24$
$\Rightarrow x = 3$
$\therefore$ Required average = $\frac{3+10}{2}$
= 6.5

11. (2) Using Rule 1,
According to the question,
$195 + x + x + 20 = 135 \times 3$
$\Rightarrow 2x + 215 = 405$
$\Rightarrow 2x = 405 - 215 = 190$
$\therefore x = \frac{190}{2} = 95$
x = Smallest number

12. (4) Using Rule 1,
$a + b + c = 18 \times 3 = 54$
and, $b + c + d = 16 \times 3 = 48$
$\therefore a + b + c - b - c - d$
$\Rightarrow 54 - 48 = 6$
$\Rightarrow a - d = 6$
$\Rightarrow a - 19 = 6$
$\Rightarrow a = 19 + 6 = 25$

13. (2) Using Rule 1,
Sixth number
= 6 × 32 + 6 × 37 – 11 × 35
= 192 + 222 – 385 = 29

14. (3) Using Rule 1,
$a + b + c = 45$ and
$b + c + d = 48$
$\Rightarrow b + c = 48 - 19 = 29$
$\therefore a + b + c = 45$
$\Rightarrow a = 45 - 29 = 16$

15. (3) Using Rule 1,
The sixth number
= 9 × 50 – 5 × 54 – 3 × 52
= 450 – 270 – 156 = 24

16. (1) Using Rule 1,
Sixth number = 6 × 60 + 6 × 65 – 11 × 63
= 360 + 390 – 693 = 57

17. (3) Using Rule 1,
Numbers in order
$\Rightarrow a$, b and c
$\therefore a + b = 2 \times 2 = 4$
$b + c = 2 \times 3 = 6$
$c + a = 2 \times 4 = 8$
On adding,
$2(a + b + c) = 4 + 6 + 8 = 18$
$\Rightarrow a + b + c = \frac{18}{2} = 9$
$\therefore$ Required average = $\frac{9}{3} = 3$

18. (1) Largest 3–digit number formed by 0, 2 and 4 = 420
Smallest number of three digits = 204
$\therefore$ Required average
$= \frac{420+204}{2} = \frac{624}{2} = 312$

19. (1) Using Rule 1,
Sum of remaining two numbers
= 6 × 3.95 – 2 × 3.4 – 2 × 3.85
= 23.7 – 6.8 – 7.7 = 9.2
$\therefore$ Required average = $\frac{9.2}{2} = 4.6$

20. (1) Let three numbers be a,b and c respectively.
$\therefore a + b + c = 16 \times 3 = 48$ ---(i)
$b + c + 20 = 15 \times 3 = 45$
$\Rightarrow b + c = 45 - 20 = 25$ ---(ii)
By equation (i) - (ii),
$a = 48 - 25 = 23$
Aliter : Using Rule 16,
Here, n = 3, F = 16, L = 15
l = 20, f= ?
f – l= n (F – L)
f – 20= 3 (16 – 15)
f = 3 + 20
f = 23

21. (2) Sum of new numbers
= na + (2 + 4 + 8 + 16 ..... to n terms)
Now, S = 2 + 4 + 8 + 16 + ... to n terms
Here, a = first term = 2
r = common ratio = $\frac{4}{2} = 2$
It is a geometric series.
$\therefore S = \frac{a(r^n - 1)}{r - 1} = \frac{2(2^n - 1)}{2 - 1}$
$= 2(2^n - 1)$
$\therefore$ Required average
$= \frac{na + 2(2^n - 1)}{n}$
$= a + \frac{2(2^n - 1)}{n}$

22. (2) Sum of remaining 10 numbers
= 12 × 15 – 2 × 14
= 180 – 28 = 152
$\therefore$ Required average = $\frac{152}{10}$
$= \frac{76}{5} = 15\frac{1}{5}$

23. (4) When each number is multiplied by 8, the new average gets multiplied by 8. i.e.,
21 × 8 = 168

24. (2) Seventh observation
= 65 × 7 + 7 × 75 – 13 × 70
= 455 + 525 – 910
= 980 – 910 = 70
Aliter :
Here, n = 13, x = 70
m =7, y = 65
m = 7, z = 75
Seventh result = m (y + z) – nx
= 7 (65 + 75) – 13 × 70
= 7 × (140) – 910
= 980 – 910 = 70

25. (3) Average of five numbers

$$= \frac{2\times 8+3\times 3}{2+3}$$

$$= \frac{16+9}{5} = \frac{25}{5} = 5$$

26. (4) Middle i.e. eighth number
= 8 × 6.5 + 8 × 8.5 – 15 × 7
= 52 + 68 – 105 = 120 – 105
= 15

TYPE-III

1. (2) Average of 7 consecutive numbers is 20.
Since the numbers are consecutive, they form an arithmetic series with common difference 1.
Since, 7 is odd, 20 must be the middle number.
We can write the series as below,
17, 18, 19, 20, 21, 22, 23
∴ The largest of these numbers is 23.

2. (4) Using Rule 1,
The required average

$$= \frac{2+3+5+7+11+13+17+19+23}{9}$$

$$= \frac{100}{9} = 11\frac{1}{9}$$

3. (4) Using Rule 1,
The average will increase by 1.5.

As, $\frac{1+2+3+4+5}{5} = 3$,

$$\frac{1+2+3+4+5+6+7+8}{8} = 4.5$$

⇒ 4.5 – 3 = 1.5

4. (3) Using Rule 3,

Tricky approach

$$1 + 2 + 3 + \ldots\ldots + n = \frac{n(n+1)}{2}$$

Average of these numbers

$$= \frac{n+1}{2}$$

∴ Required average

$$= \frac{100+1}{2} = 50.5$$

5. (2) Tricky Approach

Average of the first n natural odd numbers $= \frac{n}{2}$

Number of odd numbers upto

$$\frac{100}{2} = 50 = \text{required average}$$

Aliter : Using Rule 7,
Odd numbers are
1, 3, 5, ..., 99
Total odd numbers are= 50
∴ Average = 50

6. (4) Using Rule 4,

$$\frac{1^2+2^2+3^2+\ldots+n^2}{n}$$

$$= \frac{(n+1)(2n+1)}{6}$$

$$\therefore \frac{1^2+2^2+3^2+\ldots+10^2}{10}$$

$$= \frac{(10+1)(2\times 10+1)}{6}$$

$$= \frac{11\times 21}{6} = 38.5$$

7. (4) Using Rule 1,
Required average

$$= \frac{0+1+2+3+\ldots+9}{10}$$

$$= \frac{9\times(9+1)}{2\times 10} = 4.5$$

8. (3) If the smallest number be x, then

$$\frac{x}{3} + 12 = x + 2$$

⇒ $x + 36 = 3x + 6$
⇒ $3x - x = 36 - 6$
⇒ $2x = 30 \Rightarrow x = 15$
∴ Third number = 15 + 4 = 19

9. (4) $x + x + 2 + x + 4 + x + 6 + x + 8 + x + 10 + x + 12 + x + 14 + x + 16$
$= 9 \times 53$
⇒ $9x + 72 = 477$
⇒ $9x = 477 - 72 = 405$

$$\Rightarrow x = \frac{405}{9} = 45$$

10. (3) Required average

$$= \frac{3(1+2+3+\ldots\ldots+9)}{9}$$

$$= \frac{9\times 10}{2\times 3} = 15$$

Aliter : Using Rule 9,
Here, n = 9, x = 3

$$\text{Average} = x\left(\frac{1+n}{2}\right)$$

$$= 3\left(\frac{1+9}{2}\right) = 15$$

11. (2) Using Rule 1,
$x+x+1+x+2+x+3+x+4+x+5+x+6$
$= 26 \times 7$
⇒ $7x + 21 = 182$
⇒ $7x = 182 - 21 = 161$

$$\Rightarrow x = \frac{161}{7} = 23$$

Quicker Approach

Fourth number = 26
∴ First number = 23

12. (2) Average of $a, b, c, d, e, f, g = d$
Average of $j, k, l, m, n, = l$

$$\therefore \text{Required average} = \frac{d+l}{2}$$

13. (2) Numbers = $x, x+2, \ldots, x+10$
Required difference
$= x + 10 - x = 10$

14. (1) $m + m + 1 + m + 2 + m + 3 + m + 4 = 5n$
⇒ $5m + 10 = 5n$
⇒ $m + 2 = n$ ....(i)
Required average
$= m + 2 + m + 3 + m + 4 +$

$$\frac{+m+5+m+6+m+7}{6}$$

$$= \frac{6m+27}{6}$$

$$= \frac{2m+9}{2} = \frac{2(n-2)+9}{2} = \frac{2n+5}{2}$$

By (i) [$m = n - 2$]

15. (4) Let the first number be x.
∴ $x + 3 + x + 4 = 2 \times 6$
⇒ $2x + 7 = 12$

$$\Rightarrow 2x = 5 \Rightarrow x = \frac{5}{2}$$

∴ $x + (x + 1) + \ldots\ldots + (x + 7)$
$= 8x + 28$

$$= 8\times\frac{5}{2} + 28 = 20 + 28 = 48$$

16. (4) $x + x + 2 + x + 4 + x + 6$
$= 15 \times 4$
⇒ $4x + 12 = 60$
⇒ $4x = 60 - 12 = 48$

$$\Rightarrow x = \frac{48}{4} = 12$$

Hence, the numbers are 12, 14, 16, 18
∴ The second highest number is 16.

17. (3) Using Rule 1,
Average of first five odd multiples of 3

$= \frac{3(1+3+5+7+9)}{5}$

$= \frac{3\times 25}{5} = 15$

18. (4) Fifth number $= n$
Tenth number $= n + 5$
Eleventh number $= n + 6$
New average

$= \frac{9n+n+5+n+6}{11}$

$= \frac{11n+11}{11} = \frac{(n+1)\times 11}{11} = n+1$

19. (1) $x + x + 2 + x + 4 + x + 6$
$= 9 \times 4$
$\Rightarrow 4x + 12 = 36$
$\Rightarrow 4x = 36 - 12 = 24$

$\therefore x = \frac{24}{4} = 6$

$\therefore$ Largest number
$= 6 + 6 = 12$

20. (4) $b = a + 2$
$c = b + 2 = a + 4$
$d = c + 2 = a + 6$
$e = d + 2 = a + 8$
$\therefore$ Required average

$= \frac{a+a+2+a+4+a+6+a+8}{5}$

$= \frac{5a+20}{5} = a + 4$

21. (2) Required average

$= \frac{2+3+5+7+11}{5}$

$= \frac{28}{5} = 5.6$

22. (1) Required average

$= \frac{7+21+35+49+63+77}{6}$

$= \frac{7(1+3+5+7+9+11)}{6}$

$= \frac{7\times 36}{6} = 42$

23. (3) Required average

$= \frac{2+3+5+7+11+13+17+19+23+29}{10}$

$= \frac{129}{10} = 12.9$

24. (1) Average of 8 consecutive even numbers = 93
$\therefore$ Fifth number = 93 + 1 = 94
$\therefore$ Largest number = 94 + 6
= 100

25. (2) $x + x + 1 + x + 2 + x + 3 + x + 4 + x + 5 = 6K$
$\Rightarrow 6x + 15 = 6K$

$\Rightarrow x + \frac{15}{6} = K$

$\Rightarrow x + \frac{5}{2} = K$ ..... (i)

Again,

$\frac{x+(x+1)+\ldots\ldots\ldots(x+6)+(x+7)}{8}$

$= \frac{8x}{8} + \frac{28}{8} = x + \frac{7}{2}$ ..... (ii)

Now, $x + \frac{7}{2} - x - \frac{5}{2} = 1$

26. (2) Five consecutive integers are : x, $x + 1$, $x + 2$, $x + 3$ and $x + 4$
$\therefore$ Their average

$= \frac{x+x+1+x+2+x+3+x+4}{5}$

$= \frac{5x+10}{5} = x + 2$

New average

$= \frac{(5x+10)+x+5+x+6}{7}$

$= \frac{7x+21}{7} = x + 3$

Difference $= x + 3 - x - 2 = 1$

27. (2) Required average

$= \frac{3+5+7+9+11+13+15+17+19+21}{10}$

$= \frac{120}{10} = 12$

28. (2) Let three consecutive even numbers be x, $x + 2$ and $x + 4$.
According to the question,

$(x + x + 2 + x + 4) - \frac{x+x+2+x+4}{3}$
$= 28$

$\Rightarrow (3x + 6) - \frac{3x+6}{3} = 28$
$\Rightarrow (3x + 6) - (x + 2) = 28$
$\Rightarrow 3x + 6 - x - 2 = 28$
$\Rightarrow 2x + 4 = 28$
$\Rightarrow 2x = 28 - 4 = 24$

$\Rightarrow x = \frac{24}{2} = 12$

29. (2) Average of 7 consecutive numbers = 20
$\therefore$ Fourth number = 20
$\therefore$ Largest number = 20 + 3
= 23

30. (1) Average of 25 consecutive odd numbers = 55
$\therefore$ Mid number i.e. 13th number = 55
$\therefore$ 25th number = 55 + 2 × 12
= 55 + 24 = 79

TYPE-IV

1. (1) A + B = ₹ 28,000 ...(i)
B + C = ₹ 31,200 ...(ii)
C + A = 28,800 ...(iii)
Adding,
2(A + B + C) = 88000
$\Rightarrow$ A + B + C = 44000
From equation (i),
28000 + C = 44000
$\Rightarrow$ C = 44000 – 28000
= ₹ 16000

2. (3) $X + Y$ = ₹ (2 × 5050)
= ₹ 10100
$Y + Z$ = ₹ (2 × 6250)
= ₹ 12500
$z + x$ = ₹ (2 × 5200)
= ₹ 10400
Adding all three,
2 $(X + Y + Z)$
= ₹ (10100 + 12500 + 10400)
= ₹ 33000
$\Rightarrow X + Y + Z$ = Rs. 16500
$\therefore X = (X + Y + Z) - (Y + Z)$
= ₹ (16500 – 12500)
= ₹ 4000

3. (1) Total annual expenditure of man
= Rs.(5 × 1200 + 7 × 1300)
= Rs. (6000 + 9100)
= Rs. 15100
His total annual income
= Rs. (15100 + 2900)
= Rs. 18000
$\therefore$ Average monthly income

$= \frac{18000}{12}$ = Rs. 1500

4. (2) Total daily income of A, B and C = 3 × 450 = ₹ 1350
Total daily income of A and B
= 2 × 400 = ₹ 800
Total daily income of B and C
= 2 × 430 = ₹ 860
$\therefore$ B's daily income
= ₹ (800 + 860 – 1350) = ₹ 310

5. (4) Number of other workers except officers $= x$

$\therefore 12 \times 400 + x \times 56 = (x + 12) \times 60$

$\Rightarrow 4800 + 56x = 60x + 720$

$\Rightarrow 60x - 56x = 4800 - 720$

$\Rightarrow 4x = 4080$

$\Rightarrow x = \frac{4080}{4} = 1020$

$\therefore$ Total number of workers

$= 1020 + 12 = 1032$

6. (2) Total annual expenditure of the family = ₹ $(4 \times 2570 + 3 \times 2490 + 5 \times 3030)$

= ₹ (10280 + 7470 + 15150)

= ₹ 32900

Total income

= ₹ (32900 + 5320)

= ₹ 38220

$\therefore$ Required average monthly income $= \frac{38220}{12}$ = ₹ 3185

7. (3) Total expenditure of man in a year

= ₹ $(4 \times 1800 + 8 \times 2000)$

= ₹ (7200 + 16000)

= ₹ 23200

Total annual income

= (23200 + 5600)

= ₹ 28800

$\therefore$ Average monthly income

$= \frac{28800}{12}$ = ₹ 2400

8. (2) Total monthly income of P and Q = 2 × 5050 = ₹ 10100

Total monthly income of Q and R = 2 × 6250 = ₹ 12500

Total monthly income of P and R = 2 × 5200 = ₹ 10400

On adding all three,

Total monthly income of 2(P + Q + R)

= ₹ (10100 + 12500 + 10400)

= ₹ 33000

$\therefore$ Total monthly income of (P + Q + R) $= \frac{33000}{2}$

= ₹ 16500

$\therefore$ P's monthly income

= ₹ (16500 – 12500)

= ₹ 4000

9. (2) Total workers $= x$ (let)

$\therefore 7 \times 12000 + (x - 7) \times 6000 = 8000\,x$

$\Rightarrow 84000 + 6000\,x - 42000 = 8000\,x$

$\Rightarrow 8000\,x - 6000\,x = 42000$

$\Rightarrow 2000\,x = 42000$

$\Rightarrow x = \frac{42000}{2000} = 21$

10. (4) Total income of A and B

= Rs. (2 × 200) = Rs. 400

Total income of C and D

= Rs. (2 × 250) = Rs. 500

$\therefore$ Required average

$= \frac{400 + 500}{4} = \frac{900}{4}$ = Rs. 225

11. (3) Average daily salary :

Men $\Rightarrow$ Rs. x (let).

Women $\Rightarrow$ Rs. $(x - 10)$

Boys $\Rightarrow$ Rs. $(x - 20)$

According to the question,

$7x + 11(x - 10) + 2(x - 20) = 20 \times 257.5$

$\Rightarrow 7x + 11x - 110 + 2x - 40 = 5150$

$\Rightarrow 20x - 150 = 5150$

$\Rightarrow 20x = 5150 + 150 = 5300$

$\Rightarrow x = \frac{5300}{20}$ = Rs. 265

12. (1) Total members in the group $= x$

Non–senior members $= x - 7$

According to the question,

$16000x = 24000 \times 7 + (x - 7) \times 12000$

$\Rightarrow 16x = 24 \times 7 + (x - 7) \times 12$

$\Rightarrow 16x = 168 + 12x - 84$

$\Rightarrow 16x - 12x = 168 - 84$

$\Rightarrow 4x = 84$

$\Rightarrow x = \frac{84}{4} = 21$

13. (2) Required average

$= \text{Rs.} \left(\frac{16000 \times 19 + 20000}{20}\right)$

$= \text{Rs.} \left(\frac{304000 + 20000}{20}\right)$

$= \text{Rs.} \left(\frac{324000}{20}\right)$

= Rs. 16200

OR

Difference = Rs. (20000 – 16000)

= Rs. 4000

$\therefore$ Increase in average $= \frac{4000}{20}$

= Rs. 200

$\therefore$ Required average

= Rs. (16000 + 200)

= Rs. 16200

14. (3) Total number of workers in the factory $= x$ (let)

Number of technicians = 7

Remaining workers $= x - 7$

According to the question,

$\frac{7 \times 15000 + (x - 7) \times 9000}{x} = 12000$

$\Rightarrow 7 \times 15 + 9x - 63 = 12x$

$\Rightarrow 105 - 63 = 12x - 9x$

$\Rightarrow 3x = 42$

$\Rightarrow x = \frac{42}{3} = 14$

15. (2) Let the average monthly income of man be Rs. x.

$\therefore$ Man's annual income

= Rs. $12x$

$\therefore$ Man's annual expenses

$= \text{Rs.} \left(\frac{6x \times 12}{8}\right)$

= Rs. $9x$

$\therefore$ Savings $= 12x - 9x =$ Rs. $3x$

$\therefore 3x = 6000$

$\Rightarrow x = \frac{6000}{3}$ = Rs. 2000

TYPE-V

1. (2) $x + y + z = 180$

$x = \frac{1}{4}(y + z)$

$\Rightarrow 4x = y + z$

$\Rightarrow 5x = 180, \therefore x = 36$

2. (2) Let third number be x.

$\therefore$ Second number = 3x

and first number $= \frac{3x}{2}$

Now, $x + 3x + \frac{3x}{2} = 3 \times 44$

$\Rightarrow \frac{8x + 3x}{2} = 3 \times 44$

$\Rightarrow 11x = 6 \times 44$

$\Rightarrow x = \frac{6 \times 44}{11} = 24$

$\therefore$ The largest number

$= 3x = 3 \times 24 = 72$

3. (3) Let the numbers be a, b, c,

$$\frac{a+b+c}{3} = 3d$$

$\Rightarrow a + b + c = 9d$

Again, $\frac{a+b+c+d}{4} = 5$

$\Rightarrow a + b + c + d = 20$

$\Rightarrow 9d + d = 20$

$\Rightarrow 10d = 20 \Rightarrow d = 2$

4. (1) Let the third number be x.

$\therefore$ The second number = 2x

and the third number

= 2 × 2x = 4x

According to the question,

$$\frac{4x+2x+x}{3} = 21$$

$\Rightarrow 7x = 21 \times 3$

$$\Rightarrow x = \frac{21\times 3}{7} = 9$$

Aliter : Using Rule 15,

a = 2, b = 2, x = 21

$$\text{First number} = \frac{3ab}{1+b+ab}x$$

$$= \frac{3\times 2\times 2}{1+2+4}\times 21$$

$$= \frac{12}{7}\times 21 = 36$$

$$\text{Second number} = \frac{3b}{1+a+ab}x$$

$$= \frac{3\times 2}{7}\times 21 = 18$$

$$\text{Third number} = \frac{3}{1+a+ab}x$$

$$= \frac{3}{7}\times 21 = 9$$

5. (3) Let second number be x

$\therefore$ The first number = 3x

and the third number = 15x

Now, x + 3x + 15x

= 3 × 57

$\Rightarrow 19x = 3 \times 57$

$$\Rightarrow x = \frac{3\times 57}{19} = 9$$

$\therefore$ Required difference

= 15x – x = 14x

= 14 × 9 = 126

Aliter : Using Rule 15,

a = 3, b = 5, x = 57

$$\text{First number} = \frac{3ab}{1+b+ab}x$$

$$= \frac{3\times 3\times 5}{1+3+15}\times 57$$

$$= \frac{45}{19}\times 57 = 135$$

Second number

$$= \frac{3b}{1+b+ab}\times x$$

$$= \frac{3\times 5}{19}\times 57$$

$$= \frac{15}{19}\times 57 = 45$$

$$\text{Third number} = \frac{3}{1+b+ab}\times x$$

$$= \frac{3}{19}\times 57 = 9$$

Required result = 135 – 9 = 126

6. (3) Let the third number be x.

$\therefore$ Second number = $3x$

First number = $6x$

$\therefore (x + 3x + 6x) = 100 \times 3$

$\Rightarrow 10x = 300$

$\Rightarrow x = 30$

$\therefore$ The largest number = $6x$

= 6 × 30 = 180

Aliter : Using Rule 15,

a = 2, b = 3, x = 100

Largest number

$$= \frac{3ab}{1+b+ab}\times x$$

$$= \frac{3\times 2\times 3}{1+3+2\times 3}\times 100$$

$$= \frac{18\times 100}{10} = 180$$

7. (3) Let the third number be x.

$\therefore$ Second number = $3x$

First number = $6x$

$$\text{Now, } \frac{x+3x+6x}{3} = 10$$

$\Rightarrow 10x = 30 \Rightarrow x = 3$

$\therefore$ The largest number

= $6x$ = 6 × 3 = 18.

Aliter : Using Rule 15,

a = 2, b = 3, x = 10

Largest number

$$= \frac{3ab}{1+b+ab}\times x$$

$$= \frac{3\times 2\times 3}{1+3+2\times 3}\times 10$$

$$= \frac{18}{10}\times 10 = 18$$

8. (2) $\frac{a+b+c}{3} = 2d$

$\Rightarrow a + b + c = 6d$ ...(i)

Also, $\frac{a+b+c+d}{4} = 12$

$\Rightarrow a + b + c + d = 48$

$\Rightarrow 6d + d = 48$

$\Rightarrow 7d = 48$

$$\Rightarrow d = \frac{48}{7}$$

9. (4) Let the third number = x

$\therefore$ Second number = $2x$

First number = $4x$

Now, $x + 2x + 4x = 3 \times 77$

$\Rightarrow 7x = 3 \times 77$

$$\Rightarrow x = \frac{3\times 77}{7} = 33$$

$\therefore$ First number = 33 × 4 = 132

Aliter : Using Rule 15,

Here, a = 2, b = 2, x = 77

$$\text{First number} = \frac{3ab}{1+b+ab}\times x$$

$$= \frac{3\times 2\times 2}{1+2+2\times 2}\times 77$$

$$= \frac{12}{7}\times 77$$

$$= 12\times 11 = 132$$

10. (4) Let the numbers be $2x$, x and $4x$ respectively

$$\therefore \text{Average} = \frac{2x+x+4x}{3}$$

$$\Rightarrow \frac{7x}{3} = 56$$

$$\Rightarrow x = \frac{3\times 56}{7} = 24$$

$\therefore$ First number

= $2x$ = 2 × 24 = 48

Third number = $4x$

= 4 × 24 = 96

$\therefore$ Required difference

= 96 – 48 = 48

Aliter : Using Rule 15,

Here, a = 2, b = $\frac{1}{4}$, x = 56

First number

$$= \frac{3ab}{1+b+ab} \times x$$

$$= \frac{3 \times 2 \times \frac{1}{4}}{1+\frac{1}{4}+2\times\frac{1}{4}} \times 56$$

$$= \frac{\frac{3}{2}\times 4}{4+1+2} \times 56 = 48$$

Third number = $\frac{3}{1+b+ab} \times x$

$$= \frac{3}{1+\frac{1}{4}+2\times\frac{1}{4}} \times 56$$

$$= \frac{3\times 4}{4+4+2} \times 56 = 96$$

Required difference = 96–48 = 48

11. (1) Let the second number be x.

Then first number = $\frac{x}{2}$

and third number = $2x$

According to the question,

$$\frac{x}{2} + x + 2x = 28 \times 3$$

$$\Rightarrow \frac{x+2x+4x}{2} = 28 \times 3$$

$\Rightarrow 7x = 28 \times 3 \times 2$

$\Rightarrow x = \frac{168}{7} = 24$

$\therefore$ Third number = 2 × 24 = 48

Aliter : Using Rule 15,

Here, a = $\frac{1}{2}$, b = $\frac{1}{2}$, x = 28

Third Number = $\frac{3}{1+b+ab} \times x$

$$= \frac{3}{1+\frac{1}{2}+\frac{1}{2}\times\frac{1}{2}} \times 28$$

$$= \frac{3}{\frac{4+2+1}{4}} \times 28$$

$$= \frac{3\times 4\times 28}{7} = 48$$

12. (4) Let the third number be x.

$\therefore$ Second number = $3x$

First number = $6x$

$$\therefore \frac{6x+3x+x}{3} = 40$$

$\Rightarrow 10x = 120 \Rightarrow x = 12$

$\therefore$ Required difference

$= 6x - x = 5x = 5 \times 12 = 60$

Aliter : Using Rule 15,

Here, a = 2, b = 3, x = 40

Largest Number = First Number

$$= \frac{3ab}{1+b+ab} \times x$$

$$= \frac{3\times 2\times 3}{1+3+2\times 3} \times 40$$

$$= \frac{18}{10} \times 40 = 72$$

Smallest Number = Third Number

$$= \frac{3}{1+b+ab} \times x$$

$$= \frac{3}{1+3+2\times 3} \times 40$$

$$= \frac{3}{10} \times 40 = 12$$

Difference = 72 – 12 = 60

13. (1) Let the second number be x.

$\therefore$ First number = $2x$

$\therefore$ Third number = $\frac{2x}{3}$

$$\therefore 2x + x + \frac{2x}{3} = 49.5 \times 3$$

$\Rightarrow 6x + 3x + 2x = 49.5 \times 9 = 445.5$

$\Rightarrow 11x = 445.5$

$$\Rightarrow x = \frac{445.5}{11} = 40.5$$

$\therefore$ Required difference

$$= 2x - \frac{2x}{3} = \frac{4x}{3}$$

$$= \frac{4 \times 40.5}{3} = 54$$

Aliter : Using Rule 15,

Here, a = 2, b = $\frac{3}{2}$, x = 49.5

First Number = $\frac{3ab}{1+b+ab} 5x$

$$= \frac{3\times 2\times\frac{3}{2}}{1+\frac{3}{2}+2\times\frac{3}{2}} \times 49.5$$

$$= \frac{\frac{18}{2}}{\frac{11}{2}} \times 49.5$$

$$= \frac{18\times 49.5}{11} = 18 \times 4.5$$

$$= \frac{18\times 45}{10} = 81$$

Third Number = $\frac{3}{1+b+ab} \times x$

$$= \frac{3}{1+\frac{3}{2}+2\times\frac{3}{2}} \times 49.5$$

$$= \frac{3}{\frac{11}{2}} \times 49.5$$

$= 6 \times 4.5 = 27$

Difference = 81 – 27 = 54

14. (3) Let the first number be x, then,

$$x = \frac{240-x}{4}$$

$\Rightarrow 4x = 240 - x$

$\Rightarrow 5x = 240$

$$\Rightarrow x = \frac{240}{5} = 48$$

15. (2) Let the third number be x.

$\therefore$ Second number = $3x$

and first number = $6x$

$\therefore 6x + 3x + x = 3 \times 20$

$\Rightarrow 10x = 60 \Rightarrow x = 6$

$\therefore$ Required sum = $6x + x = 7x$

= 7 × 6 = 42

Aliter :

Here, a = 2, b = 3, x = 20

Largest Number= $\frac{3ab}{1+b+ab}.x$

$$= \frac{3\times 2\times 3}{1+3+2\times 3} \times 20$$

$$= \frac{18}{10} \times 20 = 36$$

Smallest Number = $\frac{3}{1+b+ab} \times x$

$$= \frac{3}{1+3+2\times 3} \times 20$$

$$= \frac{3}{10} \times 20 = 6$$

Sum = 36 + 6 = 42

16. (3) $\frac{3a+4b}{2} > 50$

$\Rightarrow 3a + 4b > 100$

$\Rightarrow 3a + \frac{4a}{2} > 100$ [$\because a = 2b$]

$\Rightarrow 3a + 2a > 100$

$\Rightarrow 5a > 100$

$\Rightarrow a > 20$

$\therefore$ Minimum value of $a = 21$

17. (2) Let the third number be x,

$\therefore$ First number = $3x$

$\therefore$ Second number = $\frac{3x}{4}$

According to the question,

$3x + \frac{3x}{4} + x = 3 \times 95$

$\Rightarrow \frac{12x+3x+4x}{4} = 285$

$\Rightarrow 19x = 285 \times 4$

$\Rightarrow x = \frac{285 \times 4}{19} = 60$

Aliter : Using Rule 15,

Here, a = 4, b = $\frac{3}{4}$, x = 95

Third Number = $\frac{3}{1+b+ab} \times x$

$= \frac{3}{1+\frac{3}{4}+4\times\frac{3}{4}} \times 95$

$= \frac{3\times4}{4+3+12} \times 95 = 60$

18. (2) Let the first number be x.

$\therefore$ Second number = $2x$

and third number = $\frac{2x}{3}$

According to the question,

$x + 2x + \frac{2x}{3} = 33 \times 3$

$\Rightarrow 3x + \frac{2x}{3} = 99$

$\Rightarrow \frac{9x+2x}{3} = 99$

$\Rightarrow 11x = 99 \times 3$

$\Rightarrow x = \frac{99\times3}{11} = 27$

$\therefore$ Largest number = $2x$

$= 2 \times 27 = 54$

TYPE-VI

1. (3) According to question,

Total marks = 71 × 14 = 994

Correct total marks

= 994 + (56 – 42) + (32 – 74)

= 994 + 14 – 42 = 966

$\therefore$ Required average = $\frac{966}{14} = 69$

Aliter : Using Rule 27,

Here n = 14, m = 71

a = 56, b = 42

p = 32, q = 74

Correct Average

$= m + \frac{(a+b-p-q)}{n}$

$= 71 + \frac{(56+32-42-74)}{14}$

$= 71 - \frac{28}{14}$

= 71 – 2 = 69

2. (3) Total weight of A, B and C = 84 × 3 = 252 kg.

Again, A + B + C + D = 80 × 4 = 320 kg.

$\therefore$ D = (320 – 252) kg.

= 68 kg.

E = 68 + 3 = 71 kg.

B + C + D + E = 79 × 4

= 316 kg.

Now,

(A + B + C + D) – (B + C + D +E)

= (320 – 316) kg.

$\therefore$ A – E = 4 kg.

or A = 4 + E = 4 + 71 = 75 kg.

3. (3) Total length of 20 measurements = 56 × 20 = 1120 cm

Correct length of 20 measurements

= 1120 – 64 + 61 = 1117

Correct average = $\frac{1117}{20}$

= 55.85 cm

Aliter : Using Rule 26,

Here, n = 20, m = 56

a = 61, b = 64

Correct Average = $m + \frac{(a-b)}{n}$

$= 56 + \left(\frac{61-64}{20}\right)$

$= 56 - \frac{3}{20}$

= 56 – 0.15 = 55.85 cm

4. (3) Total marks obtained by 5 students = 50 × 5 = 250.

Now, in this total marks, 84 is included instead of 48.

$\therefore$ Correct total marks

= 250 – 84 + 48 = 214

$\therefore$ Correct average

$= \frac{214}{5} = 42.8$

Aliter :

Here, n = 5, m = 50

a = 48, b = 84

Correct Average = $m + \frac{(a-b)}{n}$

$= 50 + \frac{(48-8)}{5}$

$= 50 - \frac{36}{5}$

= 50 – 7.2 = 42.8

5. (4) Weight of the new student

= (40 + 15 × 1.5) kg

= (40 + 22.5) kg

= 62.5 kg

Aliter : Using Rule 18,

Here, N = 15, T = 40, t = 1.5

Weight of new Person = T + Nt

= 40 + 15 × 1.5

= 40 + 22.5

= 62.5 kg.

6. (3) Total of correct marks

= 100 × 40 – 83 + 53 = 3970

$\therefore$ Correct average marks

$= \frac{3970}{100} = 39.70$

Aliter : Using Rule 26,

Here, n = 100, m = 40

a = 53, b = 83

Correct Average = $m + \frac{(a-b)}{n}$

$= 40 + \left(\frac{53-83}{100}\right)$

$= 40 - \frac{30}{100} = 39.70$

7. (4) Difference in weight

= 87 – 78 = 9 kg

$\therefore$ Correct average weight

$= 89.4 + \frac{9}{20}$

= 89.4 + 0.45 = 89.85 kg

Aliter : Using Rule 26,

Here, n = 20, m = 89.4

a = 87, b = 78

Correct Average = $m+\frac{(a-b)}{n}$

$= 89.4 + \frac{(87-78)}{20}$

$= 89.4 + \frac{9}{20}$

= 89.4 + 0.45 = 89.85 kg

8. (2) Difference in observations
= 64 + 28 – 46 – 82 = – 36
∴ Correct average

$= 124 - \frac{36}{18} = 122$

9. (3) Required average

$= 30 + \frac{(28+31-82-13)}{50}$

$= 30 + \left(-\frac{36}{50}\right)$

= 30 – 0.72 = 29.28

Aliter : Using Rule 27,
Here, n = 50, m = 30
a = 28, b = 31
p = 82, q = 13
Correct Average

$= m + \frac{(a+b-p-q)}{n}$

$= 30 + \frac{(28+31-82-13)}{50}$

$= 30 + \left(\frac{59-95}{50}\right)$

$= 30 - \frac{36}{50}$

= 30 – 0.72 = 29.28

10. (2) Difference of two observations
= 73 – 48 = 25

∴ New average $= 13 + \frac{25}{25} = 14$

Aliter : Using Rule 26,
Here, n = 25, m = 13
a = 73, b = 48

Correct Average = $m + \frac{(a-b)}{n}$

$= 13 + \frac{(73-48)}{25}$

= 13 + 1 = 14

11. (1) Difference
= 15 + 23 – 51 – 32 = –45
∴ Correct average

$= 30 - \frac{45}{10} = 25.5$

Aliter : Using Rule 27,
Here, n = 10, m = 30
a = 15, b = 23
p = 51, q = 32
Correct Average

$= m + \frac{(a+b-p-q)}{n}$

$= 30 + \frac{(15+23-51-32)}{10}$

$= 30 + \left(\frac{38-83}{10}\right)$

$= 30 - \frac{45}{10}$

= 30 – 4.5 = 25.5

12. (3) The sum of 50 observations =
50 × 36 = 1800
The correct mean

$= \frac{1800-23+48}{50}$

$= \frac{1825}{50} = 36.5$

Aliter : Using Rule 26,
Here, n = 50, m = 36
a = 48, b = 23

Correct Average = $m + \frac{(a-b)}{n}$

$= 36 + \frac{(48-23)}{50}$

$= 36 + \frac{25}{50} = 36.5$

13. (1) Difference of numbers
= 64 – 46 = 18

Correct average = $50 - \frac{18}{10}$

= 50 – 1.8 = 48.2

Aliter : Using Rule 26,
Here, n = 10, m = 50
a = 46, b = 64

Correct Average = $m + \frac{(a-b)}{n}$

$= 50 + \frac{(46-64)}{10}$

$= 50 - \frac{18}{10}$

= 50 – 1.8 = 48.2

14. (3) Correct total of 10 numbers
= 15 × 10 – 26 + 36
= 160

∴ Correct average = $\frac{160}{10} = 16$

Aliter : Using Rule 26,
Here, n = 10, m =15
a = 36, b = 26

Correct Average = $m + \frac{(a-b)}{n}$

$= 15 + \frac{(36-26)}{10} = 15 + 1 = 16$

15. (1) Difference in average = 1.8
∴ Difference between the number and the number formed by interchanging the digits
= 1.8 × 10 = 18
(∵ 53 – 35 = 18)
∴ Number = 35
∴ Difference of digits
= 5 – 3 = 2

16. (3) Difference of numbers
= 82 – 28 = 54
∴ Required average

$= 60 + \frac{54}{27} = 62$

Aliter : Using Rule 26,
Here, n = 27, m = 60
b = 28, a = 82

New Average = $m + \frac{(a-b)}{n}$

$= 60 + \frac{(82-28)}{27}$

$= 60 + \frac{54}{27} = 62$

17. (1) Difference = 86 – 68 = 18

∴ Actual average = $58 + \frac{18}{100}$

= 58.18

Aliter : Using Rule 26,
Here, n = 100, m = 58
a = 86, b = 68

Correct Average = $m + \frac{(a-b)}{n}$

$= 58 + \frac{(86-68)}{100}$

$= 58 + \frac{18}{100}$

= 58 + 0.18 = 58.18

18. (1) Difference = 62 – 26 = 36
∴ Required average

$= 47 + \frac{36}{20}$

= 47 + 1.8 = 48.8

Aliter : Using Rule 26,
Here, n = 20, m = 47
a = 62, b = 26

Correct Average = $m + \frac{(a-b)}{n}$

$= 47 + \frac{(62-26)}{20}$

$= 47 + \frac{36}{20}$

$= 47 + 1.8 = 48.8$

19. (3) Difference = 97 – 79 = 18

True average = $75 + \frac{18}{20} = 75.9$

Aliter : Using Rule 26,
Here, n = 20, m = 75
a = 97, b = 79

Correct mean = $m + \frac{(a-b)}{n}$

$= 75 + \frac{(97-79)}{20}$

$= 75 + \frac{18}{20}$

$= 75 + 0.9 = 75.9$

20. (2) Required Average

$= \frac{100 \times 46 - 61 - 34 + 16 + 43}{90}$

$= \frac{4600-36}{90} = \frac{4564}{90} = 50.7$

21. (3) Difference = 31 – 17 = 14
∴ Required average

$= 18 + \frac{14}{7} = 20$

Aliter : Using Rule 26,
Here, n = 7, m = 18
a = 31, b = 17

New Average = $m + \frac{(a-b)}{n}$

$= 18 + \frac{(31-17)}{7}$

$= 18 + \frac{14}{7}$

$= 18 + 2 = 20$

22. (1) Let the number of candidates be x, then
$60x - 45x = 30 \times 100$
$\Rightarrow 15x = 3000$
$\Rightarrow x = 200$

23. (1) Let total number of candidates be x.
$\therefore 50x - 30 \times 100 = 45x$
$\Rightarrow 5x = 3000$

$\Rightarrow x = \frac{3000}{5} = 600$

24. (3) Corrected mean

$= \frac{80 \times 10 - 60 + 50}{10}$

$= \frac{800-10}{10} = \frac{790}{10} = 79$

Aliter : Using Rule 26,
Here, n = 10, m = 80
a = 50, b = 60

Correct Average = $m + \frac{(a-b)}{n}$

$= 80 + \frac{(50-60)}{10} = 80 - 1 = 79$

25. (1) Sum of 9 integers
$= 9 \times 11 = 99.$
New average

$= \frac{90+23-32}{9} = \frac{90}{9} = 10$

Aliter : Using Rule 26,
Here, n = 9, m = 11
a = 23, b = 32

Correct mean = $m + \frac{(a-b)}{n}$

$= 11 + \frac{(23-32)}{9}$

$= 11 + \frac{(-9)}{9}$

$= 11 - 1 = 10$

26. (3) Required answer
$= 30 + 20 \times 0.75$
= 30 kg + 15 kg = 45 kg
Aliter : Using Rule 18,
Here, N = 20, T= 30, t = 0.75
Weight of New student = T + Nt
$= 30 + 20 \times 0.75$
$= 30 + 15 = 45$ kg

27. (4) Total weight increased
$= 1 \times 25 = 25$ kg
∴ Weight of new person
$= 60 + 25 = 85$ kg
Aliter : Using Rule 18,
Here, N = 25, T = 60 t = 1
Weight of New person = T + Nt
$= 60 + 25 \times 1 = 85$ Kg

28. (3) Total weight increased

$= \frac{1}{2} \times 50 = 25$ kg.

∴ Weight of the new man
$= 50 + 25 = 75$ kg.
Aliter : Using Rule 18,
Here, N = 50, T = 50, t = $\frac{1}{2}$
Weight of New boy = T + Nt

$= 50 + 50 \times \frac{1}{2} = 75$ kg.

29. (4) Weight of the new oarsman

$= 60 + 8 \times \frac{3}{2}$

$= 60 + 12 = 72$ kg
Aliter : Using Rule 18,

Here, N = 8, T = 60, t = $\frac{3}{2}$

Weight of new man = T + Nt

$= 60 + 8 \times \frac{3}{2}$

$= 60 + 12 = 72$

30. (4) Weight of the new man

$= 55 + \frac{1}{3} \times 12 = 59$ kg.

Aliter : Using Rule 18,

Here, N = 12, T = 55, t = $\frac{1}{3}$

Weight of new man = T + Nt

$= 55 + 12 \times \frac{1}{3}$

$= 55 + 4 = 59$ kg.

31. (2) Marks obtained by eleventh candidate
$= 22 \times 45 - (10 \times 55 + 11 \times 40)$
$= 990 - (550 + 440)$
$= 990 - 990 = 0$

32. (3) Sum of 18 items
$= 55 \times 20 - 45 - 30$
$= 1100 - 75 = 1025$

∴ Required average = $\frac{1025}{18}$

$= 56.9$

33. (3) Sum of marks of top 5 students = $40 \times 86 - 35 \times 85$
$= 3440 - 2975 = 465$

∴ Their average = $\frac{465}{5} = 93$

34. (1) Sum of 50 numbers
$= 50 \times 38 = 1900$
Sum of 48 numbers
$= 1900 - 45 - 55 = 1800$
∴ Required average

$= \frac{1800}{48} = 37.5$

35. (4) Required number = sum of six numbers – sum of five numbers

= 6 × 20 – 15 × 5

= 120 – 75 = 45

36. (4) Difference of correct and incorrect marks = 64 – 46 = 18

∴ Correct mean

$= 52 + \frac{18}{36} = 52.5$

Aliter : Using Rule 26,

Here, n = 36, m = 52

a = 64, b = 46

New mean $= m + \frac{(a-b)}{n}$

$= 52 + \frac{(64-46)}{36}$

$= 52 + \frac{18}{36}$

$= 52 + \frac{1}{2} = 52.5$

37. (1) Correct average

$= 35 - \left(\frac{61-16}{20}\right)$

$= 35 - \frac{45}{20} = 35 - 2.25 = 32.75$

Aliter : Using Rule 26,

Here, n = 20, m = 35

a = 16, b = 61

Correct mean $= m + \frac{(a-b)}{n}$

$= 35 + \frac{(16-61)}{20}$

$= 35 - \frac{45}{20}$

= 35 – 2.25 = 32.75

38. (2) Correct sum of 20 numbers

= 20 × 35 – 45 + 85

= 700 + 40 = 740

∴ Correct average $= \frac{740}{20} = 37$

Aliter : Using Rule 26,

Here, n = 20, m = 35

a = 85, b = 45

Correct mean $= m + \frac{(a-b)}{n}$

$= 35 + \frac{(85-45)}{20} = 35 + 2 = 37$

39. (2) Correct sum of marks obtained by the student

= 88 × 6 – 86 + 68

= 528 – 86 + 68 = 510

∴ Correct average $= \frac{510}{6} = 85$

Aliter : Using Rule 26,

Here, n = 6, m = 88

a = 68, b = 86

Correct mean $= m + \frac{(a-b)}{n}$

$= 88 + \frac{(68-86)}{6}$

$= 88 - \frac{18}{6} = 85$

40. (3) Correct sum of 100 items

= 30 × 100 – 32 – 12 + 23 + 11

= 3000 – 44 + 34 = 2990

∴ Required average $= \frac{2990}{100}$

= 29.9

41. (1) Correct sum of numbers

= 10 × 50 – 64 + 46

= 500 – 18 = 482

∴ Correct average $= \frac{482}{10}$

= 48.2

42. (2) Correct sum of 9 observations

= 9 × 35 – 18 + 81

= 315 + 63 = 378

∴ Required correct average

$= \frac{378}{9} = 42$

TYPE-VII

1. (3) Let the no. of wickets taken till the last match be n.

∴ Total runs at 24.85 runs per wicket = 24.85n

Total runs after the current match = 24.85n + 52

Total no. of wickets after the current match = n + 5

Bowling Average after the current match

$\Rightarrow \frac{24.85n + 52}{n+5} = 24.85 - 0.85$

$\therefore \frac{24.85n + 52}{n+5} = 24$

or 24.85n + 52

= 24n + 120

or 0.85n = 120 – 52

or $n = \frac{68}{0.85} = 80$

2. (1) Let the batsman make x runs. Total runs in 10 innings = 10 × 32 = 320

$\therefore \frac{320 + x}{11} = 32 + 4$

$\Rightarrow 320 + x = 36 \times 11$

$\Rightarrow x = 396 - 320 = 76$

Aliter : Using Rule 18,

Here, T = 32, N = 11, t = 4

Required Run = T + Nt

[Here N is taken as (n + 1)]

= 32 + 11 × 4

= 32 + 44 = 76

3. (3) Let the number of wickets taken by the cricketer before the last match = x

According to the question,

$\frac{12.4x + 26}{x+5} = 12.2$

$\Rightarrow 12.4x + 26 = 12.2x + 61$

$\Rightarrow 0.2x = 61 - 26 = 35$

$\Rightarrow x = \frac{35}{0.2} = \frac{350}{2} = 175$

4. (2) Let the cricketer's average of runs for his 64 innings be x runs.

∴ Total number of runs in 64 innings = $64x$

According to the question,

$\frac{64x + 0}{65} = x - 2$

$\Rightarrow 64x = 65x - 130$

$\Rightarrow x = 130$

∴ New average of runs = $x - 2$

= 130– 2 = 128

5. (3) Let the average of runs of the cricketer in 8 innings be x.

According to the question,

$\frac{8x + 100}{9} = x + 9$

$\Rightarrow 8x + 100 = 9x + 81$

$\Rightarrow x = 100 - 81 = 19$

∴ New average of runs = 19 + 9 = 28

6. (2) Let the number of runs scored in 11th innings be x.

$\therefore 10 \times 50 + x = 11 \times 52$

$\Rightarrow 500 + x = 572$

$\Rightarrow x = 572 - 500 = 72$ runs

Aliter : Using Rule 18,

Here, T = 50,

N = (10 + 1) = 11, t = 2

Required Runs = T + Nt

= 50 + 11 × 2 = 72

7. (3) Let the batsman's average in 11 innings be x runs.

$\therefore \frac{11x+90}{12} = x - 5$

$\Rightarrow 11x + 90 = 12x - 60$

$\Rightarrow x = 150$

$\therefore$ Required average = 150 – 5 = 145

8. (4) Let the highest score be x.

$\therefore$ Lowest score = $x - 172$

$\therefore x + x - 172 = 40 \times 50 - 38 \times 48$

$\Rightarrow 2x - 172 = 2000 - 1824 = 176$

$\Rightarrow 2x = 176 + 172 = 348$

$\therefore x = \frac{348}{2} = 174$

9. (4) Let the cricketer's highest score be x runs.

$\therefore 60 \times 62 + x + x - 180 = 64 \times 62$

$\Rightarrow 3720 + 2x - 180 = 3968$

$\Rightarrow 2x = 428$

$\Rightarrow x = 214$ runs

10. (3) If the average in 10 tests be x, then,

$x \times 10 + 100 = (x + 5) \times 11$

$\Rightarrow 11x - 10x = 100 - 55$

$\Rightarrow x = 45$

$\therefore$ Required average = 50

11. (2) Required runs

= 60 + 11 × 2 = 82 runs

Aliter : Using Rule 18,

Here, T = 60, N = (10 + 1)

t = 62 – 60 = 2

Required Runs = T + Nt

= 60 + 11 × 2 = 82

12. (3) Total runs = 20 × 7.2 = 144

Total runs in 15 overs

= 15 × 6 = 90

Runs to be scored in the next 5 overs

= 144 – 90 = 54

$\therefore$ Required run-rate

$= \frac{54}{5} = 10.8$

13. (2) Extra runs = 12 × 2 = 24

$\therefore$ Required average

= 63 – 24 = 39

14. (2) Lowest score = x

Highest score = $x + 100$

$\therefore 28 \times 38 + x + x + 100 = 30 \times 40$

$\Rightarrow 1064 + 2x + 100 = 1200$

$\Rightarrow 2x = 1200 - 1164 = 36$

$\Rightarrow x = 18$

15. (3) Sachin's new average = x runs

Total runs in 11 innings

$= 11(x - 5)$

$\therefore 11(x - 5) + 120 = 12x$

$\therefore 12x - 11x = 65$

$\therefore x = 65$ runs

16. (4) Required number of wickets = x (let)

According to question,

$12.4 \times x + 26 = (x + 5)(12.4 - 0.4) = (x + 5) \times 12$

$\Rightarrow 12.4x + 26 = 12x + 60$

$\Rightarrow 12.4x - 12x = 60 - 26$

$\Rightarrow 0.4x = 34$

$\Rightarrow x = \frac{34}{0.4} = \frac{340}{4} = 85$

17. (4) Runs scored in the next innings = x (let)

According to the question,

$10 \times 32 + x = 11 \times 38$

$\Rightarrow 320 + x = 418$

$\Rightarrow x = 418 - 320 = 98$

Aliter : Using Rule 18,

Here, T = 32,

N= (10 + 1) = 11, t = 6

Required Runs = T + Nt

= 32 + 11 × 6

= 32 + 66 = 98

18. (1) Average runs in 16 innings

= 87 – 17 × 3 = 87 – 51 = 36

$\therefore$ Required average

= 36 + 3 = 39 runs

19. (4) Let the highest score of cricketer be x runs.

$\therefore$ His lowest score

= $(x - 172)$ runs

According to the question,

$38 \times 48 + x + x - 172 = 40 \times 50$

$\Rightarrow 1824 - 172 + 2x = 2000$

$\Rightarrow 1652 + 2x = 2000$

$\Rightarrow 2x = 2000 - 1652 = 348$

$\therefore x = \frac{348}{2} = 174$ runs

20. (1) Total runs scored by the cricketer in 20 innings

= 32 × 20 = 640

If the runs scored in 21st innings be x, then

$640 + x = 21 \times 36$

$\Rightarrow 640 + x = 756$

$\Rightarrow x = 756 - 640 = 116$

21. (3) Average runs after 12 innings = x (let)

Average runs after 11 innings = $x - 5$

According to the question,

$12x = (x - 5) \times 11 + 120$

$\Rightarrow 12x - 11x = 120 - 55$

$\Rightarrow x = 65$

22. (4) Runs scored by the cricketer in the 6th innings

= 6 × 60 + 6 × 65 – 11 × 63

= 360 + 390 – 693 = 57

23. (3) Total runs scored by remaining 10 cricketers

= 23 × 11 – 113 = 253 – 113

= 140

$\therefore$ Required average $= \frac{140}{10}$

= 14 runs

24. (3) Number of runs scored in 100th innings

= 100 × 100 – 99 × 99

= 10000 – 9801 = 199

OR

Increase in average = 1 run

$\therefore$ Runs scored in 100th innings

= 100 + 99 = 199

25. (3) Total runs scored in first 10 overs = 3.2 × 10 = 32

Runs to be scored in remaining 40 overs = 282 – 32 = 250

$\therefore$ Required run–rate $= \frac{250}{40}$

= 6.25

26. (3) Let the number of wickets before the last match be x.

According to the question,

$12.4x + 22 = (x + 5) \times 12$

$\Rightarrow 12.4x + 22 = 12x + 60$

$\Rightarrow 12.4x - 12x = 60 - 22$

$\Rightarrow 0.4x = 38$

$\Rightarrow x = \frac{38}{0.4} = \frac{380}{4} = 95$

27. A batsman has a certain average of runs for 12 innings. In the 13th innings he scores 96 runs thereby increasing his average by 5 runs. What will be his average after 13th innings?

(1) 28 (2) 32

(3) 36 (4) 42

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE-VIII

1. (4) Total sum of five numbers

= 27 × 5 = 135

Total sum of four numbers

= 25 × 4 = 100

$\therefore$ Required number

= 135 – 100 = 35

2. (2) Total marks of 28 students

= 28× 50 = 1400

Total marks of 20 students

= 20 × 55 = 1100

$\therefore$ Total marks of 8 students

= 1400 – 1100 = 300

$\therefore$ Average $= \frac{300}{8} = 37.5$

3. (3) Total weight 12 parcels
= 12 × 1.8 = 21.6 kg.
New average of 13 parcels
= 1.8 – 0.05 = 1.75 kg.
Total weight of 13 parcels
= 13 × 1.75 = 22.75 kg.
∴ Weight of new parcel
= 22.75 – 21.6 = 1.15 kg.
Aliter : Using Rule 18,
Here, T = 1.8, N= (12 + 1) = 13

$t = \frac{50}{1000} = .05$

Weight of new parcel = T – Nt
= 1.8 – 13 × 0.05
= 1.8 – 0.65
= 1.15 kg

4. (3) Required average

$= \frac{38 \times 50 - 45 - 55}{48}$

$= \frac{1800}{48} = 37.5$

5. (3) Weight of the student who left
= 50 × 45 – 49 × 44.9
= 2250 – 2200.1 = 49.9 kg.

6. (1) Weight of teacher
= 50 + 26 × 1 = 76 kg
Aliter : Using Rule 24,
Here, N = 50, T = 45,

$t = \frac{1}{10} = 0.1$

Weight of teacher
= Average + × (n + 1)
= 50 + 1 (25 + 1)
= 50 + 26 = 76 kg

7. (4) Suppose the initial expenditure per day = ₹ x

$\Rightarrow \frac{x}{35} - \frac{x+42}{42} = 1$

$\Rightarrow \frac{6x - 5x - 210}{210} = 1$

$\Rightarrow x = 210 + 210 =$ ₹ 420

8. (2) Let the new observation be x. Then,

$\frac{x + 6 \times 45.5}{7} = 47$

$\Rightarrow x + 273 = 47 \times 7 = 329$

$\Rightarrow x = 329 - 273 = 56$

Aliter : Using Rule 24,
Here, x = (47 – 45.5) = 1.5
n = 6
New observation
= Average + x (n + 1)
= 45.5 + 1.5 (6 + 1)
= 45.5 + 10.5 = 56

9. (3) Required number
= 5 × 140 – 4 × 130
= 700 – 520 = 180
Aliter : Using Rule 25,
Here, x = (140 – 130) = 10
n = 5
Excluded number
= Average + x (n – 1)
= 140 + 10 × 4 = 180

10. (3) Sum of the three new numbers
= 8 × 8.5 – 5 × 7 = 68 – 35 = 33

∴ Required average $= \frac{33}{3} = 11$

11. (3) Change = 2×3 – 3 × 4 = – 6

∴ New average $= 32 - \frac{6}{6} = 31$

12. (4) Weight of the teacher

$= 42 \text{ kg.} + \frac{35 \times 400}{1000} \text{ kg}$

= 42 + 14 = 56 kg.
Aliter : Using Rule 24,

Here, $x = \frac{400}{100} = 0.4$, n = 34

Weight of teacher
= Average + x (n + 1)
= 42 + 0.4 (34 + 1)
= 42 + 14 = 56 kg

13. (3) 4C = 22 × 4 – 20 × 4
= 88 – 80 = 8

$\Rightarrow C = \frac{8}{4} = 2$

14. (2) Total weight of 40 children
= 40 × 36.2 kg = 1448 kg
Total weight of 43 children = 1448 + 42.3 + 39.7 + 39.5
= 1569.5 kg
∴ Required average weight

$= \frac{1569.5}{43} = 36.5$ kg

15. (1) Let the number of boys be x and that of girls be y.
∴ $71x + 73y = 71.8\ (x + y)$
$\Rightarrow 71.8x - 71x = 73y - 71.8y$
$\Rightarrow 0.8x = 1.2y$

$\Rightarrow \frac{x}{y} = \frac{1.2}{0.8} = \frac{12}{8} = \frac{3}{2}$

$\therefore \frac{x}{y} + 1 = \frac{3}{2} + 1 \Rightarrow \frac{x+y}{y} = \frac{5}{2}$

∴ Percentage of girls

$= \frac{y}{x+y} \times 100 = \frac{2}{5} \times 100 = 40\%$

16. (1) Total increase = 3.6 × 10
= 36
∴ If the number be $10x + y$, then
Number obtained after reversing the digits = $10y + x$
∴ $10y + x - 10x - y = 36$
$\Rightarrow 9y - 9x = 36$
$\Rightarrow 9\ (y - x) = 36$

$\Rightarrow y - x = \frac{36}{9} = 4$

17. (3) Sum of three new numbers
= 8 × 8.5 – 7 × 5
= 68 – 35 = 33

∴ Required average $= \frac{33}{3}$

= 11

TYPE-IX

1. (4) Total age of 14 girls + 1 teacher = 15 × 15 = 225 yrs.
Average age of 14 girls = 14 yrs.
∴ Total age of 14 girls
= 14 × 14 = 196 yrs.
∴ Teacher's age
= 225 – 196 = 29 yrs.

2. (1) Average age of 4 brothers
= 12 yrs.
Total age of 4 brothers = 4 × 12
= 48 yrs.
Average age of 4 brothers + mother (= 5 persons)
= 12 + 5 = 17 yrs.
∴ Total age of 4 brothers + mother = 5 × 17 = 85 yrs.
∴ The age of the mother
= 85 – 48 = 37 yrs.
Aliter : Using Rule 24,
Here, x = 5, n = 4
Age of mother = Average+x (n+1)
= 12 + 5 (4 + 1)
= 12 + 25 = 37 years

3. (2) Age of new person
= 8 × 2 + 24
= 16 + 24 = 40 years

4. (4) Overall increase in the total age = 8 × 2 = 16 years
∴ Total age of two new men
= 21 + 23 + 16 = 60 years
∴ Average age of new men

$= \frac{60}{2} = 30$ years

Aliter : Using Rule 23,
Here, x = 2, n = 8
Age of new person
= Age of replaced person + x
= 24 + 2 × 8
= 24 + 16 = 40 years

5. (2) **Trick**
Average age of new players

$$=\left\{(20+17)11\times\frac{2}{12}\right\}\times\frac{1}{2}$$

$$\frac{422}{12\times 2}=\frac{211}{12}\Rightarrow 17\frac{7}{12}$$

= 17 years 7 months

6. (4) New average age of class

$$=\frac{20\times 12+5\times 7}{25}=\frac{240+35}{25}$$

$$=\frac{275}{25}=11 \text{ years}$$

7. (4) Using Rule 10,
Average age

$$=\frac{10\times 12.5+20\times 13.1}{10+20}$$

$$=\frac{125+262}{30}=12.9 \text{ years}$$

8. (1) Required average

$$=\frac{5\times 12+3\times 16}{5+3}=\frac{60+48}{8}$$

$$=\frac{108}{8}=\frac{27}{2}=13\frac{1}{2} \text{ years}$$

9. (4) The average age is reduced by 3 years.
∴ Age of the retired teacher
= 25 + 3 × 10 = 55 years

10. (2) Total age of 40 old students = 40 × 15 = 600 years.
Total age of 40 old and 10 new students = 50 × 15.2 = 760 years
∴ Total age of 10 new students = 760–600 = 160 years.
∴ Required average age

$$=\frac{160}{10}=16 \text{ years.}$$

11. (3) Sum of the present ages of whole family = 36 × 4 = 144 years
Sum of the ages of the family at the birth of youngest member
= 144 – 4 × 12 = 96 years
∴ Required Average age

$$=\frac{96}{3}=32 \text{ years}$$

12. (2) Total age of 20 new students
= (60 × 18.5 – 40 × 18) years
= (1110 – 720) years
= 390 years
∴ Their average age

$$=\frac{390}{20}=19.5 \text{ years}$$

= 19 years 6 months

13. (2) Required average age

$$=\left(\frac{20\times 15+25\times 24}{20+25}\right)\text{years}$$

$$=\left(\frac{300+600}{45}\right)\text{ years}$$

$$=\left(\frac{900}{45}\right)\text{ years} = 20 \text{ years}$$

14. (3) Total increase = 11 × 2
= 22 months
∴ Sum of the age of both cricketers
= (18 + 20) years 22 months
= 38 years 22 months
∴ Average age =19 years 11 months

15. (3) Sum of the age of two new persons
= 30 + 34 + 3 × 8
= 88 years
∴ Required average

$$=\frac{88}{2}=44 \text{ years}$$

16. (4) Sum of the present age of 10 members
= 20 × 10 = 200 years
Total age of 9 members, 10 years ago
= 100 years
Required average

$$=\frac{100}{9}=11\frac{1}{9} \text{ years}$$

17. (1) A + B + C + D = 20 years
⇒ A + B + D = 20 – 8 = 12 years
Now, A + B + D + E = 24 years
∴ E = 24 – 12 = 12 years

18. (3) Present age of (P + Q)
= 30 + 10 = 40 years
(P + Q + R)'s present age
= 20 × 3 = 60 years
R's present age = 60 – 40
= 20 years
∴ R's age after 10 years
= 20 + 10 = 30 years

19. (3) After five years of marriage,
Husband + wife + child
= 46 + 10 + 1
= 57 years
At the time of birth of child,
Husband + wife + child
= 57 – 3 = 54 years
∴ Required average age

$$=\frac{54}{3}=18 \text{ years}$$

20. (1) Sum of present ages of 9 member family = 18 × 9
= 162 years
Sum of 8 member's present ages
= 18 × 8 + 2 × 8
= 144 + 16 = 160 years
Child's age = 162 – 160
= 2 years

21. (2) Age of new boy

$$=\left(10+\frac{2\times 42}{12}\right)=17 \text{ years}$$

22. (4) Ram + two children = 51 years
His wife + two children
= 48 years
∴ Ram – wife = 3 years
⇒ 33 – wife = 3 years
∴ Wife = 33 – 3 = 30 years

23. (3) A + B = 2 × 20 = 40
C + B = 2 × 19 = 38
C + A = 2 × 21 = 42
On adding all three,
2 (A + B + C)
= 40 + 38 + 42 = 120
⇒ A + B + C = 60
∴ A = (A + B + C) – (B + C)
= 60 – 38 = 22 years
B = (A + B + C) – (A + C)
= 60 – 42 = 18 years
C = (A + B + C) – (A + B)
= 60 – 40 = 20 years

24. (1) Sum of the present age of family members = 33 × 5 = 165 years
9 years ago,
Sum of their age
= 165 – 9 × 5 = 120 years

$$\therefore \text{ Required average age} = \frac{120}{4}$$

= 30 years

25. (2) Total age of 12 players
= 12 × 25 = 300
Total age including captain
= 13 × 26 = 338
∴ Age of the captain
= 338 – 300 = 38 years
Aliter : Using Rule 23,
Here, x = 1, n = 12
Age of the captain
= Average + x (n + 1)
= 25 + 1 (12 + 1) = 38 years

26. (1) Total age of 40 boys
= 40 × 16 = 640 years
New total age of 40 boys
= 40 × 15.875 = 635 years
∴ Age of new boy
= [635 – (640–17)] = 12 years
Aliter : Using Rule 23,
Here, n = 40
x = 16 – 15.875
x = 0.125
Age of new boy
= Age of replaced boy–xn
= 17 – 0.125 × 40
= 17 – 5 = 12 years

27. (2) Total age of 30 boys
= 30 × 15 = 450 years
One boy, aged 20 years, left the class
Now, total age of 29 boys
= 450 – 20 = 430 years
Again, two new boys join the class
Then, the total age of 31 boys
= 15 × 31 = 465 years
∴ Age of two new boys
= 465 – 430 = 35 years
Let the individual age of two boys be x and y years
∴ x + y = 35
x – y = 5 (According to the question)
∴ 2x = 40
$x = \frac{40}{2} = 20$ years
∴ y = 15 years
∴ Age of the younger new comer
= 15 years

28. (4) Age of new boy
= 18 years – total decrease
= (18 – 0.1 × 30) years
= 15 years
Aliter : Using Rule 23,
Here, x = 17 – 16.9 = 0.1
n = 30
Age of new boy
= Age of replaced boy–xn
= 18 – 0.1 × 30
= 18 – 3 = 15 years

29. (3) Let the mother's age
= x years
∴ Father's age = (x + 8) years
Sum of age of 6 sons
= 8 × 6 = 48 years
Sum of age of 6 sons and parents = 22 × 8 = 176 years.
∴ Age of Parents = 176 – 48
= 128 years
⇒ $x + x + 8 = 128$
⇒ $2x = 120$
⇒ $x = 60$
Hence, mother's age = 60 years

30. (2) Total age decreased
= 10 × 3 = 30 years.
∴ Age of the retired teacher
= 25 + 30 = 55 years.
Aliter : Using Rule 23,
Here, n = 10, x = 3
Age of new teacher
= Age of retired teacher – xn
25 = Age of retired teacher
– 10 × 3
= Age of retired teacher
= 25 + 30 = 55 years

31. (2) Total age of 5 members, 3 years ago = 17 × 5 = 85 years
Total age of 5 members, now
= (85 + 3 × 5) = 100 years
Total age of 6 members, now
= 17 × 6 = 102 years
∴ Age of the baby
= 102 – 100 = 2 years
Aliter : Using Rule 17,
Here, t = 3, N = 5
T = 17, n = 1
Present age of baby = nT – Nt
= 1 × 17 – 5 × 3
= 17 – 15 = 2 years

32. (2) Reduction in total age of 45 persons = $45 \times \frac{1}{9}$
Age of the new person
$= 60 - 45 \times \frac{1}{9} = 55$ years
Aliter : Using Rule 23,
Age of new corner
= Age of replaced
member – xn = $60 - 45 \times \frac{1}{9}$
= 60 – 5 = 55 years

33. (3) H + W + S = 42 × 3 = 126
(H + W + S) + D + C = 36 × 5
= 180
(126 + 6 × 3) + D + C = 180
⇒ (126 + 18) + D + C = 180
⇒ 144 + D + C = 180
⇒ D + C = 180 – 144 = 36
∴ Age of daughter-in-law at the time of marriage (D).
= 36 – (6 + 6) = 24 years

34. (2) Let the age of younger boy be x years.
∴ Age of older boy
= (x + 5) years.
Then, total age of 30 boys
= 30 × 15 = 450 years.
Total age of 31 boys after two newcomers join &1 left
= 450 – 20 + x + x + 5
= 435 + 2x
Clearly, 435 + 2x = 31 × 15
⇒ 2x = 465 – 435
$\Rightarrow x = \frac{30}{2} = 15$ years

35. (2) The age of the teacher
= (24 + 1) × 15 – 24 × (15 – 1)
= 25 × 15 – 24 × 14
= 375 – 336 = 39 years.

36. (3) Total age decrease
= 24 × 1 = 24 months = 2 years
∴ Age of newcomer = 18 – 2
= 16 years.

37. (4) Total age of 30 students
= 9 × 30 = 270 years
Total age of 30 students and a teacher = 31×10 = 310 years
∴ Age of the teacher
= 310 – 270 = 40 years

38. (3) Total age increase
= 2 × 24 = 48 months = 4 years
∴ Age of the new boy
= 10 + 4 = 14 years.

39. (3) Sum of the present age of A, B, C and D = 45 × 4 + 4 × 5
= 180 + 20 = 200 years
Sum of the present age of A, B, C, D and E = 49 × 5 = 245 years
∴ Present age of E
= (245 – 200) years = 45 years

40. (2) Father + mother
= 2 × 35 = 70 years
Father + mother + son
= 27 × 3 = 81 years
∴ Son's age = 81 – 70 = 11 years

41. (2) Teacher's age
= 16 × 10 – 19 × 4 – 5 × 10
= 160 – 76 – 50 = 34 years

42. (1) Sum of the present age of P, Q and R
= (25 × 3 + 3 × 5) years
= (75 + 15) years = 90 years
Sum of the present age of Q and R = (20 × 2 + 2 × 7) years
= 54 years
∴ p's present age
= (90 – 54) years = 36 years

43. (2) Total age of 11 players
= 11 × 20 = 220 years
Total age of 11 players and the coach = 12 × 22 = 264 years
∴ Age of the coach
= (264 – 220) years
= 44 years

44. (4) Sum of the present age of husband and wife
= 2 × 27 + 8 = 62 years
Sum of the present age of husband, wife and child
= 21 × 3 = 63 years
∴ present age of the child
= 63 – 62 = 1 year

45. (2) Sum of the present age of husband and wife
= 2 × 25 + 2 × 4 = 58 years
Sum of the present age of husband, wife and child
= 3 × 20 = 60 years
∴ Child's present age
= 60 – 58 = 2 years

46. (2) Sum of the present age of P and Q.
= 2 × 25 + 10 = 60 years
Sum of the present age of P, Q and R = 25 × 3 = 75 years
∴ R's present age = 75 – 60
= 15 years
∴ R's age after 5 years = 20 years

47. (1) Let the number of students be n. Then,

$$7 = \frac{n \times 6 + 12 \times 40}{n + 12}$$

$\Rightarrow 7n + 84 = 6n + 480$
$\Rightarrow n = 480 - 84 = 396$

48. (2) Number of girls = x
Number of boys = 600 – x
∴ $(600 - x) \times 12 + 11x$

$$= 11\frac{3}{4} \times 600 = \frac{47}{4} \times 600$$

$\Rightarrow 7200 - 12x + 11x = 7050$
$\Rightarrow x = 7200 - 7050 = 150$

49. (2) Average age of the whole group

$$= \frac{3 \times 20 + 4 \times 21 + 3 \times 22}{10}$$

$$= \frac{60 + 84 + 66}{10} = \frac{210}{10}$$

= 21 years

50. (3) Present age of child
= 17 × 6 – (17 × 5 + 3 × 5)
= 102 – (85 + 15) = 102 – 100
= 2 years

51. (1) Total age of remaining 6 children = 12 × 7 – 6
= 84 – 6 = 78 years

∴ Their average age = $\frac{78}{6}$
= 13 years

52. (3) Total age of three youngsters
= 33 × 3 – 11 × 3 = 99 – 33
= 66 years
∴ Required average

$$= \frac{66}{3} = 22 \text{ years}$$

53. (1) Required average

$$= \frac{8 \times 3 + 20 \times 2 + 26 \times m + 29 \times 1}{3 + 2 + m + 1}$$

$$\Rightarrow 17 = \frac{24 + 40 + 26m + 29}{6 + m}$$

$\Rightarrow 17(6 + m) = 93 + 26m$
$\Rightarrow 102 + 17m = 93 + 26m$
$\Rightarrow 26m - 17m = 102 - 93$
$\Rightarrow 9m = 9 \Rightarrow m = 1$

54. (4) Increase in ages of five members in 3 years
= (3 × 5) years = 15 years
As average age remains same,
∴ Required difference = 15 years

55. (1) Three years ago,
Total age of the family = 17 × 5 = 85 years
Total age of 5 member family today = 85 + 15 = 100 years
Total age of the family with child today = 17 × 6 = 102 years
Age of baby = 102 – 100 = 2 years

56. (3) Five years ago, total age of five members = 17 × 5 = 85 years
Sum of their present ages
= 85 + 3 × 5 = 100 years
Sum of present ages of 6 members
= 17 × 6 = 102 years
∴ Present age of baby
= 102 – 100 = 2 years

57. (2) Total age of 5-member family 3 years ago = 17 × 5 = 85 years
Their total present age
= 85 + 3 × 5 = 100 years
Total present age of 6 members
= 17 × 6 = 102 years
∴ Present age of child
= 102 – 100 = 2 years

58. (1) According to question,

$$\frac{P + Q + R}{3} = R + 5$$

$\Rightarrow P + Q + R = 3R + 15$
$\Rightarrow P + Q = 3R - R + 15$
$\Rightarrow 2R + 15 = P + Q = 39$
$\Rightarrow 2R = 39 - 15 = 24$

$$\Rightarrow R = \frac{24}{2} = 12 \text{ years}$$

59. (3) Total present age of 5 – member family
= (17 × 5 + 3 × 5) years
= 85 + 15 = 100 years
Total present age of 6 – member family = 17 × 6 = 102 years
∴ Present age of child
= 102 – 100 = 2 years

60. (2) Total present age of family
= (2 × 23 + 2 × 5 + 1) years
= (46 + 10 + 1) years = 57 years

∴ Required average = $\frac{57}{3}$
= 19 years

61. (4) Total age of initial 30 students
= 14 years 4 months × 30
= 430 years
Total age of 35 students
= 13 years 9 months × 35
= (455 + 26) years 3 months
= 481 years 3 months
∴ Total age of 4 new students
= 481 years 3 months – 430 years – 9 years 11 months
= 481 years 3 months – 439 years 11 months
= 41 years 4 months
∴ Required average

$$= \frac{41 \text{ years } 4 \text{ months}}{4}$$

= 10 years 4 months

62. (1) Age of the retired teacher
= (25 + 3 × 10) years
= 55 years

63. (4) Mother + 6 children $\Rightarrow 12 \times 7 = 84$ years
6 children $\Rightarrow 6 \times 7 = 42$ years
$\therefore$ Mother's age $\Rightarrow 84 - 42$
$= 42$ years

64. (3) Sum of the ages of 4 members of family
$= (28 \times 5 - 20)$ years
$= (140 - 20)$ years $= 120$ years
$\therefore$ Required average $= \frac{120}{4}$
$= 30$ years

65. (2) According to the question,
Sum of the present ages of husband, wife and child
$= 3 \times (27 + 3)$
$= 3 \times 30$ years $= 90$ years
Sum of the presents age of wife and child
$= 2((20 + 5)$
$= 50$ years
$\therefore$ Husband's present age
$= 90 - 50 = 40$ years

66. (2) Rita's age 2 years ago
$= x$ years
$\therefore$ Pushpa's present age
$= 2x$ years
According to the question,
$2x - (x + 2) = 2$
$\Rightarrow x - 2 = 2 \Rightarrow x = 4$ years
$\therefore$ Pushpa's present age
$= 2 \times 4 = 8$ years

67. (1) Age of tenth child
= (9 years 9 months) × 10 – (8 years 11 months) × 9
= 97 years 6 months – 80 years 3 months
= 17 years 3 months

68. (3) Daughter's present age
$= x$ years (let)
$\therefore$ Mother's present age
$= (60 - x)$ years
According to the question,
12 years ago,
$(60 - x - 12) = 8(x - 12)$
$\Rightarrow 48 - x = 8x - 96$
$\Rightarrow 8x + x = 96 + 48$
$\Rightarrow 9x = 144$
$\Rightarrow x = \frac{144}{9} = 16$ years

69. (3) Difference between ages
$= 39 - 55 = -16$ years
$\therefore$ Required average
$= 40 - \frac{16}{8} = 38$ years

70. (1) Total age of 4 children
$= 4 \times 12 = 48$ years
Total age of 4 children and father $= 20 \times 5 = 100$ years
$\therefore$ Father's age
$= (100 - 48)$ years $= 52$ years

71. (2) Let teacher's age be x years.
According to the question,
$36 \times 14 + x = 37 \times 15$
$\Rightarrow 504 + x = 555$
$\Rightarrow x = 555 - 504 = 51$ years

72. (4) Teacher's age = 10 years + total increase = (10 + 31) years
= 41 years

73. (3) Ram's present age $= x$ years
$\therefore$ Shyam's present age
$= (x + 20)$ years
According to the question,
5 years ago,
$$\frac{x-5}{x+20-5} = \frac{3}{5}$$
$$\Rightarrow \frac{x-5}{x+15} = \frac{3}{5}$$
$\Rightarrow 5x - 25 = 3x + 45$
$\Rightarrow 5x - 3x = 25 + 45$
$\Rightarrow 2x = 70$
$\Rightarrow x = \frac{70}{2} = 35$
$\therefore$ Sum of present ages of Ram and Shyam
$= (2x + 20)$ years
$= (2 \times 35 + 20)$ years
$= 90$ years

74. (1) Total age of the family 3 years ago
$= 5 \times 17 = 85$ years
Total present age of the family
$= 85 + 15 = 100$ years
Let the child's present age be x years.
According to the question,
$100 + x = 17 \times 6 = 102$
$\Rightarrow x = 102 - 100 = 2$ years

75. (1) Sum of the present ages of A, B and C
$= (51 \times 3 + 3 \times 7)$ years
$= (153 + 21)$ years $= 174$ years
Again,
A = B + 3 = C + 6
B = C + 3
$\therefore$ A + B + C = 174
$\Rightarrow$ C + 6 + C + 3 + C = 174
$\Rightarrow$ 3C = 174 – 9 = 165
$\Rightarrow C = \frac{165}{3} = 55$ years
$\therefore$ A = C + 6 = 55 + 6 = 61 years
B = C + 3 = 55 + 3 = 58 years

76. (3) Total age of boys $= ax$ years
Total age of girls $= by$ years
$\because$ Required average $= \frac{ax + by}{x + y}$

77. (2) Age of teacher = 15 years + total increase
= 15 years + (40 × 3) months
$= 15$ years $+ \left(\frac{40 \times 3}{12}\right)$ years
$= (15 + 10)$ years $= 25$ years

78. (4) According to the question,
Average age remains same.
$\therefore$ Fourth friend's age = Average age of three friends
= 23 years.

79. (1) Let the number of boys in the class be $3x$ and that of girls be $2x$.
$\therefore$ Average age of class
$$= \frac{3x \times 18 + 2x \times 12}{3x + 2x}$$
$$= \frac{54x + 24x}{5x} = \frac{78}{5}$$
$= 15.6$ years

TYPE-X

1. (1) Let average production of a company in 9 months be x items
$\therefore$ According to question,
$$4375 = \frac{3 \times 4000 + 9 \times x}{12}$$
or, $4375 \times 12 = 12 \times 1000 + 9 \times x$
$\therefore 9 \times x = 12(4375 - 1000)$
$= 12 \times 3375$
$$\therefore x = \frac{12 \times 3375}{9} = 4500$$

2. (3) Let the number of white balls be x.
$\therefore$ Number of red balls $= (10 - x)$
$\therefore 10 \times 28 = x \times 30 + 25(10 - x)$
$\Rightarrow 280 = 30x + 250 - 25x$
$= 5x + 250$
$\Rightarrow 5x = 280 - 250 = 30$
$\Rightarrow x = 6$

3. (3) Let mean score of remaining 55% = x
$$52 = \frac{20 \times 80 + 25 \times 31 + 55 \times x}{100}$$
$\Rightarrow 5200 = 1600 + 775 + 55x$
$\Rightarrow 55x = 5200 - 1600 - 775$
$55x = 2825$
$$\therefore x = \frac{2825}{55} = 51.36 \approx 51.4\%$$

4. (1) Let the number of successful students = x
∴ Number of unsuccessful students = 120 – x
According to the question,
x × 39 + (120 – x) × 15
= 120 × 35
⇒ 39x – 15x + 1800 = 4200
⇒ 24x = 4200 – 1800 = 2400
⇒ x = 100

5. (2) Total salary of 3 years
= ₹ (380 × 9 + 420 × 12 + 460 × 12 + 500 × 3)
= ₹ (3420 + 5040 + 5520 + 1500)
= ₹ 15480
Average monthly salary
$= \frac{15480}{36} =$ ₹ 430
∴ Amount of pension
$= \frac{430}{2} =$ ₹ 215

6. (2) Let the total number of workers be x.
Total salary of all the workers = $8000x$
Total salary of 7 technicians = 7 × 12000
= ₹ 84000
Total salary of $(x-7)$ workers = $(x - 7)$ 6000
∴ $(x - 7)$ 6000 + 84000
= 8000 x
or $8000x - 6000\,x$
= 84000 – 42000
or 2000 x = 42000
or $x = \frac{42000}{2000} = 21$

7. (1) Total age of 15 students
= 15 × 15 = 225 years.
Total age of 5 students
= 5 × 14 = 70 years
Total age of other 9 students = 9 × 16 = 144 years
∴ The age of 15th student
= 225 – (70 + 144)
= 225 – 214 = 11 years.

8. (3) Let the number of minors be x.
According to the question,
$\frac{8 \times 15 + x \times 6}{8 + x} = 10.8$
⇒ 120 + 6x = 86.4 + 10.8 x
⇒ 10.8x – 6x = 120 – 86.4
⇒ 4.8x = 33.6
$\Rightarrow x = \frac{33.6}{4.8} = 7$

9. (3) Let the number of other workers be x.
∴ Number of agricultural workers = 11x
∴ Required average monthly income
$= \frac{S \times 11x + x \times T}{(11x + x)}$
$=$ ₹ $\frac{11S + T}{12}$

10. (2) Let the number of boys and girls in the class be x and y respectively.
∴ $60x + 80y = 68(x + y)$
⇒ $60x + 80y = 68x + 68y$
⇒ $8x = 12y$
$\Rightarrow 2x = 3y \Rightarrow y = \frac{2}{3}x$
∴ Required percentage
$= \frac{x}{x+y} \times 100$
$= \frac{x}{x + \frac{2}{3}x} \times 100$
$= \frac{3x}{3x + 2x} \times 100$
$= \frac{3}{5} \times 100 = 60\%$
By Alligation method
Method 2 :
According to the question,

girls		boys
80		60
	68	
(68–60)		(80–68)
8		12

Ratio of girls to boys = 8 : 12
= 2 : 3
∴ Percentage of boys
$= \frac{3}{5} \times 100 = 60\%$

11. (3) Let the number of workers be x.
According to the question,
7 × 10000 + $(x - 7)$ 7800
= x × 8500
⇒ 700 + 78x – 78 × 7
= 85x
⇒ 85x – 78x = 700 – 546
⇒ 7x = 154
$\Rightarrow x = \frac{154}{7} = 22$

12. (1) A + B + C = 3 × 80
= ₹ 240
Then money spent
= 240 – 180 = 60
⇒ A + 2A + 3A = 60
⇒ 6A = 60
⇒ A = ₹ 10

13. (4) Let the number of boys in the class be 3x. The ratio of boys and girls in the class is 3 : 1, then the number of girls in the class is x.
∴ Average score of the girls
$= \frac{(3x + x) \times A - 3x(A + 1)}{x}$
$= \frac{4xA - 3xA - 3x}{x}$
$= \frac{xA - 3x}{x} = \frac{x(A - 3)}{x} = A - 3$

14. (3) Total number of 'm' numbers
$= m \times n^2$
Total number of 'n' numbers
$= n \times m^2$
∴ Average of $(m + n)$ numbers
$= \frac{mn^2 + m^2n}{m + n} = \frac{mn(n + m)}{m + n} = mn$

15. (3) $x + y + z = 3 \times 45 = 135$ ...(i)
$x = \frac{y + z}{2} + 9$
⇒ $2x - y - z = 18$ ...(ii)
and, $\frac{y + z}{2} = y + 2$
⇒ $y + z = 2y + 4$
⇒ $z - y = 7$ ...(iii)
By equations (i) + (ii),
$3x = 135 + 18 = 153$
⇒ $x = 51$
By equations (i) and (iii),
$x + y + z + z - y$
$= 135 + 4 = 139$
⇒ $x + 2z = 139$
⇒ $51 + 2z = 139$
⇒ $2z = 139 - 51 = 88$
∴ $z = 44$
∴ $x - z = 51 - 44 = 7$

16. (1) Annual expenditure of the man
= ₹ (5 × 5000 + 7 × 5400)
= ₹ (25000 + 37800)
= ₹ 62800
Annual savings = ₹ 2300
∴ Average monthly income
$=$ ₹ $\left(\frac{62800 + 2300}{12}\right)$
$=$ ₹ $\left(\frac{65100}{12}\right) =$ ₹ 5425

17. (2) Sum of the eight numbers
$= 20 \times 8 = 160$
Sum of the first two numbers
$= 31$
Sum of the next three numbers
$= \frac{64}{3} \times 3 = 64$
Let the sixth number $= x$
$\therefore$ Seventh number $= x + 4$
and eighth number $= x + 7$
$\therefore 31 + 64 + x + x + 4 + x + 7 = 160$
$\Rightarrow 3x + 106 = 160$
$\Rightarrow 3x = 160 - 106 = 54$
$\Rightarrow x = \frac{54}{3} = 18$
$\therefore$ Eighth number
$= x + 7 = 18 + 7 = 25$

18. (4) If average cost of 1 pen
= ₹ x, then
$30x + 75 \times 2 = 510$
$\Rightarrow 30x = 510 - 150 = 360$
$\Rightarrow x = \frac{360}{30}$ = ₹ 12

19. (3) If the number of students in section A be x and that in section B be y, then
$74 = \frac{77.5 \times x + y \times 70}{x + y}$
$\Rightarrow 74x + 74y = 77.5x + 70y$
$\Rightarrow 77.5x - 74x = 74y - 70y$
$\Rightarrow 3.5x = 4y$
$\Rightarrow \frac{x}{y} = \frac{4}{3.5} = \frac{8}{7}$
$\Rightarrow 8 : 7$

20. (2) Required average weight
$= \frac{30 \times 16 + 20 \times 15.5}{50}$
$= \frac{480 + 310}{50} = \frac{790}{50} = 15.8$ kg.

21. (2) Number of non-teaching staff $= x$
$\therefore 20 \times 12000 + x \times 5000$
$= (x + 20) \times 10000$
$\Rightarrow 240000 + 5000x = (x + 20) \times 10000$
$\Rightarrow 240 + 5x = (x + 20) \times 10$
$\Rightarrow 10x - 5x = 240 - 200$
$\Rightarrow 5x = 40$
$\Rightarrow x = \frac{40}{5} = 8$

22. (4) C = 5 years 2 months
B = 8 years 6 months
A = 13 years 1 month
$\therefore$ Average
$= \frac{26 \text{ years } 9 \text{ months}}{3}$
$\left[\frac{26\frac{9}{12}}{3} = \frac{26 \text{ years } 9 \text{ months}}{3}\right]$
= 8 years 11 months

23. (3) $\frac{x + \frac{1}{x}}{2} = M$
$\Rightarrow x + \frac{1}{x} = 2M$
Required average
$= \frac{x^2 + \frac{1}{x^2}}{2} = \frac{\left(x + \frac{1}{x}\right)^2 - 2}{2}$
$= \frac{4M^2 - 2}{2} = 2M^2 - 1$

24. (3) Weight of first member $= x$ kg
Weight of second member
$= (x + 2)$ kg
.....
Weight of fifth member
$= (x + 8)$ kg
$\therefore$ Difference $= x + 8 - x = 8$ kg

25. (3) Expenditure of 9th person = ₹ x
$\therefore x - \frac{x + 8 \times 30}{9} = 20$
$\therefore \frac{9x - x - 240}{9} = 20$
$\Rightarrow 8x - 240 = 180$
$\Rightarrow 8x = 240 + 180 = 420$
$\Rightarrow x = \frac{420}{8} = 52.5$
Total expenditure = 52.5 + 240
= ₹ 292.5

26. (3) Required average rate of reading
$= \frac{100 + 100}{\frac{100}{60} + \frac{100}{40}}$
$= \frac{200}{\frac{5}{3} + \frac{5}{2}} = \frac{200}{\frac{10 + 15}{6}}$
$= \frac{200 \times 6}{25}$ = 48 pages/hour

27. (1) Let each exam be of 100 marks.
$\therefore$ Difference = 82 – 77 = 5
$\because 5 \equiv 100$ marks
$\therefore 25 \equiv 500$ marks
$\therefore$ Required marks
$= 500 \times \frac{80}{100} = 400$

28. (2) Sales tax on the article sold at ₹ 400
$= \frac{400 \times 7}{100}$ = ₹ 28
Sales tax on the article sold at ₹ 6400
$= \frac{6400 \times 9}{100}$ = ₹ 576
Total tax = 28 + 576 = ₹ 604
Percentage sales tax
$= \frac{604}{6800} \times 100$
$= \frac{151}{17} = 8\frac{15}{17}\%$

29. (1) Number of students in class A $= x$
Number of students in class B $= y$
$\therefore 25x + 40y = 30(x + y)$
$\Rightarrow 25x + 40y = 30x + 30y$
$\Rightarrow 30x - 25x = 40y - 30y$
$\Rightarrow 5x = 10y$
$\Rightarrow \frac{x}{y} = \frac{10}{5} = 2 : 1$

30. (2) Quantity of milk :
First year $\Rightarrow \frac{4080}{7.5}$
= 544 litres
Second year $\Rightarrow \frac{4080}{8}$
= 510 litres
Third year $\Rightarrow \frac{4080}{8.5}$
= 480 litres
$\therefore$ Required average
$= \frac{3 \times 4080}{544 + 510 + 480}$
$= \frac{12240}{1534}$ = ₹ 7.98 per litre

31. (3) Ratio of values
$= 15 \times 3 : 10 \times 2 : 5 \times 5$
$= 45 : 20 : 25$
$\therefore$ Required average cost
$= \frac{45 + 20 + 25}{10} = \frac{90}{10}$ = ₹ 9

32. (2) Average cost of 1 bag of rice
$= ₹ \left(\frac{7 \times 800 + 8 \times 1000 + 5 \times 1200}{7 + 8 + 5}\right)$
$= ₹ \left(\frac{5600 + 8000 + 6000}{20}\right)$
$= \frac{19600}{20}$ = ₹ 980

33. (3) Arithmetic mean
$= \frac{3^{30} + 3^{60} + 3^{90}}{3}$
$= 3^{29} + 3^{59} + 3^{89}$

34. (3)Let the amount spent by tenth person be Rs x,

According to the question,

$$x - \frac{40 \times 9 + x}{10} = 9$$

$$\Rightarrow \frac{10x - 360 - x}{10} = 9$$

$\Rightarrow 9x - 360 = 90$

$\Rightarrow 9x = 360 + 90 = 450$

$$\Rightarrow x = \frac{450}{9} = \text{Rs. } 50$$

$\therefore$ Total expenditure $= 40 \times 9 + x$

$= 360 + 50 = \text{Rs. } 410$

35. (2) Number of girls $= 4x$

Number of boys $= 5x$

$\therefore$ Required average marks

$$= \frac{4x \times 85 + 5x \times 87}{4x + 5x}$$

$$= \frac{340 + 435}{9} = \frac{775}{9} = 86.1$$

36. (3) Sales on Sunday

$= \text{Rs. } (6 \times 15640 - 5 \times 14124)$

$= \text{Rs. } (93840 - 70620)$

$= \text{Rs. } 23220$

37. (2) Total number of customers in 15 movie theatres

$= 15 \times 600 = 9000$

$\therefore$ Required average number of

$$\text{customers} = \frac{9000}{9} = 1000$$

38. (3) Number of non-working days last year

$= 5 \times 16 = 80$

Number of non-working days this year

$= 80 + 3 \times 10 - 2 \times 5 = 100$

$$\therefore \text{Required average} = \frac{100}{5} = 20$$

39. (4) Let the maximum temperature of Chennai be x°C.

According to the question,

$$\frac{35^\circ + 33^\circ + 34^\circ + x^\circ}{4} = 35^\circ$$

$\Rightarrow 102^\circ + x^\circ = (35 \times 4)^\circ = 140^\circ$

$\Rightarrow x^\circ = 140^\circ - 102^\circ = 38^\circ$C

40. (2) Let the contribution of president be Rs. x.

According to the question,

$$x - \frac{x + 800}{9} = 50$$

$$\Rightarrow \frac{9x - x - 800}{9} = 50$$

$\Rightarrow 8x - 800 = 50 \times 9$

$\Rightarrow 8x = 450 + 800 = 1250$

$$\Rightarrow x = \frac{1250}{8} = \text{Rs. } 156.25$$

41. (3) Total annual income of (A + B)

$= \text{Rs. } (2 \times 80000)$

$= \text{Rs. } 160000$ ..... (i)

Total annual income of (B + C) = Rs. (2×75000)

$= \text{Rs. } 150000$ ..... (ii)

Total annual income of (C + A) = Rs. (2×78000)

$= \text{Rs. } 156000$ ..... (iii)

On adding all three,

Total annual income of 2 (A + B + C)

$= \text{Rs. } (160000 + 150000 + 156000)$

$= \text{Rs. } 466000$

$\therefore$ Total annual income of (A + B + C)

$= \text{Rs. } 233000$ ..... (iv)

$\therefore$ A's annual income = Equation (iv) – (ii)

$= \text{Rs. } (233000 - 150000)$

$= \text{Rs. } 83000$

42. (2) Total savings by 10 students

$= \text{Rs. } (10 \times 600) = \text{Rs. } 6000$

Three of the students have no savings.

Total savings by 6 students

$= \text{Rs. } (6000 - 1300) = \text{Rs. } 4700$

Let the savings by each of 5 students be Rs. 250.

$\therefore$ Largest amount of savings

$= \text{Rs. } (4700 - 5 \times 250)$

$= \text{Rs. } (4700 - 1250)$

$= \text{Rs. } 3450$

43. (1) Let the number of members of Indian army be x.

$\therefore$ Number of European army = $12000 - x$.

According to the question,

$$\frac{5\frac{9}{12} \times x + 5\frac{10}{12} \times (12000 - x)}{12000}$$

$$= 5\frac{39}{48}$$

$$\Rightarrow \frac{69x}{12} + \frac{70}{12} \times 12000 - \frac{70x}{12}$$

$$= \frac{279}{48} \times 12000$$

$\Rightarrow 69x + 840000 - 70x$

$= 837000$

$\Rightarrow x = 840000 - 837000 = 3000$

44. (2) Difference $= -83 + 53$

$= -30$

$\therefore$ Decrease in average

$$= \frac{-30}{100} = -0.3$$

$\therefore$ Required average

$= 40 - 0.3 = 39.7$

45. (1) Total collection

$= \text{Rs. } (2 \times 15 + 5 \times 7.5 + 13 \times 2.5)$

$= \text{Rs. } (30 + 37.5 + 32.5)$

$= \text{Rs. } 100$

Required average

$$= \text{Rs. } \left(\frac{100}{2 + 5 + 13}\right) = \text{Rs. } \left(\frac{100}{20}\right)$$

$= \text{Rs. } 5$

46. (1) Weight of new parcel

$= 1.7$ kg. – Total decrease

$$= \left(1.7 - \frac{60 \times 11}{1000}\right) \text{ kg.}$$

$= (1.7 - 0.66)$ kg.

$= 1.04$ kg.

47. (3) According to the question,

$M + T + W + Th = 60 \times 4$

$= 240^\circ$ ..... (i)

$T + W + Th + F = 63 \times 4$

$= 252^\circ$ ..... (ii)

By equation (ii) – (i),

$F - M = 252^\circ - 240^\circ = 12^\circ$

$\Rightarrow 25x - 21x = 12^\circ$

$$\Rightarrow 4x = 12^\circ \Rightarrow x = \frac{12^\circ}{4} = 3^\circ$$

$\therefore$ Temperature on Friday $= 25x$

$= 25 \times 3 = 75^\circ$

48. (2) Required total points scored

$= 84 \times 8 - (92 - 85)$

$= 672 - 7 = 665$

49. (4) Let the previous average price be Rs. x.

According to the question,

$60x + 336 = (x - 1)\,64$

$\Rightarrow 60x + 336 = 64x - 64$

$\Rightarrow 64x - 60x = 336 + 64$

$\Rightarrow 4x = 400$

$$\Rightarrow x = \frac{400}{4} = \text{Rs. } 100$$

50. (3) According to the question,

$A + B + C = 84 \times 3$

$= 252$ kg. ..... (i)

$A + B + C + D = 80 \times 4$

$= 320$ kg. ..... (ii)

By equation (ii) – (i),

$D = 320 - 252 = 68$ kg.

$E = 68 + 3 = 71$ kg.

$\therefore B + C + D + E = 79 \times 4$

$= 316$ kg.

$\Rightarrow B + C + 68 + 71 = 316$

$\Rightarrow B + C = 316 - 68 - 71$

$= 177$ kg. ..... (iii)

By equation (i) – (iii),

A's weight = $(252 - 177)$ kg.

$= 75$ kg.

❑❑❑

TEST YOURSELF

1. The average salary of 12 officers in a factory is Rs. 3950 per month and that of other employees of the factory is Rs. 1850 per month. If the average salary of all employees (including the officers) of the factory be Rs. 2150 per month, find the total number of employees in the factory.

(1) 80 (2) 85
(3) 84 (4) 86

2. In a class there are 40 boys and their average age is 16 years. One boy aged 17 years leaves the school and another joins, and their average age becomes 15.95 years. What is the age of the new boy ?

(1) 14 years (2) 15 years
(3) 16 years (4) 18 years

3. The average weight of 29 students is 40 kg. If the weight of teacher be included, the average weight is increased by 300 gms. The weight of the teacher is :

(1) 49 kg (2) 56 kg
(3) 58 kg (4) None of these

4. The difference between the ages of two sisters is half the difference between the ages of their parents. The elder sister is 18 years of age. Their father's age was 32 years when the younger sister was born who is now 15 years old. What is their mother's age?

(1) 40 (2) 41
(3) 42 (4) 43

5. The average of five results is 46 and that of first four is 45. Find the value of the fifth result.

(1) 50 (2) 60
(3) 45 (4) 40

6. Out of three numbers, the first is twice of the second and is half of the third. If the average of three numbers is 56, find the largest number.

(1) 50 (2) 48
(3) 96 (4) 75

7. The average of three numbers is 42. The first is twice the second and the second is twice the third. What is the difference between the largest and the smallest number?

(1) 50 (2) 46
(3) 48 (4) 54

8. The average age of three boys is 15 *y*ears. If their ages are in the ratio 3 : 5 : 7, what is the age of the *y*oungest boy?

(1) 9 years
(2) 8 years
(3) 8 years 3 months
(4) None of these

9. a, b, c, d and e are five consecutive odd numbers. What is their average?

(1) $a + 2$ (2) $a + 4$
(3) $a + 3$ (4) $a + 1$

10. The average height of 30 girls out of a class of 40 is 160 cms and that of the remaining girls is 156 cms. What is the average height of the whole class?

(1) 155cm (2) 157 cm
(3) 159 cm (4) None of these

11. The average of 50 numbers is 38. If two numbers, namely 45 and 55 are discarded, what is the average of the remaining numbers?

(1) 38.5 (2) 36.5
(3) 35.5 (4) 37.5

12. The average of 25 results is 18; that of first twelve is 14 and of last twelve is 17. Find the thirteenth result.

(1) 68 (2) 78
(3) 79 (4) 87

13. The average of ten numbers is calculated as 15. It was discovered later on that while calculating the average one number namely 36 was wrongly read as 26. Find the correct average.

(1) 16 (2) 18
(3) 19 (4) 16.5

14. Out of four numbers, the average of first three is 15 and that of last three is 16. If the last number is 19, find the first number.

(1) 14 (2) 15
(3) 16 (4) 18

15. The average of 6 observations is 12. A new seventh observation is included and the new average is decreased by 1. Find the seventh observation.

(1) 5 (2) 7
(3) 8 (4) 9

16. The average of 8 numbers is 21. If each of the numbers is multiplied by 8, find the average of new set of numbers.

(1) 166 (2) 168
(3) 170 (4) 172

17. The average height of 40 students is 163 cm. On a particular day, three students namely A, B, C were absent and the average of the remaining 37 students was found to be 162 cm. If A and B have equal height and the height of C be 2 cm less than that of A, find the height of A.

(1) 170 cm (2) 172 cm
(3) 176 cm (4) 174 cm

18. The average age of a committee of eight members is 40 years. A member aged 55 years retired and his place was taken by another member aged 39 years. Find the average age of the present committee.

(1) 38 years (2) 36 years
(3) 39 years (4) 40 years

19. The average weight of 3 men A, B and C is 84 kg. Another man D joins the group and the average now becomes 80 kg. If another man E whose weight is 3 kg more than that of D, replaces A, then the average weight of B, C, D and E becomes 79 kg. Find the weight of A.

(1) 72 kg (2) 74 kg
(3) 75 kg (4) 76 kg

SHORT ANSWERS

1. (3)	**2.** (2)	**3.** (1)	**4.** (2)
5. (1)	**6.** (3)	**7.** (4)	**8.** (1)
9. (2)	**10.** (3)	**11.** (4)	**12.** (2)
13. (1)	**14.** (3)	**15.** (1)	**16.** (2)
17. (3)	**18.** (1)	**19.** (3)	

EXPLANATIONS

1. (3) Let the number of employees other than officers be x.

$\therefore$ Total salary of officers
= Rs. (12 × 3950)
Total salary of other employees
= Rs. (x × 1850)
$\therefore 2150(x+12) = 12\times3950 + 1850x$
$\Rightarrow 2150x + 25800 = 47400 + 1850x$
$\Rightarrow 2150x - 850x = 47400 - 25800$
$\Rightarrow 300x = 21600$

$\therefore x = \frac{21600}{300} = 72$

$\therefore$ Total number of employees
$= x + 12 = 72 + 12 = 84$

2. (2) Total age of 40 boys initially = 16 × 40 = 640 years
Total age of 39 boys
= 640 – 17 = 623 years
New total age = 40 × 15.95
= 638 years
Age of new boy = 638 – 623
= 15 years

3. (1) Weight of teacher

$= \left(\frac{30\times300}{1000} + 40\right)$ kg
= 49 kg

4. (2) Father's present age
= 32 + 15 = 47 years
$\therefore 47 - x = 2(18 - 15) = 6$
$\Rightarrow x = 47 - 6 = 41$ years

5. (1) Sum total of five results
= 5 × 46 = 230
Sum total of first four results
= 4 × 45 = 180
So, fifth result = 230–180 = 50.

6. (3) Let the first number be x.

Second number $= \frac{x}{2}$

Third number = $2x$

Average $= \frac{x + \frac{x}{2} + 2x}{3} = \frac{7}{6}x$

Given : $\frac{7}{6}x = 56 \Rightarrow x = 48$

So, the three numbers are 48, 24 and 96.

7. (4) Let the third number be x
Second number = $2x$
First number = $4x$

Average $= \frac{x + 2x + 4x}{3} = \frac{7x}{3}$

Given : $\frac{7x}{3} = 42$

or $x = 18$
The smallest number is $x = 18$
The largest number $= 4x = 72$
Difference = 72 – 18 = 54.

8. (1) Let the age of three boys be $3x$, $5x$ and $7x$

Average age $= \frac{3x + 5x + 7x}{3} = 5x$

and , $5x = 15$
$x = 3$ years
The age of the youngest boy = $3x$
= 9 years.

9. (2) Each successive odd number exceeds its predecessor by 2.
$a + b + c + d + e = a + (a + 2) + (a + 4) + (a + 6) + (a + 8)$
$= 5a + 20 = 5(a + 4)$

Average $= \frac{5(a+4)}{5} = a + 4.$

10. (3) Total height of the whole class
= (30 × 160) + (40 – 30) × 156
= 6360 cms
Average height of the whole class

$= \frac{6360}{40} = 159$ cms.

11. (4) Sum total of 50 numbers = 38 × 50 = 1900
Sum total of remaining 48 numbers
= 1900 – (45 + 55) = 1800

and their average $= \frac{1800}{48} = 37.5.$

12. (2) Sum of 25 results
= Average × their number
= 18 × 25 = 450
Similarly,
Sum of 1st twelve results
= 12 × 14 = 168
and sum of last twelve results
= 12 × 17 = 204
$\therefore$ Thirteenth result
= 450 – 168 – 204 = 78

13. (1) Since 36 was misread as 26, i.e., 26 was counted while calculating average.
Incorrect average = 15
$\therefore$ Incorrect sum of ten numbers
= 10 × 15 = 150
$\therefore$ Correct sum total
= 150 + 36 – 26 = 160

$\therefore$ Correct average $= \frac{160}{10} = 16$

14. (3) Sum of all four numbers
= 3 × 15 + 19 = 64
Sum of last three numbers
= 3 × 16 = 48
So, first number = 64 – 48 = 16

15. (1) Seventh observation = Sum of 7 observations – Sum total of 6 observations
= (7 × 11) – (6 × 12) = 77 – 72 = 5

16. (2) Sum of eight numbers
= 8 × 21 = 168
Now, each of the numbers is multiplied by 8.
$\therefore$ Sum of new eight numbers
= 168 × 8 = 1344
$\therefore$ Average of new set of numbers

$= \frac{1344}{8} = 168$

17. (3) Let the height of A, B, C be x cm, x cm and $(x - 2)$ cm respectively.
Now, sum of height of 40 students
= 163 × 40 = 6520 cm
Sum of height of 37 students excluding A, B and C
= 162 × 37 = 5994 cm.
$\therefore$ Sum of heights of A, B and C
= (6520 – 5994) = 526 cm
$\Rightarrow x + x + x - 2 = 526$
$\Rightarrow 3x = 526 + 2 = 528$

$\Rightarrow x = \frac{528}{3} = 176$ cm

$\therefore$ Height of A = 176 cm

18. (1) Sum of age of 8 members = 8 × 40 = 320 years
After a person of age 55 years retires,
Sum of ages of 7 persons
= 320 – 55 = 265 years
Sum of ages of 8 persons when a man of age 39 years joins it
= 265 + 39 = 304 years

$\therefore$ Required average $= \frac{304}{8}$

= 38 years

19. (3) Total weight of $(A + B + C)$
= 84 × 3 = 252 kg.
Total weight of $(A + B + C + D)$
= 4 × 80 = 320 kg.
$\therefore$ Weight of $D = 320 - 252 = 68$ kg.
$\therefore$ Weight of $E = 68 + 3 = 71$ kg.
$\therefore$ $(B + C + D + E)$'s weight
= 79 × 4 = 316 kg.
Now, $(A+B+C+D) - (B+C+D+E)$
= 320 – 316 = 4 kg.
$\Rightarrow A - E = 4$ kg
$\Rightarrow A = 4 + E = 4 + 71 = 75$ kg.
Hence, weight of A = 75 kg

6 RATIO AND PROPORTION

Very few questions are directly asked from this chapter. But it does not mean that chapter is of no use. The concepts of ratio and proportion find their applications in problems based on speed & distance, linear equations, partnership and many more. All the concepts and important rules related to Ratio and Proportion are discussed here. So, it is advised to go through the rules carefully.

IMPORTANT POINTS

Ratio– The comparative relation between two amounts/ quantities of same type is called ratio.

The ratio of two amounts is equal to a fraction. It shows how much less or more time an amount is in comparision to another.

Ratio always occurs between same units, as –Rupees: Rupees, kg: kg, Hour : Hour, Second : Second etc.

Let an amount be x and another is y, then, the ratio between them is x : y or x ÷ y.

In ratio 1st number i.e., 'x' is called "antecedent". and 2nd number i.e., 'y' is called "consequent".

If a:b :: c:d, then a and d are called extremes and b and c are called means.

∴ Product of extremes = Product of means.

i.e., ad = bc

Directly Proportional : If x = ky, where k is a constant, then we say that x is directly proportional to y. It is written as $x \propto y$.

Inversely Proportional : If $x = \frac{k}{y}$ where k is a constant, then we say that x is inversely proportional to y. It is written as $x \propto \frac{1}{y}$

Proportion : When two ratios are equal to each other, then they are called proportional as

a:b = c:d, then, a, b, c and d are in proportion.

or,

a:b :: c:d

E.g. 2:5 = 6 : 15, then we write 2:5 :: 6:15

RULE 1 : It does not change the ratio, when we multiply or divide antecedent and consequent of the ratio by a same non–zero number as–

e.g. $a : b = \frac{a}{b} = \frac{a \times c}{b \times c} = ac : bc = a : b$

RULE 2 : What should be added to all of a, b, c, d (numbers) so that these become proportional respectively?

Let x should be added :

Then $\frac{a+x}{b+x} :: \frac{c+x}{d+x}$

RULE 3 : Mixed ratio – Let x:y and P:Q be two ratios, then Px : Qy is called mixed ratio.

RULE 4 : Duplicate Ratio–The mixed ratio of two equal ratios is called the duplicate Ratio as

duplicate ratio of a:b is $a^2:b^2$

RULE 5 : Subduplicate Ratio–The square root of a certain ratio is called its subduplicate.

The subduplicate ratio of a:b = $\sqrt{a} : \sqrt{b}$

RULE 6 : Triplicate Ratio–The cube of a certain ratio is called triplicate ratio.

The triplicate ratio of a:b = $a^3 : b^3$

RULE 7 : Subtriplicate Ratio–The cube root of a certain ratio is called subtriplicate ratio as–

The Subtriplicate Ratio of a:b = $\sqrt[3]{a} : \sqrt[3]{b}$

RULE 8 : Inverse Ratio–The Reciprocal of quantities of ratio is called its inverse. Reciprocal or inverse ratio of a:b

$= \frac{1}{a} : \frac{1}{b}$ or $= \left(\frac{1}{a} : \frac{1}{b}\right) \times$ (L.C.M. of a and b)

RULE 9 : Invertendo–The proportion in which antecedent and consequent quantities change their places, is called invertendo, as–

Invertendo of a:b = c:d is b:a = d:c

means $\frac{a}{b} = \frac{c}{d}$ then $\frac{b}{a} = \frac{d}{c}$

RULE 10 : Alternendo–If a:b ::c:d is a proportion then its alternendo is a:c::b:d. i.e alternendo of $\frac{a}{b} = \frac{c}{d}$ is $\frac{a}{c} = \frac{b}{d}$

RULE 11 : Componendo–If a:b::c:d is a proportion, then componendo is (a + b) : b :: (c + d) : d

It means, If $\frac{a}{b} = \frac{c}{d}$ then, $\frac{a+b}{b} = \frac{c+d}{d}$

or, $\left[\frac{a}{b}+1=\frac{c}{d}+1 \Rightarrow \frac{a+b}{b}=\frac{c+d}{d}\right]$

RULE 12 : Dividendo–If a:b :: c:d is a proportion, then its dividendo is (a – b): b:: (c – d):d

It means, $\frac{a}{b} = \frac{c}{d} \Rightarrow \frac{a}{b} - 1 = \frac{c}{d} - 1$

$\Rightarrow \frac{a-b}{b}=\frac{c-d}{d}$

RULE 13 : Componendo and dividendo–If there is a proportion a:b::c:d then its componendo and dividendo is

(a + b):(a – b)::(c + d):(c – d) or, $\frac{a+b}{a-b}=\frac{c+d}{c-d}$

To simplify the proportion any one method of componendo, dividendo, componendo and Dividendo can directly be used.

RULE 14: Mean Proportion – Let x be the mean proportion between a and b, then a:x::x:b (Real condition)

$\therefore \frac{a}{x} = \frac{x}{b} \Rightarrow x^2 = ab$

$\therefore x = \sqrt{ab}$

So, mean proportion of a and b = $\sqrt{ab}$

If x be the mean proportion between (x – a) and (x – b) then what will be the value of x ?

$x = \frac{ab}{a+b}$

RULE 15 : Third proportional–Let 'x' be the third proportional of a and b then,

a:b :: b:x (Real condition)

i.e. $\frac{a}{b} = \frac{b}{x} \Rightarrow ax = b^2$

$\therefore x = \frac{b^2}{a}$

$\therefore$ Third proportional of a and b = $\frac{b^2}{a}$

RULE 16 : Fourth Proportional– Let x be the fourth proportional of a, b and c, then a:b::c:x (Real condition)

$\Rightarrow \frac{a}{b} = \frac{c}{x} \Rightarrow ax = bc$

$\therefore x = \frac{bc}{a}$

$\therefore$ Fourth proportional of a, b and c = $\frac{bc}{a}$

RULE 17 : First Proportional–Let x be the first proportional of a,b and c, then, x:a::b:c (Real condition)

$\therefore \frac{x}{a} = \frac{b}{c} \Rightarrow cx = ab$

$\therefore x = \frac{ab}{c}$

RULE 18 : If A:B = x:y and B:C = p:q then

(i) A:C = xp : yq

(ii) A:B:C = (x:y) × p:qy =xp:yp:qy

It is done as follows:

A:B = x:y

B:C = p:q

A:B:C = xp:yp:qy

RULE 19 : If A:B = x:y, B:C = p:q and C:D = m:n then,

(i) A:D = xpm : yqn

(ii) A:B:C:D = (xp:yp:yq) × m:yqn = xpm:ypm:yqm:yqn

RULE 20 : If A:B:C:D = w:x:y:z and D:E = m:n then,

A:B:C:D:E = wm:xm:ym:zm:zn

RULE 21 : If an amount R is to be divided between A and B in the ratio m:n then

(i) Part of A = $\frac{m}{m+n}\times R$

(ii) Part of B = $\frac{n}{m+n}\times R$

(iii) Difference of part of A and B = $\frac{mn}{m+n}\times R$,

where m > n

RULE 22 : If the ratio of A and B is m:n and the difference in their share is 'R' units then,

(i) Part of A = $\frac{m}{m-n}\times R$

(ii) Part of B = $\frac{n}{m-n}\times R$

(iii) The sum of parts of A and B = $\frac{m+n}{m-n}\times R$

where m > n

RULE 23 : If the ratio of A and B is m:n and the part of A is 'R', then

(i) Share of B = $\frac{n}{m}\times R$

(ii) Total share of A and B = $\frac{m+n}{m} \times R$

(iii) Difference in share of A and B = $\frac{m-n}{m} \times R$

where m > n

RULE 24 : If the amount R is divided among A, B and C in the ratio l:m:n, then

(i) The share of A = $\frac{l}{l+m+n} \times R$

(ii) The share of B = $\frac{m}{l+m+n} \times R$

(iii) The share of C = $\frac{n}{l+m+n} \times R$

(iv) Difference in share of A and B = $\frac{l-m}{l+m+n} \times R$,

where l > m

(v) Difference in share of B and C = $\frac{l-n}{l+m+n} \times R$

where m>n

RULE 25 : If the ratio of A, B and C is l : m : n and the part of A is 'R' then,

(i) Part of B = $\frac{m}{l} \times R$

(ii) Part of C = $\frac{n}{l} \times R$

(iii) Difference in parts of B and C = $\frac{m-n}{l} \times R$,

(where m > n)

(iv) Total share of A,B and C = $\frac{(l+m+n)}{l} \times R$

RULE 26 : If an amount is to be divided among A, B and C in the ratio l : m : n and the difference between A and B is 'R', then

(i) Part of C = $\frac{n}{l-m} \times R$, where l > m

(ii) Total share of A, B and C = $\frac{l+m+n}{l-m} \times R$,

where l > m

(iii) Difference in share of B and C = $\frac{m-n}{l-m} \times R$, where

l > m and m > n

RULE 27 : If there are notes of 'x' rupees, 'y' rupees and 'z' rupees in a box in the ratio m:n:r and the total value of notes is 'R', then

(i) Number of notes of 'x' rupees = $\frac{m}{(xm+yn+zr)} \times R$

(ii) Number of notes of 'y' rupees = $\frac{n}{(xm+yn+zr)} \times R$

(iii) Number of notes of 'z' rupees = $\frac{r}{(xm+yn+zr)} \times R$

RULE 28 : If adding/subtracting a certain quantity gives new ratio, then multiplier

$= \frac{(\text{Total Quantity} \pm \text{Change in Quantity})}{\text{Sum of Ratios}}$

$\Rightarrow$ Then quantity

= Multiplier × Ratio figure of that quantity

RULE 29 : If the ratio of alligation of milk and water in a glass is m:n and in other glass alligation is p:q, then the ratio of milk and water in third glass which contains alligation of both glasses is

Ratio = $\left(\frac{m}{m+n}+\frac{p}{p+q}\right):\left(\frac{n}{m+n}+\frac{q}{p+q}\right)$

RULE 30 : If the ratio of milk and water in the alligation of A litre is p:q then water must be added in it so that ratio of milk and water would be r:s is

Required amount of water = $\frac{A(ps-qr)}{r(p+q)}$ litres

RULE 31 : The ratio of income of two persons A and B is p:q. If the ratio of their expenditures is r:s, then the monthly income of A and B, when each one of them saves 'R' rupees will be

Monthly income of A = $\frac{Rp(r-s)}{ps-rq}$

Monthly income of B = $\frac{Rp(r-s)}{ps-rq}$

RULE 32 : Let 'x' be a number which is subtracted from a, b, c and d to make them proportional, then

$x = \frac{ad-bc}{(a+d)-(b+c)}$

Let 'x' be a number which is added to a, b, c and d to make them proportional, then

$$x = \frac{bc - ad}{(a+d)-(b+c)}$$

Here, a, b, c and d should always be in ascending order.

RULE 33 : If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \ldots\ldots\ldots\ldots$, then each ratio

$$= \frac{a+c+e+\ldots\ldots\ldots}{b+d+f+\ldots\ldots\ldots}$$

RULE 34 : Two numbers are in the ratio a:b and if each number is increased by x, the ratio becomes c:d. Then the two numbers will be $\frac{xa(c-d)}{ad-bc}$ and $\frac{xb(c-d)}{ad-bc}$

RULE 35 : Two numbers are in the ratio a:b and if x is subtracted from each number the ratio becomes c:d. The two numbers will be = $\frac{xa(d-c)}{ad-bc}$ and $\frac{xb(d-c)}{ad-bc}$

PROBLEMS BASED ON AGES

Importance : You would be knowing that such questions are asked in different competitive exams.

Scope of questions : In these questions age/ratio of ages of a person/his relatives is asked for present/future or past ages.

Way to success : Given rules and mental mapping in these questions will save your time and labour.

Rule 1.

If the ratio of present age and the ratio of age after 'n' years is given then present age factor is given by :

$$x = \frac{(\text{Difference in 2nd ratio}) \times \text{time}}{(\text{Difference in cross products of ratio})}$$

Rule 2.

If x is the present age factor, and the difference in cross product of ratio is zero then,

$$x = \frac{\text{time}}{(\text{Difference of ratio})}$$

Rule 3.

If the ratio of 'some years ago' and 'after some years' is given. And Before 't_1' years, the ratio of ages of A and B was a : b.

Present age of A = $ax + t_1$

Present age of B = $bx + t_1$

after 't_2' years, the ratio of their ages will be c : d.

$$\therefore x = \frac{(\text{Difference in 2nd ratio}) \times (t_1 + t_2)}{(\text{Difference in cross products of the ratio})}$$

When, the difference in ratios is equal, then

$$x = \frac{(t_1 + t_2)}{(\text{Difference in ratio})}$$

Rule 4.

If the product of present ages is given, then,

$$x = \sqrt{\frac{\text{Product of ages of two persons}}{\text{Product of ratio}}}$$

Rule 5.

If sum of present age and ratio of the ages is given then, present age factor,

$$x = \frac{\text{Sum of Present ages}}{\text{Sum of ratio}}$$

Rule 6.

If the ratio of ages and difference in ages is given then,

$$x = \frac{\text{difference between ages}}{\text{difference in ratio}}$$

Rule 7.

The ratio of ages of A and B was x : y 'n' years ago.

(i) If the present age ratio is a : b, then, $\frac{x+n}{y+n} = \frac{a}{b}$

(ii) If after 'm' years, the ratio of ages will be p : q then, $\frac{x+n+m}{y+n+m} = \frac{p}{q}$

Rule 8.

If 'n' years before, the ratio of ages of A, B and C was x : y : z, then the ratio of their present ages is (x + n) : (y + n) : (z + n)

Rule 9.

If after m years, the ratio of ages of A and B will be x : y, then the ratio of their present ages is (x – m) : (y – m).

MIXTURE OR ALLIGATION

Importance : Mixture is a specific type of ratio and proportion, but since 1 or 2 questions from this chapter are asked regularly in competitions hence it is comfortable and useful to study this chapter separately.

Questions are of limited nature hence marks can be ensured with very less efforts.

Scope of Questions : Questions are related to getting new mixture or alloy from mixing of two liquids/metals. In final mixture you have to find ratio of elements or to access required quantity to get a certain ratio.

Way to success : In these questions, it is very useful to know alligation method and other.

In how much ratio mixture has been made, this ratio is called the rule of mixture.

Objects < Value (Cost) / Liquidity or part.

(i) On the base of cost :

Cost of Objects < Cheap / dear/costly

RULE 1 : The cost of cheap object is Rs. C/kg and the cost of dear object is Rs. D/kg. If the mixture of both object costs Rs. M/kg. then

$$\frac{\text{Cheap object}}{\text{Dear object}} = \frac{D-M}{M-C}$$

$\therefore$ Ratio is (D – M) : (M–C)

RULE 2 : Quantity of x in mixture

$$= \frac{\text{Ratio of } x \times \text{Quantity of Mixture}}{\text{Sum of Ratios}}$$

RULE 3 : If from x litre of liquid A, p litre is withdrawn and same quantity of liquid B is added. Again from mixture q litre mixture is withdrawn and same quantity of liquid B is added. Again from mixture, r litre is withdrawn and same quantity of liquid B is added, then

In final mixture, liquid A is

$$x\left(\frac{x-p}{x}\right)\left(\frac{x-q}{x}\right)\left(\frac{x-r}{x}\right) \ldots\ldots\ldots\ldots\ldots$$

If only one process is repeated n times, then liquid A in final mixture is $= x\left(\frac{x-p}{x}\right)^n$ or $x\left(1-\frac{p}{x}\right)^n$ and liquid B in final mixture = x –(liquid A in final mixture)

RULE 4 : If x is initial amount of liquid, p is the amount which is drawn, and this process is repeated n-times such that the resultant mixture is in the ratio a : b then,

$$\frac{a}{a+b} = \left(\frac{x-p}{x}\right)^n$$

RULE 5 : There are two pots of same volume. Both the pots contains mixture of milk and water in the ratio m:n and p:q respectively. If both the mixtures are mixed together in a big pot, then what will be the final ratio of milk and water?

$$\text{Required ratio} = \left(\frac{m}{m+n}+\frac{p}{p+q}\right):\left(\frac{n}{m+n}+\frac{q}{p+q}\right)$$

RULE 6 : The ratio of milk and water in the mixture of 'x' unit liquid is a:b. If 'd' unit milk is added to it then ratio of milk and water becomes $a_1 : b_1$. Then, $d = \frac{x(a_1b-ab_1)}{(a+b)b_1}$ unit.

If 'd' unit water is added to it then,

$$d = \frac{x(ab-a_1b_1)}{(a+b)a_1} \text{ unit}$$

RULE 7 : There is x% milk in 'a' unit mixture of milk and water. The amount of milk that should be added to increase the percentage of milk from x% to y% is given by

$$\text{Required quantity of milk} = \frac{a(y-x)}{(100-y)} \text{ unit.}$$

RULE 8 : There is x% water in 'a' unit the mixture of sugar and water. The quantity of water vapourised such that decrease in the percentage of water is from x% to y% is given by

$\therefore$ Required quantity of vapourised water

$$= \frac{a(x-y)}{y} \text{ unit.}$$

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. If a : b = 7 : 9 and b : c =15 : 7, then what is a : c?
(1) 5 : 3 (2) 3 : 5
(3) 7 : 21 (4) 7 : 15
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If $x = \frac{1}{3}y$ and $y = \frac{1}{2}z$, then x : y : z, is equal to :
(1) 3 : 2 : 1 (2) 1 : 2 : 6
(3) 1 : 3 : 6 (4) 2 : 4 : 6
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. If p : q = r : s = t : u = 2 : 3, then (mp + nr + ot) : (mq + ns + ou) is equal to :
(1) 1 : 3 (2) 1 : 2
(3) 2 : 3 (4) 3 : 2
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. If a : b = c : d = e : f = 1 : 2, then (pa + qc + re) : (pb + qd + rf) is equal to :
(1) p : (q + r) (2) (p + q) : r
(3) 2 : 3 (4) 1 : 2
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

5. If x : y = 3 : 1, then $x^3 - y^3 : x^3 + y^3$ = ?
(1) 13 : 14 (2) 14 : 13
(3) 10 : 11 (4) 11 : 10
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

6. The fourth proportional to 0.12, 0.21, 8 is :
(1) 8.9 (2) 56
(3) 14 (4) 17
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

7. The ratio $2^{1.5} : 2^{0.5}$ is the same as :
(1) 2 : 1 (2) 3 : 1
(3) 6 : 1 (4) 3 : 2
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

8. If m : n = 3 : 2, then (4m + 5n) : (4m – 5n) is equal to :
(1) 4 : 9 (2) 9 : 4
(3) 11 : 1 (4) 9 : 1
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

9. If A : B = 3 : 4, B : C = 5 : 7 and C : D = 8 : 9 then A : D is equal to
(1) 3 : 7 (2) 7 : 3
(3) 21 : 10 (4) 10 : 21
(SSC CGL Prelim Exam. 24.02.2002 & 13.11.2005 (Middle Zone)

10. If $a : b = \frac{2}{9} : \frac{1}{3}$,
$b : c = \frac{2}{7} : \frac{5}{14}$ and $d : c = \frac{7}{10} : \frac{3}{5}$
then $a : b : c : d$ is
(1) 4 : 6 : 7 : 9
(2) 16 : 24 : 30 : 35
(3) 8 : 12 : 15 : 7
(4) 30 : 35 : 24 : 16
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

11. If b is the mean proportional of a and c, then $(a - b)^3 : (b - c)^3$ equals
(1) $a^3 : c^3$ (2) $b^2 : c^2$
(3) $a^2 : c^2$ (4) $a^3 : b^3$
(SSC CPO S.I. Exam. 05.09.2004)

12. ₹ 6200 divided into three parts proportional to $\frac{1}{2} : \frac{1}{3} : \frac{1}{5}$ are respectively
(1) ₹ 3000, ₹ 2000, ₹ 1200
(2) ₹ 3500, ₹ 1500, ₹ 1200
(3) ₹ 2500, ₹ 2000, ₹ 1700
(4) ₹ 2200, ₹ 3000, ₹ 1000
(SSC CPO S.I. Exam. 05.09.2004)

13. 94 is divided into two parts in such a way that the fifth part of the first and the eighth part of the second are in the ratio 3 : 4. The first part is :
(1) 30 (2) 36
(3) 40 (4) 28
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

14. If $a : b = 5 : 7$ and $c : d = 2a : 3b$, then $ac : bd$ is :
(1) 20 : 38 (2) 50 : 147
(3) 10 : 21 (4) 50 : 151
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

15. If $x : y = 3 : 2$, then the ratio $2x^2 + 3y^2 : 3x^2 - 2y^2$ is equal to :
(1) 12 : 5 (2) 6 : 5
(3) 30 : 19 (4) 5 : 3
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

16. If $a : b = b : c$, then $a^4 : b^4$ is equal to
(1) $ac : b^2$ (2) $a^2 : c^2$
(3) $c^2 : a^2$ (4) $b^2 : ac$
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

17. If $A : B = \frac{1}{2} : \frac{3}{8}$, $B : C = \frac{1}{3} : \frac{5}{9}$ and $C : D = \frac{5}{6} : \frac{3}{4}$, then the ratio $A : B : C : D$ is
(1) 6 : 4 : 8 : 10
(2) 6 : 8 : 9 : 10
(3) 8 : 6 : 10 : 9
(4) 4 : 6 : 8 : 10
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

18. If $A : B : C = 2 : 3 : 4$, then ratio $\frac{A}{B} : \frac{B}{C} : \frac{C}{A}$ is equal to
(1) 8 : 9 : 16 (2) 8 : 9 : 12
(3) 8 : 9 : 24 (4) 4 : 9 : 16
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

19. If $a : b = c : d = e : f = 1 : 2$, then $(3a + 5c + 7e) : (3b + 5d + 7f)$ is equal to
(1) 8 : 7 (2) 2 : 1
(3) 1 : 4 (4) 1 : 2
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

20. If $a : (b+c) = 1 : 3$ and $c : (a+b) = 5:7$, then $b : (a+c)$ is equal to
(1) 1 : 2 (2) 2 : 3
(3) 1 : 3 (4) 2 : 1
(SSC CPO S.I. Exam. 03.09.2006)

21. If $p : q : r = 1 : 2 : 4$, then $\sqrt{5p^2 + q^2 + r^2}$ is equal to
(1) 5 (2) $2q$
(3) $5p$ (4) $4r$
(SSC CPO S.I. Exam. 03.09.2006)

22. The mean proportional between $(3 + \sqrt{2})$ and $(12 - \sqrt{32})$ is
(1) $\sqrt{7}$ (2) $2\sqrt{7}$
(3) 6 (4) $\frac{15 - 3\sqrt{2}}{2}$
(SSC CPO S.I. Exam. 03.09.2006)

23. If $x : y = 2 : 3$, then the value of $\frac{3x+2y}{9x+5y}$ is equal to

(1) $\frac{11}{4}$ (2) $\frac{4}{11}$

(3) $\frac{1}{2}$ (4) $\frac{5}{14}$

(SSC CPO S.I. Exam. 03.09.2006)

24. If a, b, c are three numbers such that $a : b = 3 : 4$ and $b : c = 8 : 9$, then $a : c$ is equal to

(1) 1 : 3 (2) 2 : 3

(3) 3 : 2 (4) 1 : 2

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

25. If $a : b : c = 2 : 3 : 4$ and $2a - 3b + 4c = 33$, then the value of c is

(1) 6 (2) 9

(3) 12 (4) $\frac{66}{7}$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

26. If $a : b = c : d$, then $\frac{ma+nc}{mb+nd}$ is ***not*** equal to

(1) $\frac{a}{b}$ (2) $\frac{c}{d}$

(3) $\frac{a+c}{b+d}$ (4) $\frac{c-a}{b-d}$

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

27. The ratio of A to B is 4 : 5 and that of B to C is 2 : 3. If A equals 800, C equals

(1) 1000 (2) 1200

(3) 1500 (4) 2000

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

28. If $a : b : c = 7 : 3 : 5$, then $(a+b+c) : (2a+b-c)$ is equal to

(1) 1 : 2 (2) 2 : 3

(3) 3 : 4 (4) 5 : 4

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

29. If A : B = 2 : 3 and B : C = 4 : 5, then A : B : C is

(1) 2 : 3 : 5 (2) 5 : 4 : 6

(3) 6 : 4 : 5 (4) 8 : 12 : 15

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

30. If two times of A is equal to three times of B and also equal to four times of C, then A : B : C is

(1) 2 : 3 : 4 (2) 3 : 4 : 2

(3) 4 : 6 : 3 (4) 6 : 4 : 3

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

31. If A : B = 2 : 3, B : C = 2 : 4 and C : D = 2 : 5, then A : D is equal to :

(1) 2 : 15 (2) 2 : 5

(3) 1 : 5 (4) 3 : 5

(SSC CPO S.I. Exam. 16.12.2007)

32. If $a : b : c = 3 : 4 : 7$, then the ratio $(a + b + c) : c$ is equal to

(1) 2 : 1 (2) 14 : 3

(3) 7 : 2 (4) 1 : 2

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

33. If A and B are in the ratio 3 : 4, and B and C in the ratio 12 : 13, then A and C will be in the ratio

(1) 3 :13 (2) 9 : 13

(3) 36 :13 (4) 13 : 9

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

34. If A : B = 3 : 2 and B : C = 3 : 4 then A : C is equal to

(1) 1 : 2 (2) 2 : 1

(3) 8 : 9 (4) 9 : 8

(SSC CPO S.I. Exam. 09.11.2008)

35. If $x : y = 2 : 1$, then $(x^2 - y^2) : (x^2 + y^2)$ is

(1) 3 : 5 (2) 5 : 3

(3) 4 : 5 (4) 5 : 6

(SSC CPO S.I. Exam. 06.09.2009)

36. If ₹ 1000 is divided between A and B in the ratio 3 : 2, then A will receive

(1) ₹ 400 (2) ₹ 500

(3) ₹ 600 (4) ₹ 800

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

37. If $W_1 : W_2 = 2 : 3$ and $W_1 : W_3 = 1 : 2$ then $W_2 : W_3$ is

(1) 3 : 4 (2) 4 : 3

(3) 2 : 3 (4) 4 : 5

(SSC CGD Tier-I Exam. 16.05.2010 (Second Sitting)

38. If $3x = 5y = 4z$, then $x : y : z$ is equal to

(1) 9 : 12 : 16 (2) 20 : 12 : 15

(3) 15 : 10 : 9 (4) 8 : 5 : 3

(SSC SAS Exam. 26.06.2010 (Paper-1)

39. If A : B = 3 : 4 and B : C = 6 : 5, then A : (A + C) is equal to

(1) 9 : 10 (2) 10 : 9

(3) 9 : 19 (4) 19 : 9

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

40. If a and b are rational numbers and $a + b\sqrt{3} = \frac{1}{2-\sqrt{3}}$, then $a : b$ is equal to

(1) – 2 : 1 (2) 2 : 1

(3) $\sqrt{3}$: 1 (4) $-\sqrt{3}$: 1

(SSC (South Zone) Investigator Exam. 12.09.2010)

41. If A : B = 3 : 4 and B : C = 8 : 9, then A : B : C is

(1) 8 : 6 : 9 (2) 9 : 8 : 6

(3) 6 : 8 : 9 (4) 3 : 32 : 9

(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

42. If 78 is divided into three parts which are in the ratio $1 : \frac{1}{3} : \frac{1}{6}$, the middle part is

(1) $9\frac{1}{3}$ (2) 13

(3) $17\frac{1}{3}$ (4) $18\frac{1}{3}$

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

43. If $x : y = 4 : 5$, then $(3x + y) : (5x + 3y) =$

(1) 3 : 5 (2) 5 : 3

(3) 17 : 35 (4) 35 : 17

(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

44. If $x : y = 5 : 6$, then $(3x^2 - 2y^2) : (y^2 - x^2)$ is

(1) 7 : 6 (2) 11 : 3

(3) 3 : 11 (4) 6 : 7

(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

45. If $x : y = 3 : 4$, then $4x + 5y : 5x - 2y =$

(1) 7 : 32 (2) 32 : 7

(3) 4 : 3 (4) 5 : 2

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

46. If A : B is 2 : 3, B : C is 6 : 11, then A : B : C is :

(1) 2 : 3 : 11 (2) 4 : 6 : 22

(3) 4 : 6 : 11 (4) 2 : 6 : 11

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

47. If two-third of A is four-fifth of B, then A : B = ?

(1) 5 : 6 (2) 6 : 5

(3) 10 : 9 (4) 9 :10

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

48. If $\frac{2}{3}$ of A = 75% of B = 0.6 of C, then A : B : C is
(1) 2 : 3 : 3 (2) 3 : 4 : 5
(3) 4 : 5 : 6 (4) 9 : 8 : 10
(SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting) & SSC CISF ASI Exam. 29.08.2010)

49. ₹ 33,630 are divided among A, B and C in such a manner that the ratio of the amount of A to that of B is 3 : 7 and the ratio of the amount of B to that of C is 6 : 5. The amount of money received by B is
(1) ₹ 14,868 (2) ₹ 16,257
(3) ₹ 13,290 (4) ₹ 12,390
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

50. If A : B = 3 : 5 and B : C = 4 : 7, then A :B : C is
(1) 6 : 9 : 14 (2) 3 : 5 : 7
(3) 12 : 20 : 21 (4) 12 : 20 : 35
(SSC Data Entry Operator Exam. 31.08.2008)

51. If A = $\frac{4}{5}$ of B and B = $\frac{5}{2}$ of C, then the ratio of A : C is
(1) 1 : 2 (2) 2 : 1
(3) 2 : 3 (4) 1 : 3
(SSC Data Entry Operator Exam. 02.08.2009)

52. If A = $\frac{1}{4}$ B and B = $\frac{1}{2}$ C, then A : B : C is :
(1) 8 : 4 : 1 (2) 4 : 2 : 1
(3) 1 : 4 : 8 (4) 1 : 2 : 4
(SSC CHSL DEO & LDC Exam. 27.11.2010)

53. If 2A=3B = 4C, then A: B: C is :
(1) 2 : 3 : 4 (2) 4 : 3 : 2
(3) 6 : 4 : 3 (4) 3 : 4 : 6
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

54. The ratio $4^{3.5} : 2^5$ is the same as
(1) 4 : 1 (2) 2 : 1
(3) 1 : 2 (4) 1 : 4
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

55. If A : B = 1 : 2, B : C = 3 : 4 C : D = 6 : 9 and D : E = 12 : 16 then A : B : C : D : E is equal to
(1) 1 : 3 : 6 : 12 : 16
(2) 2 : 4 : 6 : 9 : 16
(3) 3 : 4 : 8 : 12 : 16
(4) 3 : 6 : 8 : 12 : 16
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

56. If $x : y = 2 : 5$, then $(5x + 3y) : (5x - 3y)$ is equal to
(1) 5 (2) 3
(3) –3 (4) –5
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

57. If $\frac{a}{b} = \frac{2}{3}$ and $\frac{b}{c} = \frac{4}{5}$, then $(a + b) : (b + c) = ?$
(1) 3 : 4 (3) 4 : 5
(2) 5 : 9 (4) 20 : 27
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

58. Marks of two candidates P and Q are in the ratio of 2 : 5. If the marks of P is 120, marks of Q will be
(1) 120 (2) 240
(3) 300 (4) 360
(SSC CISF Constable (GD) Exam. 05.06.2011)

59. If A : B = 4 : 9 and A : C = 2 : 3, then (A + B) : (A + C) is
(1) 15: 13 (2) 10 : 13
(3) 13: 1 0 (4) 13: 15
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

60. The third proportional to 0.8 and 0.2 is :
(1) 0.05 (2) 0.8
(3) 0.4 (4) 0.032
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

61. If $x : y = 3 : 4$, then the value of $\frac{5x - 2y}{7x + 2y} =$
(1) $\frac{7}{25}$ (2) $\frac{7}{23}$
(3) $\frac{7}{29}$ (4) $\frac{7}{17}$
(SSC Multi-Tasking (Non-Technical) Staff Exam. 22.02.2011)

62. There are three numbers A, B, C such that twice A is equal to thrice B and four times B is equal to five times C. Then the ratio between A and C is
(1) 3 : 4 (2) 8 : 15
(3) 15 : 8 (4) 4 : 3
(SSC CPO S.I. Exam. 06.09.2009)

63. On mixing two classes A and B of students having average marks 25 and 40 respectively, the overall average obtained is 30. Find the ratio of the students in the class A and B.
(1) 2 : 1 (2) 5 :8
(3) 5 : 6 (4) 3 : 4
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

64. A fruit seller sold big, medium and small sized apples for ₹ 15, ₹ 10 and ₹ 5 respectively. The total number of apples sold were in the ratio 3 : 2 : 5. Find the average cost of an apple.
(1) ₹ 8 (2) ₹ 10
(3) ₹ 9 (4) ₹ 7
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

65. In a school, the ratio of boys to girls is 4 : 3 and the ratio of girls to teachers is 8 : 1. The ratio of students to teachers is :
(1) 56 : 3 (2) 55 : 1
(3) 49 : 3 (4) 56 : 1
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

66. If $\frac{3x+5}{5x-2} = \frac{2}{3}$, then the value of x is
(1) 11 (2) 19
(3) 23 (4) 7
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

67. A, B and C are batsmen. The ratio of the runs scored by them in a certain match are given below :
A : B = 5 : 3 and B : C = 4 : 5. In all they scored 564 runs. The number of runs scored by B is:
(1) 124 (2) 104
(3) 114 (4) 144
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

68. If $(a + b) : (b + c) : (c + a) = 6 : 7 : 8$ and $(a + b + c) = 14$, then the value of c is
(1) 6 (2) 7
(3) 8 (4) 14
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

69. If 5.5 of a = 0.65 of b, then $a : b$ is equal to :
(1) 13 : 11 (2) 11 : 13
(3) 13 : 110 (4) 110 : 13
(SSC Multi-Tasking Staff Exam. 10.03.2013)

70. The ratio of boys and girls in a college is 5 : 3. If 50 boys leave the college and 50 girls join the college, the ratio becomes 9 : 7. The number of boys in the college is
(1) 300 (2) 400
(3) 500 (4) 600
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

71. A person distributes his pens among four friends A, B, C, D in the ratio $\frac{1}{3}:\frac{1}{4}:\frac{1}{5}:\frac{1}{6}$. What is the minimum number of pens that the person should have?
(1) 57 (2) 65
(3) 75 (4) 45
(SSC Graduate Level Tier-I Exam. 21.04.2013)

72. If A = $\frac{2}{3}$ of B and B = $\frac{4}{5}$ of C, then A : B : C is.
(1) 12 : 8 : 10 (2) 15 : 10 : 8
(3) 10 : 15 : 12 (4) 8 : 12 : 15
(SSC Constable (GD) Exam. 12.05.2013)

73. The ratio of $25^{2.5} : 5^3$ is same as
(1) 5 : 3 (2) 5 : 6
(3) 1 : 25 (4) 25 : 1
(SSC Graduate Level Tier-I Exam. 19.05.2013)

74. The third proportional of 12 and 18 is
(1) 3 (2) 6
(3) 27 (4) 144
(SSC Graduate Level Tier-II Exam. 29.09.2013

75. If x runs are scored by A, y runs by B and z runs by C, then $x : y = y : z = 3 : 2$. If total number of runs scored by A, B and C is 342, the runs scored by each would be respectively
(1) 144, 96, 64 (2) 162, 108, 72
(3) 180, 120, 80 (4) 189, 126, 84
(SSC Graduate Level Tier-II Exam. 29.09.2013)

76. If A : B = 3 : 4 and B : C = 6 : 5, then C : A is
(1) 10 : 9 (2) 9 : 10
(3) 8 : 9 (4) 9 : 8
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

77. Find two mean proportionals between 2 and 54.
(1) 6 and 18 (2) 6 and 12
(3) 12 and 18 (4) 6 and 9
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

78. Which of the following represents a correct proportion ?
(1) 12 : 9 = 16 : 12
(2) 13 : 11 = 5 : 4
(3) 30 : 45 = 13 : 24
(4) 3 : 5 = 2 : 5
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

79. If 18, x and 50 are in continued proportion, then the value of x is
(1) 30 (2) 3
(3) 5 (4) 32
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014

80. If A : B = 7 : 9 and B : C = 3 : 5, then A : B : C is equal to
(1) 7 : 9 : 5 (2) 21 : 35 : 45
(3) 7 : 9 : 15 (4) 7 : 3 : 15
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

81. If $x : y = 5 : 2$, then
(1) 22 : 29 (2) 26 : 61
(3) 29 : 22 (4) 61 : 26
(SSC CHSL DEO & LDC Exam. 9.11.2014)

82. The ratio of the length of a school ground to its width is 5 : 2. If the width is 40 m, then the length is
(1) 200 m (2) 100 m
(3) 50 m (4) 80 m
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

83. If $x : y :: 2 : 3$ and $2 : x :: 4 : 8$ the value of y is
(1) 6 (2) 8
(3) 4 (4) 12
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

84. If $(a + b) : \sqrt{ab} = 4 : 1$, where $a > b > 0$, then $a : b$ is
(1) $(2 + \sqrt{3}) : (2 - \sqrt{3})$
(2) $(2 - \sqrt{3}) : (2 + \sqrt{3})$
(3) $(3 + \sqrt{2}) : (3 - \sqrt{2})$
(4) $(3 - \sqrt{2}) : (3 + \sqrt{2})$
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

85. 12 monkeys can eat 12 bananas in 12 minutes. In how many minutes can 4 monkeys eat 4 bananas ?
(1) 10 (2) 12
(3) 4 (4) 8
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

86. What must be added to each term of the ratio 2 : 5 so that it may equal to 5 : 6 ?
(1) 65 (2) 78
(3) 13 (4) 12
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

87. If A : B = 2 : 3 and B : C = 3 : 7, then A + B : B + C : C + A is
(1) 4 : 8 : 9 (2) 5 : 8 : 9
(3) 5 : 10 : 9 (4) 4 : 10 : 9
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

88. If $(x^3 - y^3) : (x^2 + xy + y^2) = 5 : 1$ and $(x^2 - y^2) : (x - y) = 7 : 1$, then the ratio $2x : 3y$ equals
(1) 4 : 1 (2) 2 : 3
(3) 4 : 3 (4) 3 : 2
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

89. If A : B = 2 : 1 and A : C = 1 : 3, then A : B : C is
(1) 1 : 3 : 2 (2) 1 : 2 : 6
(3) 3 : 2 : 1 (4) 2 : 1 : 6
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

90. The mean proportion of 1.21 and 0.09 is
(1) 3.3 (2) 0.33
(3) 3.03 (4) 0.033
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

91. The numbers x, y and z are respectively proportional to 2, 3 and 5 and the sum of x, y and z is 80. If the number z is given by the equation $z = ax - 8$, then a is
(1) 6 (2) $\frac{3}{2}$
(3) 3 (4) $\frac{5}{2}$
(SSC CGL Tier-I (CBE) Exam.10.09.2016)

92. Rs. 2420 were divided among A, B and C so that A : B = 5 : 4 and B : C = 9 : 10 then C gets
(1) Rs. 680 (2) Rs. 800
(3) Rs. 900 (4) Rs. 950
(SSC CGL Tier-II Online Exam.01.12.2016)

93. Among 132 examinees of a certain school, the ratio of successful to unsuccessful students is 9 : 2. Had 4 more students passed, then the ratio of successful to unsuccessful students would have been
(1) 14 : 3 (2) 14 : 5
(3) 28 : 3 (4) 28 : 5
(SSC CGL Tier-II Online Exam.01.12.2016)

94. In a regiment the ratio between the number of officers to soldiers was 3 : 31 before battle. In a battle 6 officers and 22 soldiers were killed and the ratio became 1 : 13, the number of officers in the regiment before battle was
(1) 31 (2) 38
(3) 21 (4) 28
(SSC CGL Tier-II Online Exam.01.12.2016)

95. The ratio of number of boys and girls in a school of 720 students is 7 : 5. How many more girls should be admitted to make the ratio 1 : 1 ?
(1) 90 (2) 120
(3) 220 (4) 240
(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

96. The number of pupils of a class is 55. The ratio of the number of male pupils to the number of female pupils is 5: 6. The number of female pupils is
(1) 11 (2) 25
(3) 30 (4) 35
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

97. In a parade of school students, the number of boys and girls are in the ratio of 9 : 7 respectively and the number of students is 256. Find the number of girls.
(1) 102 (2) 112
(3) 118 (4) 128
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

98. Sum of two numbers is thrice their difference. Their ratio is
(1) 1:2 (2) 2:1
(3) 3:1 (4) 1:3
(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

99. The compound ratio of the inverse ratios of the ratios
$x : yz$, $y : zx$, $z : xy$ is :
(1) $1 : xyz$ (2) $xyz : 1$
(3) 1 : 1 (4) $x : yz$
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

100. If $\left(x+\frac{1}{x}\right) : \left(x-\frac{1}{x}\right) = 5 : 3$, then the value(s) of x is/are
(1) ±1 (2) ±2
(3) ±3 (4) 0
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

101. If the three numbers in the ratio 3 : 2 : 5 be such that the sum of the squares is equal to 1862 then which number is the middle one ?
(1) 16 (2) 14
(3) 13 (4) 15
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

102. If $2r = h + \sqrt{r^2 + h^2}$ then the ratio $r : h$ $(r \neq 0)$ is
(1) 1 : 2 (2) 2 : 3
(3) 4 : 3 (4) 3 : 5
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

103. A box of sweets was distributed between A and B in the ratio 3 : 4. If A got 36 sweets, what was the total number of sweets?
(1) 12 (2) 84
(3) 144 (4) 27
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

104. In a college union, there are 48 students. The ratio of the number of boys to the number of girls is 5 : 3. The number of girls to be added in the union, so that the ratio of boys to girls in 6 : 5 is
(1) 6 (2) 7
(3) 12 (4) 17
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

105. In a coloured picture of blue and yellow color, blue and yellow colour is used in the ratio of 4 : 3 respectively. If in upper half, blue : yellow is 2 : 3, then in the lower half blue : yellow is
(1) 1 : 1 (2) 2 : 1
(3) 26 : 9 (4) 9 : 26
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–II

1. To get the ratio $p : q$ (for $p \neq q$), one has to add a number to each term of the ratio $x : y$, the number is
(1) $\frac{px+qy}{p-q}$ (2) $\frac{qx-py}{p-q}$
(3) $\frac{px-qy}{p-q}$ (4) $\frac{py-qx}{p-q}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

2. If $x : y = 3 : 4$, then the value of $(4x - y) : (2x + 3y)$ is
(1) 4 : 9 (2) 8 : 9
(3) 4 : 3 (4) 8 : 3
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

3. If $x : y = 3 : 4$ and $y : z = 3 : 4$, then $\frac{x+y+z}{3z}$ is equal to
(1) $\frac{13}{27}$ (2) $\frac{1}{2}$
(3) $\frac{73}{84}$ (4) $\frac{37}{48}$
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

4. If $A : B = \frac{1}{2} : \frac{1}{3}$, $B : C = \frac{1}{5} : \frac{1}{3}$, then (A + B) : (B + C) is equal to
(1) 5 : 8 (2) 9 : 10
(3) 15 : 16 (4) 6 : 15
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

5. If $\frac{x}{y} = \frac{3}{4}$, the ratio of $(2x + 3y)$ and $(3y - 2x)$ is
(1) 2 : 1 (2) 3 : 2
(3) 1 : 1 (4) 3 : 1
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

6. Two numbers are in the ratio $1\frac{1}{2} : 2\frac{2}{3}$, when each of these is increased by 15, they are in the ratio $1\frac{2}{3} : 2\frac{1}{2}$. The greater of the numbers
(1) 27 (2) 36
(3) 48 (4) 64
(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

7. If 177 is divided into 3 parts in the ratio $\frac{1}{2} : \frac{2}{3} : \frac{4}{5}$, then the second part is
(1) 75 (2) 45
(3) 72 (4) 60
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

8. A and B together have Rs. 6300. If $\frac{5}{19}$ th of A's amount is equal to $\frac{2}{5}$ th of B's amount. The amount of 'B' is
(1) Rs. 2500 (2) Rs. 3800
(3) Rs. 2300 (4) Rs. 4000
(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

9. Find the fraction which bears the same ratio to $\frac{1}{27}$ that $\frac{3}{7}$ does to $\frac{5}{9}$.

(1) $\frac{5}{9}$ (2) $\frac{1}{35}$

(3) $\frac{45}{7}$ (4) $\frac{7}{45}$

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

10. Rs. 782 is divided into three parts in the ratio $\frac{1}{2} : \frac{2}{3} : \frac{3}{4}$, the first part is

(1) Rs. 182 (2) Rs. 204

(3) Rs. 190 (4) Rs. 196

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

11. The reciprocals of the squares of the numbers $1\frac{1}{2}$ and $1\frac{1}{3}$. are in the ratio

(1) 64 : 81 (2) 8 : 9

(3) 81 : 64 (4) 9 : 85

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

TYPE–III

1. There is a ratio of 5 : 4 between two numbers. If 40 per cent of the first is 12, then 50% of the second number is

(1) 12 (2) 24

(3) 18 (4) 20

(SSC Graduate Level Tier-II Exam.16.09.2012)

2. A milkman makes 20% profit by selling milk mixed with water at ₹ 9 per litre. If the cost price of 1 litre pure milk is ₹ 10, then the ratio of milk and water in the mixture is

(1) 3 : 1 (2) 4 : 1

(3) 3 : 2 (4) 4 : 3

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

3. A man ordered 4 pairs of black socks and some pairs of brown socks. The price of a black socks is double that of a brown pair. While preparing the bill the clerk interchanged the number of black and brown pairs by mistake which increased the bill by 50%. The ratio of the number of black and brown pairs of socks in the original order was :

(1) 2 : 1 (2) 1 : 4

(3) 1 : 2 (4) 4 : 1

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

4. The ratio of the number of boys and girls in a school is 8 : 12. If 50% of boys and 25% of girls are getting scholarships for their studies, what is the percentage of school students who are not getting any scholarships ?

(1) 65 (2) 66

(3) 67 (4) 68

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

5. In an ornament the ratio of gold and copper is 3 : 2. The percentage of gold in the ornament is :

(1) 60 (2) 40

(3) 30 (4) 20

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

TYPE–IV

1. The ratio of ages of two students is 3 : 2. One is older to the other by 5 years. What is the age of the younger student ?

(2) 2 years (2) 10 years

(3) $2\frac{1}{2}$ years (4) 15 years

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

2. The ratio of present age of two brothers is 1 : 2 and 5 years back. the ratio was 1 : 3. What will be the ratio of their age after 5 years ?

(1) 1 : 4 (2) 2 : 3

(3) 3 : 5 (4) 5 : 6

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

3. The sum of the age of a father and his son is 100 years now. 5 years ago their age were in the ratio of 2 : 1. The ratio of the age of father and son after 10 years will be

(1) 5 : 3 (2) 4 : 3

(3) 10 : 7 (4) 3 : 5

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

4. Four years ago, the ratio of A's age to B's age was 11 : 14 and four years later their age will be in the ratio 13 : 16. The present age of A is

(1) 48 years (2) 26 years

(3) 44 years (4) 28 years

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

5. At present, the ratio of the age of Maya and Chhaya is 6 : 5 and fifteen years from now, the ratio will get changed to 9 : 8. Maya's present age is

(1) 21 years (2) 24 years

(3) 30 years (4) 40 years

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

6. The ratio of the age of Ram and Rahim 10 years ago was 1 : 3. The ratio of their age five years hence will be 2 : 3. Then the ratio of their present age is

(1) 1 : 2 (2) 3 : 5

(3) 3 : 4 (4) 2 : 5

(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

7. The ratio of the age of a father to that of his son is 5: 2. If the product of their ages in years is 1000, then the father's age (in years) after 10 years will be :

(1) 50 (2) 60

(3) 80 (4) 100

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

8. The ratio between Sumit's and Prakash's age at present is 2 : 3. Sumit is 6 years younger than Prakash. The ratio of Sumit's age to Prakash's age after 6 years will be

(1) 2 : 3 (2) 1 : 2

(3) 4 : 3 (4) 3 : 4

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

9. Harsha is 40 years old and Ritu is 60 years old. How many years ago was the ratio of their ages 3 : 5 ?

(1) 10 years (2) 20 years

(3) 37 years (4) 5 years

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

10. The ratio of present age of two brothers is 1 : 2 and 5 years back the ratio was 1 : 3. What will be the ratio of their age after 5 years ?

(1) 1 : 4 (2) 2 : 3

(3) 3 : 5 (4) 5 : 6

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

11. Four years ago, the ratio of the age of A and B was 2 : 3 and after four years it will become 5 : 7. Find their present age.
(1) 36 years and 40 years
(2) 32 years and 48 years
(3) 40 years and 56 years
(4) 36 years and 52 years
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

12. The average age of boys in the class is twice the number of girls in the class. The ratio of boys and girls in the class of 50 is 4 : 1. The total of the ages (in years) of the boys in the class is
(1) 2000 (2) 2500
(3) 800 (4) 400
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

13. The ratio of age of two boys is 5 : 6. After two years the ratio will be 7 : 8. The ratio of their age after 12 years will be
(1) $\frac{22}{24}$ (2) $\frac{15}{16}$
(3) $\frac{17}{18}$ (4) $\frac{11}{12}$
(SSC CPO S.I. Exam. 07.09.2003 & SSC CHSL DEO & LDC Exam. 20.10.2013)

14. The ratio of the present age of Puneet and Appu is 2 : 3. After 3 years the ratio of their age will be 3 : 4. The present age of Puneet is :
(1) 3 years (2) 6 years
(3) 9 years (4) 4 years
(SSC CPO S.I. Exam. 26.05.2005)

15. The ratio of the ages of a father and his son 10 years hence will be 5 : 3, while 10 years ago, it was 3:1. The ratio of the age of the son to that of the father today, is
(1) 1 : 2 (2) 1 : 3
(3) 2 : 3 (4) 2 : 5
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

16. The ratio of the present age of Rahul and Rashmi is 2 : 1. The ratio of their age after 30 years will be 7 : 6. What is the present age of Rahul ?
(1) 6 years (2) 10 years
(3) 12 years (4) 20 years
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

17. The present age of A and B are in the ratio 4 : 5 and after 5 years they will be in the ratio 5 : 6. The present age of A is
(1) 10 years (2) 20 years
(3) 25 years (4) 40 years
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

18. The present age of two persons are 36 and 50 years respectively. If after n years the ratio of their age will be 3 : 4, then the value of n is
(1) 4 (2) 7
(3) 6 (4) 3
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

19. The ratio between Sumit's and Prakash's age at present is 2 : 3. Sumit is 6 years younger than Prakash. The ratio of Sumit's age to Prakash's age after 6 years will be
(1) 2 : 3 (2) 1 : 2
(3) 4 : 3 (4) 3 : 4
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

20. The ratio of the ages of two persons is 4 : 7 and the age of one of them is greater than that of the other by 30 years. The sum of their ages (in years) is
(1) 110 (2) 100
(3) 70 (4) 40k
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

21. My grandfather was 9 times older than me 16 years ago. He will be 3 times of my age 8 years from now. Eight years ago, the ratio of my age to that of my grandfather was
(1) 3 : 8 (2) 2 : 5
(3) 1 : 2 (4) 1 : 5
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting) & SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

22. The ratio of the ages of A and B at present is 3:1. Four years earlier the ratio was 4:1. The present age of A is
(1) 48 years (2) 40 years
(3) 36 years (4) 32 years
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

23. Eighteen years ago, the ratio of A's age to B's age was 8 : 13. Their present ratios are 5 : 7. What is the present age of A ?
(1) 60 years (2) 70 years
(3) 50 years (4) 40 years
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

24. The ratio of ages of two persons is 5 : 9 and the age of one of them is greater than the other by 40 years. The sum of their ages in year is
(1) 180 (2) 140
(3) 150 (4) 160
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

25. The current ages of Sonali and Monali are in the ratio 5 : 3. Five years from now, their ages will be in the ratio 10 : 7. Then, Monali's current age is :
(1) 5 years (2) 3 years
(3) 9 years (4) 15 years
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

26. If 4 years ago the ratio between the ages of P and Q was 5 : 6 and the sum of their ages at present is 52 years, what is the ratio of their present ages ?
(1) 5 : 6 (2) 6 : 7
(3) 7 : 8 (4) 4 : 5
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

27. The present ages of A and B are in the ratio 5 : 6 respectively. After seven years this ratio becomes 6 : 7. Then the present age of A in years is :
(1) 35 years (2) 32 years
(3) 33 years (4) 30 years
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

28. The ratio of the present ages of two boys is 3:4. After 3 years, the ratio of their ages is equal to will be 4:5.The ratio of their ages after 21 years will be
(1) 14:17 (2) 17:19
(3) 11:12 (4) 10:11
(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

29. The ratio of A's age to B's age is 4 : 3. 'A' will be 26 years old after 6 years. The age of B now is :
(1) $19\frac{1}{2}$ years
(2) 12 years
(3) 21 years (4) 15 years
(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

30. The present ages of A and B are in the ratio 3 : 4. Ten years ago, this ratio was 4 : 7. The present ages of A and B are respectively :
(1) 18 years, 27 years
(2) 21 years, 28 years
(3) 24 years, 32 years
(4) 27 years, 36 years
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

TYPE–V

1. The ratio of two numbers is 3 : 8 and their difference is 115. The smaller of the two numbers is :
(1) 184 (2) 194
(3) 69 (4) 59
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. Four numbers are in the ratio 1 : 2 : 3 : 4. Their sum is 16. The sum of the first and fourth number is equal to :
(1) 5 (2) 8
(3) 10 (4) 80
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. The sum of two numbers is 40 and their difference is 4. The ratio of the numbers is :
(1) 21 : 19 (2) 22 : 9
(3) 11 : 9 (4) 11 : 18
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

4. The ratio of two numbers is 10 : 7 and their difference is 105. The sum of these numbers is
(1) 595 (2) 805
(3) 1190 (4) 1610
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

5. The product of two positive integers is 1575 and their ratio is 9 : 7. The smaller integer is
(1) 25 (2) 35
(3) 45 (4) 70
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

6. Three numbers are in the ratio of 3 : 2 : 5 and the sum of their squares is 1862. The smallest of these numbers is
(1) 24 (2) 21
(3) 14 (3) 35
(SSC CPO S.I. Exam. 12.01.2003

7. The sum of three numbers is 116. The ratio of second to the third is 9 : 16 and the first to the third is 1 : 4. The second number is
(1) 30 (2) 32
(3) 34 (4) 36
(SSC CPO S.I. Exam. 07.09.2003)

8. The sum of three numbers is 98. If the ratio of the first to the second is 2 : 3 and that of the second to the third is 5 : 8, then the second number is
(1) 49 (2) 48
(3) 30 (4) 20
(SSC CPO S.I. Exam. 07.09.2003)

9. In a 45 litres mixture of milk and water, the ratio of the milk to water is 2 : 1. When some quantity of water is added to the mixture, this ratio becomes 1 : 2. The quantity of water added is
(1) 10 litres (2) 21 litres
(3) 35 litres (4) 45 litres
(SSC CPO S.I. Exam. 05.09.2004)

10. Of the three numbers, the ratio of the first and the second is 8 : 9 and that of the second and third is 3 : 4. If the product of the first and third number is 2400, then the second number is :
(1) 45 (2) 40
(3) 30 (4) 55
(SSC CPO S.I. Exam. 26.05.2005)

11. Two numbers are in the ratio 2 : 3. If 2 is subtracted from the first and 2 is added to the second, the ratio becomes 1 : 2. The sum of the numbers is :
(1) 30 (2) 28
(3) 24 (4) 10
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

12. Three numbers are in the ratio $\frac{1}{2} : \frac{2}{3} : \frac{3}{4}$. The difference between the greatest and the smallest number is 36. The numbers are
(1) 72, 84, 108 (2) 60, 72, 96
(3) 72, 84, 96 (4) 72, 96, 108
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

13. The sum of three numbers is 68. If the ratio of the first to the second be 2 : 3 and that of the second to the third be 5 : 3, then the second number is
(1) 30 (2) 58
(3) 20 (4) 48
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

14. When a particular number is subtracted from each of 7, 9, 11 and 15, the resulting numbers are in proportion. The number to be subtracted is :
(1) 1 (2) 2
(3) 3 (4) 5
(SSC CPO S.I. Exam. 16.12.2007)

15. The two numbers are in the ratio 2 : 3 and their product is 96. The sum of the numbers is
(1) 5 (2) 20
(3) 101 (4) 102
(SSC CPO S.I. Exam. 06.09.2009)

16. The ratio between two numbers is 3 : 4. If each number is increased by 6, the ratio becomes 4 : 5. The difference between the numbers is
(1) 1 (2) 3
(3) 6 (4) 8
(SSC CPO S.I. Exam. 06.09.2009)

17. Two numbers are in the ratio 5 : 7. On diminishing each of them by 40, they become in the ratio 17 : 27. The difference of the numbers is :
(1) 18 (2) 52
(3) 137 (4) 50
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

18. Three numbers are in the ratio 5 : 6 : 7. If the product of the numbers is 5670, then the greatest number is
(1) 15 (2) 18
(3) 21 (4) 28
(SSC CPO S.I. Exam. 06.09.2009)

19. Two numbers are in the ratio 1 : 3. If their sum is 240, then their difference is
(1) 120 (2) 108
(3) 100 (4) 96
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

20. If the sum of two quantities is equal to three times their difference, then the ratio of the two quantities is
(1) 1 : 3 (2) 3 : 1
(3) 2 : 1 (4) 2 : 3
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

21. Three numbers are in the ratio 3 : 4 : 5. The sum of the largest and the smallest equals the sum of the second and 52. The smallest number is
(1) 20 (2) 27
(3) 39 (4) 52
(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

22. Which number when added to each of the numbers 6, 7, 15, 17 will make the resulting numbers proportional ?
(1) 6 (2) 5
(3) 4 (4) 3
(SSC Data Entry Operator Exam. 02.08.2009)

23. What number should be added to each of 6, 14, 18 and 38 so that the resulting numbers make a proportion ?
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CHSL DEO & LDC Exam. 27.11.2010)

24. Of three positive numbers, the ratio of 1st and 2nd is 8 : 9, that of 2nd and 3rd is 3:4. The product of 1st and 3rd is 2400. The sum of the three numbers is
(1) 145 (2) 185
(3) 295 (4) 155
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

25. The ratio between a two – digit number and the sum of the digits of that number is 4 : 1. If the digit at the unit's place is 3 more than the digit at the ten's place, then the number is
(1) 47 (2) 69
(3) 36 (4) 25
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

26. The ratio of number of balls in bags x,y is 2 : 3. Five balls are taken from bag y and are dropped in bag x. Number of balls are equal in each bag now. Number of balls in each bag now is
(1) 45 (2) 20
(3) 30 (4) 25
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

27. If the square of the sum of two numbers is equal to 4 times of their product, then the ratio of these numbers is :
(1) 2 : 1 (2) 1 : 3
(3) 1 : 1 (4) 1 : 2
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

28. Three numbers are in the ratio 2 : 3 : 4. If the sum of their squares is 1856, then the numbers are
(1) 8, 12 and 16
(2) 16, 24 and 32
(3) 12, 18 and 24
(4) None of the above
(SSC Graduate Level Tier-II Exam. 29.09.2013)

29. The number to be added to each of the numbers 7, 16, 43, 79 to make the numbers in proportion is
(1) 2 (2) 3
(3) 5 (4) 1
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

30. The average of two numbers is 62. If 2 is added to the smallest number, the ratio between the numbers becomes 1 : 2. The difference of the numbers is
(1) 62 (2) 40
(3) 84 (4) 44
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I)
North Zone (Ist Sitting)

31. What number should be subtracted from both terms of the ratio 15 : 19 in order to make it 3 : 4 ?
(1) 9 (2) 6
(3) 5 (4) 3
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

32. The sum of two numbers is equal to 20 and their difference is 25. The ratio of the two numbers is
(1) 9 : 1 (2) 7 : 9
(3) 3 : 5 (4) 2 : 7
(SSC CGL Tier-II Exam. 21.09.2014)

33. Two numbers are in the ratio of 2 : 3. If their sum is 125, find the numbers.
(1) 50, 75 (2) 24, 36
(3) 20, 30 (4) 32, 78
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

34. The ratio of three positive numbers is 2 : 3 : 5 and the sum of their squares is 608. The three numbers are
(1) 2, 3, 5 (2) 10, 15, 25
(3) 8, 12, 20 (4) 4, 6, 10
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

35. If the product of two positive numbers is 1575 and their ratio is 7 : 9, then the greater number is
(1) 45 (2) 35
(3) 135 (4) 63
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

36. If A and B are in the ratio 4 : 5 and the difference of their squares is 81, what is the value of A ?
(1) 45 (2) 12
(3) 36 (4) 15
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

37. If two numbers are in the ratio 2 : 3 and the ratio becomes 3 : 4 when 8 is added to both the numbers, then the sum of the two numbers is
(1) 10 (2) 80
(3) 40 (4) 100
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

38. Two numbers are in ratio 5 : 8. If their difference is 48, then the smaller number is
(1) 80 (2) 96
(3) 128 (4) 64
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

39. Three numbers are in the ratio 5:7:12. If the sum of the first and the third numbers is greater than the second number by 50. The sum of the three numbers is
(1) 125 (2) 120
(3) 95 (4) 85
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

40. Two numbers whose sum is 84 can not be in the ratio
(1) 5 : 7 (2) 13 : 8
(3) 1 : 3 (4) 3 : 2
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

41. Two numbers are in the ratio 3 : 5. If 6 is added to each of them, the ratio becomes 2 : 3. The numbers are
(1) 21 and 35 (2) 30 and 50
(3) 24 and 40 (4) 18 and 30
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

42. The sum of three numbers is 540. The ratio of second to third is 9 : 13 and that of first to third is 2 : 7. The third number is :
(1) 273 (2) 280
(3) 250 (4) 286
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

TYPE–VI

1. Two numbers are in the ratio 4 : 5 and their L.C.M. is 180. The smaller number is
(1) 9 (2) 15
(3) 36 (4) 45
(SSC CPO S.I. Exam. 16.12.2007)

2. Two numbers are in the ratio 3 : 4 and their LCM is 180. The first number is
(1) 15 (2) 60
(3) 36 (4) 45
(SSC SAS Exam. 26.06.2010 (Paper-1)

3. Two numbers are in the ratio 3 : 5 and their LCM is 225. The smaller number is
(1) 45 (2) 60
(3) 75 (4) 90
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

4. The ratio of two numbers is 3 : 4 and their LCM is 48. The sum of the two numbers is :
(1) 32 (2) 28
(3) 26 (4) 24
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

5. The ratio of two numbers is 3 : 4 and their LCM is 120. The sum of numbers is
(1) 105 (2) 140
(3) 70 (4) 35
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

6. The ratio of two numbers is 3 : 4 and their HCF is 15. Then the sum of the two numbers is :
(1) 105 (2) 115
(3) 120 (4) 110
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

TYPE–VII

1. A and B have money in the ratio 2 : 1. If A gives ₹ 2 to B, the money will be in the ratio 1 : 1. What were the initial amounts they had?
(1) ₹ 12 and ₹ 6
(2) ₹ 16 and ₹ 8
(3) ₹ 8 and ₹ 4
(4) ₹ 6 and ₹ 3
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The ratio of the number of boys and girls of a school with 504 students is 13 : 11. What will be the new ratio if 12 more girls are admitted?
(1) 91 : 81 (2) 81 : 91
(3) 9 : 10 (4) 10 : 9
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

3. Two numbers are in the ratio $1\frac{1}{2} : 2\frac{2}{3}$. When each of these is increased by 15, they become in the ratio $1\frac{2}{3} : 2\frac{1}{2}$. The greater of the numbers is :
(1) 27 (2) 36
(3) 48 (4) 64
(SSC CGL Prelim Exam. 24.02.2002 & 13.11.2005 (IInd Sitting)

4. The students in three classes are in the ratio 2 : 3 : 5. If 40 students are increased in each class, the ratio changes to 4 : 5 : 7. Originally, the total number of students was :
(1) 100 (2) 180
(3) 200 (4) 400
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. Two numbers are in the ratio 5 : 7. If 9 is subtracted from each of them, their ratio becomes 7 : 11. The difference of the numbers is
(1) 6 (2) 12
(3) 15 (4) 18
(SSC CPO S.I. Exam. 12.01.2003

6. Two numbers are in the ratio 3 : 5. If 9 is subtracted from each, then they are in the ratio 12 : 23. Find the smaller number.
(1) 27 (2) 33
(3) 49 (4) 55
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

7. The ratio of number of boys to that of girls in a group becomes 2:1 when 15 girls leave. But, afterwards, when 45 boys also leave, the ratio becomes 1 : 5. Originally the number of girls in the group was
(1) 20 (2) 30
(3) 40 (4) 50
(SSC CPO S.I. Exam. 05.09.2004)

8. The students in three classes are in the ratio 2 : 3 : 5. If 20 students are increased in each class, the ratio changes to 4 : 5 : 7. Originally the total number of students was :
(1) 50 (2) 90
(3) 100 (4) 150
(SSC CGL Prelim Exam. 24.02.2002, 13.11.2005 (Ist Sitting) & 04.02.2007 (IInd sitting), & SSC CHSL DEO & LDC Exam. 28.10.2012)

9. The ratio of the number of boys and that of girls in a school having 504 students is 13 :11. What will be the new ratio if 3 more girls are admitted?
(1) 7 : 6 (2) 6 : 7
(3) 10 :11 (4) 13 :14
(SSC CPO S.I. Exam. 03.09.2006)

10. The ratio of the number of ladies to that of gents at a party was 3 : 2. When 20 more gents joined the party, the ratio was reversed. The number of ladies present at the party was
(1) 36 (2) 32
(3) 24 (4) 16
(SSC CPO S.I. Exam. 03.09.2006)

11. In a school having roll strength 286, the ratio of boys and girls is 8 : 5. If 22 more girls get admitted into the school, the ratio of boys and girls becomes
(1) 12 : 7 (2) 10 : 7
(3) 8 : 7 (4) 4 : 3
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

12. The number of students in three classes are in the ratio 2 : 3 : 4. If 12 students are increased in each class, this ratio changes to 8 : 11 :14. The total number of students in the three classes at the beginning was
(1) 162 (2) 108
(3) 96 (4) 54
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

13. What must be added to each term of the ratio 7 : 11, so as to make it equal to 3 : 4 ?
(1) 8 (2) 7.5
(3) 6.5 (4) 5
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

14. Two numbers are in the ratio 7 : 11. If 7 is added to each of the numbers, the ratio becomes 2 : 3. The smaller number is
(1) 39 (2) 49
(3) 66 (4) 77
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

15. Two numbers are in the ratio 3 : 5. If each number is increased by 10, the ratio becomes 5 :7. The smaller number is
(1) 9 (2) 12
(3) 15 (4) 25
(SSC (South Zone) Investigator Exam. 12.09.2010)

16. The ratio between two numbers is 2 : 3. If each number is increased by 4, the ratio between them becomes 5 : 7. The difference between the numbers is
(1) 8 (2) 6
(3) 4 (4) 2
(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

17. What number should be added to or subtracted from each term of the ratio 17 : 24 so that it becomes equal to 1 : 2 ?
(1) 5 is subtracted
(2) 10 is added
(3) 7 is added
(4) 10 is subtracted
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

18. Two numbers are such that the ratio between them is 4 : 7. If each is increased by 4, the ratio becomes 3 : 5. The larger number is
(1) 36 (2) 48
(3) 56 (4) 64
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

19. The students in three classes are in the ratio 4 : 6 : 9. If 12 students are increased in each class, the ratio changes to 7 : 9 : 12. Then the total number of students in the three classes before the increase is
(1) 95 (2) 76
(3) 100 (4) 114
(SSC Graduate Level Tier-II Exam.16.09.2012)

20. The total number of students in a school was 660. The ratio between boys and girls was 13 : 9. After some days, 30 girls joined the school and some boys left the school and new ratio between boys and girls became 6 : 5. The number of boys who left the school is :
(1) 50 (2) 40
(3) 30 (4) 60
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

21. If there is a reduction in the number of workers in a factory in the ratio 15 : 11 and an increment in their wage in the ratio 22 : 25, then the ratio by which the total wage of the workers should be decreased is
(1) 6 : 5 (2) 5 : 6
(3) 3 : 7 (4) 3 :5
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

22. Two numbers are in the ratio of 3 : 5. If 9 be subtracted from each, then they are in the ratio of 12 : 23. Find the numbers.
(1) 15, 28 (2) 36, 115
(3) 33, 55 (4) 60, 69
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

23. Three numbers are in the ratio 1 : 2 : 3. By adding 5 to each of them, the new numbers are in the ratio 2 : 3 : 4. The numbers are:
(1) 10, 20, 30 (2) 15, 30, 45
(3) 1, 2, 3 (4) 5, 10, 15
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

24. Ram got twice as many marks in English as in Science. His total marks in English, Science and Maths are 180. If the ratio of his marks in English and Maths is 2 : 3, what is his marks in Science ?
(1) 30 (2) 60
(3) 72 (4) 90
(SSC Graduate Level Tier-II Exam. 29.09.2013)

25. What number should be subtracted from both the terms of the ratio 11 : 15 so as to make it as 2 : 3 ?
(1) 2 (2) 3
(3) 4 (4) 5
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

26. Two numbers are in the ratio of 3 : 5. If 9 is subtracted from each then they are in the ratio 12 : 23. The smaller number is
(1) 55 (2) 33
(3) 28 (4) 36
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

27. The average of 11 numbers is 36, whereas average of 9 of them is 34. If the remaining two numbers are in the ratio of 2 : 3, find the value of the smaller number (between remaining two numbers).
(1) 45 (2) 48
(3) 54 (4) 36
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

28. The ratio of number of boys to the number of girls in a school of 432 pupils is 5 : 4. When some new boys and girls are admitted, the number of boys increase by 12 and the ratio of the boys to girls changes to 7 : 6. The number of new girls admitted is
(1) 12 (2) 14
(3) 24 (4) 20
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

29. If the ratio of two numbers is 1 : 5 and their product is 320, then the difference between the squares of these two numbers is :
(1) 1024 (2) 1256
(3) 1536 (4) 1435
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

30. The ratio of two positive numbers is 3 : 4. The sum of their squares is 400. What is the sum of the numbers ?
(1) 28 (2) 22
(3) 24 (4) 26
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

31. Three numbers are in the ratio 1 : 2 : 3 and the sum of their cubes is 4500 . The smallest number is
(1) 4 (2) 5
(3) 6 (4) 10
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

TYPE–VIII

1. Zinc and copper are in the ratio of 5 : 3 in 200 gm of an alloy. How much grams of copper be added to make the ratio as 3 : 5?
(1) $133\frac{1}{3}$ (2) $\frac{1}{200}$
(3) 72 (4) 66
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. The ratio of copper and zinc in brass is 13 : 7. How much zinc will be there in 100 kg of brass ?
(1) 20 kg. (2) 55 kg.
(3) 35 kg. (4) 40 kg.
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

3. In 30 litres mixture of acid, the ratio of acid and water is 2 : 3 . What amount of water should be added to the mixture so that the ratio of acid and water becomes 2 : 5 ?
(1) 10 litres (2) 15 litres
(3) 18 litres (4) 12 litres
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

4. In an alloy, the ratio of copper and zinc is 5 : 2. If 1.250 kg of zinc is mixed in 17 kg 500 g of alloy, then the ratio of copper and zinc will be
(1) 2 : 1 (2) 2 : 3
(3) 3 : 2 (4) 1 : 2
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

5. There are three containers of equal capacity. The ratio of Sulphuric acid to water in the first container is 3 : 2, that in the second container is 7 : 3 and in the third container it is 11 : 4. If all the liquids are mixed together, then the ratio of Sulphuric acid to water in the mixture will be :
(1) 61 : 29 (2) 61 : 28
(3) 60 : 29 (4) 59 : 29
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

6. 200 litres of a mixture contains milk and water in the ratio 17 : 3. After the addition of some more milk to it, the ratio of milk to water in the resulting mixture becomes 7 : 1. The quantity of milk added to it was
(1) 20 litres (2) 40 litres
(3) 60 litres (4) 80 litres
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

7. A can contains a mixture of two liquids A and B in the ratio 7 : 5. When 9 litres of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7 : 9. Litres of liquid A contained by the can initially was
(1) 10 (2) 20
(3) 21 (4) 25
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

8. A container contains two liquids A and B in the ratio 7 : 5. When 9 litres of mixture are drawn off and the container is filled with B, the ratio of A and B becomes 1:1. How many litres of liquid A was in the container initially ?
(1) 26 (2) $16\frac{1}{2}$
(3) $36\frac{3}{4}$ (4) $26\frac{3}{4}$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

9. A and B are two alloys of gold and copper prepared by mixing metals in ratios 7 : 2 and 7 : 11 respectively. If equal quantities of the alloys are melted to form a third alloy C, the ratio of gold and copper in C will be ;
(1) 7 : 5 (2) 5 : 9
(3) 9 : 5 (4) 5 : 7
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

10. The ratio in which a man must mix rice at ₹ 10.20 per kg and ₹ 14.40 per kg so as to make a mixture worth ₹ 12.60 per kg, is
(1) 4 : 3 (2) 2 : 5
(2) 18 : 24 (4) 3 : 4
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

11. A mixture contains spirit and water in the ratio 3 : 2. If it contains 3 litres more spirit than water, the quantity of spirit in the mixture is
(1) 10 litres (2) 12 litres
(3) 8 litres (4) 9 litres
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

12. A vessel is filled with liquid, 3 parts of which are water and 5 parts syrup. How much of the mixture must be drawn off and replaced with water so that the mixture may be half water and half syrup ?
(1) $\frac{1}{3}$ (2) $\frac{1}{4}$
(3) $\frac{1}{5}$ (4) $\frac{1}{7}$
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

13. Two vessels A and *B* contain milk and water mixed in the ratio 4 : 3 and 2 : 3. The ratio in which these mixtures be mixed to form a new mixture containing half milk and half water is
(1) 7 : 5 (2) 6 : 5
(3) 5 : 6 (4) 4 : 3
(SSC CHSL DEO& LDC Exam. 28.10.2012 (Ist Sitting) & (SSC MTS Exam. 17.03.2013 (Kolkata) 11.11.2011 & 04.02.2011)

14. A container contains 60 kg of milk. From this container 6 kg of milk was taken out and replaced by water. This process was repeated further two times. The amount of milk left in the container is
(1) 34.24 kg (2) 39.64 kg
(3) 43.74 kg (4) 47.6 kg
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

15. The proportion of acid and water in three samples is 2 : 1, 3 : 2 and 5 : 3. A mixture containing equal quantities of all three samples is made. The ratio of water and acid in the mixture is :
(1) 120 : 133 (2) 227 : 133
(3) 227 : 120 (4) 133 : 227
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

16. Two alloys are both made up of copper and tin. The ratio of copper and tin in the first alloy is 1 : 3 and in the second alloy is 2 : 5. In what ratio should the two alloys be mixed to obtain a new alloy in which the ratio of tin and copper be 8 : 3 ?
(1) 3 : 5 (2) 4 : 7
(3) 3 : 8 (4) 5 : 11
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

17. A mixture contains alcohol and water in the ratio 4 : 3. If 5 litres of water is added to the mixture, the ratio becomes 4 : 5. The quantity of alcohol in the given mixture is
(1) 3 litres (2) 4 litres
(3) 15 litres (4) 10 litres
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

18. In two alloys A and B, the ratio of zinc to tin is 5 : 2 and 3 : 4 respectively. Seven kg of the alloy A and 21 kg of the alloy B are mixed together to form a new alloy. What will be the ratio of zinc and tin in the new alloy ?
(1) 2 : 1 (2) 1 : 2
(3) 2 : 3 (4) 1 : 1
(SSCCHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

19. Zinc and copper are in the ratio 5 : 3 in 400 gm of an alloy. How much of copper (in grams) should be added to make the ratio 5 : 4?

(1) 50 (2) 66
(3) 72 (4) 200

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

20. Two vessels A and B contain milk and water mixed in the ratio 8 : 5 and 5 : 2 respectively. The ratio in which these two mixtures be mixed to get a new mixture containing $69\frac{3}{13}\%$ milk is:

(1) 3 : 5 (2) 5 : 2
(3) 5 : 7 (4) 2 : 7

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

21. A mixture of 30 litres contain milk and water in the ratio of 7 : 3. How much water should be added to it so that the ratio of milk and water becomes 3 : 7 ?

(1) 40 litres (2) 49 litres
(3) 56 litres (4) 63 litres

(SSC CPO S.I. Exam. 07.09.2003)

22. A barrel contains a mixture of wine and water in the ratio 3 : 1. How much fraction of the mixture must be drawn off and substituted by water so that the ratio of wine and water in the resultant mixture in the barrel becomes 1 : 1 ?

(1) $\frac{1}{4}$ (2) $\frac{1}{3}$
(3) $\frac{3}{4}$ (4) $\frac{2}{3}$

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

23. There is 81 litres pure milk in a container. One-third of milk is replaced by water in the container. Again one-third of mixture is extracted and equal amount of water is added. What is the ratio of milk to water in the new mixture?

(1) 1 : 2 (2) 1 : 1
(3) 2 : 1 (4) 4 : 5

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

24. In 80 litres mixture of milk and water the ratio of amount of milk to that of amount of water is 7 : 3. In order to make this ratio 2 : 1, how many litres of water should be added ?

(1) 5 (2) 6
(3) 8 (4) 4

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

25. Vessels A and B contain mixtures of milk and water in the ratios 4 : 5 and 5 : 1 respectively. In what ratio should quantities of mixture be taken from A and B to form a mixture in which milk to water is in the ratio 5 : 4?

(1) 2 : 5 (2) 4 : 3
(3) 5 : 2 (4) 2 : 3

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

26. The milk and water in a mixture are in the ratio 7 : 5. When 15 litres of water are added to it, the ratio of milk and water in the new mixture becomes 7 : 8. The total quantity of water in the new mixture is

(1) 35 litres (2) 40 litres
(3) 60 litres (4) 96 litres

(SSC CPO S.I. Exam. 16.12.2007)

27. In a 729 litres mixture of milk and water, the ratio of milk to water is 7 : 2. To get a new mixture containing milk and water in the ratio 7 : 3, the amount of water to be added is

(1) 81 litres (2) 71 litres
(3) 56 litres (4) 50 litres

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

28. In 40 litres mixture of milk and water the ratio of milk to water is 7 : 1. In order to make the ratio of milk and water 3 : 1, the quantity of water (in litres) that should be added to the mixture will be

(1) 6 (2) $6\frac{1}{2}$
(3) $6\frac{2}{3}$ (4) $6\frac{3}{4}$

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

29. A jar contained a mixture of two liquids A and B in the ratio 4 : 1. When 10 litres of the mixture was taken out and 10 litres of liquid B was poured into the jar, this ratio became 2 : 3. The quantity of liquid A contained in the jar initially was

(1) 4 litres (2) 8 litres
(3) 16 litres (4) 40 litres

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

30. In a mixture of 75 litres, the ratio of milk to water is 2 : 1. The amount of water to be further added to the mixture so as to make the ratio of the milk to water 1 : 2 will be

(1) 45 litres (2) 60 litres
(3) 75 litres (4) 80 litres

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

31. A and B are two alloys of gold and copper prepared by mixing metals in the ratio 5 : 3 and 5 : 11 respectively. Equal quantities of these alloys are melted to form a third alloy C. The ratio of gold and copper in the alloy C is

(1) 25 : 33 (2) 33 : 25
(3) 15 : 17 (4) 17 : 15

(SSC CPO S.I. Exam. 09.11.2008)

32. A mixture contains wine and water in the ratio 3 : 2 and another mixutre contains them in the ratio 4 : 5. How many litres of the later must be mixed with 3 litres of the former so that the resulting mixture may contain equal quantities of wine and water ?

(1) $5\frac{2}{5}$ litres (2) $5\frac{2}{3}$ litres
(3) $4\frac{1}{2}$ litres (4) $3\frac{3}{4}$ litres

(SSC SAS Exam. 26.06.2010 (Paper-1)

33. The ratio of the volume of water and glycerine in 240cc of a mixture is 1 : 3. The quantity of water (in cc) that should be added to the mixture so that the new ratio of the volumes of water and glycerine becomes 2:3 is

(1) 55 cc (2) 60 cc
(3) 62.5 cc (4) 64 cc

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

34. The ratio of the quantities of an acid and water in a mixture is 1 : 3. If 5 litres of acid is further added to the mixture, the new ratio becomes 1 : 2. The quantity of new mixture (in litres) is

(1) 32 (2) 40
(3) 42 (4) 45

(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

35. In a mixture of 25 litres, the ratio of acid to water is 4 : 1. Another 3 litres of water is added to the mixture. The ratio of acid to water in the new mixture is
(1) 5 : 2 (2) 2 : 5
(3) 3 : 5 (4) 5 : 3
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

36. Two equal vessels are filled with the mixtures of water and milk in the ratio of 3:4 and 5:3 respectively. If the mixtures are poured into a third vessel, the ratio of water and milk in the third vessel will be
(1) 15 : 12 (2) 53 : 59
(3) 20 : 9 (4) 59 : 53
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

37. Two types of alloy possess gold and silver in the ratio of 7 : 22 and 21 :37. In what ratio should these alloys be mixed so as to have a new alloy in which gold and silver would exist in the ratio 25 : 62 ?
(1) 13 : 8 (2) 8 :13
(3) 13 :12 (4) 6 : 9
(SSC Data Entry Operator Exam. 31.08.2008)

38. In one glass, milk and water are mixed in the ratio 3 : 5 and in another glass they are mixed in the ratio 6 : 1. In what ratio should the contents of the two glasses be mixed together so that the new mixture contains milk and water in the ratio 1 : 1 ?
(1) 20 : 7 (2) 8 : 3
(3) 27 : 4 (4) 25 : 9
(SSC Data Entry Operator Exam. 02.08.2009)

39. In a mixture of 60 litres, the ratio of milk and water is 2 : 1. How much more water must be added to make its ratio 1 : 2 ?
(1) 40 litres (2) 52 litres
(3) 54 litres (4) 60 litres
(SSC CHSL DEO & LDC Exam. 27.11.2010)

40. Two vessels A and B contains acid and water in the ratio 4 : 3 and 5 : 3 respectively. Then the ratio in which these mixtures to be mixed to obtain a new mixture in vessel C containing acid and water in the ratio 3 : 2 is
(1) 5 : 8 (2) 7 : 8
(3) 7 : 5 (4) 4 : 7
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

41. Two containers have acid and water mixed respectively in the ratio 3 : 1 and 5 : 3. To get a new mixture with ratio of acid to water as 2 : 1, the two types have to be mixed in the ratio
(1) 1 : 2 (2) 2 : 1
(3) 2 : 3 (4) 3 : 2
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

42. Acid and water are mixed in a vessel A in the ratio of 5 : 2 and in the vessel B in the ratio 8 : 5. In what proportion should quantities be taken out from the two vessels so as to form a mixture in which the acid and water will be in the ratio of 9 : 4?
(1) 7: 2 (2) 2: 7
(3) 7: 4 (4) 2: 3
(SSCCHSL DEO & LDC Exam. 04.12.2011(Ist Sitting (East Zone)

43. The ratio of spirit and water in two mixturers of 20 litre and 36 litre is 3 : 7 and 7 : 5 respectively. Both the mixtures are mixed together. Now the ratio of the spirit and water in the new mixture is
(1) 25 : 29 (2) 9 : 10
(3) 27 : 29 (4) 27 : 31
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

44. Alcohol and water in two vessels A and B are in the ratio 5 : 3 and 5 : 4 respectively. In what ratio, the liquids in both the vessels be mixed to obtain a new mixture in vessel C in the ratio 7 : 5 ?
(1) 2 : 3 (2) 3 : 2
(3) 3 : 5 (4) 2 : 5
(SSC CHSL DEO & LDC Exam. 11.12.2011(IInd Sitting (East Zone)

45. Two vessels contain milk and water in the ratio 3 : 2 and 7 : 3. Find the ratio in which the contents of the two vessels have to be mixed to get a new mixture in which the ratio of milk and water is 2 : 1.
(1) 2 : 1 (2) 1 : 2
(3) 4 : 1 (4) 1 : 4
(SSC Graduate Level Tier-II Exam.16.09.2012)

46. In two types of stainless steel, the ratio of chromium and steel are 2 : 11 and 5 : 21 respectively. In what proportion should the two types be mixed so that the ratio of chromium to steel in the mixed type becomes 7 : 32 ?
(1) 2 : 3 (2) 3 : 4
(3) 1 : 2 (4) 1 : 3
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

47. A and B are two alloys of gold and copper in the ratio 7 : 2 and 7:11 respectively. If equal quantities of these two alloys are melted to form a new alloy C, then the ratio of gold and copper in C is
(1) 6 : 5 (2) 9 : 4
(3) 12:7 (4) 7:5
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

48. A Can contains a mixture of two liquids A and B in the ratio 7:5. When 9 litres of mixture are drained off and the Can is filled with B, the ratio of A and B becomes 7 : 9. How many litres of liquid A was contained by the Can initially ?
(1) 10 litres (2) 20 litres
(3) 21 litres (4) 25 litres
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

49. The ratio of milk and water in mixtures of four containers are 5 : 3, 2 : 1, 3 : 2 and 7 : 4 respectively. In which container is the quantity of milk, relative to water, minimum ?
(1) First (2) Second
(3) Third (4) Fourth
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

50. An alloy contains copper, zinc and nickel in the ratio of 5 : 3 : 2. The quantity of nickel (in kg) that must be added to 100 kg of this alloy to have the new ratio 5 : 3 : 3 is
(1) 8 (2) 10
(3) 12 (4) 15
(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

51. In an alloy, zinc and copper are in the ratio 1 : 2. In the second alloy, the same elements are in the ratio 2 : 3. If these two alloys be mixed to form a new alloy in which two elements are in the ratio 5 : 8, the ratio of these two alloys in the new alloy is
(1) 3 : 10 (2) 3 : 7
(3) 10 : 3 (4) 7 : 3
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

52. A liquid 'P' is $1\frac{3}{7}$ times as heavy as water and water is $1\frac{2}{5}$ times as heavy as another liquid 'Q'. The amount of liquid 'P' that must be added to 7 litres of the liquid 'Q' so that the mixture may weigh as much as an equal volume of water, will be

(1) 7 litres (2) $5\frac{1}{6}$ litres

(3) 5 litres (4) $4\frac{2}{3}$ litres

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

53. The milk and water in two vessels A and B are in the ratio 4 : 3 and 2 : 3 respectively. In what ratio, the liquids in both the vessels be mixed to obtain a new mixture in vessel C containing half milk and half water ?

(1) 7 : 5 (2) 5 : 2
(3) 3 : 11 (4) 1 : 2

(SSC CGL Tier-I Exam. 19.10.2014)

54. There are two containers of equal capacity. The ratio of milk to water in the first container is 3 : 1, in the second container 5 : 2. If they are mixed up, the ratio of milk to water in the mixture will be

(1) 28 : 41 (2) 41 : 28
(3) 15 : 41 (4) 41 : 15

(SSC CGL Tier-II Exam. 21.09.2014)

55. Two equal glasses filled with alcohol and water in the proportions 2 : 1 and 3 : 2 are emptied into a third glass. The proportion of alcohol and water in the third glass will be

(1) 13 : 17 (2) 19 : 17
(3) 13 : 11 (4) 19 : 11

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

56. A vessel full of pure acid contains 10 litres of it, of which 2 litres are withdrawn. The vessel is then filled with water. Next 2 litres of the mixture are withdrawn, and again the vessel is filled up with water. The ratio of the acid left in the vessel with that of the original quantity is

(1) 1 : 5 (2) 4 : 5
(3) 4 : 25 (4) 16 : 25

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

57. Gold is 19 times as heavy as water and copper is 9 times as heavy as water. In what ratio should these be mixed to get an alloy 15 times as heavy as water ?

(1) 1 : 1 (2) 1 : 2
(3) 2 : 3 (4) 3 : 2

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

58. 80 litres of a mixture contains milk and water in the ratio of 27 : 5. How much more water is to be added to get a mixture containing milk and water in the ratio of 3 : 1 ?

(1) 5 litres (2) 10 litres
(3) 15 litres (4) 20 litres

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

59. The ratio of two liquids in a mixture is 3 : 5 and that in another mixture is 6 : 1. The ratio in which these two mixtures should be mixed so as to make the ratio of the liquids 7 : 3 is

(1) 44 : 71 (2) 44 : 81

(3) 44 : 91 (4) 44 : 61

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

60. A vessel contains 20 litres of acid. 4 litres of acid is taken out of the vessel and replaced by the same quantity of water. Next 4 litres of the mixture are withdrawn, and again the vessel is filled with the same quantity of acid left in the vessel with the quantity of acid initially in the vessel is

(1) 4 : 5 (2) 4 : 25

(3) 16 : 25 (4) 1 : 5

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

61. In two blends of mixed tea, the ratios of Darjeeling and Assam tea are 4 : 7 and 2 : 5. The ratio in which these two blends should be mixed to get the ratio of Darjeeling and Assam tea in the new mixture as 6 : 13 is

(1) 22 : 35 (2) 26 : 35

(3) 35 : 78 (4) 13 : 22

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

62. In a mixture of three varieties of tea, the ratio of their weights is 4 : 5 : 8. If 5 kg tea of the first variety, 10 kg tea of the second variety and some quantity of tea of the third variety are added to the mixture, the ratio of the weights of three varieties of tea becomes as 5 : 7 : 9. In the final mixture, the quantity (in kg) of the third variety of tea was

(1) 42 (2) 45

(3) 48 (4) 40

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

63. Three vessels whose capacities are 3 : 2 : 1 are completely filled with milk mixed with water. The ratio of milk and water in the mixture of vessels are 5 : 2, 4 : 1 and 4 : 1 respectively. Taking $\frac{1}{3}$ of first, $\frac{1}{2}$ of second and $\frac{1}{7}$ of third mixtures, a new mixture kept in a new vessel is prepared. The percentage of water in the new mixture is

(1) 28 (2) 32
(3) 30 (4) 24

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

64. 729 ml of a mixture contains milk and water in the ratio 7 : 2. How much more water is to be added to get a new mixture containing milk and water in the ratio 7 : 3 ?

(1) 81 ml (2) 60 ml
(3) 71 ml (4) 52 ml

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

65. Two alloys contain tin and iron in the ratio of 1 : 2 and 2 : 3. If the two alloys are mixed in the proportion of 3 : 4 respectively (by weight), the ratio of tin and iron in the newly formed alloy is :

(1) 10 : 21 (2) 13 : 22
(3) 14 : 25 (4) 12 : 23

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

66. Three utensils contain equal quantity of mixtures of milk and water in the ratio 6 : 1, 5 : 2 and 3 : 1 respectively. If all the solutions are mixed together, the ratio of milk and water in the final mixture is
(1) 65 : 28 (2) 65 : 19
(3) 19 : 65 (4) 19 : 28
(SSC CGL Tier-I Re-Exam, 30.08.2015)

67. 60 kg of an alloy A is mixed with 100 kg of alloy B. If alloy A has lead and tin in the ratio 3 : 2 and alloy B has tin and copper in the ratio 1 : 4, the amount of tin in the new alloy is
(1) 53 kg (2) 44 kg
(3) 80 kg (4) 24 kg
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

68. Three glasses of equal volume contains acid mixed with water. The ratios of acid and water are 2 : 3, 3 : 4 and 4 : 5 respectively. Contents of these glasses are poured in a large vessel. The ratio of acid and water in the large vessel is
(1) 411 : 540 (2) 401 : 544
(3) 417 : 564 (4) 407 : 560
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

69. Two blends of a commodity costing Rs. 35 and Rs. 40 per kg. respectively are mixed in the ratio 2 : 3 by weight. If one–fifth of the mixture is sold at Rs. 46 per kg and the remaining at the rate of Rs. 55 per kg. the profit percent is
(1) 50 (2) 30
(3) 40 (4) 20
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

70. 20 litres of a mixture contains milk and water in the ratio 3 : 1. Then the amount of milk to be added to the mixture so as to have milk and water in ratio 4 : 1 is :
(1) 7 litres (2) 4 litres
(3) 5 litres (4) 6 litres
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

71. A mixture contains milk and water in the ratio 5 : 1. On adding 5 litres of water, the ratio of milk and water becomes 5 : 2. The quantity of milk in the mixture is :
(1) 25 litres (2) 32.5 litres
(3) 16 litres (4) 22.75 litres
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

72. A vessel contains 60 litres of milk. 12 litres of milk is taken out from it and replaced by water. Then again from mixture, 12 litres is again taken out and replaced by water. The ratio of milk and water in the resultant mixture is :
(1) 15:10 (2) 16:9
(3) 9:5 (4) 16:10
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

73. A mixture contains spirit and water in the ratio of 3 : 2. If it contains 3 litres more spirit than water, the quantity of spirit in the mixture is
(1) 12 litres (2) 10 litres
(3) 9 litres (4) 8 litres
(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

74. 49 kg of blended tea contains Assam and Darjeeling tea in the ratio 5 : 2. Then the quantity of Darjeeling tea to be added to the mixture to make the ratio of Assam to Darjeeling tea 2 : 1 is
(1) 4.5 kg (2) 3.5 kg
(3) 5 kg (4) 6 kg
(SSC CGL Tier-II Online Exam.01.12.2016)

75. Three containers have their volumes in the ratio 3 : 4 : 5. They are full of mixtures of milk and water. The mixtures contain milk and water in the ratio of (4 :1), (3 : 1) and (5 : 2) respectively. The contents of all these three containers are poured into a fourth container. The ratio of milk and water in the fourth container is
(1) 4 : 1 (2) 151 : 48
(3) 157 : 53 (4) 5 : 2
(SSC CGL Tier-II Online Exam.01.12.2016)

76. In what proportion must a grocer mix sugar at Rs.12 a kg and Rs.7 a kg so as to make a mixture worth Rs. 8 a kg.?
(1) 7 : 12 (2) 1 : 4
(3) 2 : 3 (4) 12 : 7
(SSC CGL Tier-II Online Exam.01.12.2016)

77. A canister holds 36 litres of mixture of milk and water in the ratio 3 : 1. 15 litres of milk is added to the canister. The new ratio of the mixture is :
(1) 12 : 5 (2) 14 : 3
(3) 7 : 4 (4) 9 : 4
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

78. In a mixture of 25 litres, the ratio of milk to water is 4 : 1. Another 3 litres of water is added to the mixture. The ratio of milk to water in the new mixture is
(1) 5 : 1 (2) 5 : 2
(3) 5 : 3 (4) 5 : 4
(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

79. Three containers whose volumes are in the ratio of 2 : 3 : 4 are full of mixture of spirit and water. In the 1st container, the ratio of spirit and water is 4 : 1, in the 2nd container the ratio is 11 : 4 and in the 3rd container ratio is 7 : 3. All the three mixtures are mixed in a big container. The ratio of spirit and water in the resultant mixture is :
(1) 4 : 9 (2) 11 : 4
(3) 5 : 10 (4) 9 : 5
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

80. Two bottles contain acid and water in the ratio 2 : 3 and 1 : 2 respectively. These are mixed in the ratio 1 : 3. What is the ratio of acid and water in the new mixture ?
(1) 7:13 (2) 11:57
(3) 23:37 (4) 1:3
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

81. In two types of brass, the ratios of Copper to Zinc are 8:3 and 15:7 respectively. If the two types of brass be melted and mixed in the ratio 5:2 a new type of brass is obtained. The ratio of Copper to Zinc in this new type of brass is
(1) 3:2 (2) 2:3
(3) 3:4 (4) 5:2
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

82. There are three bottles of mixture of syrup and water of ratios 2 : 3, 3 : 4 and 7 : 5. 10 litres of the first and 21 litres of the second bottles are taken. How much quantity from third bottle is to be taken so that final mixture from three bottles will be of ratios 1 : 1.
(1) 25 litres (2) 20 litres
(3) 35 litres (4) 30 litres
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–IX

1. The income of A, B and C are in the ratio 3 : 7 : 4 and their expenses in the ratio 4 : 3 : 5. If A saves ₹ 300 out of an income of ₹ 2,400, the savings of B and C are :
(1) ₹ 4025 and ₹ 575
(2) ₹ 1575 and ₹ 2.625
(3) ₹ 2750 and ₹ 1.525
(4) ₹ 3725 and ₹ 1.525
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. Between two consecutive years my income are in the ratio of 2 : 3 and expenses in the ratio 5 : 9. If my income in the second year is ₹ 45000 and my expenses in the first year is ₹ 25000 my total savings for the two years is :
(1) Nil (2) ₹ 15000
(3) ₹ 10000 (4) ₹ 5000
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. A and B have monthly incomes in the ratio 5 : 6 and monthly expenditures in the ratio 3 : 4. If they save ₹ 1800 and ₹ 1600 respectively, find the monthly income of B :
(1) ₹ 3400 (2) ₹ 2700
(3) ₹ 1720 (4) ₹ 7200
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. The ratio of income of two persons is 5 : 3 and that of their expenditures is 9 : 5. Find the income of each person, if they save ₹ 1,300 and ₹ 900 respectively.
(1) ₹ 4,000, ₹ 2,400
(2) ₹ 3,000, ₹ 1,800
(3) ₹ 5,000, ₹ 3,000
(4) ₹ 4,500 ₹ 2,700
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. The annual income of A and B are in the ratio 4 : 3 and the ratio of their expenditures is 3 : 2. If each of them saves ₹ 600 in the year, the annual income of A is
(1) ₹ 4800 (2) ₹ 1800
(3) ₹ 1200 (4) ₹ 2400
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & SSC CPO SI 03.09.2006, 26.05.2005 & SSC MT (Non- Technical) Exam. 27.02.2011)

6. The income of A, B and C are in the ratio 7 : 9 : 12 and their spendings are in the ratio 8 : 9 : 15. If A saves $\frac{1}{4}$th of his income, then the savings of A, B and C are in the ratio of :
(1) 56 : 99 : 69 (2) 69 : 56 : 99
(3) 99 : 56 : 69 (4) 99 : 69 : 56
(SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting) & SSC CGL Tier-I Exam. 26.06.2011(IInd sitting)

7. The ratio of income of P and Q is 3 : 4 and the ratio of their expenditures is 2 : 3. If both of them save ₹ 6000, the income of P is
(1) ₹ 20000 (2) ₹ 12000
(3) ₹ 18000 (4) ₹ 24000
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

8. A man spends a part of his monthly income and saves a part of it. The ratio of his expenditure to his saving is 26 : 3. If his monthly income is ₹ 7250, what is the amount of his monthly savings ?
(1) ₹ 350 (2) ₹ 290
(3) ₹ 750 (4) ₹ 780
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

9. The monthly salaries of A, B and C are in the ratio 2 : 3 : 5. If C's monthly salary is ₹ 12,000 more than that of A, then B's annual salary is
(1) ₹ 1,20,000 (2) ₹ 1,44,000
(3) ₹ 1,80,000 (4) ₹ 2,40,000
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

10. The ratio of income of two persons is 5 : 3 and that of their expenditures is 9 : 5. If they save ₹ 2600 and ₹1800 respectively, their incomes are :
(1) ₹ 8000; ₹ 4800
(2) ₹ 6000; ₹ 3600
(3) ₹ 10000; ₹ 6000
(4) ₹ 9000; ₹ 5400
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

11. The monthly income of two persons are in the ratio 2 : 3 and their monthly expenses are in the ratio 5 : 9. If each of them saves ₹ 600 per month, then their monthly incomes are
(1) ₹ 1,500; ₹ 2,250
(2) ₹ 1,200; ₹ 1,800
(3) ₹ 1,600; ₹ 2,400
(4) ₹ 1,400; ₹ 2,100
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

12. A person bought some rice and wheat for ₹ 380. The ratio of weight of rice and wheat is 4 : 3 and the price of equal amount of rice and wheat is in the ratio 5 : 6. The rice was bought of worth
(1) ₹ 380 (2) ₹ 300
(3) ₹ 200 (4) ₹ 180
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

13. The ratio of incomes of A and B is 5 : 6. If A gets ₹ 1,100 less than B, their total income (in rupees) is
(1) 9,900 (2) 12,100
(3) 14,400 (4) 10,000
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

14. The income of A and B are in the ratio 5 : 3. The expenses of A, B and C are in the ratio 8 : 5 : 2. If C spends ₹ 2000 and B saves ₹ 700, then A saves
(1) ₹ 1500 (2) ₹ 1000
(3) ₹ 500 (4) ₹ 250
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

15. The ratio of income and expenditure of a person is 11 : 10. If he saves ₹ 9,000 per annum, his monthly income is
(1) ₹ 8,000 (2) ₹ 8,800
(3) ₹ 8,500 (4) ₹ 8,250
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

16. The ratio of the income to the expenditure of a family is 10 : 7. If the family's expenses are ₹10,500, then savings of the family is
(1) ₹ 4, 500 (2) ₹ 10, 000
(3) ₹ 4, 000 (4) ₹ 5, 000
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

17. Monthly income of A and B are in the ratio of 4 : 3 and their expenses bear the ratio 3 : 2. Each of them saves ₹ 6,000 at the end of the month, then the monthly income of A is
(1) ₹ 12,000 (2) ₹ 24,000
(3) ₹ 30,000 (4) ₹ 60,000
(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

18. The ratio of weekly income of A and B is 9 : 7 and the ratio of their expenditures is 4 : 3. If each saves ₹ 200 per week, then the sum of their weekly income is
(1) ₹ 3,600 (2) ₹ 3,200
(3) ₹ 4,800 (4) ₹ 5,600
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

19. The ratio of the incomes of A and B as well as of B and C is 3 : 2. If one third of A's income exceeds one fourth of C's income by ₹1000, what is B's income in ₹ ?
(1) 3000 (2) 2500
(3) 3500 (4) 4000
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

20. The income of A and B are in the ratio 2 : 3 and their expenditures are in the ratio 1 : 2. If each saves ₹24,000, find A's income.
(1) ₹ 24,000 (2) ₹ 72,000
(3) ₹ 19,200 (4) ₹ 48,000
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

21. Incomes of A and B are in the ratio 4 : 3 and their annual expenses in the ratio 3 : 2. If each saves ₹ 60,000 at the end of the year, the annual income of A is
(1) ₹ 1,20,000 (2) ₹ 1,50,000
(3) ₹ 2,40,000 (4) ₹ 3,60,000
(SSC Data Entry Operator Exam. 02.08.2009)

22. Ratio between the monthly incomes of A and B is 9 : 8 and the ratio between their expenditures is 8 : 7. If they save ₹ 500 each, find A's monthly income.
(1) ₹ 3,500 (2) ₹ 4,000
(3) ₹ 4,500 (4) ₹ 5,000
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

23. If the annual income of A, B and C are in the ratio 1 : 3 : 7 and the total annual income of A and C is₹ 8,00,000, then the monthly salary of B (in ₹) is
(1) 20,000 (2) 25,000
(3) 30,000 (4) 15,000
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

24. Annual incomes of Amit and Veeri are in the ratio 3:2, while the ratio of their expenditure is 5 : 3. If at the end of the year each saves ₹ 1,000, the annual income of Amit is
(1) ₹ 9,000 (2) ₹ 8,000
(3) ₹ 7,000 (4) ₹ 6,000
(SSC Graduate Level Tier-II Exam.16.09.2012)

25. The ratio of monthly incomes of A, B is 6 : 5 and their monthly expenditures are in the ratio 4 : 3. If each of them saves ₹ 400 per month, find the sum of their monthly incomes.
(1) 2300 (2) 2400
(3) 2200 (4) 2500
(SSC Graduate Level Tier-I Exam. 21.04.2013)

26. Incomes of x and y are in the ratio 4:3. Their expenditures are in the ratio 12:7. Both save Rs. 3200 at the end of the month, then the income of x is
(1) ₹ 8000 (2) ₹ 6000
(3) ₹ 2000 (4) ₹ 4000
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

27. The incomes of A and B are in the ratio 3 : 2 and their expenditures are in the ratio 5 : 3. If each saves Rs. 1000, then A's income is
(1) Rs. 6000 (2) Rs. 4000
(3) Rs. 2000 (4) Rs. 5000
(SSC CGL Tier-I Re-Exam, 30.08.2015)

28. A and B have their monthly incomes in the ratio 8 : 5, while their monthly expenditures are in the ratio 5 : 3. If they have saved Rs. 12,000 and Rs. 10,000 monthly respectively, then the difference in their monthly incomes is
(1) Rs. 52,000(2) Rs. 42,000
(3) Rs. 44,000(4) Rs. 46,000
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

29. A man spends a part of his monthly income and saves the rest. The ratio of his expenditure to the savings is 61 : 6. If his monthly income is Rs. 8710, the amount of his monthly savings is
(1) Rs. 870 (2) Rs. 690
(3) Rs. 980 (4) Rs. 780
(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

30. A's income is Rs. 140 more than B's income and C's income is Rs. 80 more than D's. If the ratio of A's and C's incomes is 2 : 3 and the ratio of B's and D's incomes is 1 : 2, then the incomes of A, B, C and D are respectively
(1) Rs. 260, Rs. 120, Rs. 320 and Rs. 240
(2) Rs. 300, Rs. 160, Rs. 600 and Rs. 520
(3) Rs. 400, Rs. 260, Rs. 600 and Rs. 520
(4) Rs. 320, Rs. 180, Rs. 480 and Rs. 360
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–X

1. ₹ 180 contained in a box consists of one rupee, 50 paise and 25 paise coins in the ratio 2 : 3 : 4. What is the number of 50 paise coins?
(1) 60 (2) 120
(3) 150 (4) 180
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. If 378 coins consist of rupees, 50 paise and 25 paise coins, whose values are in the ratio of 13 : 11 : 7, the number of 50 paise coins will be :
(1) 132 (2) 128
(3) 136 (4) 133
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

3. A bag contains ₹ 90 in coins of denominations of 50 paise, 25 paise and 10 paise. If coins of 50 paise, 25 paise and 10 paise are in the ratio 2 : 3 : 5, then the number of 25 paise coins in the bag is
(1) 80 (2) 120
(3) 100 (4) 135
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

4. There are ₹ 225 consisting of one rupee, 50 paise and 25 paise coins. The ratio of their numbers in that order is 8 : 5 : 3. The number of one-rupee coins is :
(1) 80 (2) 112
(3) 160 (4) 172
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

5. A box contains 1-rupee, 50-paise and 25-paise coins in the ratio 8 : 5 : 3. If the total amount of money in the box is ₹ 112.50, the number of 50-paise coins is
(1) 80 (2) 50
(3) 30 (4) 42
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

6. In a bag, there are three types of coins — 1-rupee, 50 paise and 25-paise in the ratio of 3 : 8 : 20. Their total value is ₹ 372. The total number of coins is
(1) 1200 (2) 961
(3) 744 (4) 612
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

7. A box has 210 coins of denominations one-rupee and fifty paise only. The ratio of their respective values is 13 : 11. The number of one-rupee coins is

(1) 65 (2) 66
(3) 77 (4) 78

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

8. A boy has a few coins of denominations 50 paise, 25 paise and 10 paise in the ratio 1 : 2 : 3. If the total amount of the coins is ₹ 6.50, the number of 10 paise coins is

(1) 5 (2) 10
(3) 15 (4) 20

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

9. A man has in all ₹ 640 in the denominations of one-rupee, five-rupee and ten-rupee notes. The number of each type of notes are equal. What is the total number of notes he has ?

(1) 150 (2) 120
(3) 100 (4) 90

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

10. A bag contains three types of coins-rupee-coins. 50p-coins and 25 p-coins totalling 175 coins. If the total value of the coins of each kind be the same, the total amount in the bag is

(1) ₹ 75 (2) ₹ 175
(3) ₹ 300 (4) ₹ 126

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

11. There are 480 coins in half rupees, quarter rupees and 10 paise coins and their values are proportional to 5 : 3 : 1. The number of coins in each case are

(1) 100, 200, 180
(2) 50, 30, 400
(3) 150, 180, 150
(4) 300, 90, 90

(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

12. A box contains 420 coins in rupee, 50 paise and 20 paise coins. The ratio of their rupee values being 13 : 11 : 7. The number of 50 paise coins is

(1) 42 (2) 78
(3) 66 (4) 132

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

13. A box contains ₹ 56 in the form of coins of one rupee, 50 paise and 25 paise. The number of 50 paise coins is double the number of 25 paise coins and four times the number of one rupee coins. How many 50 paise coins are there in the box?

(1) 52 (2) 64
(3) 32 (4) 16

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

14. The salaries of A, B and C are in the ratio 1 : 3 : 4. If the salaries are increased by 5%, 10% and 15% respectively, then the increased salaries will be in the ratio

(1) 20 : 66 : 95 (2) 21 : 66 : 95
(3) 21 : 66 : 92 (4) 19 : 66 : 92

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

15. Three persons A, B, C whose salaries together amount to ₹ 72000 spend 80, 85 and 75 percent of their salaries respectively. If their savings are in the ratio 8 : 9 : 20, then A's salary is

(1) ₹ 20,000 (2) ₹ 16,000
(3) ₹ 22,000 (4) ₹ 18,000

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

16. A box contains 280 coins of one-rupee, 50-paise and 25-paise. The values of each kind of the coins are in the ratio of 8 : 4 : 3. Then the number of 50-paise coins is

(1) 70 (2) 60
(3) 80 (4) 90

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

TYPE–XI

1. By mistake, instead of dividing ₹ 117 among A, B and C in the ratio $\frac{1}{2}:\frac{1}{3}:\frac{1}{4}$ it was divided in the ratio of 2 : 3 : 4. Who gains the most and by how much?

(1) A, ₹ 28 (2) B, ₹ 3
(3) C, ₹ 20 (4) C, ₹ 25

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If a sum of money is to be divided among A, B, C such that A's share is equal to twice B's share and B's share is 4 times C's share, then their shares are in the ratio:

(1) 1 : 2 : 4 (2) 1 : 4 : 1
(3) 8 : 4 : 1 (4) 2 : 4 : 1

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. Divide ₹ 7,500 among A, B and C such that A's share to B's share is in ratio 5 : 2 and B's share to C's share is in the ratio 7 : 13. How much will B receive?

(1) ₹ 1,400 (2) ₹ 3,500
(3) ₹ 2,600 (4) ₹ 7,000

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. A sum of ₹ 1240 is distributed among A, B and C such that the ratio of amount received by A and B is 6 : 5 and that of B and C is 10 : 9 repectively. Find the share of C.

(1) ₹ 480 (2) ₹ 360
(3) ₹ 400 (4) ₹ 630

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

5. ₹ 3400 is divided among A, B, C, D in such a way that the share of A and B, B and C, C and D may be as 2 : 3, 4 : 3 and 2 : 3 respectively. The sum of shares of B and D is

(1) ₹ 2040 (2) ₹ 1680
(3) ₹ 2000 (4) ₹ 1720

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

6. ₹ 750 are divided among A, B and C in such a manner that A : B is 5 : 2 and B : C is 7 : 13. What is A's share ?

(1) ₹ 350 (2) ₹ 260
(3) ₹ 140 (4) ₹ 250

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

7. ₹ 68000 is divided among A, B and C in the ratio of $\frac{1}{2} : \frac{1}{4} : \frac{5}{16}$. The difference of the greatest and the smallest part is :
(1) ₹ 6000 (2) ₹ 14440
(3) ₹ 9200 (4) ₹ 16000
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

8. ₹ 6,400 are divided among three workers in the ratio $\frac{3}{5} : 2 : \frac{5}{3}$. The share (in rupees) of the second worker is
(1) 3,200 (2) 3,840
(3) 2,560 (4) 3,000
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

9. Divide ₹ 1250 among A, B, C, so that A gets $\frac{2}{9}$ of B's share and C gets $\frac{3}{4}$ of A's share.
(1) ₹ 200, ₹ 800, ₹ 250
(2) ₹ 200, ₹ 900, ₹ 150
(3) ₹ 150, ₹ 800, ₹ 300
(4) ₹ 200, ₹ 900, ₹ 75
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

10. A sum of ₹ 9000 is to be distributed among A, B and C in the ratio 4 : 5 : 6. What will be the difference between A's and C's shares?
(1) ₹ 600 (2) ₹ 1000
(3) ₹ 900 (4) ₹ 1200
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

11. A sum of ₹ 370 is to be divided among A, B and C such that $\frac{\text{A's Share}}{\text{B's Share}} = \frac{\text{B's Share}}{\text{C's Share}} = \frac{3}{4}$, A's share (in rupees) is
(1) 240 (2) 120
(3) 100 (4) 90
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

12. An amount of money is to be distributed among P, Q and R in the ratio of 2 : 7 : 9. The total of P's and Q's share is equal to R's share. What is the difference between the shares of P and Q ?
(1) ₹ 5000 (2) ₹ 7500
(3) ₹ 9000
(4) Information inadequate
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

13. ₹ 2010 are to be divided among A, B and C in such a way that if A gets ₹ 5 then B must get Rs. 12 and if B gets ₹ 4 then C must get ₹ 5.50. The share of C will exceed that of B by
(1) ₹ 620 (2) ₹ 430
(3) ₹ 360 (4) ₹ 270
(SSC CPO S.I. Exam. 16.12.2007)

14. ₹ 600 are divided among A, B and C so that ₹ 40 more than $\frac{2}{5}$ of A's share, ₹ 20 more than $\frac{2}{7}$ of B's share and ₹ 10 more than $\frac{9}{17}$ of C's share are all equal. A's share is
(1) ₹ 180 (2) ₹ 160
(3) ₹ 150 (4) ₹ 140
(SSC SAS Exam. 26.06.2010 (Paper-1)

15. A sum of ₹ 86, 700 is to be divided among A, B and C in such a manner that for every rupee that A gets, B gets 90 paise and for every rupee that B gets, C gets 100 paise. B's share will be
(1) ₹ 26, 010 (2) ₹ 27,000
(3) ₹ 28,000 (4) ₹ 28, 090
(SSC Data Entry Operator Exam. 31.08.2008)

16. A sum of ₹ 7,000 is divided among A, B, C in such a way that the shares of A and B are in the ratio 2 : 3 and those of B and C are in the ratio 4 : 5. The share of B is
(1) ₹ 2,400 (2) ₹ 3,000
(3) ₹ 1,600 (4) ₹ 2,000
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

17. ₹ 180 are to be divided among 66 persons (men and women). The ratio of the total amount of money received by men and women is 5 : 4. But the ratio of the money received by each man and woman is 3 : 2. The number of men is
(1) 20 (2) 24
(3) 30 (4) 36

18. ₹ 738 is divided among A, B, C so that their shares are in the ratio of 2 : 3 : 4. B's share is
(1) ₹ 328 (2) ₹ 246
(3) ₹ 264 (4) ₹ 164
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

19. ₹ 1740 is divided among A, B, and C such that 0.5 of A = ₹ 0.6 of B = ₹ 0.75 of C. Then C will get
(1) ₹ 580 (2) ₹ 696
(3) ₹ 348 (4) ₹ 464
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

20. A certain amount of money is divided among x, y and z. If x receives 25% more than y and y receives 25% less than z, then $x : y : z$ is equal to
(1) 14 : 12 : 13
(2) 15 : 12 : 16
(3) 10 : 9 : 12
(4) 12 : 10 : 11
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

21. A sum of ₹ 53 is divided among A, B and C in such a way that A gets ₹ 7 more than what B gets and B gets ₹ 8 more than what C gets. The ratio of their share is
(1) 16 : 9 : 18 (2) 25 : 18 : 10
(3) 18 : 25 : 10 (4) 15 : 8 : 30
(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

22. ₹ 700 is divided among A, B, C in such a way that the ratio of the amount of A and B is 2 : 3 and that of B and C is 4 : 5. Find the amount (in ₹) each received, in the order A, B, C.
(1) 150, 250, 300
(2) 160, 240, 300
(3) 150, 250, 290
(4) 150, 240, 310
(SSC Graduate Level Tier-I Exam. 21.04.2013)

23. Divide ₹ 2,600 among A, B,C in the ratio $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$. Find the share of each.
(1) ₹ 1,200,₹ 600,₹ 800
(2) ₹ 1,200,₹ 800,₹ 600
(3) ₹ 600,₹ 800,₹ 1,200
(4) ₹ 800,₹ 600,₹ 1,200
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

24. A sum of ₹ 300 is divided among P, Q and R in such a way that Q gets ₹ 30 more than P and R gets ₹ 60 more than Q. The ratio of their share is
(1) 5 : 3 : 2 (2) 2 : 3 : 5
(3) 3 : 2 : 5 (4) 2 : 5 : 3
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

25. ₹ 900 is divided among A, B, C; the division is such that $\frac{1}{2}$ of A's money = $\frac{1}{3}$ of B's money = $\frac{1}{4}$ of C's money. Find the amount (in ₹) received by A, B, C.
(1) 300, 400, 200
(2) 350, 450, 100
(3) 200, 300, 400
(4) 400, 150, 350
(SSC Graduate Level Tier-II Exam. 29.09.2013)

26. If ₹ 126.50 is divided among A, B and C in the ratio of 2 : 5 : 4, the share of B exceeds that of A by
(1) ₹ 36.50 (2) ₹ 35.50
(3) ₹ 34.50 (4) ₹ 33.50
(SSC Graduate Level Tier-II Exam. 29.09.2013)

27. A sum of ₹ 76 is divided among A, B and C in such a way that A gets ₹ 7 more than that what B gets and B gets ₹ 6 more than what C gets. The ratio of their shares is
(1) 19 : 24 : 33 (2) 32 : 25 : 19
(3) 32 : 24 : 20 (4) 19 : 25 : 33
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

28. ₹ 3,000 is divided between A, B and C, so that A receives $\frac{1}{3}$ as much as B and C together receive and B receives $\frac{2}{3}$ as much as A and C together receive. Then the share of C is
(1) ₹ 600 (2) ₹ 525
(3) ₹ 1,625 (4) ₹ 1,050
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

29. ₹ 555 was to be divided among A, B and C in the ratio of $\frac{1}{4}:\frac{1}{5}:\frac{1}{6}$. But by mistake it was divided in the ratio of 4 : 5 : 6. The amount in excess received by C was
(1) ₹ 72 (2) ₹ 75
(3) ₹ 22 (4) ₹ 52
(SSC CGL Tier-I Exam. 26.10.2014)

30. A man divides his property so that his son's share to his wife's and wife's share to his daughter's are both as in the ratio 3 : 1. If the daughter gets ₹ 10,000 less than son, the value (in rupees) of the whole property is
(1) ₹ 16,250 (2) ₹ 16,000
(3) ₹ 18,250 (4) ₹ 17,000
(SSC CGL Tier-II Exam. 21.09.2014)

31. A sum of ₹ 730 was divided among A, B and C in such a way that if A gets ₹ 3, then B gets ₹ 4 and if B gets ₹ 3.50 then C gets ₹ 3. The share of B exceeds that of C by
(1) ₹ 30 (2) ₹ 40
(3) ₹ 70 (4) ₹ 210
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

32. A sum of money is divided among A, B, C and D in the proportion of 7 : 6 : 3 : 5. If B gets ₹ 270 more than C, then share of D is
(1) ₹ 250 (2) ₹ 350
(3) ₹ 450 (4) ₹ 455
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

33. In a partnership business, B's capital was half of A's. If after 8 months, B withdrew half of his capital and after 2 months more A withdrew $\frac{1}{4}$ th of his capital, then the profit ratio of A and B will be
(1) 5 : 2 (2) 10 : 23
(3) 2 : 5 (4) 23 : 10
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

34. A and B invest in the ratio 3 : 5. After 6 months, C joins the business investing an amount equal to B's. At the end of the year what will be the ratio of their profits ?
(1) 6 : 10 : 5 (2) 3 : 5 : 2
(3) 8 : 10 : 5 (4) 3 : 5 : 5
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

35. A and B entered into a partnership investing Rs 16000 and Rs. 12000 respectively. After 3 months A withdrew Rs. 5000 while B invested Rs. 5000 more. After 3 more months C joins the business with a capital of Rs 21000. The share of B exceeds that of C, out of a total profit of Rs. 26400 after one year by
(1) Rs. 2400 (2) Rs. 1200
(3) Rs. 3600 (4) Rs. 4800
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

36. In a business A and C invested amounts in the ratio 2 : 1, whereas A and B invested amounts in the ratio 3 : 2. If their annual profit be Rs. 157300, then B's share in the profit is
(1) Rs. 24200 (2) Rs. 48000
(3) Rs. 36300 (4) Rs. 48400
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

37. An amount of Rs. 380 is to be divided among 5 men, 8 boys and 4 women such that the ratio of amount received by the three is in the ratio of 8: 4: 7. What is the share of a woman?
(1) Rs. 35 (2) Rs. 36.5
(3) Rs. 40 (4) Rs. 32.8
(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

38. A certain sum of money was divided between A, B and C in the ratio 5 : 6 : 9. If A received Rs. 450, the sum divided was
(1) Rs. 2000 (2) Rs. 1800
(3) Rs. 2250 (4) Rs. 1000
(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

39. Rs. 490 is divided among A, B and C such that A's share is half that of B's and thrice that of C's. What is C's share ?
(1) Rs. 49 (2) Rs. 147
(3) Rs. 294 (4) Rs. 245
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

40. A profit of Rs. 960 is divided between A and B in the ratio $\frac{1}{3}:\frac{1}{2}$. The difference of their profits is :
(1) Rs. 120 (2) Rs. 160
(3) Rs. 180 (4) Rs. 240
(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

41. Three brothers divided Rs. 1620 among themselves in such a way that the share of second is equal to $\frac{5}{13}$ of the share of other two, combined. What is the share of the second one?
(1) Rs. 1170 (2) Rs. 450
(3) Rs. 540 (4) Rs. 500
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

42. If a certain amount is fully distributed among A, B and C in such a way that A receives $\frac{1}{2}$ of the amount, B receives $\frac{1}{3}$ of the amount and C receives Rs. 1200, then how much money would A receive ?
(1) Rs. 4000 (2) Rs. 1600
(3) Rs. 3600 (4) Rs. 1800
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

43. A, B and C together start a business. Three times the investment of A equals four times the investment of B and the capital of B is twice that of C. The ratio of share of each in the profit is
(1) 8 : 3 : 6 (2) 3 : 8 : 6
(3) 3 : 6 : 8 (4) 8 : 6 : 3
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

44. A sum of Rs. 770 has been divided among A, B and C in such a way that A receives $\frac{2}{9}$th of what B and C together receive. Then A's share is
(1) Rs. 140 (2) Rs. 154
(3) Rs. 165 (4) Rs. 170
(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (IST Sitting)

45. A sum of Rs. 730 was divided among A, B and C in such a way that if A gets Rs. 3 then B gets Rs. 4 and if B gets Rs. 3.50 then C gets Rs. 3. The share of B exceeds that of C by
(1) Rs. 30 (2) Rs. 40
(3) Rs. 70 (4) Rs. 210
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

46. A and B start an enterprise together, with A as active partner. A invests Rs. 4000 and Rs. 2000 more after 8 months. B invests Rs. 5000 and withdraws Rs. 2000 after 9 months. Being the active partner, A takes Rs. 100 per month as allowance, from the profit. What is the share of B if the profit for the year is Rs. 6700?
(1) Rs. 3350 (2) Rs. 3250
(3) Rs. 2700 (4) Rs. 2800
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

47. A sum of Rs. 15525 is divided among Sunil, Anil and Jamil such that if Rs. 22, Rs. 35 and Rs. 48 be diminished from their shares respectively, their remaining sums shall be in the ratio 7 : 10 : 13. What would have been the ratio of their sums if Rs. 16, Rs. 77 and Rs. 37 respectively were added to their original shares?
(1) 9 :13 : 17 (2) 18 : 26 : 35
(3) 36 : 52 : 67 (4) None of these
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

48. ₹ 1980 is divided among A, B and C so that half of A's part, one-third of B's part and one-sixth of C's part are equal. Then B's part is
(1) ₹ 540 (2) ₹ 660
(3) ₹ 1,080 (4) ₹ 360
(SSC Multi-Tasking Staff Exam. 30.04.2017)

49. A, B and C invested ₹ 13,000, ₹ 17,000 and ₹ 5,000 respectively in a business. At the end of the year, they earn a profit of ₹ 1,400. B's share of profit is
(1) ₹ 680 (2) ₹ 410
(3) ₹ 630 (4) ₹ 720
(SSC Multi-Tasking Staff Exam. 30.04.2017)

50. ₹ 600 is divided among A, B and C. ₹ 40 more than $\frac{2}{5}$th of A' share, ₹ 20 more than $\frac{2}{7}$th of B's share and ₹ 10 more than $\frac{9}{17}$th of C's share are all equal. Then A's share is
(1) ₹ 150 (2) ₹ 170
(3) ₹ 280 (4) ₹ 140
(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE–XII

1. How many sides does a regular polygon have whose interior and exterior angles are in the ratio 2 : 1?
(1) 3 (2) 5
(3) 6 (4) 12
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. The smallest integer, which subtracted from both the terms of 6 : 7 gives a ratio less than 16 : 21, is :
(1) 5 (2) 4
(3) 3 (4) 2
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. Two numbers are in the ratio 17 : 45. One-third of the smaller is less than $\frac{1}{5}$ of the bigger by 15. The smaller number is
(1) $25\frac{1}{2}$ (2) $67\frac{1}{2}$
(3) $76\frac{1}{2}$ (4) $86\frac{1}{2}$
(SSC CPO S.I. Exam. 12.01.2003

4. Tea worth ₹126 per kg and ₹135 per kg are mixed with a third variety in the ratio 1 : 1 : 2. If the mixture is worth ₹153 per kg, the price of the third variety per kg will be
(1) ₹175.5 (2) ₹ 180.0
(3) ₹169.5 (4) ₹170.0
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

5. Same quantity of rice is required for each member of a family of 15 members. On a particular day, due to the absence of some members of the family, the consumption of rice was reduced in the ratio 5 : 3. The number of members absent on that day was
(1) 3 (2) 6
(3) 8 (4) 9
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

6. Instead of dividing ₹ 117 among *P*, *Q*, *R* in the ratio $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$, by mistake it was divided in the ratio 2 : 3: 4. Who gained in the transaction ?
(1) Only *P* (2) Only *Q*
(3) Only *R* (4) Both *Q* and *R*
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

7. The ratio of the first and second class train fares between two stations is 3 : 1 and that of the numbers of passengers travelling between the two stations by first and second classes is 1 : 50. If on a particular day, ₹ 1, 325 are collected from passengers travelling between the two stations, then the amount collected from the second class passengers is
(1) ₹ 1,250 (2) ₹ 1,000
(3) ₹ 850 (4) ₹ 750
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

8. In an innings of a cricket match, three players A, B and C scored a total of 361 runs. If the ratio of the number of runs scored by A to that scored by B and also number of runs scored by B to that scored by C be 3 : 2, the number of runs scored by A was
(1) 171 (2) 181
(3) 185 (4) 161
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

9. In an examination, the number of those who passed and the number of those who failed were in the ratio 25 : 4. If five more had appeared and the number of failures was 2 less than earlier, the ratio of passers to failures would have been 22 : 3. The total number who appeared at the examination is
(1) 145 (2) 150
(3) 155 (4) 180
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

10. In a cricket match the total number of runs scored by Sachin, Vinod and Sourav is 285. The ratio of the number of runs scored by Sachin and Sourav is 3 : 2 and that of the runs scored by Sourav and Vinod is also 3 : 2. The number of runs scored by Sachin in that match is

(1) 135 (2) 90
(3) 60 (4) 140

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

11. The total marks obtained by Arun in English and Mathematics are 170. If the difference between his marks in these two subjects is 10, then the ratio of his marks in these subjects is

(1) 7 : 8 (2) 8 : 7
(3) 9 : 8 (4) 9 : 7

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

12. The weight of Mr. Gupta and Mrs. Gupta are in the ratio 7 : 8 and their total weight is 120 kg. After taking a dieting course Mr. Gupta reduces by 6 kg and the ratio between their weights changes to 5 : 6. So Mrs. Gupta has reduced by

(1) 2 kg (2) 4 kg
(3) 3 kg (4) 5 kg

(SSC CPO S.I. Exam. 06.09.2009)

13. The ratio of the numbers of boys and girls in a school was 5 : 3. Some new boys and girls were admitted to the school, in the ratio 5 : 7. At this, the total number of students in the school became 1200, and the ratio of boys to girls changed to 7 : 5. The number of students in the school before new admissions was

(1) 700 (2) 720
(3) 900 (4) 960

(SSC SAS Exam. 26.06.2010 (Paper-1)

14. The price of a refrigerator and a television set are in the ratio 5 : 3. If the refrigerator costs ₹ 5500 more than the television set, then the price of the refrigerator is:

(1) ₹ 27500 (2) ₹ 8250
(3) ₹ 13750 (4) ₹ 16500

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

15. A man leaves ₹ 8,600 to be divided among 5 sons, 4 daughters and 2 nephews. If each daughter receives four times as much as each nephew and each son receives five times as much as each nephew, how much does each daughter receive?

(1) ₹ 100 (2) ₹ 600
(3) ₹ 800 (4) ₹ 1,000

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

16. A and B together have ₹ 158. C has ₹ 101 less than what A and B together have, and B has ₹ 23 more than C. The amount of A is :

(1) ₹ 80 (2) ₹ 78
(3) ₹ 57 (4) ₹ 88

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

17. A sum of ₹ 340.68 is distributed among L, M and N such that L gets ₹ 5.72 more than N and M gets Rs. 2.24 more than L. N gets

(1) ₹ 109 (2) ₹ 110.90
(3) ₹ 113.56 (4) ₹ 114.72

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

18. The ratio of the first and second class fares between two railway stations is 4 : 1 and that of the number of passengers travelling by first and second classes is 1 : 40. If on a day ₹ 1,100 are collected as total fare, the amount collected from the first class passengers is

(1) ₹ 315 (2) ₹ 275
(3) ₹ 137.50 (4) ₹ 100

(SSC Data Entry Operator Exam. 02.08.2009)

19. Three persons walk from place A to place B. Their speeds are in the ratio 4 :3 : 5. The ratio of the time taken by them to reach B will be :

(1) 10 : 15 : 13 (2) 2 : 3 : 4
(3) 15 : 20 : 12 (4)16 : 18 : 15

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

20. From each of the two given unequal numbers, half the smaller number is subtracted. Then, of the resulting numbers, the larger one is five times than the smaller one. Then the ratio of the larger to smaller one is

(1) 2 : 1 (2) 3 : 2
(3) 3 : 1 (4) 1 : 4

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

21. A person ordered 4 shirts of brand *A* and some shirts of brand *B*. The price of one shirt of brand *A* was twice that of brand *B*. When the order was executed, it was found that the numbers of the two brands has been interchanged. This increased the bill by 40%. The ratio of the number of brand *A* shirts to that of brand *B* shirts in the original order was

(1) 1 : 2 (2) 1 : 3
(3) 1 : 4 (4) 1 : 5

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

22. The ratio of successful and unsuccessful examinees in an examination in a school is 6 : 1. The ratio would have been 9 : 1 if 6 more examinees had been successful. The total number of examinees is

(1) 140 (2) 120
(3) 200 (4) 160

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

23. A box filled with paper bundles weighs 36 kg. If the weight of the box and paper bundles respectively are in the ratio of 3 : 22, then the weight of the papers (in grams) is

(1) 30680 grams (2) 30710 grams
(3) 31500 grams (4) 31680 grams

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

24. Two numbers are such that the square of one is 224 less than 8 times the square of the other. If the numbers are in the ratio of 3 :4, then their values are

(1) 12, 16 (2) 6, 8
(3) 9, 12 (4) 12, 9

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

25. In a school, 10% of number of girls is equal to $\frac{1}{20}$ th of number of boys. Ratio between the number of boys to number of girls is

(1) 1 : 2 (2) 2 : 1
(3) 1 : 4 (4) 4 : 1

(SSC Graduate Level Tier-I Exam. 19.05.2013)

26. A policeman starts to chase a thief. When the thief goes 10 steps the policeman moves 8 steps. 5 steps of the policeman is equal to 7 steps of the thief. The ratio of the speeds of the policeman and the thief is

(1) 25 : 28 (2) 25 : 26
(3) 28 : 25 (4) 56 : 25

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

27. A got twice as many marks in English as in Science. His total marks in English, Science and Mathematics is 180. If the ratio of his marks in English and Mathematics is 2 : 3, what is his marks in Science ?
(1) 20 (2) 60
(3) 30 (4) 40
(SSC CHSL DEO & LDC Exam. 16.11.2014)

28. Tom is chasing Jerry. In the same interval of time Tom jumps 8 times while Jerry jumps 6 times. But the distance covered by Tom in 7 jumps is equal to the distance covered by Jerry in 5 jumps. The ratio of speed of Tom and Jerry is
(1) 48 : 35 (2) 28 : 15
(3) 24 : 20 (3) 20 : 21
(SSC CHSL DEO & LDC Exam. 16.11.2014)

29. In a library the ratio of story books and other books is 7 : 2 and there are 1512 story books. Due the collection of some more story books the said ratio becomes 15 : 4. The number of story books collected is
(1) 108 (2) 100
(3) 205 (4) 97
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

30. In a 500 metre race, the ratio of speeds of two runners P and Q is 3 : 5. P has a start of 200 metre then the distance between P and Q at the finish of the race is
(1) P wins by 100 metre
(2) Both reach at the same time
(3) Q wins by 100 metre
(4) Q wins by 50 metre
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

31. In a school there were 1554 students and the ratio of the number of the boys and girls was 4 : 3. After a few days, 30 girls joined the school but a few boys left; as a result the ratio of the boys and girls became 7 : 6. The number of boys who left the school is
(1) 76 (2) 74
(3) 84 (4) 86
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

32. The ratio of the radii of two cylinders is 2 : 3, and the ratio of their heights is 5 : 3. The ratio of their volumes will be
(1) 9 : 4 (2) 20 : 27
(3) 4 : 9 (4) 27 : 20
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

33. In a cricket match there are three types of tickets say A, B and C each costing Rs. 1000, Rs. 500 and Rs. 200 respectively. The ratio of the tickets sold of categories A, B and C is 3 : 2 : 5. If the total collection from selling the tickets is Rs 2.5 crore, find the total number of tickets sold?
(1) 5000 (2) 4800
(3) 50000 (4) 52000
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

34. An office opens at 10 AM and closes at 5 PM. The lunch interval is for 30 minutes. The ratio of lunch interval to the total period of office hours is
(1) 1 : 7 (2) 1 : 14
(3) 7 : 1 (4) 14 : 1
(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

35. The railway fares of air conditioned sleeper and ordinary sleeper class are in the ratio 4 : 1. The number of passengers travelled by air conditioned sleeper and ordinary sleeper classes were in the ratio 3 : 25. If the total collection was Rs. 37,000, how much did air conditioner sleeper passengers pay ?
(1) Rs. 15,000 (2) Rs. 10,000
(3) Rs. 12,000 (4) Rs. 16,000
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

36. The ratio of the amount of work done by $(x - 1)$ labours in $(x + 1)$ days and that done by $(x + 1)$ labours in $(x + 2)$ days is 5 : 6. Then the value of x is
(1) 16 (2) 15
(3) 17 (4) 14
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

37. If the ratio of cost price and selling price of an article is 4 : 5, then the percentage of profit will be
(1) 20 (2) 0.1
(3) 10 (4) 25
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

38. A shopkeeper earns a profit of 15% after selling a book at 20% discount on the printed price. The ratio of the cost price and printed price of the book is :
(1) 20 : 23 (2) 23 : 20
(3) 16 : 23 (4) 23 : 16
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

39. The rates of working of A and B are in the ratio of 2 : 3. The number of days taken by each of them to finish the work is in the ratio :
(1) 2 : 3 (2) 4 : 9
(3) 3 : 2 (4) 9 : 4
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

40. In an army selection process, the ratio of selected to unselected candidates was 3 : 1. If 80 less had applied and 40 less selected, the ratio of selected to unselected candidates would have been 4 : 1. How many candidates had applied for the process?
(1) 480 (2) 960
(3) 240 (4) 1440
(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

41. In an army selection process, the ratio of selected to unselected candidates was 4:1. If 90 less had applied and 20 less were selected, the ratio of selected to unselected candidates would have been 5:1. How many candidates had applied for the process ?
(1) 1650 (2) 3300
(3) 825 (4) 4950
(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

SHORT ANSWERS

TYPE-I

1. (1)	**2.** (3)	**3.** (3)	**4.** (4)
5. (1)	**6.** (3)	**7.** (1)	**8.** (3)
9. (4)	**10.** (2)	**11.** (4)	**12.** (1)
13. (1)	**14.** (2)	**15.** (3)	**16.** (2)
17. (3)	**18.** (3)	**19.** (4)	**20.** (1)
21. (3)	**22.** (2)	**23.** (2)	**24.** (2)
25. (3)	**26.** (3)	**27.** (3)	**28.** (4)
29. (4)	**30.** (4)	**31.** (1)	**32.** (1)
33. (2)	**34.** (4)	**35.** (1)	**36.** (3)
37. (1)	**38.** (2)	**39.** (3)	**40.** (2)

41. (3)	**42.** (3)	**43.** (3)	**44.** (3)
45. (2)	**46.** (3)	**47.** (2)	**48.** (4)
49. (1)	**50.** (4)	**51.** (2)	**52.** (3)
53. (3)	**54.** (1)	**55.** (4)	**56.** (4)
57. (4)	**58.** (3)	**59.** (3)	**60.** (1)
61. (3)	**62.** (3)	**63.** (1)	**64.** (3)
65. (1)	**66.** (2)	**67.** (4)	**68.** (1)
69. (3)	**70.** (3)	**71.** (1)	**72.** (4)
73. (4)	**74.** (3)	**75.** (2)	**76.** (1)
77. (1)	**78.** (1)	**79.** (1)	**80.** (3)
81. (3)	**82.** (2)	**83.** (1)	**84.** (1)
85. (2)	**86.** (3)	**87.** (3)	**88.** (1)
89. (4)	**90.** (2)	**91.** (3)	**92.** (2)
93. (4)	**94.** (3)	**95.** (2)	**96.** (3)
97. (2)	**98.** (2)	**99.** (2)	**100.** (2)
101. (2)	**102.** (3)	**103.** (2)	**104.** (2)
105. (3)			

TYPE-II

1. (2)	**2.** (1)	**3.** (4)	**4.** (3)
5. (4)	**6.** (3)	**7.** (4)	**8.** (1)
9. (2)	**10.** (2)	**11.** (1)	

TYPE-III

1. (1)	**2.** (1)	**3.** (2)	**4.** (1)
5. (1)			

TYPE-IV

1. (2)	**2.** (3)	**3.** (1)	**4.** (1)
5. (3)	**6.** (2)	**7.** (2)	**8.** (4)
9. (1)	**10.** (3)	**11.** (4)	**12.** (3)
13. (3)	**14.** (2)	**15.** (1)	**16.** (3)
17. (2)	**18.** (3)	**19.** (4)	**20.** (1)
21. (4)	**22.** (3)	**23.** (3)	**24.** (2)
25. (3)	**26.** (2)	**27.** (1)	**28.** (4)
29. (4)	**30.** (1)		

TYPE-V

1. (3)	**2.** (2)	**3.** (3)	**4.** (1)
5. (2)	**6.** (3)	**7.** (4)	**8.** (3)
9. (4)	**10.** (1)	**11.** (1)	**12.** (4)
13. (1)	**14.** (3)	**15.** (2)	**16.** (3)
17. (4)	**18.** (3)	**19.** (1)	**20.** (3)
21. (3)	**22.** (4)	**23.** (2)	**24.** (1)
25. (3)	**26.** (2)	**27.** (3)	**28.** (2)
29. (3)	**30.** (4)	**31**. (4)	**32**. (1)
33. (1)	**34.** (3)	**35.** (1)	**36.** (2)
37. (3)	**38.** (1)	**39.** (2)	**40.** (4)
41. (4)	**42.** (1)		

TYPE-VI

1. (3)	**2.** (4)	**3.** (1)	**4.** (2)
5. (3)	**6.** (1)		

TYPE-VII

1. (3)	**2.** (1)	**3.** (3)	**4.** (3)
5. (2)	**6.** (2)	**7.** (3)	**8.** (3)
9. (1)	**10.** (3)	**11.** (4)	**12.** (1)
13. (4)	**14.** (2)	**15.** (3)	**16.** (1)
17. (4)	**18.** (3)	**19.** (2)	**20.** (3)
21. (1)	**22.** (3)	**23.** (4)	**24.** (1)
25. (2)	**26.** (2)	**27.** (4)	**28.** (3)
29. (3)	**30.** (1)	**31.** (2)	

TYPE-VIII

1. (1)	**2**. (3)	**3.** (4)	**4.** (1)
5. (1)	**6.** (2)	**7.** (3)	**8.** (3)
9. (1)	**10.** (4)	**11.** (4)	**12.** (3)
13. (1)	**14.** (3)	**15.** (2)	**16.** (2)
17. (4)	**18.** (4)	**19.** (1)	**20.** (4)
21. (1)	**22.** (2)	**23.** (4)	**24.** (4)
25. (3)	**26.** (2)	**27.** (1)	**28.** (3)
29. (4)	**30.** (3)	**31.** (3)	**32.** (1)
33. (2)	**34.** (4)	**35.** (1)	**36.** (4)
37. (1)	**38.** (1)	**39.** (4)	**40.** (2)
41. (1)	**42.** (2)	**43.** (3)	**44.** (2)
45. (2)	**46.** (3)	**47.** (4)	**48.** (3)
49. (3)	**50.** (2)	**51.** (1)	**52.** (4)
53. (1)	**54.** (4)	**55.** (4)	**56.** (4)
57. (4)	**58.** (2)	**59.** (3)	**60.** (3)
61. (1)	**62.** (2)	**63.** (4)	**64.** (1)
65. (2)	**66.** (2)	**67.** (2)	**68.** (2)
69. (3)	**70.** (3)	**71.** (1)	**72.** (2)
73. (3)	**74.** (2)	**75.** (3)	**76.** (2)
77. (2)	**78.** (2)	**79.** (2)	**80.** (1)
81. (4)	**82.** (4)		

TYPE-IX

1. (1)	**2.** (4)	**3.** (4)	**4.** (1)
5. (4)	**6.** (1)	**7.** (3)	**8.** (3)
9. (2)	**10.** (1)	**11.** (3)	**12.** (3)
13. (2)	**14.** (1)	**15**. (4)	**16.** (1)
17. (2)	**18.** (2)	**19.** (1)	**20.** (4)
21. (3)	**22.** (3)	**23.** (2)	**24.** (4)
25. (3)	**26.** (1)	**27.** (1)	**28.** (2)
29. (4)	**30.** (3)		

TYPE-X

1. (2)	**2.** (1)	**3.** (2)	**4.** (3)
5. (2)	**6.** (2)	**7.** (4)	**8.** (3)
9. (2)	**10.** (1)	**11.** (3)	**12.** (4)
13. (2)	**14.** (3)	**15.** (2)	**16.** (3)

TYPE-XI

1. (4)	**2.** (3)	**3.** (1)	**4.** (2)
5. (1)	**6.** (1)	**7.** (4)	**8.** (4)
9. (2)	**10.** (4)	**11.** (4)	**12.** (4)
13. (4)	**14.** (3)	**15.** (2)	**16.** (1)
17. (3)	**18.** (2)	**19.** (4)	**20.** (2)
21. (2)	**22.** (2)	**23.** (2)	**24.** (2)
25. (3)	**26.** (3)	**27.** (2)	**28.** (4)
29. (1)	**30.** (1)	**31**. (2)	**32**. (3)
33. (4)	**34.** (1)	**35.** (3)	**36.** (4)
37. (1)	**38.** (2)	**39.** (1)	**40.** (4)
41. (2)	**42.** (3)	**43.** (4)	**44.** (1)
45. (2)	**46.** (3)	**47.** (3)	**48.** (1)
49. (1)	**50.** (1)		

TYPE-XII

1. (3)	**2.** (3)	**3.** (3)	**4.** (1)
5. (4)	**6.** (3)	**7.** (1)	**8.** (1)
9. (1)	**10.** (1)	**11.** (3)	**12.** (2)
13. (4)	**14.** (3)	**15.** (3)	**16.** (2)
17. (1)	**18.** (4)	**19.** (3)	**20.** (3)
21. (2)	**22.** (1)	**23.** (4)	**24.** (2)
25. (2)	**26.** (3)	**27.** (3)	**28.** (4)
29. (1)	**30.** (2)	**31**. (1)	**32.** (2)
33. (3)	**34.** (2)	**35.** (3)	**36.** (1)
37. (4)	**38.** (3)	**39.** (3)	**40.** (1)
41. (1)			

EXPLANATIONS

TYPE-I

1. (1) a : c = (a : b) × (b : c)

$= \frac{7}{9} \times \frac{15}{7} = \frac{15}{9}$ = 5 : 3

Aliter : Using Rule 18,

A : C = 7 × 15 : 9 × 7 = 5 : 3

2. (3) $x = \frac{1}{3}y \Rightarrow x : y = 1 : 3$

Again, $y = \frac{1}{2}z \Rightarrow y : z$

= 1 : 2 = 3 : 6

∴ x : y : z = 1 : 3 : 6

3. (3) Using Rule 33,

If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f}$, then each of these ratios is equal to $\frac{a+c+e}{b+d+f}$

Here,

$\frac{p}{q} = \frac{r}{s} = \frac{t}{u} = \frac{2}{3}$

$\Rightarrow \frac{mp}{mq} = \frac{nr}{ns} = \frac{ot}{ou} = \frac{2}{3}$

$\Rightarrow \frac{mp+nr+ot}{mq+ns+ou} = \frac{2}{3}$ or 2 : 3

4. (4) Using Rule 33,

$\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \frac{1}{2}$

$\Rightarrow \frac{pa}{pb} = \frac{qc}{qd} = \frac{re}{rf} = \frac{1}{2}$

$\Rightarrow \frac{pa+qc+re}{pb+qd+rf} = \frac{1}{2}$ or 1 : 2

5. (1) Using Rule 13,

$\frac{x}{y} = \frac{3}{1} \Rightarrow \frac{x^3}{y^3} = \frac{27}{1}$

$\Rightarrow \frac{x^3 - y^3}{x^3 - y^3} = \frac{27-1}{27+1}$

[By componendo and dividendo]

$= \frac{26}{28} = \frac{13}{14}$ = 13 : 14

6. (3) Let the fourth proportional be x

Then, $\frac{0.12}{0.21} = \frac{8}{x}$

or $x = 8 \times \frac{0.21}{0.12}$

or $x = 8 \times \frac{21}{12}$

or x = 14

Aliter : Using Rule 16,

Fourth proportion = $\frac{bc}{a}$

$= \frac{0.21 \times 18}{0.12}$ = 14

7. (1) Required ratio $= \frac{2^{1.5}}{2^{0.5}}$

$= \frac{2^{1.5-0.5}}{1}$

$\frac{2}{1}$ = 2 : 1

8. (3) $\frac{m}{n} = \frac{3}{2}$ (Given)

$\therefore \frac{4m+5n}{4m-5n} = \frac{4\left(\frac{m}{n}\right)+5}{4\left(\frac{m}{n}\right)-5}$

$= \frac{4 \times \frac{3}{2} + 5}{4 \times \frac{3}{2} - 5} = \frac{6+5}{6-5} = 11:1$

9. (4) A : D = $\frac{A}{D} = \frac{A}{B} \times \frac{B}{C} \times \frac{C}{D}$

$= \frac{3}{4} \times \frac{5}{7} \times \frac{8}{9} = \frac{10}{21}$ = 10 : 21

Aliter : Using Rule 19,

A : D = xpm : yqn

= 3 × 5 × 8 : 4 × 7 × 9

= 10 : 21

10. (2) Using Rule 19 (ii),

$a : b = \frac{2}{9} : \frac{1}{3}$ = 2 : 3

$b : c = \frac{2}{7} : \frac{5}{14}$ = 4 : 5

$d : c = \frac{7}{10} : \frac{3}{5}$ = 7 : 6

⇒ c : d = 6 : 7

Thus,

a : b = 2 : 3

b : c = 4 : 5

c : d = 6 : 7

a : b : c : d = 2 × 4 × 6 : 3 × 4 × 6 : 3 × 5 × 6 : 3 × 5 × 7

= 16 : 24 : 30 : 35

11. (4) Since b is the mean proportional of a and c.

$\therefore \frac{a}{b} = \frac{b}{c} = k$ (Suppose)

∴ $a = bk$, $b = ck$

$\therefore \frac{(a-b)^3}{(b-c)^3} = \frac{(bk-b)^3}{(ck-c)^3}$

$= \frac{b^3(k-1)^3}{c^3(k-1)^3} = \frac{b^3}{c^3} = \frac{a^3}{b^3}$

12. (1) Ratio = $\frac{1}{2} : \frac{1}{3} : \frac{1}{5}$

$= \frac{1}{2} \times 30 : \frac{1}{3} \times 30 : \frac{1}{5} \times 30$

= 15 : 10 : 6

Sum of the ratios

= 15 + 10 + 6 = 31

∴ First part = ₹ $\frac{15}{31} \times 6200$

= ₹ 3000

Second part = ₹. $\frac{10}{31} \times 6200$

= ₹ 2000

Third part = ₹ $\frac{6}{31} \times 6200$

= ₹ 1200

13. (1) First part = x and second part = $94 - x$

$\therefore \frac{\frac{x}{5}}{\frac{94-x}{8}} = \frac{3}{4}$

$\Rightarrow \frac{x}{5} \times \frac{8}{(94-x)} = \frac{3}{4}$

⇒ 32 x = 15 × 94 − 15x

⇒ 47 x = 15 × 94

$\Rightarrow x = \frac{15 \times 94}{47} = 30$

14. (2) $\frac{a}{b} = \frac{5}{7}, \frac{c}{d} = \frac{2a}{3b}$

$\Rightarrow \frac{a}{b} \times \frac{c}{d} = \frac{5}{7} \times \frac{2a}{3b}$

$\Rightarrow \frac{ac}{bd} = \frac{10}{21} \times \frac{5}{7} = \frac{50}{147}$

= 50 : 147

15. (3) $x : y = 3 : 2$

$\Rightarrow x^2 : y^2 = 9 : 4$

$$\therefore \frac{2x^2+3y^2}{3x^2-2y^2} = \frac{2\frac{x^2}{y^2}+3}{3\frac{x^2}{y^2}-2}$$

$$= \frac{2\times\frac{9}{4}+3}{3\times\frac{9}{4}-2} = \frac{\frac{18+12}{4}}{\frac{27-8}{4}}$$

$= 30 : 19$

16. (2) $\frac{a}{b} = \frac{b}{c}$

$\Rightarrow b^2 = ac \Rightarrow b^4 = a^2c^2$

$$\therefore \frac{a^4}{b^4} = \frac{a^4}{a^2c^2} = \frac{a^2}{c^2}$$

17. (3) A : B $= \frac{1}{2} : \frac{3}{8} = 4 : 3 = 8 : 6$

B : C $= \frac{1}{3} : \frac{5}{9} = 3 : 5 = 6 : 10$

C : D $= \frac{5}{6} : \frac{3}{4} = 10 : 9$

$\therefore$ A : B : C : D = 8 : 6 : 10 : 9

18. (3) A : B : C = 2 : 3 : 4

$$\therefore \frac{A}{B} = \frac{2}{3}, \frac{B}{C} = \frac{3}{4}, \frac{C}{A} = \frac{4}{2} = 2$$

$$\therefore \frac{A}{B} : \frac{B}{C} : \frac{C}{A} = \frac{2}{3} : \frac{3}{4} : \frac{2}{1}$$

$= 8 : 9 : 24$

19. (4) $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \frac{1}{2}$

$$\therefore \frac{3a}{3b} = \frac{5c}{5d} = \frac{7e}{7f} = \frac{1}{2}$$

$$\therefore \frac{3a+5c+7e}{3b+5d+7f} = \frac{1}{2} = 1 : 2$$

20. (1) $a : (b+c) = 1 : 3$

$$\Rightarrow \frac{b+c}{a} = \frac{3}{1} \Rightarrow \frac{b+c}{a}+1 = \frac{3}{1}+1$$

$$\Rightarrow \frac{a+b+c}{a} = \frac{3+1}{1} = \frac{4}{1} \text{..... (i)}$$

Similarly,

$$\frac{a+b}{c} = \frac{7}{5}$$

$$\Rightarrow \frac{a+b+c}{c} = \frac{12}{5} \text{ ..... (ii)}$$

On dividing (i) by (ii),

$$\frac{c}{a} = \frac{4\times5}{12} = \frac{5}{3} = k \text{ ..... (iii)}$$

From equation (i), b = $4k$

$$\therefore \frac{b}{a+c} = \frac{4k}{3k+5k} = 1 : 2$$

21. (3) $\frac{p}{1} = \frac{q}{2} = \frac{r}{4} = k$ (let)

$\Rightarrow p = k, q = 2k, r = 4k$

$$\therefore \sqrt{5p^2+q^2+r^2}$$

$$= \sqrt{5k^2+4k^2+16k^2} = \sqrt{25k^2}$$

$= 5k = 5p$

22. (2) Using Rule 14,

Mean proportional

$$= \sqrt{(3+\sqrt{2})(12-\sqrt{32})}$$

$$= \sqrt{(3+\sqrt{2})4(3-\sqrt{2})}$$

$$= 2\sqrt{9-2} = 2\sqrt{7}$$

23. (2) Given, $\frac{x}{y} = \frac{2}{3}$ ..... (i)

Expression $= \frac{3x+2y}{9x+5y}$

$$= \frac{3.\frac{x}{y}+2}{9\frac{x}{y}+5} = \frac{3\times\frac{2}{3}+2}{9\times\frac{2}{3}+5} \text{ [from (i)]}$$

$$= \frac{2+2}{11} = \frac{4}{11}$$

24. (2) We can write $a : c$ by compounding $a : b$ and $b : c$

$$\frac{a}{c} = \frac{a}{b}\times\frac{b}{c}, \frac{a}{c} = \frac{3}{4}\times\frac{8}{9}, \frac{a}{c} = \frac{2}{3}$$

$\Rightarrow a : c = 2 : 3$

Aliter : Using Rule 18 (i),

A : C = xp : yq

$= 3 \times 8 : 4 \times 9 = 2 : 3$

25. (3) $a : b : c = 2 : 3 : 4$

$\therefore \frac{a}{2} = \frac{b}{3} = \frac{c}{4} = k$ (let)

$\Rightarrow a = 2k$, $b = 3k$, and $c = 4k$

Given $2a - 3b + 4c = 33$

$\Rightarrow 2 \times 2k - 3\times3k + 4 \times 4k = 33$

$\Rightarrow 4k - 9k + 16k = 33$

$$\Rightarrow 11k = 33 \Rightarrow k = \frac{33}{11} = 3$$

$\therefore c = 4k = 4\times3 = 12$

26. (3) $a : b = c : d$

$$\Rightarrow \frac{a}{b} = \frac{c}{d} = \frac{ma}{mb} = \frac{nc}{nd}$$

$$\Rightarrow \frac{a+c}{b+d} = \frac{ma+nc}{mb+nd}$$

27. (3) A : B = 4 : 5

B : C = 2 : 3

$\therefore$ A : B : C = $4 \times 2 : 5 \times 2 : 5 \times 3$

= 8 : 10 : 15

If A equals 800, then C equals 1500.

28. (4) $a : b : c = 7 : 3 : 5$

$\Rightarrow \frac{a}{7} = \frac{b}{3} = \frac{c}{5} = k$ (let)

$\Rightarrow a = 7k$, $b = 3k$, $c = 5k$

Now $(a + b + c) : (2a + b - c)$

$= (7k + 3k + 5k) : (2 \times 7k + 3k - 5k)$

$= 15\,k : 12\,k = 5 : 4$

29. (4) Using Rule 18(ii),

A : B = 2 : 3

B : C = 4 : 5

$\therefore$ A : B : C = $2 \times 4 : 3 \times 4 : 3 \times 5$

= 8 : 12 : 15

30. (4) According to the question,

$$2\,A = 3\,B \Rightarrow B = \frac{2}{3}\,A$$

and $2A = 4C \Rightarrow C = \frac{1}{2}\,A$

$$\therefore A : B : C = A : \frac{2}{3}\,A : \frac{1}{2}\,A$$

$$= 1 : \frac{2}{3} : \frac{1}{2} = 6 : 4 : 3$$

31. (1) $\frac{A}{B}\times\frac{B}{C}\times\frac{C}{D} = \frac{2}{3}\times\frac{2}{4}\times\frac{2}{5}$

$$\Rightarrow \frac{A}{D} = \frac{2}{15} = 2 : 15$$

Aliter : Using Rule 19(i),

A : D = xpm : yqn

$= 2 \times 2 \times 2 : 3 \times 4 \times 5$

$= 2 : 15$

32. (1) $\frac{a}{3} = \frac{b}{4} = \frac{c}{7} = k$

$\Rightarrow a = 3k$, b = $4k$ and $c = 7k$

$$\Rightarrow \frac{a+b+c}{c} = \frac{3k+4k+7k}{7k}$$

$$= \frac{14k}{7k} = \frac{2}{1} = 2 : 1$$

33. (2) A : B = 3 : 4 = 9 : 12
B : C = 12 : 13
∴ A : B : C = 9 : 12 : 13
⇒ A : C = 9 : 13
Aliter : Using Rule 18 (i),
A : C = xp : yq
= 3 × 12 : 4 × 13
= 9 : 13

34. (4) A : B = 3 : 2
B : C = 3 : 4
∴ A : B : C = 3 × 3 : 2 × 3 : 2 × 4
= 9 : 6 : 8
∴ A : C = 9 : 8
Aliter : Using Rule 18(i),
A : C = xp : yq
= 3 × 3 : 2 × 4 = 9 : 8

35. (1) Here, $\frac{x}{y}=\frac{2}{1} \Rightarrow \frac{x^2}{y^2}=\frac{4}{1}$

$$\therefore \frac{x^2-y^2}{x^2+y^2}=\frac{\frac{x^2}{y^2}-1}{\frac{x^2}{y^2}+1}$$

$$=\frac{4-1}{4+1}=\frac{3}{5} = 3 : 5$$

36. (3) A's share

$$= ₹ \left(\frac{3}{5}\times 1000\right) = ₹\ 600$$

Aliter : Using Rule 22,

Part of A= $\frac{m}{m+n}\times R$

$$=\frac{3}{3+2}\times 1000$$

= ₹ 600

37. (1) $\boxed{\text{Tricky Approach}}$

$$\frac{W_1}{W_2}=\frac{2}{3}$$

$$\Rightarrow \frac{W_2}{W_1}=\frac{3}{2} \text{ and } \frac{W_1}{W_3}=\frac{1}{2}$$

$$\therefore \frac{W_2}{W_1}\times\frac{W_1}{W_3}=\frac{W_2}{W_3}=\frac{3}{2}\times\frac{1}{2}=\frac{3}{4}$$

= 3 : 4

38. (2) $3x = 5y = 4z$
LCM of 3, 5 and 4 = 60

$$\therefore \frac{3x}{60}=\frac{5y}{60}=\frac{4z}{60}$$

$$\Rightarrow \frac{x}{20}=\frac{y}{12}=\frac{z}{15}$$

∴ $x : y : z$ = 20 : 12 : 15

39. (3) $\frac{A}{B}\times\frac{B}{C}=\frac{3}{4}\times\frac{6}{5}$

$$\Rightarrow \frac{A}{C}=\frac{9}{10} \Rightarrow \frac{C}{A}=\frac{10}{9}$$

$$\Rightarrow \frac{C}{A}+1=\frac{10}{9}+1$$

$$=\frac{C+A}{A}=\frac{10+9}{9}=\frac{19}{9}$$

⇒ A : (A + C) = 9 : 19

40. (2) $a + b\sqrt{3}$

$$=\frac{1}{2-\sqrt{3}}=2+\sqrt{3}$$

(After rationalising)
⇒ $a = 2$ and $b = 1$
∴ $a : b$ = 2 : 1

41. (3) A : B = 3 : 4 = 6 : 8
B : C = 8 : 9
∴ A : B : C = 6 : 8 : 9
Aliter : Using Rule 18(ii),
A : B : C = xp : yp : qy
= 3 × 8 : 4 × 8 : 9 × 4
= 24 : 32 : 36
= 6 : 8 : 9

42. (3) Ratio = $1 : \frac{1}{3} : \frac{1}{6}$
= 6 : 2 : 1
Sum of the ratios = 6 + 2+1 = 9

∴ Middle part = $\frac{2}{9}\times 78$

$$=\frac{52}{3}=17\frac{1}{3}$$

43. (3) $\frac{x}{y}=\frac{4}{5}$

$$\therefore \frac{3x+y}{5x+3y}=\frac{3\left(\frac{x}{y}\right)+1}{5\left(\frac{x}{y}\right)+3}$$

$$=\frac{3\times\frac{4}{5}+1}{5\times\frac{4}{5}+3}=\frac{\frac{12+5}{5}}{7}$$

$$=\frac{17}{35}=17 : 35$$

44. (3) $\frac{x}{y}=\frac{5}{6}$

$$\therefore \frac{3x^2-2y^2}{y^2-x^2}=\frac{3.\frac{x^2}{y^2}-2}{1-\frac{x^2}{y^2}}$$

$$=\frac{3\times\frac{25}{36}-2}{1-\frac{25}{36}}=\frac{75-72}{36-25}=\frac{3}{11}$$

= 3 : 11

45. (2) $\frac{x}{y}=\frac{3}{4}$ (Given)

$$\therefore \frac{4x+5y}{5x-2y}=\frac{4\frac{x}{y}+5}{5\frac{x}{y}-2}$$

$$=\frac{4\times\frac{3}{4}+5}{5\times\frac{3}{4}-2}=\frac{8}{\frac{15-8}{4}}$$

$$=\frac{8\times 4}{7}=\frac{32}{7}$$

46. (3) A : B = 2 : 3 = 4 : 6
B : C = 6 : 11
∴ A : B : C = 4 : 6 : 11
Aliter : Using Rule 18 (ii),
A : B : C = xp : yp : qy
= 2 × 6 : 3 × 6 : 3 × 11
= 12 : 18 : 33
= 4 : 6 : 11

47. (2) $A\times\frac{2}{3}=B\times\frac{4}{5}$

$$\Rightarrow \frac{A}{B}=\frac{4}{5}\times\frac{3}{2} = 6 : 5$$

48. (4) According to the question,

$$A\times\frac{2}{3}=B\times\frac{75}{100}=C\times\frac{6}{10}$$

$$\Rightarrow A\times\frac{2}{3}=B\times\frac{3}{4}=C\times\frac{3}{5}$$

Now, $A\times\frac{2}{3}=B\times\frac{3}{4}$

$$\Rightarrow \frac{A}{B}=\frac{3}{4}\times\frac{3}{2}=\frac{9}{8} \Rightarrow A : B = 9 : 8$$

and $B\times\frac{3}{4}=C\times\frac{3}{5}$

$\Rightarrow \frac{B}{C} = \frac{3}{5} \times \frac{4}{3} = \frac{4}{5} = \frac{8}{10}$

= B : C = 8 : 10

∴ A : B : C = 9 : 8 : 10

49. (1) A : B = 3 : 7

B : C = 6 : 5

A : B : C = 3×6 : 7×6 : 7×5

= 18 : 42 : 35

Sum of the ratios

= 18 + 42 + 35 = 95

∴ B's share

$= ₹\left(\frac{42}{95} \times 33630\right) = ₹14868$

50. (4) A : B = 3 : 5 = 12 : 20

B : C = 4 : 7 = 20 : 35

∴ A : B : C = 12 : 20 : 35

Aliter : Using Rule 18 (ii),

A : B : C = xp : yp : qy

= 3 × 4 : 5 × 4 : 5 × 7

= 12 : 20 : 35

51. (2) $\frac{A}{B} = \frac{4}{5}$; $\frac{B}{C} = \frac{5}{2}$

$\therefore \frac{A}{C} = \frac{A}{B} \times \frac{B}{C} = \frac{4}{5} \times \frac{5}{2} = 2:1$

Aliter : Using Rule 18 (i),

A : B = 4 : 5, B : C = 5 : 2

A : C = 4 × 5 : 5 × 2

= 20 : 10 = 2 : 1

52. (3) $A = \frac{1}{4} B$

⇒ A : B = 1 : 4

B : C = 1 : 2 = 4 : 8

∴ A : B : C = 1:4: 8

Aliter : Using Rule 18(ii),

A : B= 1 : 4, B : C = 1 : 2

A : B : C= 1 × 1 : 4 × 1 : 4 × 2

= 1 : 4 : 8

53. (3) 2A = 3B = 4C

$\Rightarrow \frac{2A}{12} = \frac{3B}{12} = \frac{4C}{12}$

$\Rightarrow \frac{A}{6} = \frac{B}{4} = \frac{C}{3}$

⇒ A : B : C = 6 : 4 : 3

54. (1) $4^{3.5} : 2^5 = 4^3 \times 4^{0.5} : 32$

= 64 × 2 : 32 = 4 : 1

55. (4) Using Rule 20,

A : B = 1 : 2 = 3 : 6

B : C = 3 : 4 = 6 : 8

C : D = 6 : 9 = 2 : 3 = 8 : 12

D : E = 12 : 16

∴ A : B : C : D : E

= 3 : 6 : 8 : 12 : 16

56. (4) $\frac{x}{y} = \frac{2}{5}$ (Given)

$\therefore \frac{5x+3y}{5x-3y} = \frac{5\left(\frac{x}{y}\right)+3}{5\left(\frac{x}{y}\right)-3}$

(Dividing numerator and denominator by y)

$= \frac{5 \times \frac{2}{5}+3}{5 \times \frac{2}{5}-3} = \frac{2+3}{2-3} = -5$

Aliter : Using Rule 23,

Marks of Q $= \frac{n}{m} \times R$

(Where m = 2, n = 5, R = 120)

$= \frac{5}{2} \times 120 = 300$

57. (4) $a : b = 2 : 3$

$b : c = 4 : 5$

$\therefore a : b : c = 2 \times 4 : 3 \times 4 : 3 \times 5$

= 8 : 12 : 15

$\therefore \frac{a+b}{b+c} = \frac{8+12}{12+15} = \frac{20}{27}$

= 20 : 27

58. (3) Marks of Q $= \frac{5}{2} \times 120 = 300$

59. (3) A : B = 4 : 9

A : C = 2 : 3 = 4 : 6

$\therefore \frac{A+B}{A+C} = \frac{4+9}{4+6} = \frac{13}{10}$

60. (1) If the third proportional be x, then

0.8 : 0.2 : : 0.2 : x

$\Rightarrow 0.8 \times x = 0.2 \times 0.2$

$\Rightarrow x = \frac{0.2 \times 0.2}{0.8} = \frac{4}{80} = 0.05$

Aliter :

Third proportion

$= \frac{b^2}{a} = \frac{(0.2)^2}{0.8}$

$= \frac{0.04}{0.8} = 0.05$

61. (3) $\frac{x}{y} = \frac{3}{4}$ (Given)

$\therefore \frac{5x-2y}{7x+2y} = \frac{5\frac{x}{y}-2}{7\frac{x}{y}+2}$

$= \frac{5 \times \frac{3}{4}-2}{7 \times \frac{3}{4}+2} = \frac{\frac{15-8}{4}}{\frac{21+8}{4}} = \frac{7}{29}$

62. (3) As given,

2A = 3B

⇒ A : B = 3 : 2

and, 4B = 5C

⇒ B : C = 5 : 4

∴ A : B : C

= 3 × 5 : 2 × 5 : 2 × 4

= 15 : 10 : 8

∴ A : C = 15 : 8

Aliter : Using Rule 18 (i),

Here, 2A = 3B i,eA : B = 3 : 2

4B = 5C i,e B : C = 5 : 4

A : C = xp : yq

= 3 × 5 : 2 × 4

= 15 : 8

63. (1) Number of students in class A = x

Number of students in class B = y

$\therefore 25x + 40y = 30(x + y)$

$\Rightarrow 25x + 40y = 30x + 30y$

$\Rightarrow 30x - 25x = 40y - 30y$

$\Rightarrow 5x = 10y$

$\Rightarrow \frac{x}{y} = \frac{10}{5} = 2 : 1$

64. (3) Ratio of values

= 15 × 3 : 10 × 2 : 5 × 5

= 45 : 20 : 25

∴ Required average cost

$= \frac{45+20+25}{10} = \frac{90}{10} = ₹\ 9$

65. (1) Boys : Girls

= 4 : 3 = 32 : 24

Girls : Teachers

= 8 : 1 = 24 : 3

∴ Boys : Girls : Teachers

= 32 : 24 : 3

∴ Required ratio

= (32 + 24) : 3 = 56 : 3

66. (2) $\frac{3x+5}{5x-2} = \frac{2}{3}$

$\Rightarrow 10x - 4 = 9x + 15$

$\Rightarrow 10x - 9x = 15 + 4 = 19$

$\Rightarrow x = 19$

67. (4) A : B = 5 : 3

B : C = 4 : 5

∴ A : B : C

= 5 × 4 : 3 × 4 : 3 × 5

= 20 : 12 : 15

Sum of ratios

= 20 + 12 + 15 = 47

∴ Runs scored by B

$= \frac{12}{47} \times 564 = 144$

68. (1) $\frac{a+b}{6} = \frac{b+c}{7} = \frac{c+a}{8} = k$

$\Rightarrow a + b = 6k;\ b + c = 7k;$
$c + a = 8k$

$\therefore a + b + b + c + c + a$
$= 6k + 7k + 8k$

$\Rightarrow 2\ (a + b + c) = 21k$

$\Rightarrow 2 \times 14 = 21k \Rightarrow k = \frac{4}{3}$

$\therefore c = (a + b + c) - (a + b)$

$= 14 - 6 \times \frac{4}{3} = 14 - 8 = 6$

69. (3) $a \times 5.5 = b \times 0.65$

$\Rightarrow \frac{a}{b} = \frac{0.65}{5.5} = \frac{65}{550} = \frac{13}{110}$

70. (3) Original number of boys
$= 5x$
Original number of girls $= 3x$

$\therefore \frac{5x-50}{3x+50} = \frac{9}{7}$

$\Rightarrow 35x - 350 = 27x + 450$
$\Rightarrow 35x - 27x = 350 + 450$
$\Rightarrow 8x = 800$
$\Rightarrow x = 100$
Number of boys $= 5x$
$= 5 \times 100 = 500$

71. (1) A : B : C

$= \frac{1}{3}:\frac{1}{4}:\frac{1}{5}:\frac{1}{6}$

$= \frac{1}{3} \times 60 : \frac{1}{4} \times 60 : \frac{1}{5} \times 60 : \frac{1}{6} \times 60$

[LCM of 3, 4, 5 & 6 = 60]
$= 20 : 15 : 12 : 10$
$\therefore$ Minimum number of pens
$= 20 + 15 + 12 + 10 = 57$

72. (4) $A = B \times \frac{2}{3}$

$\Rightarrow A : B = 2 : 3 = 8 : 12$

$B = C \times \frac{4}{5}$

$\Rightarrow B : C = 4 : 5 = 12 : 15$
$\therefore A : B : C = 8 : 12 : 15$
Aliter : Using Rule 18 (ii),
Here, A : B = 2 : 3, B : C = 4 : 5
A : B : C = xp : yp : qy
$= 2 \times 4 : 3 \times 4 : 5 \times 3$
$= 8 : 12 : 15$

73. (4) $25^{2.5} : 5^3$
$= (5^2)^{2.5} : 5^3$
$= 5^5 : 5^3$
$= 5^2 : 1$
$= 25 : 1$

74. (3) Third proportional of 12 and 18 = x
$\therefore 12 : 18 = 18 : x$

$\Rightarrow x = \frac{18 \times 18}{12} = 27$

Aliter : Using Rule 15,

Third proportion $= \frac{b^2}{a} = \frac{18^2}{12}$

$= \frac{18 \times 18}{12} = 27$

75. (2) $x : y = 3 : 2 = 9 : 6$
$y : z = 3 : 2 = 6 : 4$
$\therefore x : y : z = 9 : 6 : 4$
$\therefore 9a + 6a + 4a = 342$
$\Rightarrow 19a = 342$
$\Rightarrow a = 342 \div 19 = 18$
$\therefore$ A $\Rightarrow 18 \times 9 = 162$
B $\Rightarrow 18 \times 6 = 108$
C $\Rightarrow 18 \times 4 = 72$

76. (1) $\frac{A}{B} = \frac{3}{4}, \frac{B}{C} = \frac{6}{5}$

$\Rightarrow \frac{A}{B} \times \frac{B}{C} = \frac{3}{4} \times \frac{6}{5} = \frac{9}{10}$

$\Rightarrow \frac{A}{C} = \frac{9}{10} \Rightarrow \frac{C}{A} = \frac{10}{9}$

Aliter : Using Rule 18(i),
A : C = xp : yq
$= 3 \times 6 : 4 \times 5$
$= 18 : 20$
A : C = 9 : 10
$\therefore$ C : A = 10 : 9

77. (1) $\frac{2}{x} = \frac{y}{54}$
$\Rightarrow xy = 2 \times 54 = 6 \times 18$

78. (1) $\frac{12}{9} = \frac{16}{12}$
$\Rightarrow 12 \times 12 = 9 \times 16$
$\Rightarrow 144 = 144.$

79. (1) $\frac{18}{x} = \frac{x}{50}$
$\Rightarrow x^2 = 18 \times 50$
$= 900$
$\Rightarrow x = \sqrt{900} = 30$

80. (3) A : B = 7 : 9
B : C = 3 : 5
$\therefore$ A : B : C
$= 7 \times 3 : 9 \times 3 : 9 \times 5$
$= 7 : 9 : 15$
Aliter : Using Rule 18(ii),
A : B : C = xp : py : qy
$= 7 \times 3 : 9 \times 3 : 5 \times 9$
$= 21 : 27 : 45$
$= 7 : 9 : 15$

81. (3) $\frac{x}{y} = \frac{5}{2}$ (Given)

Expression $= \frac{8x+9y}{8x+2y}$

$= \frac{\frac{8x+9y}{y}}{\frac{8x+2y}{y}}$

$= \frac{8\frac{x}{y}+9}{8\frac{x}{y}+2} = \frac{8 \times \frac{5}{2}+9}{8 \times \frac{5}{2}+2}$

$= \frac{20+9}{20+2} = \frac{29}{22} = 29 : 22$

82. (2) Length : breadth = 5 : 2
Breadth = 40 metre

$\therefore$ Length $= \frac{5}{2} \times 40 = 100$ metre

83. (1) $\frac{2}{x} = \frac{4}{8} \Rightarrow 4x = 2 \times 8$

$\Rightarrow x = \frac{2 \times 8}{4} = 4$

$\therefore \frac{x}{y} = \frac{2}{3}$

$\Rightarrow \frac{4}{y} = \frac{2}{3}$

$\Rightarrow 2y = 4 \times 3$

$\Rightarrow y = \frac{4 \times 3}{2} = 6$

84. (1) $\frac{a+b}{\sqrt{ab}} = \frac{4}{1} \Rightarrow \frac{a+b}{2\sqrt{ab}} = \frac{2}{1}$
By componendo and dividendo,

$\frac{a+b+2\sqrt{ab}}{a+b-2\sqrt{ab}} = \frac{3}{1}$

$\Rightarrow \frac{\left(\sqrt{a}+\sqrt{b}\right)^2}{\left(\sqrt{a}-\sqrt{b}\right)^2} = \frac{\left(\sqrt{3}\right)^2}{(1)^2}$

$\Rightarrow \frac{\sqrt{a}+\sqrt{b}}{\sqrt{a}-\sqrt{b}} = \frac{\sqrt{3}}{1}$

Again using componendo and dividendo,

$$\frac{2\sqrt{a}}{2\sqrt{b}} = \frac{\sqrt{3}+1}{\sqrt{3}-1}$$

$$\Rightarrow \frac{\sqrt{a}}{\sqrt{b}} = \frac{\sqrt{3}+1}{\sqrt{3}-1}$$

On squaring both sides

$$\frac{a}{b} = \left(\frac{\sqrt{3}+1}{\sqrt{3}-1}\right)^2 = \frac{3+1+2\sqrt{3}}{3+1-2\sqrt{3}}$$

$$= \frac{4+2\sqrt{3}}{4-2\sqrt{3}} = \frac{2+\sqrt{3}}{2-\sqrt{3}}$$

$$= 2+\sqrt{3} : 2-\sqrt{3}$$

85. (2)

Monkey	Banana	Time
12 ↑	12 ↓	12 ↓
4	4	x

$\therefore \left.\begin{matrix} 4:12 \\ 12:4 \end{matrix}\right\} :: 12 : x$

$\Rightarrow 4 \times 12 \times x = 12 \times 12 \times 4$

$\Rightarrow x = \dfrac{12 \times 12 \times 4}{4 \times 12}$

= 12 minutes

86. (3) Let x be added to each term. According to the question,

$$\frac{2+x}{5+x} = \frac{5}{6}$$

$\Rightarrow 12 + 6x = 25 + 5x$

$\Rightarrow 6x - 5x = 25 - 12$

$\Rightarrow x = 13$

87. (3) A : B = 2 : 3

B : C = 3 : 7

$\therefore$ A : B : C = 2 : 3 : 7

$\therefore$ A = $2k$, B = $3k$, C = $7k$

$\therefore$ A + B = $5k$; B + C = $10k$, C + A = $9k$

$\therefore$ Required ratio = $5k : 10k : 9k$ = 5 : 10 : 9

88. (1) $\dfrac{x^3 - y^3}{x^2 + xy + y^2} = \dfrac{5}{1}$

$$\Rightarrow \frac{(x-y)(x^2+xy+y^2)}{x^2+xy+y^2} = 5$$

$\Rightarrow x - y = 5$ ....(i)

Again,

$$\frac{x^2 - y^2}{x - y} = 7$$

$$\Rightarrow \frac{(x+y)(x-y)}{x-y} = 7$$

$\Rightarrow x + y = 7$ ....(ii)

On adding equations (i) and (ii),

$2x = 12 \Rightarrow x = 6$

From equation (ii),

$x + y = 7 \Rightarrow y = 7 - 6 = 1$

$$\therefore \frac{2x}{3y} = \frac{2 \times 6}{3 \times 1} = 4 : 1$$

89. (4) A : B = 2 : 1

A : C = 1 : 3 = 2 : 6

$\therefore$ A : B : C = 2 : 1 : 6

90. (2) $\dfrac{1 \cdot 21}{x} = \dfrac{x}{0.09}$

Where = x = mean Proportion

$\Rightarrow x^2 = 1.21 \times 0.09$

$\Rightarrow x^2 = 1.1 \times 1.1 \times 0.3 \times 0.3$

$\Rightarrow x = 1.1 \times 0.3 = 0.33$

91. (3) According to the question,

$x = 2k$

$y = 3k$

$z = 5k$

$\because x + y + z = 80$

$\Rightarrow 2k + 3k + 5k = 80$

$\Rightarrow 10k = 80$

$\Rightarrow k = \dfrac{80}{10} = 8$

$\therefore x = 2 \times 8 = 16$

$y = 3 \times 8 = 24$

$z = 5 \times 8 = 40$

$\therefore z = ax - 8$

$\Rightarrow 40 = a \times 16 - 8$

$\Rightarrow 16a = 40 + 8 = 48$

$\Rightarrow a = \dfrac{48}{16} = 3$

92. (2) A : B = 5 : 4 = 45 : 36

B : C = 9 : 10 = 36 : 40

$\therefore$ A : B : C = 45 : 36 : 40

Sum of the terms of ratio

= 45 + 36 + 40 = 121

$\therefore$ C's share = Rs. $\left(\dfrac{40}{121} \times 2420\right)$

= Rs. 800

93. (4) Successful students

$\Rightarrow \dfrac{9}{11} \times 132 = 108$

Unsuccessful students

$\Rightarrow \dfrac{2}{11} \times 132 = 24$

When 4 more students succeed,

Required ratio

= (108 + 4) : (24 – 4)

= 112 : 20 = 28 : 5

94. (3) Before battle,

Officers $\Rightarrow 3x$

Soldiers $\Rightarrow 31x$

According to the question,

After battle,

$$\frac{3x-6}{31x-22} = \frac{1}{13}$$

$\Rightarrow 39x - 78 = 31x - 22$

$\Rightarrow 39x - 31x = 78 - 22$

$\Rightarrow 8x = 56$

$\Rightarrow x = \dfrac{56}{8} = 7$

$\therefore$ Required number of officers = 3 × 7 = 21

95. (2) Boys : Girls = 7 : 5

Number of boys = $\dfrac{7}{12} \times 720$

= 420

Number of girls = $\dfrac{5}{12} \times 720$

= 300

Let x girls be admitted.

According to the question,

$420 = 300 + x$

$\Rightarrow x = 420 - 300 = 120$

96. (3) Boys : Girls = 5 : 6

Sum of the terms of ratio

= 5 + 6 = 11

$\therefore$ Number of girls

$= \dfrac{6}{11} \times 55 = 30$

97. (2) Boys : Girls = 9 : 7,

Sum of the terms of the ratio = 9 + 7 = 16

Number of students = 256

$\therefore$ Number of girls

$= \dfrac{256 \times 7}{16} = 112$

98. (2) Let the numbers be x and y.

According to the question,

$x + y = 3(x - y)$

$\Rightarrow x + y = 3x - 3y$

$\Rightarrow 3x - x = y + 3y$

$\Rightarrow 2x = 4y$

$\Rightarrow x = 2y$

$\Rightarrow \dfrac{x}{y} = \dfrac{2}{1}$

99. (2) Reciprocal ratio

$= \dfrac{yz}{x} : \dfrac{zx}{y} : \dfrac{xy}{z}$

Their compound ratio

$= \dfrac{yz.zx.xy}{xyz} = xyz : 1$

100. (2) According to the question,

$$\frac{x + \frac{1}{x}}{x - \frac{1}{x}} = \frac{5}{3}$$

$\Rightarrow 5x - \frac{5}{x} = 3x + \frac{3}{x}$

$\Rightarrow 5x - 3x = \frac{5}{x} + \frac{3}{x}$

$\Rightarrow 2x = \frac{8}{x}$

$\Rightarrow x^2 = \frac{8}{2} = 4$

$\Rightarrow x = \sqrt{4} = \pm 2$

101. (2) Let the numbers be $3x$, $2x$ and $5x$.
According to the question,
$(3x)^2 + (2x)^2 + (5x)^2 = 1862$
$\Rightarrow 9x^2 + 4x^2 + 25x^2 = 1862$
$\Rightarrow 38x^2 = 1862$

$\Rightarrow x^2 = \frac{1862}{38} = 49 = 5 : 2$

$\therefore x = \sqrt{49} = 7$

$\therefore$ Number in the middle
$= 2x = 14$

102. (3) $2r = h + \sqrt{r^2 + h^2}$

$\Rightarrow 2r - h = \sqrt{r^2 + h^2}$

On squaring both sides,
$4r^2 + h^2 - 4rh = r^2 + h^2$
$\Rightarrow 3r^2 = 4rh$
$\Rightarrow 3r = 4h$

$\Rightarrow \frac{r}{h} = \frac{4}{3} = 4 : 3$

103. (2) Let the number of sweets be x.
A : B = 3 : 4
Sum of the terms of ratio
= 3 + 4 = 7

$\therefore$ A's share $= \frac{3x}{7}$

$\therefore \frac{3x}{7} = 36$

$\Rightarrow 3x = 36 \times 7$

$\Rightarrow x = \frac{36 \times 7}{3} = 84$

104. (2) In the college union,

Number of boys $= \frac{5}{8} \times 48 = 30$

Number of girls $= \frac{3}{8} \times 48 = 18$

Let the number of girls added be x.

$\therefore \frac{30}{18 + x} = \frac{6}{5}$

$\Rightarrow 108 + 6x = 150$
$\Rightarrow 6x = 150 - 108 = 42$

$\Rightarrow x = \frac{42}{6} = 7$

105. (3) In coloured picture,

Blue part $= \frac{4}{7}$

Yellow part $= \frac{3}{7}$

In upper half,

Blue part $= \frac{2}{5 \times 2} = \frac{1}{5}$

Yellow part $= \frac{3}{5 \times 2} = \frac{3}{10}$

In lower half,

Blue part $= \frac{4}{7} - \frac{1}{5} = \frac{20 - 7}{35}$

$= \frac{13}{35}$

Yellow part $= \frac{3}{7} - \frac{3}{10} = \frac{30 - 21}{70}$

$= \frac{9}{70}$

$\therefore$ Required ratio $= \frac{13}{35} : \frac{9}{70}$

$= 26 : 9$

TYPE-II

1. (2) Let the number to be added be z.

$\therefore \frac{x + z}{y + z} = \frac{p}{q}$

$\Rightarrow qx + zq = py + zp$
$\Rightarrow zp - zq = qx - py$
$\Rightarrow z(p - q) = qx - py$

$\Rightarrow z = \frac{qx - py}{p - q}$

2. (1) $\frac{x}{y} = \frac{3}{4}$

$\therefore \frac{4x - y}{2x + 3y} = \frac{4\frac{x}{y} - 1}{2\frac{x}{y} + 3}$

$= \frac{4 \times \frac{3}{4} - 1}{2 \times \frac{3}{4} + 3}$

$= \frac{2}{\frac{3}{2} + 3} = \frac{2 \times 2}{9} = 4 : 9$

3. (4) $x : y = 3 : 4 = 9 : 12$
$y : z = 3 : 4 = 12 : 16$
$\therefore x : y : z = 9 : 12 : 16$

$\therefore \frac{x + y + z}{3z} = \frac{9k + 12k + 16k}{3 \times 16k}$

$= \frac{37}{48}$

4. (3) A : B $= \frac{1}{2} : \frac{1}{3} = 3 : 2$

B : C $= \frac{1}{5} : \frac{1}{3} = 3 : 5$

$\frac{A}{B} = \frac{3}{2}$

$\Rightarrow \frac{A + B}{B} = \frac{3 + 2}{2} = \frac{5}{2}$

$\frac{B}{C} = 3 : 5 \Rightarrow \frac{C}{B} = \frac{5}{3}$

$\Rightarrow \frac{C + B}{B} = \frac{5}{3} + 1 = \frac{8}{3}$

$\therefore \frac{A + B}{C + B} = \frac{5}{2} \div \frac{8}{3}$

$= \frac{5}{2} \times \frac{3}{8} = \frac{15}{16} = 15 : 16$

5. (4) $\frac{x}{y} = \frac{3}{4}$ (Given)

$\therefore \frac{2x + 3y}{3y - 2x} = \frac{2\frac{x}{y} + \frac{3y}{y}}{\frac{3y}{y} - \frac{2x}{y}}$

(Dividing numerator and denominator by y)

$= \frac{2.\frac{x}{y} + 3}{3 - 2.\frac{x}{y}} = \frac{2 \times \frac{3}{4} + 3}{3 - 2 \times \frac{3}{4}}$

$= \frac{\frac{3}{2} + 3}{3 - \frac{3}{2}}$

$= \frac{3 + 6}{6 - 3} = \frac{9}{3} = 3 : 1$

6. (3) First number $= \frac{3x}{2}$ and

second number $= \frac{8x}{3}$

According to the question,

$$\frac{\frac{3x}{2}+15}{\frac{8x}{3}+15} = \frac{\frac{5}{3}}{\frac{5}{2}}$$

$$\Rightarrow \frac{\frac{3x+30}{2}}{\frac{8x+45}{3}} = \frac{5}{3} \times \frac{2}{5} = \frac{2}{3}$$

$$\Rightarrow \frac{(3x+30)\times 3}{(8x+45)\times 2} = \frac{2}{3}$$

$\Rightarrow 32x + 180 = 27x + 270$

$\Rightarrow 32x - 27x = 270 - 180$

$\Rightarrow 5x = 90$

$\Rightarrow x = \frac{90}{5} = 18$

$\therefore$ Larger number $= \frac{8x}{3}$

$= \frac{8 \times 18}{3} = 48$

7. (4) Ratio of division

$= \frac{1}{2} : \frac{2}{3} : \frac{4}{5}$

$= \frac{1}{2} \times 30 : \frac{2}{3} \times 30 : \frac{4}{5} \times 30$

[LCM of 2, 3 and 5 = 30]

$= 15 : 20 : 24$

$\therefore$ Sum of the terms of ratio

$= 15 + 20 + 24 = 59$

$\therefore$ Second part

$= \text{Rs.} \left(\frac{20}{59} \times 177\right) = \text{Rs. } 60$

8. (1) According to the question,

$\frac{5A}{19} = \frac{2B}{5}$

$\Rightarrow 5A = \frac{19 \times 2\,B}{5}$

$\Rightarrow A = \frac{38 \times B}{5 \times 5}$

$\Rightarrow A : B = 38 : 25$

Sum of the terms of ratio

$= 38 + 25 = 63$

$\Rightarrow$ B's share $= \text{Rs.} \left(\frac{25}{63} \times 6300\right)$

$= \text{Rs. } 2500$

9. (2) Let the required fraction be x.

According to the question,

$x : \frac{1}{27} = \frac{3}{7} : \frac{5}{9}$

$\Rightarrow x \times \frac{5}{9} = \frac{1}{27} \times \frac{3}{7} = \frac{1}{63}$

$\Rightarrow x = \frac{1}{63} \times \frac{9}{5} = \frac{1}{35}$

10. (2) A : B : C $= \frac{1}{2} : \frac{2}{3} : \frac{3}{4}$

$= \left(\frac{1}{2} \times 12\right) : \left(\frac{2}{3} \times 12\right) : \left(\frac{3}{4} \times 12\right)$

$= 6 : 8 : 9$

Sum of the terms of ratio

$= 6 + 8 + 9 = 23$

$\therefore$ First part

$= \text{Rs.} \left(\frac{6}{23} \times 782\right)$

$= \text{Rs. } 204$

11. (1) Ratio of the squares of $\frac{3}{2}$ and $\frac{4}{3}$

$= \frac{9}{4} : \frac{16}{9}$

Ratio of their reciprocals

$= \frac{4}{9} : \frac{9}{16}$

$= 64 : 81$

TYPE-III

1. (1) Let numbers $= 5x$ and $4x$

$\therefore 5x \times \frac{40}{100} = 12$

$\Rightarrow 2x = 12 \Rightarrow x = 6$ and

Second number $= 6 \times 4 = 24$

$\therefore$ 50% of 24 $= 24 \times \frac{50}{100} = 12$

2. (1) Milk : Water = K : 1

$\therefore$ S.P. = (K + 1) × 9

C.P. = 10K

Gain = 9 – K

Gain % $= \frac{9-K}{10K} \times 100$

$\Rightarrow \frac{9-K}{10K} \times 100 = 20$

$\Rightarrow 90 - 10K = 20K$

$\Rightarrow 30K = 90 \Rightarrow K = 3$

$\therefore$ Ratio = 3 : 1

3. (2) Number of brown socks $= x$

Price of brown socks = ₹ y per pair

Price of black socks = ₹ $2y$ per pair

$\therefore 4y + x \times 2y$

$= \frac{150}{100}(4 \times 2y + xy)$

$\Rightarrow 4 + 2x = \frac{3}{2}(8 + x)$

$\Rightarrow 8 + 4x = 24 + 3x$

$\Rightarrow x = 24 - 8 = 16$

$\therefore$ Required ratio = 4 : 16

= 1 : 4

4. (1) Number of boys $= 8x$

Number of girls $= 12x$

Students who do not get scholarships :

Boys $\Rightarrow 4x$

Girls $\Rightarrow 12x \times \frac{75}{100} = 9x$

Their sum $= 4x + 9x = 13x$

$\therefore$ Required percent

$= \frac{13x}{20x} \times 100$

= 65%

5. (1) Gold : Copper = 3 : 2

Sum of the terms of ratio

= 3 + 2 = 5

$\therefore$ Percentage of gold $= \frac{3}{5} \times 100$

= 60%

TYPE-IV

1. (2) Let their age be $3x$ and $2x$ years.

$\therefore 3x - 2x = 5$

$\Rightarrow x = 5$

$\therefore$ Younger student's age

$= 2x = 2 \times 5 = 10$ years

2. (3) Let the present age of brothers be x and $2x$ years.

Then, 5 years ago,

$\frac{x-5}{2x-5} = \frac{1}{3}$

$\Rightarrow 3x - 15 = 2x - 5$

$\Rightarrow x = 15 - 5 = 10$

$\therefore$ Age of elder brother

$= 10 \times 2 = 20$

$\therefore$ Required ratio

$= \frac{10+5}{20+5} = \frac{15}{25} = 3:5$

3. (1) 5 years ago, let the age of father = $2x$ years (let)
Then, Age of son = x years
$\therefore 2x + 5 + x + 5 = 100$
$\Rightarrow 3x = 100 - 10 = 90$
$\Rightarrow x = \frac{90}{3} = 30$
$\therefore$ Father's present age
$= 2x + 5 = 60 + 5 = 65$ years
Son's present age $= x + 5$
$= 30 + 5$
$= 35$ years.
After 10 years,
Ratio $= \frac{65+10}{35+10} = \frac{75}{45} = \frac{5}{3} = 5 : 3$

4. (1) Let the age of A and B four years ago be $11x$ and $14x$ years respectively.
According to the question,
After 4 years from now,
$\frac{11x+8}{14x+8} = \frac{13}{16}$
$\Rightarrow 176x + 128 = 182x + 104$
$\Rightarrow 182x - 176x = 128 - 104$
$\Rightarrow 6x = 24 \Rightarrow x = \frac{24}{6} = 4$
$\therefore$ A's present age $= (11x + 4)$ years
$= 11 \times 4 + 4 = 48$ years

5. (3) Let Maya's present age be $6x$ years and Chhaya's present age be $5x$ years.
After 15 years,
$\frac{6x+15}{5x+15} = \frac{9}{8}$
$\Rightarrow 48x + 120 = 45x + 135$
$\Rightarrow 48x - 45x = 135 - 120$
$\Rightarrow 3x = 15 \Rightarrow x = 5$
$\therefore$ Maya's present age $= 6x$
$= 6 \times 5 = 30$ years

6. (2) Let the age of Ram and Rahim 10 years ago be x and $3x$ years respectively.
After 5 years from now,
$\frac{x+15}{3x+15} = \frac{2}{3}$
$\Rightarrow 6x + 30 = 3x + 45$
$\Rightarrow 3x = 45 - 30 = 15$
$\Rightarrow x = 5$
$\therefore$ Ratio of their present age
$= (x + 10) : (3x + 10)$
$= 15 : 25 = 3 : 5$

7. (2) Let father's age be $5x$ years.
Son's age $= 2x$ years
$\therefore 5x \times 2x = 1000$
$\Rightarrow x^2 = 100 \Rightarrow x = 10$
$\therefore$ Father's age after 10 years
$= 5x + 10$
$= 5 \times 10 + 10 = 60$ years

8. (4) Sumit's present age
$= 2x$ years
Prakash's present age
$= 3x$ years
$\therefore 3x - 2x = 6$
$x = 6$
$\therefore$ Required ratio
$= (2 \times 6 + 6) : (3 \times 6 + 6)$
$= 18 : 24 = 3 : 4$

9. (1) Let x years ago the ratio of their age was 3 : 5
$\therefore$ According to the question
$\frac{40-x}{60-x} = \frac{3}{5}$
$\Rightarrow 200 - 5x = 180 - 3x$
$\Rightarrow 2x = 20$
$\therefore x = 10$ years

10. (3) Let the present age of two brothers be x and 2x years.
Now, $\frac{x-5}{2x-5} = \frac{1}{3}$
$\Rightarrow 3x - 15 = 2x - 5$
$\Rightarrow 3x - 2x = 15 - 5$
$\Rightarrow x = 10$
$\therefore$ Their present age
$= 10$ and 20 years
After 5 years their required ratio
$= \frac{15}{25} = \frac{3}{5} = 3 : 5$

11. (4) Four years ago let the age of A and B be 2x and 3x years respectively.
According to the question
$\frac{2x+4+4}{3x+4+4} = \frac{5}{7}$
$\Rightarrow \frac{2x+8}{3x+8} = \frac{5}{7}$
$\Rightarrow 14x + 56 = 15x + 40$
$\Rightarrow x = 16$
Present age of A $= 2x + 4$
$= 2 \times 16 + 4 = 36$ years
Present age of B
$= 3x + 4 = 3 \times 16 + 4$
$= 52$ years

12. (3) Boys in class $= \frac{4}{5} \times 50 = 40$
Girls $= \frac{1}{5} \times 50 = 10$
Average age of boys $= 10 \times 2$
$= 20$ years
$\therefore$ Total age of boys $= 20 \times 40$
$= 800$ years

13. (3) The present age of boys are $5x$ and $6x$ years respectively.
After 2 years,
$\frac{5x+2}{6x+2} = \frac{7}{8} \Rightarrow 42x + 14 = 40x + 16$
$\Rightarrow 2x = 2 \Rightarrow x = 1$
Ratio after 12 years
$\Rightarrow 5x + 12 : 6x + 12 = 17 : 18$

14. (2) Let the present age of Puneet and Appu be $2x$ and $3x$ years respectively.
After 3 years,
$\frac{2x+3}{3x+3} = \frac{3}{4}$
$\Rightarrow 9x + 9 = 8x + 12$
$\Rightarrow x = 3$
$\therefore$ Present age of Puneet
$= 2x = 2 \times 3 = 6$ years

15. (1) Let the age of father 10 years hence is $5x$ years, then age of son 10 years hence will be $3x$ years.
According to the question,
$\frac{5x-10-10}{3x-10-10} = \frac{3}{1}$
$\Rightarrow \frac{5x-20}{3x-20} = \frac{3}{1}$
$\Rightarrow 5x - 20 = 9x - 60$
$\Rightarrow 4x = 40$ or $x = 10$
$\therefore$ Required ratio
$= (3x - 10) : (5x - 10)$
$= 20 : 40 = 1 : 2$

16. (3) Let the present age of Rahul and Rashmi be $2x$ and x years respectively.
After 30 years,
$\frac{2x+30}{x+30} = \frac{7}{6}$
$\Rightarrow 12x + 180 = 7x + 210$
$\Rightarrow 12x - 7x = 210 - 180$
$\Rightarrow 5x = 30 \Rightarrow x = \frac{30}{5} = 6$
$\therefore$ Rahul's present age
$= 2x = 2 \times 6 = 12$ years

17. (2) Let the present age of A and B be $4x$ and $5x$ years respectively,
According to the question,

$$\frac{4x+5}{5x+5}=\frac{5}{6}$$

$\Rightarrow 25x + 25 = 24x + 30$
$\Rightarrow x = 30 - 25 = 5$
$\therefore$ A's present age
$= 4x = 4 \times 5 = 20$ years

18. (3) $\frac{36+n}{50+n}=\frac{3}{4}$
$\Rightarrow 144 + 4n = 150 + 3n$
$\Rightarrow 4n - 3n = 150 - 144$
$\Rightarrow n = 6$

19. (4) Sumit's present age
$= 2x$ years
Prakash's present age
$= 3x$ years
$\therefore 3x - 2x = 6$
$x = 6$
$\therefore$ Required ratio
$= (2 \times 6 + 6) : (3 \times 6 + 6)$
$= 18 : 24 = 3 : 4$

20. (1) Ages of the persons $= 4x$ and $7x$ years.
$\therefore 7x - 4x = 30 \Rightarrow 3x = 30$
$\Rightarrow x = 10$
$\therefore$ Sum of their ages $= 4x + 7x$
$= 11x$ years
$= 11 \times 10 = 110$ years

21. (4) 16 years ago,
My age $= x$ years
My grandfather's age $= 9x$ years
After 8 years from the present,
$9x + 16 + 8 = 3(x + 8 + 16)$
$\Rightarrow 9x + 24 = 3x + 24 + 48$
$\Rightarrow 9x + 24 = 3x + 72$
$\Rightarrow 9x - 3x = 72 - 24 \Rightarrow 6x = 48$

$$\Rightarrow x = \frac{48}{6} = 8$$

Required ratio 8 years ago,
$= (x + 8) : (9x + 8)$
$= (8 + 8) : (9 \times 8 + 8)$
$= 16 : 80 = 1 : 5$

22. (3) A's present age $= 3x$ years
B's present age $= x$ years
4 years ago,

$$\frac{3x-4}{x-4}=\frac{4}{1}$$

$\Rightarrow 4x - 16 = 3x - 4$
$\Rightarrow 4x - 3x = 16 - 4$
$\Rightarrow x = 12$
$\therefore$ A's present age
$= 3x = 3 \times 12 = 36$ years

23. (3) 18 years ago,
A's age $= 8x$ years
B's age $= 13x$ years
$\therefore$ At present,

$$\frac{8x+18}{13x+18}=\frac{5}{7}$$

$\Rightarrow 56x + 126 = 65x + 90$
$\Rightarrow 65x - 56x = 126 - 90$

$$\Rightarrow 9x = 36 \Rightarrow x = \frac{36}{9} = 4$$

$\therefore$ A's present age $= 8x + 18$
$= 8 \times 4 + 18 = 50$ years

24. (2) Age of first person $= 5x$ years
Age of second person
$= 9x$ years
According to the question,
$9x - 5x = 40 \Rightarrow 4x = 40$
$\Rightarrow x = 10$
$\therefore$ Sum of their ages
$= 5x + 9x = 14x$
$= 14 \times 10 = 140$ years

25. (3) Sonali's present age
$= 5x$ years
Monali's present age $= 3x$ years
According to the question,
After 5 years,

$$\frac{5x+5}{3x+5}=\frac{10}{7}$$

$$\Rightarrow \frac{x+1}{3x+5}=\frac{2}{7}$$

$\Rightarrow 7x + 7 = 6x + 10$
$\Rightarrow 7x - 6x = 10 - 7$
$\Rightarrow x = 3$
$\therefore$ Monali's present age $= 3x$
$= 9$ years

26. (2) 4 years ago,
P's age $= 5x$ years
Q's age $= 6x$ years
According to the question,
$5x + 4 + 6x + 4 = 52$
$\Rightarrow 11x = 52 - 8 = 44$

$$\Rightarrow x = \frac{44}{11} = 4$$

$\therefore$ Required ratio
$= (5x + 4) : (6x + 4)$
$= (5 \times 4 + 4) : (6 \times 4 + 4)$
$= 24 : 28 = 6 : 7$

27. (1) A's present age $= 5x$ years
B's present age $= 6x$ years
According to the question,
After 7 years,

$$\frac{5x+7}{6x+7}=\frac{6}{7}$$

$\Rightarrow 36x + 42 = 35x + 49$
$\Rightarrow 36x - 35x = 49 - 42$
$\Rightarrow x = 7$
A's present age $= 5x = 35$ years

28. (4) Let the ages of boys be $3x$ and $4x$ years respectively.
According to the question,
After 3 years

$$\frac{3x+3}{4x+3}=\frac{4}{5}$$

$\Rightarrow 16x + 12 = 15x + 15$
$\Rightarrow 16x - 15x = 15 - 12$
$\Rightarrow x = 3$
$\therefore$ Required ratio after 21 years

$$= \frac{3x+21}{4x+21}$$

$$= \frac{3\times3+21}{4\times3+21} = \frac{9+21}{12+21}$$

$$= \frac{30}{33} = \frac{10}{11}$$

29. (4) A's present age
$= 4x$ years (let).
According to the question,
$4x + 6 = 26$
$\Rightarrow 4x = 26 - 6 = 20$

$$\Rightarrow x = \frac{20}{4} = 5$$

$\therefore$ B's present age $= 3x = 3 \times 5$
$= 15$ years

30. (1) A's present age $= 3x$ years (let)
B's present age $= 4x$ years
According to the question,
10 years ago,

$$\frac{3x-10}{4x-10}=\frac{4}{7}$$

$\Rightarrow 21x - 70 = 16x - 40$
$\Rightarrow 21x - 16x = 70 - 40$
$\Rightarrow 5x = 30$

$$\Rightarrow x = \frac{30}{5} = 6$$

$\therefore$ A's present age
$= 3x = 3x \times 6 = 18$ years
B's present age
$= 4x = 4 \times 6 = 24$ years

TYPE-V

1. (3) Let the numbers be 3x and 8x.

$\therefore$ 8x – 3x = 115

$\Rightarrow$ 5x = 115 $\Rightarrow$ x = $\frac{115}{5}$ = 23

$\therefore$ The smaller number

= 3x = 3 × 23 = 69

2. (2) x + 2x + 3x + 4x = 16

$\therefore$ x = $\frac{16}{10}$ = 1.6

$\therefore$ Sum = 1.6 + 6.4 = 8

3. (3) Let the two numbers be x and y.

$\therefore$ According to question,

x + y = 40 .....(i)

x – y = 4 ....(ii)

From equation (i) and (ii), we get

x = 22 and y = 18

$\therefore$ Required ratio

= $\frac{22}{18} = \frac{11}{9}$ = 11 : 9

4. (1) Let the nos. be 10x & 7 x

then, 10 x – 7x = 105

$\Rightarrow$ 3x = 105 $\Rightarrow$ x = 35

$\therefore$ Sum = 10x + 7x = 17x

= 17 × 35 = 595

5. (2) Let the integers be $9x$ and $7x$ respectively.

According to the question,

$9x \times 7x = 1575$

$\Rightarrow x^2 = \frac{1575}{63}$

$\Rightarrow x^2 = 25$

$\Rightarrow x = 5$

[x being positive (+ve) integer]

$\therefore$ Smaller integer

$= 7x = 7 \times 5 = 35$

6. (3) Let the numbers be 3x, 2x and 5x respectively.

Now, $(3x)^2 + (2x)^2 + (5x)^2$

= 1862

$\Rightarrow 9x^2 + 4x^2 + 25x^2 = 1862$

$\Rightarrow 38x^2 = 1862$

$\Rightarrow x^2 = \frac{1862}{38} = 49$

$\Rightarrow x = \sqrt{49} = 7$

$\therefore$ The smallest number

= 2x = 2 × 7 = 14

7. (4)

Number	II		III		I
	9	:	16		
			4	:	1
	36	:	64	:	16
	9	:	16	:	4

Therefore, second number

$= \frac{9}{9+16+4} \times 116 = \frac{9}{29} \times 116$

= 36

8. (3) Let the numbers be x, y and z. Then

$x : y = 2 : 3$; $y : z = 5 : 8$

$\therefore x : y : z = 2 \times 5 : 3 \times 5 : 3 \times 8$

= 10 : 15 : 24

Sum of the ratios

= 10 + 15 + 24 = 49

$\therefore$ The second number

$= \frac{15}{49} \times 98 = 30$

9. (4) Quantity of milk in 45 litres

$= \frac{2}{3} \times 45 = 30$ litres.

$\therefore$ Water = (45 – 15)

= 15 litres

Let x litres of water be added.

$\therefore \frac{30}{15+x} = \frac{1}{2}$

$\Rightarrow 15 + x = 60$

$\Rightarrow x = 60 - 15 = 45$ litres.

10. (1) Let the numbers be a, b and c.

Now, $a : b = 8 : 9$

$b : c = 3 : 4$

$\therefore a : b : c$

$= 8 \times 3 : 9 \times 3 : 9 \times 4$

$= 24 : 27 : 36 = 8 : 9 : 12$

$\therefore \frac{a}{8} = \frac{b}{9} = \frac{c}{12} = k$

$\Rightarrow a = 8k,\ b = 9k,\ c = 12k$

According to the question,

$8k \times 12k = 2400$

$\Rightarrow k^2 = \frac{2400}{8 \times 12} = 25$

$\Rightarrow k = 5$

$\therefore$ Second number

$= 9k = 9 \times 5 = 45$

11. (1) Let the number be $2x$ and $3x$. Then.

$\frac{2x-2}{3x+2} = \frac{1}{2}$

$\Rightarrow 4x - 4 = 3x + 2$

$\Rightarrow x = 6$

$\therefore$ Sum of numbers = $5x$

$= 5 \times 6 = 30$

12. (4) Ratio of numbers

$= \frac{1}{2} : \frac{2}{3} : \frac{3}{4}$

$= \frac{1}{2} \times 12 : \frac{2}{3} \times 12 : \frac{3}{4} \times 12$

= 6 : 8 : 9

Let the numbers be $6x$, $8x$ and $9x$.

Now, $9x - 6x = 36$

$\Rightarrow x = 12$

$\therefore$ Numbers are

72, 96 and 108.

13. (1) Let the numbers be a, b and c. Then

$a : b = 2 : 3$

$b : c = 5 : 3$

$\therefore a : b : c = 2\times5 : 3\times5 : 3\times3$

= 10 : 15 : 9

Let the numbers now be $10x$, $15x$ and $9x$

$\therefore 10x + 15x + 9x = 68$

$\Rightarrow 34x = 68 \Rightarrow x = \frac{68}{34} = 2$

$\therefore$ Second number = 15 x

= 15 × 2 = 30

14. (3) Let the number to be subtracted be x.

According to the question,

$\frac{7-x}{9-x} = \frac{11-x}{15-x}$

Now, check through options

Clearly, putting $x = 3$,

Each ratio = $\frac{2}{3}$.

Note : Solve such questions orally by mental exercise.

Aliter : Using Rule 32,

The number will be x

$= \frac{ad - bc}{(a+d)-(b+c)}$

$= \frac{7\times15 - 9\times11}{(7+15)-(9+11)}$

$= \frac{105-99}{22-20}$

$= \frac{6}{2} = 3$

15. (2) Let the numbers be $2x$ and $3x$.

$\therefore 2x \times 3x = 96$

$\Rightarrow x^2 = \frac{96}{6} = 16$

$\therefore x = \sqrt{16} = 4$

$\therefore$ Sum = $2x + 3x = 5x$

$= 5 \times 4 = 20$

16. (3) Let the numbers be $3x$ and $4x$.

$\therefore \frac{3x+6}{4x+6} = \frac{4}{5}$

$\Rightarrow 16x + 24 = 15x + 30$

$\Rightarrow x = 30 - 24 = 6$

$\therefore$ Required difference = 6

Aliter : Using Rule 34,

Here, a = 3, b= 4, x = 6

c = 4, d = 5

The numbers are $= \frac{xa(c-d)}{ad-bc}$

$= \frac{6.3(4-5)}{3\times5-4\times4}$

$= \frac{18\times-1}{15-16} = 18$

$= \frac{xb(c-d)}{ad-bc}$

$= \frac{6\times4(4-5)}{3\times5-4\times4}$

$= \frac{24\times(-1)}{15-16} = 24$

Numbers are 24 and 18.

Their difference = 24 – 18 = 6

17. (4) Let the two numbers are x and y.

According to the question,

$\frac{x}{y} = \frac{5}{7}$

7x = 5y

7x – 5y = 0 ...(I)

Again, $\frac{x-40}{y-40} = \frac{17}{27}$

$\Rightarrow$ 27x – 1080 = 17y – 680

$\Rightarrow$ 27x – 17y = 1080 – 680

$\Rightarrow$ 27x – 17y = 400 ...(II)

From (I) × 17 – (II) × 5, we have

119x – 85y = 0

135x – 85y = 2000

– + –

– 16x = – 2000

$\therefore$ x = 125

Putting the value of x in equation (I)

7 × 125 = 5y

$\therefore y = \frac{7\times125}{5} = 175$

$\therefore$ Difference of the numbers = 175 – 125 = 50

Aliter : Using Rule 35,

Here, a = 5, b = 7, x = 40

c = 17, d = 27

The two numbers are

$= \frac{xa(d-c)}{ad-bc}$

$= \frac{40\times5(27-17)}{5\times27-7\times17}$

$= \frac{200\times10}{135-119}$

$= \frac{2000}{16} = \frac{500}{4}$

1st Number = 125

And $= \frac{xb(d-c)}{ad-bc}$

$= \frac{40\times7(27-17)}{5\times27-7\times17}$

$= \frac{280\times10}{135-119}$

$= \frac{2800}{16} = \frac{700}{4}$

2nd Number = 175

Their difference= 175 – 125 = 50

18. (3) Let the numbers be $5x$, $6x$ and $7x$ respectively.

$\therefore 5x \times 6x \times 7x = 5670$

$\Rightarrow x^3 = \frac{5670}{5\times6\times7} = 27$

$\therefore x = \sqrt[3]{27} = 3$

$\therefore$ The greatest number = $7x$

= 7 × 3 = 21

19. (1) Let the numbers be $3x$ and x,

Then, $3x + x = 240$

$\Rightarrow 4x = 240$

$\Rightarrow x = \frac{240}{4} = 60$

$\therefore$ Difference = $3x - x = 2x$

= 2 × 60 = 120

20. (3) $x + y = 3(x - y)$

$\Rightarrow x + y = 3x - 3y \Rightarrow 2x = 4y$

$\Rightarrow \frac{x}{y} = \frac{2}{1} \Rightarrow x : y = 2 : 1$

21. (3) Let the numbers be $3x$, $4x$ and $5x$.

$\therefore 5x + 3x = 4x + 52$

$\Rightarrow 4x = 52 \Rightarrow x = 13$

$\therefore$ The smallest number

$= 3x = 3 \times 13 = 39$

22. (4) Let required number be x.

$\therefore \frac{6+x}{7+x} = \frac{15+x}{17+x}$

$\Rightarrow 102 + 17x + 6x + x^2$

$= 105 + 7x + 15x + x^2$

$\Rightarrow 23x - 22x = 105 - 102$

$\Rightarrow x = 3$

Note : It is convenient to solve it orally using options

$\frac{6+3}{7+3} = \frac{15+3}{17+3} \Rightarrow \frac{9}{10} = \frac{18}{20}$

Aliter : Using Rule 32,

Required Number

$= \frac{bc-ad}{(a+d)-(b+c)}$

Where a = 6, b = 7, c = 15, d = 17

$= \frac{7\times15-6\times17}{(6+17)-(7+15)}$

$= \frac{105-102}{23-22} = 3$

23. (2) $\frac{6+x}{14+x} = \frac{18+x}{38+x}$

From the given alternatives

$\frac{6+2}{14+2} = \frac{18+2}{38+2}$

$\Rightarrow \frac{1}{2} = \frac{1}{2}$

Aliter : Using Rule 32,

Here, a = 6, b = 14, c = 18, d = 38

Required number x

$= \frac{bc-ad}{(a+d)-(b+c)}$

$= \frac{14\times18-6\times38}{(6+38)-(14+18)}$

$= \frac{252-228}{44-32} = \frac{24}{12} = 2$

24. (1) A : B = 8 : 9
B : C = 3 : 4 = 9 : 12
∴ A : B : C = 8 : 9 : 12
∴ Numbers = $8x$, $9x$ and $12x$
∴ $8x \times 12x = 2400$

$\Rightarrow x^2 = \frac{2400}{8 \times 12} = 25$

∴ $x = \sqrt{25} = 5$
∴ A + B + C = $8x + 9x + 12x$
$= 29x$
$= 29 \times 5 = 145$

25. (3) Check through options
Number = 36
3 + 6 = 9; 6 – 3 = 3
and 36 : 9 = 4 : 1
Otherwise– $10x + y : x + y = 4 : 1$
$\Rightarrow 10x + (x + 3) : x + (x + 3) = 4 : 1$

$\Rightarrow \frac{11x+3}{2x+3} = \frac{4}{1}$

$\Rightarrow 11x + 3 = 8x + 12$
$\Rightarrow 3x = 9 \Rightarrow x = 3$ and $y = 6$
Then the number is 36.

26. (2) Number of balls in bag x and y respectively = $2a$ and $3a$
∴ $3a - 5 = 2a + 3$
$\Rightarrow a = 5 + 3 = 8$
∴ Total number of balls
$= 5a = 40$
∴ Balls in each bag = 20

27. (3) $(x + y)^2 = 4xy$
$\Rightarrow x^2 + y^2 + 2xy - 4xy = 0$

$\Rightarrow (x - y)^2 = 0 \Rightarrow x = y$

$\Rightarrow x : y = 1 : 1$

28. (2) Numbers = $2x$, $3x$ and $4x$
∴ $(2x)^2 + (3x)^2 + (4x)^2 = 1856$
$\Rightarrow 4x^2 + 9x^2 + 16x^2 = 1856$
$\Rightarrow 29x^2 = 1856$
$\Rightarrow x^2 = 1856 \div 29 = 64$

∴ $x = \sqrt{64} = 8$
∴ Numbers = 16, 24 and 32

29. (3) From the given options number = 5, because

$\frac{7+5}{16+5} = \frac{43+5}{79+5}$

$\Rightarrow \frac{12}{21} = \frac{48}{84}$

[check other options likewise]
Aliter : Using Rule 32,
Here, a = 7, b=16, c = 43, d= 79
Required number x

$= \frac{bc - ad}{(a+d)-(b+c)}$

$= \frac{16 \times 43 - 7 \times 79}{(7+79)-(16+43)}$

$= \frac{688-553}{86-79} = \frac{35}{7} = 5$

30. (4) Average of two no's = 62
∴ Sum of the numbers
$= 62 \times 2 = 124$
Sum of the numbers = 124
If the larger number be x, then smaller number = $124 - x$

∴ $\frac{124 - x + 2}{x} = \frac{1}{2}$

$\Rightarrow 252 - 2x = x$
$\Rightarrow 3x = 252 \Rightarrow x = 84$
∴ Smaller number
$= 124 - 84 = 40$
∴ Difference = 84 – 40 = 44

31. (4) Let x be subtracted from each term of $\frac{15}{19}$.

∴ $\frac{15 - x}{19 - x} = \frac{3}{4}$

$\Rightarrow 57 - 3x = 60 - 4x$
$\Rightarrow x = 3$

32. (1) Numbers are x and y
∴ $x + y = 25$
$x - y = 20$
On adding,
$2x = 45$

$\Rightarrow x = \frac{45}{2} = 22.5$

From equation (i),
$22.5 + y = 25$
$\Rightarrow y = 25 - 22.5 = 2.5$
∴ Required ratio = 22.5 : 2.5
= 9 : 1

33. (1) ∴ Ratio of numbers = 2 : 3
Sum of ratios = 2 + 3 = 5

∴ First number = $\frac{2}{5} \times 125 = 50$

Second number = $\frac{3}{5} \times 125 = 75$

34. (3) Numbers = $2x$, $3x$ and $5x$,
According to question,
$(2x)^2 + (3x)^2 + (5x)^2 = 608$
$\Rightarrow 4x^2 + 9x^2 + 25x^2 = 608$
$\Rightarrow 38x^2 = 608$

$\Rightarrow x^2 = \frac{608}{38} = 16$

$\Rightarrow x = \sqrt{16} = 4$

∴ Numbers $\Rightarrow 2x = 2 \times 4 = 8$
$3x = 3 \times 4 = 12$
$5x = 5 \times 4 = 20$

35. (1) Numbers = $7x$ and $9x$ (let)
According to the question,
$7x \times 9x = 1575$

$\Rightarrow x^2 = \frac{1575}{7 \times 9} = 25$

$\Rightarrow x = \sqrt{25} = 5$

∴ Larger number = $9x$
$= 9 \times 5 = 45$

36. (2) Let A = $4x$ and B = $5x$.
According to the question,
$(5x)^2 - (4x)^2 = 81$
$\Rightarrow 25x^2 - 16x^2 = 81$
$\Rightarrow 9x^2 = 81 \Rightarrow x^2 = 9$

$\Rightarrow x = \sqrt{9} = 3$

∴ A = $4x = 4 \times 3 = 12$

37. (3) Let the numbers be $2x$ and $3x$ respectively.
According to the question,

$\frac{2x+8}{3x+8} = \frac{3}{4}$

$\Rightarrow 9x + 24 = 8x + 32$
$\Rightarrow 9x - 8x = 32 - 24 = 8$
$\Rightarrow x = 8$
∴ Sum of numbers = $2x + 3x$
$= 5x$
$= 5 \times 8 = 40$
Aliter : Using Rule 34,
Here, a = 2, b = 3, x= 8, c = 3, d = 4

1st Number = $\frac{xa(c-d)}{ad-bc}$

$= \frac{8 \times 2(3-4)}{2 \times 4 - 3 \times 3}$

$= \frac{-16}{-1} = 16$

2nd Number = $\frac{xb(c-d)}{ad-bc}$

$= \frac{8 \times 3(3-4)}{2 \times 4 - 3 \times 3}$

$= \frac{-24}{-1} = 24$

Sum of numbers = 16 + 24 = 40

38. (1) Numbers = $5x$ and $8x$

According to the question,

$8x - 5x = 48$

$\Rightarrow 3x = 48 \Rightarrow x = 16$

$\therefore$ Smaller number $= 5x$

$= 5 \times 16 = 80$

39. (2) Let the numbers be $5x$, $7x$ and $12x$.

According to the question,

$5x + 12x = 7x + 50$

$\Rightarrow 17x - 7x = 50$

$\Rightarrow 10x = 50$

$\Rightarrow x = \frac{50}{10} = 5$

$\therefore$ Required sum

$= 5x + 7x + 12x = 24x$

$= 24 \times 5 = 120$

40. (4) According to the question,

The number 84 must be a multiple of sum of the terms of ratio.

For ratio 3 : 2,

Sum of the terms of ratio

$= 3 + 2 = 5$ which is not a factor of 84.

41. (4) Let the numbers be $3x$ and $5x$.

According to the question,

$$\frac{3x+6}{5x+6} = \frac{2}{3}$$

$\Rightarrow 10x + 12 = 9x + 18$

$\Rightarrow 10x - 9x = 18 - 12$

$\Rightarrow x = 6$

Numbers are :

$3x = 3 \times 6 = 18$ and

$5x = 5 \times 6 = 30$

42. (1) Let three numbers be a, b and c respectively.

According to the question,

$a + b + c = 540$

and $b : c = 9 : 13$

$a : c = 2 : 7$

$\therefore \frac{a}{c} \times \frac{c}{b} = \frac{2}{7} \times \frac{13}{9}$

$\Rightarrow \frac{a}{b} = \frac{26}{63}$

$\therefore b : c = 9 : 13 = 63 : 91$

$\therefore a : b : c = 26 : 63 : 91$

Sum of the terms of ratio

$= 26 + 63 + 91 = 180$

$\therefore c = \frac{91}{180} \times 540 = 273$

TYPE-VI

1. (3) Let the numbers be $4x$ and $5x$.

Their LCM = $20x$

According to the question,

$20x = 180$

$\Rightarrow x = \frac{180}{20} = 9$

$\therefore$ Smaller number

$= 4x = 4 \times 9 = 36$

2. (4) If the numbers be $3x$ and $4x$, then their LCM = $12x$

$\therefore 12x = 180 \Rightarrow x = \frac{180}{12} = 15$

$\therefore$ First number = $3x = 45$

3. (1) Let the numbers be $3x$ and $5x$.

$\therefore$ LCM = $15x$

$\therefore 15x = 225 \Rightarrow x = \frac{225}{15} = 15$

$\therefore$ Smaller number

$= 3x = 3 \times 15 = 45$

4. (2) Let the numbers be $3x$ and $4x$.

$\therefore$ LCM = $12x$

$\therefore 12x = 48 \Rightarrow x = 4$

$\therefore$ Sum of numbers = $7x$

$= 7 \times 4 = 28$

5. (3) Numbers are : $3x$ and $4x$

Their LCM = $12x$

$\therefore 12x = 120$

$\Rightarrow x = \frac{120}{12} = 10$

$\therefore$ Sum of numbers = $3x + 4x$

$= 7x = 7 \times 10 = 70$

6. (1) Let the numbers be $3x$ and $4x$.

Their HCF = $x = 15$

$\therefore$ Sum of numbers = $3x + 4x = 7x = 15 \times 7 = 105$

TYPE-VII

1. (3) Let A and B have ₹ 2x and ₹ x initially.

$\therefore 2x - 2 = x + 2$

$\Rightarrow x = 4$

$\therefore$ Initial amount with A = ₹ 8

$\therefore$ Initial amount with B = ₹ 4.

2. (1) Total numbers of girls in the school

$= 504 \times \frac{11}{13+11}$

$= 504 \times \frac{11}{24} = 231$

Total numbers of boys in the school

$= 504 \times \frac{13}{13+11}$

$= 504 \times \frac{13}{29} = 273$

Now, total no. of girls when 12 more girls are admitted

$= 231 + 12 = 243$

$\therefore$ Required ratio

$= 273 : 243 = 91 : 81$

3. (3) Let the numbers be $\frac{3}{2}x$ and $\frac{8}{3}x$

According to question,

$$\frac{\frac{3}{2}x + 15}{\frac{8x}{3} + 15} = \frac{\frac{5}{3}}{\frac{5}{2}}$$

$$\Rightarrow \frac{\frac{3x+30}{2}}{\frac{8x+45}{3}} = \frac{2}{3}$$

$$\Rightarrow \frac{3(3x+30)}{2(8x+45)} = \frac{2}{3}$$

$$\Rightarrow \frac{9x+90}{16x+90} = \frac{2}{3}$$

$\Rightarrow 27x + 270 = 32x + 180$

$\Rightarrow 32x - 27x = 270 - 180 = 90$

$\Rightarrow 5x = 90 \Rightarrow x = 18$

$\therefore$ The greater number

$= \frac{8}{3}x = \frac{8}{3} \times 18 = 48$

4. (3) Let the number of students in three classes be 2x, 3x and 5x respectively.

Due to increase of 40 students in each class, we have

$$\frac{2x+40}{3x+40} = \frac{4}{5}$$

$\Rightarrow 10x + 200 = 12x + 160$

$\Rightarrow 2x = 200 - 160 \Rightarrow 2x = 40$

$\Rightarrow x = 20$

$\therefore$ Original strength

$= 10x = 10 \times 20 = 200$

5. (2) Let the numbers be 5x and 7x.

Now, $\frac{5x-9}{7x-9} = \frac{7}{11}$

$\Rightarrow 11(5x - 9) = 7(7x - 9)$

$\Rightarrow 55x - 99 = 49x - 63$

$\Rightarrow 55x - 49x = 99 - 63$
$\Rightarrow 6x = 36$
$\Rightarrow x = 6$
$\therefore$ Required difference
$= 7x - 5x = 2x = 2 \times 6 = 12$

Aliter : Using Rule 35,
Here, a = 5, b = 7,
x = 9, c = 7, d = 11

$$1\text{st Number} = \frac{xa(d-c)}{ad-bc}$$

$$= \frac{9\times5(11-7)}{5\times11-7\times7}$$

$$= \frac{45\times4}{55-49}$$

$$= \frac{45\times4}{6} = 30$$

$$2\text{nd Number} = \frac{xb(d-c)}{ad-bc}$$

$$= \frac{9\times7(11-7)}{5\times11-7\times7}$$

$$= \frac{63\times4}{55-49}$$

$$= \frac{63\times4}{6} = 42$$

Their difference = 42 – 30 = 12

6. (2) Let the numbers be $3x$ and $5x$.

$$\therefore \frac{3x-9}{5x-9} = \frac{12}{23}$$

$\Rightarrow 69x - 60x = 207 - 108$

$$\Rightarrow x = \frac{99}{9} = 11$$

$\therefore$ The smaller number
$= 3x = 33$

Aliter : Using Rule 35,
Here, a = 3, b = 5, x= 9, c = 12, d = 23

$$1\text{st Number} = \frac{xa(d-c)}{ad-bc}$$

$$= \frac{9\times3(23-12)}{3\times23-5\times12}$$

$$= \frac{27\times11}{69-60}$$

$$\frac{27\times11}{9} = 33$$

$$2\text{nd Number} = \frac{xb(d-c)}{ad-bc}$$

$$= \frac{9\times5(23-12)}{3\times23-5\times12}$$

$$= \frac{45\times11}{69-60}$$

$$= \frac{45\times11}{9} = 55$$

$\therefore$ Smallest number = 33

7. (3) Let the original number of boys and girls be x and y respectively.
Then

$$\frac{x}{y-15} = \frac{2}{1}$$

$\Rightarrow x = 2y - 30$ ....(i)

Again, $\frac{x-45}{y-15} = \frac{1}{5}$

$\Rightarrow 5x - 225 = y - 15$
$\Rightarrow 5x = y - 15 + 225$
$\Rightarrow 5(2y-30) = y + 210$ [From equation (i)]
$\Rightarrow 10y - 150 = y + 210$
$\Rightarrow 10y - y = 210 + 150$
$\Rightarrow 9y = 360$

$$\Rightarrow y = \frac{360}{9} = 40$$

8. (3) Let the original number of students in three classes be $2x$, $3x$ and $5x$ respectively.
As given,

$$\frac{2x+20}{3x+20} = \frac{4}{5}$$

$\Rightarrow 10x + 100 = 12x + 80$
$\Rightarrow 12x - 10x = 100 - 80$
$\Rightarrow 2x = 20$

$$\Rightarrow x = \frac{20}{2} = 10$$

$\therefore$ Total number of students originally
$= 2x + 3x + 5x = 10x$
$= 10 \times 10 = 100$

9. (1) Using Rule 21,
Number of boys

$$= \frac{13}{13+11}\times504$$

$$= \frac{13}{24}\times504 = 273$$

Number of girls
= 504–273 = 231
3 girls are admitted.
$\therefore$ Required ratio = 273 : 234
= 7 : 6

10. (3) Let the number of ladies and gents be $3x$ and $2x$ respectively.
According to the question,

$$\frac{3x}{2x+20} = \frac{2}{3}$$

$\Rightarrow 9x = 4x + 40 \Rightarrow 5x = 40$
$\Rightarrow x = 8$
$\therefore$ Number of ladies = $3x$
$= 3 \times 8 = 24$

11. (4) Using Rule 21,
Initially number of boys

$$= \frac{8}{8+5}\times286 = \frac{8}{13}\times286 = 176$$

$\therefore$ Number of girls

$$= \frac{5}{13}\times286 = 110$$

22 more girls get admitted.
$\therefore$ Required ratio

$$= \frac{176}{110+22} = \frac{176}{132} = \frac{4}{3} = 4 : 3$$

12. (1) Let the original number of students be $2x$, $3x$ and $4x$ in three class.
According to the question,

$$\frac{2x+12}{3x+12} = \frac{8}{11}$$

$\Rightarrow 24x + 96 = 22x + 132$
$\Rightarrow 2x = 132 - 96 = 36$

$$\Rightarrow x = \frac{36}{2} = 18$$

$\therefore$ Original number of students
$= 2x + 3x + 4x$
$= 9x = 9 \times 18 = 162$

13. (4) Let the required number be x.

$$\therefore \frac{7+x}{11+x} = \frac{3}{4}$$

$\Rightarrow 28 + 4x = 33 + 3x$
$\Rightarrow x = 33 - 28 = 5$

14. (2) Let the numbers be $7x$ and $11x$ respectively.

$$\therefore \frac{7x+7}{11x+7} = \frac{2}{3}$$

$\therefore 22x + 14 = 21x + 21$
$\Rightarrow x = 7$
$\therefore$ Smaller number
$= 7x = 7 \times 7 = 49$

Aliter : Using Rule 34,
Here, a = 7, b = 11,
x = 7, c= 2, d = 3

1st Number $= \frac{xa(c-d)}{ad-bc}$

$= \frac{7 \times 7(2-3)}{7 \times 3 - 11 \times 2}$

$= \frac{49 \times -1}{21-22} = 49$

2nd Number $= \frac{xb(c-d)}{ad-bc}$

$= \frac{7 \times 11(2-3)}{7 \times 3 - 11 \times 2}$

$= \frac{77 \times -1}{21-22} = 77$

$\therefore$ Smallest number = 49

15. (3) Let the numbers be $3x$ and $5x$.

$\therefore \frac{3x+10}{5x+10} = \frac{5}{7}$

$\Rightarrow 25x + 50 = 21x + 70$

$\Rightarrow 4x = 20$

$\Rightarrow x = 5$

$\therefore$ Smaller number = $3x$

$= 3 \times 5 = 15$

Aliter : Using Rule 34,

Here, a = 3, b = 5, c = 5, d = 7, x = 10

$\therefore$ Smallest number

$= \frac{xa(c-d)}{ad-bc} \quad \because a < b$

$= \frac{10 \times 3(5-7)}{3 \times 7 - 5 \times 5}$

$= \frac{-60}{21-25}$

$= \frac{60}{4} = 15$

16. (1) Let the numbers be $2x$ and $3x$.

$\therefore \frac{2x+4}{3x+4} = \frac{5}{7}$

$\therefore 15x + 20 = 14x + 28$

$\Rightarrow x = 28 - 20 = 8$

= Required difference

Aliter : Using Rule 34,

Here, a = 2, b = 3, c = 5, d = 7 and x = 4

1st Number $= \frac{xa(c-d)}{ad-bc}$

$= \frac{4 \times 2(5-7)}{2 \times 7 - 5 \times 3}$

$= \frac{8 \times -2}{14-15} = 16$

2nd Number $= \frac{xb(c-d)}{ad-bc}$

$= \frac{4 \times 3(5-7)}{2 \times 7 - 5 \times 3}$

$= \frac{4 \times 3(-2)}{14-15} = 24$

Difference of numbers

$= 24 - 16 = 8$

17. (4) Let the number x be added.

$\therefore \frac{17+x}{24+x} = \frac{1}{2}$

$\Rightarrow 34 + 2x = 24 + x$

$\Rightarrow 2x - x = 24 - 34$

$\Rightarrow x = -10$

Hence, 10 should be subtracted.

18. (3) Let the numbers be $4x$ and $7x$.

$\therefore \frac{4x+4}{7x+4} = \frac{3}{5}$

$\Rightarrow 21x + 12 = 20x + 20$

$\Rightarrow 21x - 20x = 20 - 12$

$\Rightarrow x = 8$

$\therefore$ Larger number

$= 7x = 7 \times 8 = 56$

Aliter : Using Rule 34,

a = 4, b = 7, c = 3, d = 5, x = 4

Larger number $= \frac{xb(c-d)}{ad-bc}$

$= \frac{4 \times 7(3-5)}{4 \times 5 - 3 \times 7}$

$= \frac{4 \times 7 \times (-2)}{20-21} = 56$

19. (2) Let the original number of students be $4x$, $6x$ and $9x$.

$\therefore \frac{4x+12}{6x+12} = \frac{7}{9}$

$\Rightarrow 42x + 84 = 36x + 108$

$\Rightarrow 42x - 36x = 108 - 84$

$\Rightarrow 6x = 24$

$\Rightarrow x = 4$

$\therefore$ Required number of students

$= 19x = 19 \times 4 = 76$

20. (3) In the first case,

Boys $= 660 \times \frac{13}{22} = 390$

Girls $= 660 \times \frac{9}{22} = 270$

If x boys leave the school, then

$\frac{390-x}{270+30} = \frac{6}{5}$

$\Rightarrow 390 - x = 360$

$\Rightarrow x = 390 - 360 = 30$

21. (1) $\boxed{\text{Tricky Approach}}$

Required ratio

$= 15 \times 22 : 11 \times 25 = 6 : 5$

22. (3) According to the question,

$\frac{3x-9}{5x-9} = \frac{12}{23}$

(Numbers = $3x$ and $5x$)

$\Rightarrow 69x - 207 = 60x - 108$

$\Rightarrow 9x = 207 - 108 = 99$

$\Rightarrow x = 11$

$\therefore$ Required numbers $\Rightarrow 3 \times 11 = 33$ and $5 \times 11 = 55$

Aliter : Using Rule 35,

Here, a = 3, b = 5,

c = 12, d = 23, x = 9

1st Number $= \frac{xa(d-c)}{ad-bc}$

$= \frac{9 \times 3(23-12)}{3 \times 23 - 5 \times 12}$

$= \frac{27 \times 11}{69-60}$

$= \frac{27 \times 11}{9} = 33$

2nd Number $= \frac{xb(d-c)}{ad-bc}$

$= \frac{9 \times 5(23-12)}{3 \times 23 - 5 \times 12}$

$= \frac{45 \times 11}{69-60}$

$= \frac{45 \times 11}{9} = 55$

Numbers are 33, 55

23. (4) Numbers = x, $2x$ and $3x$

$\therefore \frac{x+5}{2x+5} = \frac{2}{3}$

$\Rightarrow 4x + 10$

$= 3x + 15$

$\Rightarrow x = 5$

$\Rightarrow$ Numbers = 5, 10 and 15

24. (1) Marks in English = $2x$

Marks in Maths = $3x$

Marks in Science = x

$\therefore x + 2x + 3x = 180$

$\Rightarrow 6x = 180 \Rightarrow x = 30$

25. (2) Required number = x

$\therefore \frac{11-x}{15-x} = \frac{2}{3}$

$\Rightarrow 33 - 3x = 30 - 2x$

$\Rightarrow 3x - 2x = 33 - 30$

$\Rightarrow x = 3$

26. (2) Numbers = $3x$ and $5x$ (let)

According to question,

$\frac{3x-9}{5x-9} = \frac{12}{23}$

$\Rightarrow 69x - 207 = 60x - 108$

$\Rightarrow 69x - 60x = 207 - 108$

$\Rightarrow 9x = 99 \Rightarrow x = \frac{99}{9} = 11$

$\therefore$ Smaller number = $3x$

$= 3 \times 11 = 33$

27. (4) According to the question,

Sum of remaining two numbers

$= 11 \times 36 - 9 \times 34$

$= 396 - 306 = 90$

Ratio of the remaining two numbers = 2 : 3

$\therefore$ Smaller number

$= \frac{2}{5} \times 90 = 36$

28. (3) Original number of boys in school $= \frac{5}{9} \times 432 = 240$

Number of girls = 432 – 240 = 192

Let the new number of girls be x.

According to the question,

$\frac{240+12}{192+x} = \frac{7}{6}$

$\Rightarrow \frac{252}{192+x} = \frac{7}{6}$

$\Rightarrow 192 \times 7 + 7x = 252 \times 6$

$\Rightarrow 1344 + 7x = 1512$

$\Rightarrow 7x = 1512 - 1344 = 168$

$\Rightarrow x = \frac{168}{7} = 24$

29. (3) Let the numbers be x and $5x$.

According to the question,

$x \times 5x = 320$

$\Rightarrow 5x^2 = 320$

$\Rightarrow x^2 = \frac{320}{5} = 64$

$\Rightarrow x = \sqrt{64} = 8$

$\therefore$ Required difference

$= (5x)^2 - x^2$

$= 25x^2 - x^2 = 24x^2$

$= 24 \times 8 \times 8 = 1536$

30. (1) Let two positive numbers be $3x$ and $4x$.

According to the question,

$(3x)^2 + (4x)^2 = 400$

$\Rightarrow 9x^2 + 16x^2 = 400$

$\Rightarrow 25x^2 = 400$

$\Rightarrow x^2 = \frac{400}{25} = 16$

$\Rightarrow x = \sqrt{16} = 4$

$\therefore$ Sum of numbers

$= 3x + 4x = 7x$

$= 7 \times 4 = 28$

31. (2) Let the numbers be x, $2x$ and $3x$.

According to the question,

$x^3 + (2x)^3 + (3x)^3 = 4500$

$\Rightarrow x^3 + 8x^3 + 27x^3 = 4500$

$\Rightarrow 36x^3 = 4500$

$\Rightarrow x^3 = \frac{4500}{36} = 125$

$\therefore x = \sqrt[3]{125}$

= 5 = smallest number

TYPE-VIII

1. (1) Weight of zinc

$= 200 \times \frac{5}{8} = 125$ gram

Weight of copper

$= 200 \times \frac{3}{8} = 75$ gram.

Let the ratio of 125 gram zinc and x gram copper be 3 : 5

$\therefore \frac{125}{x} = \frac{3}{5}$

$\therefore x = \frac{125 \times 5}{3} = \frac{625}{3}$ gram

$\therefore$ Addition of copper in mixture

$= \frac{625}{3} - 75 = \frac{625-225}{3}$

$= \frac{400}{3} = 133\frac{1}{3}$ gram.

2. (3) $\because$ In 20 gm of brass, quantity of zinc = 7gm

$\therefore$ In 100 gm of brass, quantity of zinc = 7 × 5 = 35 gm.

3. (4) In 30 litres of mixture,

Acid $= \frac{2}{5} \times 30 = 12$ litres

Water $= \frac{3}{5} \times 100 = 18$ litres

$\therefore \frac{12}{18+x} = \frac{2}{5}$

$\Rightarrow 60 = 36 + 2x$

$\Rightarrow 2x = 60 - 36 = 24$

$\Rightarrow x = 12$ litres of water.

4. (1) Weight of copper in 17kg 500 gm i.e. 17500 gm of alloy

$= \frac{5}{7} \times 17500 = 12500$ gm

Weight of zinc = (17500 – 12500) = 5000 gm

1250 gm of zinc is mixed in alloy.

$\therefore$ Total weight of zinc

= 1250 + 5000 = 6250 gm.

$\therefore$ Required ratio

= 12500 : 6250 = 2 : 1

5. (1) In the new vessel, we have.

Sulphuric acid

$= \frac{3}{5} + \frac{7}{10} + \frac{11}{15}$

$= \frac{18+21+22}{30} = \frac{61}{30}$

Water $= \frac{2}{5} + \frac{3}{10} + \frac{4}{15}$

$= \frac{12+9+8}{30} = \frac{29}{30}$

$\therefore$ Sulphuric acid : Water

$= \frac{61}{30} : \frac{29}{30} = 61 : 29$

6. (2) Let the quantity of additional milk added = x litres

In the mixture of 200 litres,

Quantity of milk $= \frac{17}{20} \times 200$

= 170 litres

Quantity of water = 30 litres
According to the question,

$$\frac{170+x}{30}=\frac{7}{1}$$

$\Rightarrow$ 170 + x = 210
$\Rightarrow$ x = 210 – 170
= 40 litres

7. (3) Let A = 7x litre, B = 5x litre
In 9 litres of mixture,

$$A = \frac{7x}{12x}\times 9 = \frac{21}{4} \text{ litres}$$

$$B = \frac{5x}{12x}\times 9 = \frac{15}{4} \text{ litres}$$

In new situation,

$$\frac{7x-\frac{21}{4}}{5x-\frac{15}{4}+9}=\frac{7}{9}$$

$$\Rightarrow \frac{28x-21}{20x-15+36}=\frac{7}{9}$$

$\Rightarrow$ 252x – 189 = 140x + 147
$\Rightarrow$ 112x = 336 $\Rightarrow$ x = 3
$\therefore$ Initial quantity of liquid A
= 7x = 7 × 3 = 21 litres

8. (3) Let Liquid A = 7x litres
Liquid B = 5x litres
In 9 litres,

$$A = \frac{7}{12}\times 9 = \frac{21}{4} \text{ litres}$$

$$B = \frac{5}{12}\times 9 = \frac{15}{4} \text{ litres}$$

$$\therefore\ 7x-\frac{21}{4}=5x-\frac{15}{4}+9$$

$$\Rightarrow 2x=\frac{21}{4}-\frac{15}{4}+9$$

$$\Rightarrow 2x=\frac{21-15+36}{4}=\frac{42}{4}$$

$$\Rightarrow x=\frac{21}{4}$$

$$\therefore \text{Liquid A} = 7\times\frac{21}{4}$$

$$=\frac{147}{4} = 36\frac{3}{4} \text{ litre}$$

9. (1) Gold = $\frac{7}{9}:\frac{7}{18} = \frac{14}{18}:\frac{7}{18}$
$\therefore$ Gold in new mixture
= 14 + 7 = 21
and copper = 18 × 2 – 21
= 36 – 21 = 15
$\therefore$ Required ratio
= 21 : 15 = 7 : 5

10. (4)

$\therefore$ Required ratio = 1.8 : 2.4
= 18 : 24 = 3 : 4

11. (4) Let the amount of water be x litres.

Then, $\frac{x+3}{x}=\frac{3}{2}$

or 2x + 6 = 3x
or x = 6
$\therefore$ The quantity of spirit in the mixture = x + 3 = 6 + 3 = 9 litres

12. (3)

Ratio = 4 : 1

$\therefore$ Required quantity = $\frac{1}{5}$

13. (1)

$\therefore$ Required ratio

$$= \frac{1}{10}:\frac{1}{14} = 7:5$$

14. (3) Amount of milk left
= Initial amount ×

$$\left(1-\frac{\text{Amount taken out in each operation}}{\text{Initial amount}}\right)^3$$

$$= 60\left(1-\frac{6}{60}\right)^3$$

$$= 60\left(1-\frac{1}{10}\right)^3$$

$$= 60\times\frac{9}{10}\times\frac{9}{10}\times\frac{9}{10}$$

= 43.74 kg.

15. (2) Required ratio

$$=\left(\frac{2}{3}+\frac{3}{5}+\frac{5}{8}\right):\left(\frac{1}{3}+\frac{2}{5}+\frac{3}{8}\right)$$

$$=\left(\frac{80+72+75}{120}\right):\left(\frac{40+48+45}{120}\right)$$

= 227 : 133

16. (2) By rule of alligation,

Required ratio

$$= \frac{1}{77}:\frac{1}{44} = 4:7$$

17. (4) In original mixture,
Alcohol = 4x litres
Water = 3x litres
On adding 5 litres of water,

$$\frac{4x}{3x+5}=\frac{4}{5}$$

$\Rightarrow$ 20x = 12x + 20
$\Rightarrow$ 8x = 20

$$\Rightarrow x=\frac{20}{8}=\frac{5}{2}$$

$\Rightarrow$ Quantity of alcohol

$$= 4x = 4\times\frac{5}{2}$$

= 10 litres

18. (4) In 7 kg of alloy A,
Zinc = 5 kg, Tin = 2 kg
In 21 kg of alloy B

$$\text{Zinc} = \frac{21 \times 3}{7} = 9 \text{ kg}$$

$$\text{Tin} = \frac{21 \times 4}{7} = 12 \text{ kg}$$

∴ Required ratio
= (5 + 9) : (2 + 12) = 14 : 14
or 1 : 1

19. (1) In 400 gm of alloy,

$$\text{Zinc} = \frac{5}{8} \times 400 = 250 \text{ gm.}$$

$$\text{Copper} = \frac{3}{8} \times 400 = 150 \text{ gm.}$$

If x gm of copper be mixed, then

$$\frac{250}{150 + x} = \frac{5}{4}$$

$\Rightarrow 750 + 5x = 1000$
$\Rightarrow 5x = 1000 - 750 = 250$
$\Rightarrow x = 50$ gm.

20. (4) Milk in the resulting mixture

$$= \frac{9}{13}$$

$$= \frac{65 - 63}{7 \times 13} = \frac{2}{7 \times 13}$$

∴ Required ratio

$$= \frac{2}{7 \times 13} : \frac{1}{13}$$

= 2 : 7

21. (1) Quantity of milk in 30 litre mixture $= \frac{30}{10} \times 7 = 21$ litres

Quantity of water

$$= \frac{30}{10} \times 3 = 9 \text{ litres}$$

Suppose x litres more water is added.

According to question,

$$\frac{21}{9 + x} = \frac{3}{7}$$

$\Rightarrow 9 + x = 49$
$\Rightarrow x = 40$ litres

22. (2) Let the barrel contain 4 litres of mixture.
∴ Wine = 3 litres
Water = 1 litre
Let x litre mixture is taken out.
∴ Wine in $(4 - x)$ litres mixture

$$= \frac{3}{4}(4 - x)$$

On adding x litres water, water in mixture

$$= (4 - x) \times \frac{1}{4} + x$$

$$= 1 - \frac{x}{4} + x$$

$$= \frac{4 - x + 4x}{4} = \frac{4 + 3x}{4}$$

$$\therefore \frac{3}{4}(4 - x) = \frac{4 + 3x}{4}$$

$$\Rightarrow 3 - \frac{3x}{4} = 1 + \frac{3x}{4}$$

$$\Rightarrow 2 = \frac{6x}{4}$$

$$\Rightarrow x = \frac{2 \times 4}{6} = \frac{4}{3}$$

∴ Required answer

$$= \frac{\frac{4}{3}}{4} = \frac{1}{3}$$

23. (4) Quantity of milk in the last

$$= 81\left(1 - \frac{27}{81}\right)^2 = 81\left(1 - \frac{1}{3}\right)^2$$

$$= 81 \times \frac{2}{3} \times \frac{2}{3} = 36$$

Quantity of water in the last
= 81 − 36 = 45

$$\therefore \text{Ratio} = \frac{36}{45} = \frac{4}{5} = 4 : 5$$

24. (4) Quantity of milk

$$= \frac{7}{10} \times 80 = 56 \text{ litres}$$

Quantity of water

$$= \frac{3}{10} \times 80 = 24 \text{ litres}$$

Let x litre water be added

$$\text{Then, } \frac{56}{24 + x} = \frac{2}{1}$$

$\Rightarrow 24 + x = 28$

$x = 4$ litres

25. (3) First of all we write the fraction of milk present in three mixtures.

In A; $\frac{4}{9}$ and In B; $\frac{5}{6}$

In combination of A and B; $\frac{5}{9}$

From alligation rule,

$$= \frac{5}{18} : \frac{1}{9}$$

$$\Rightarrow \frac{5}{18} : \frac{2}{18} \Rightarrow 5 : 2$$

So, ratio of
A : B = 5 : 2

26. (2) Let the quantity of milk in the mixture = $7x$ litres and that of water = $5x$ litres.
According to the question,

$$\frac{7x}{5x + 15} = \frac{7}{8}$$

$\Rightarrow 56x = 35x + 105$
$\Rightarrow 56x - 35x = 105$
$\Rightarrow 21x = 105$

$$\Rightarrow x = \frac{105}{21} = 5$$

∴ Required quantity of water
= $(5x + 15)$ litres
= 5 × 5 + 15 = 40 litres

27. (1) Quantity of milk in 729 litres of mixture

$$= \frac{7}{9} \times 729 = 567 \text{ litres}$$

∴ Quantity of water
= (729 − 567) litres = 162 litres.

Let x litres of water is mixed to get the required ratio of 7 : 3

$\therefore \frac{567}{162+x} = \frac{7}{3}$

$\Rightarrow 7x + 1134 = 1701$

$\Rightarrow 7x = 1701 - 1134 = 567$

$\Rightarrow x = \frac{567}{7} = 81$ litres

28. (3) In 40 litres mixture,

Quantity of milk

$= \frac{7}{8} \times 40 = 35$ litres

Quantity of water = 5 litres

Let x litres of water be mixed

$\therefore \frac{35}{5+x} = \frac{3}{1}$

$\Rightarrow 3x + 15 = 35$

$\Rightarrow 3x = 20$

$\Rightarrow x = \frac{20}{3} = 6\frac{2}{3}$ litres

29. (4) Let the initial quantity of liquids A and B in the jar be $4x$ and x litres respectively.

After taking out 10 litres of the mixture,

Liquid A

$= 4x - \frac{4}{5} \times 10 = (4x - 8)$ litres

Liquid B

$= 4x - \frac{1}{5} \times 10 = (4x - 2)$ litres

After pouring 10 litres of liquid B,

$\frac{4x-8}{4x-2+10} = \frac{2}{3}$

$\Rightarrow 12x - 24 = 8x + 16$

$\Rightarrow 4x = 40$

$\Rightarrow x = \frac{40}{4} = 10$

$\therefore$ Quantity of liquid A = $4x$

= 4 × 10 = 40 litres

30. (3) In 75 litres of the mixture,

Milk = $\frac{2}{3} \times 75 =$ 50 litres

Water = $\frac{1}{3} \times 75 = 25$ litres

Let x litres of water be added. Then,

$\frac{50}{x+25} = \frac{1}{2}$

$\Rightarrow x + 25 = 100$

$\Rightarrow x = 75$ litres

31. (3) Let 1 kg of each of the alloys A and B be mixed together.

In alloy A,

Quantity of gold= $\frac{5}{8}$ kg.

Quantity of copper= $\frac{3}{8}$ kg.

In alloy B,

Quantity of gold = $\frac{5}{16}$ kg.

Quantity of copper = $\frac{11}{16}$ kg.

$\therefore$ Required ratio

$= \left(\frac{5}{8} + \frac{5}{16}\right) : \left(\frac{3}{8} + \frac{11}{16}\right)$

$= \frac{15}{16} : \frac{17}{16} = 15 : 17$

32. (1) By the rule of alligation,

$\therefore$ Required ratio = $\frac{1}{18} : \frac{1}{10} = 5:9$

$= 3 : \frac{9}{5} \times 3 = 3 : 5\frac{2}{5}$

$\therefore 5\frac{2}{5}$ litre must be added

33. (2) In the original mixture,

water = 60 cc

Glycerine = 180 cc

Let x cc of water be mixed.

$\therefore \frac{60+x}{180} = \frac{2}{3}$

$\Rightarrow 180 + 3x = 360$

$\Rightarrow 3x = 360 - 180 = 180$

$\therefore x = \frac{180}{3} = 60$ cc

34. (4) Let the quantity of acid in original mixture be x litre and that of water be $3x$ litres.

$\therefore \frac{x+5}{3x} = \frac{1}{2}$

$\Rightarrow 2x + 10 = 3x$

$\Rightarrow x = 10$

$\therefore$ Quantity of new mixture

$= 4x + 5 = 45$ litres

35. (1) In 25 litres of mixture,

Acid = $\frac{4}{5} \times 25 = 20$ litres

Water = 5 litres.

After adding 3 litres of water, quantity becomes 8 litres

$\therefore$ New ratio = 20 : 8 = 5 : 2

36. (4) Let the capacity of each vessel =1 litre

In First Vessel

Water = $\frac{3}{7}$ litre

Milk = $\frac{4}{7}$ litre

In Second Vessel

Water = $\frac{5}{8}$ litre

Milk = $\frac{3}{8}$ litre

In 2 litres of mixture,

Water : milk

$= \frac{3}{7} + \frac{5}{8} : \frac{4}{7} + \frac{3}{8}$

$= \frac{24+35}{56} : \frac{32+21}{56} = 59 : 53$

37. (1) Quantity of gold in 1 kg of alloy 'A' = $\frac{7}{29}$

Quantity of gold in 1kg of alloy 'B' = $\frac{21}{58}$

Quantity of gold in 1 kg of alloy 'C' = $\frac{25}{87}$

$\therefore$ Required ratio

$= \left(\frac{21}{58} - \frac{25}{87}\right) : \left(\frac{25}{87} - \frac{7}{29}\right)$

$= \frac{63-50}{174} : \frac{25-21}{87}$

$= \frac{13}{174} : \frac{4}{87} = 13 : 8$

38. (1) In glass I

Milk = $\frac{3}{8}$, water = $\frac{5}{8}$

In glass II,

Milk = $\frac{6}{7}$, water = $\frac{1}{7}$

By Alligation rule,

$\frac{3}{8}$ $\quad$ $\frac{6}{7}$

$\frac{1}{2}$

$\frac{6}{7}-\frac{1}{2}=\frac{5}{14}$ $\quad$ $\frac{1}{2}-\frac{3}{8}=\frac{1}{8}$

∴ Required ratio

$= \frac{5}{14} : \frac{1}{8} = 20 : 7$

39. (4) In original mixture,
Milk = 40 litres
Water = 20 litres
If x litres of water is mixed,

$\frac{40}{20+x}=\frac{1}{2}$

$\Rightarrow 20 + x = 80 \Rightarrow x = 60$ litres

40. (2) By alligation rule
Mixture -I $\quad$ Mixture – II

Acid = $\frac{4}{7}$ $\quad$ Acid = $\frac{5}{8}$

$\frac{3}{5}$

$\frac{5}{8}-\frac{3}{5}=\frac{1}{40}$ $\quad$ $\frac{3}{5}-\frac{4}{7}=\frac{1}{35}$

∴ Required ratio

$= \frac{1}{40}:\frac{1}{35} = 7 : 8$

41.(1) Solution -I $\quad$ Solution - II

Acid = $\frac{3}{4}$ $\quad$ Acid $\frac{5}{8}$

$\frac{2}{3}$

$\frac{2}{3}-\frac{5}{8}$ $\quad$ $\frac{3}{4}-\frac{2}{3}$

$=\frac{16-15}{24}=\frac{1}{24}$ $\quad$ $=\frac{9-8}{12}=\frac{1}{12}$

∴ Required ratio

$= \frac{1}{24} : \frac{1}{12} = 1 : 2$

42. (2) By alligation rule,
Mixture-I $\quad$ Mixture-II

Acid = $\frac{5}{7}$ $\quad$ Acid = $\frac{8}{13}$

$\frac{9}{13}$

$\frac{5}{7}-\frac{9}{13}$ $\quad$ $\frac{9}{13}-\frac{8}{13}=\frac{1}{13}$

$=\frac{65-63}{91}=\frac{2}{91}$

∴ Required ratio

$= \frac{2}{91} : \frac{1}{13} = 2 : 7$

43. (3) In 20 litres of mixture,

Spirit $= \frac{3}{10}\times 20 = 6$ litres,

Water = 14 litres
In 36 litres of mixture

Spirit $= \frac{7}{12}\times 36 = 21$ litres

Water = 15 litres
∴ Required ratio
= (21 + 6) : (14 + 15) = 27 : 29

44. (2) By Alligation Rule
Mixture-I $\quad$ Mixture II

Alcohol = $\frac{5}{8}$ $\quad$ Alcohol = $\frac{5}{9}$

$\frac{7}{12}$

$\frac{7}{12}-\frac{5}{9}$ $\quad$ $\frac{5}{8}-\frac{7}{12}$

$=\frac{21-20}{36}$ $\quad$ $=\frac{15-14}{24}$

$=\frac{1}{36}$ $\quad$ $=\frac{1}{24}$

∴ Ratio = $\frac{1}{36} : \frac{1}{24} = 3 : 2$

45. (2) By Alligation Rule
Milk-I $\quad$ Milk-II

$\frac{3}{5}$ $\quad$ $\frac{7}{10}$

$\frac{2}{3}$

$\frac{7}{10}-\frac{2}{3}$ $\quad$ $\frac{2}{3}-\frac{3}{5}=\frac{1}{15}$

$=\frac{21-20}{30}$ $\quad$ $=\frac{10-9}{15}$

$=\frac{1}{30}$ $\quad$ $=\frac{1}{15}$

∴ Required ratio $= \frac{1}{30} : \frac{1}{15}$

= 1 : 2

46. (3) By Alligation Rule

Stainless Steel	I	II	III
Chromium	$\frac{2}{13}$	$\frac{5}{26}$	$\frac{7}{39}$

By Alligation Rule,

$\frac{2}{13}$ $\quad$ $\frac{5}{26}$

$\frac{7}{39}$

$\frac{5}{26}-\frac{7}{39}$ $\quad$ $\frac{7}{39}-\frac{2}{13}$

$=\frac{15-14}{78}=\frac{1}{78}$ $\quad$ $=\frac{7-6}{39}=\frac{1}{39}$

∴ Required ratio = 1 : 2

47. (4) 1 kg of each mixture is taken.
A ⇒ 7 : 2 = 14 : 4

Gold = $\frac{14}{18}$; Copper = $\frac{4}{18}$

B ⇒ 7 : 11

Gold = $\frac{7}{18}$; Copper = $\frac{11}{18}$

∴ Required ratio

$=\left(\frac{14}{18}+\frac{7}{18}\right):\left(\frac{4}{18}+\frac{11}{18}\right)$

= 21 : 15 = 7 : 5

48. (3) Let the original quantity be $12x$ litres.

In 9 litres of the mixture,

Liquid A $= \frac{7}{12} \times 9 = \frac{21}{4}$ litres

Liquid B $= \frac{5}{12} \times 9 = \frac{15}{4}$ litres

According to question,

$$\frac{7x - \frac{21}{4}}{5x - \frac{15}{4} + 9} = \frac{7}{9}$$

$$\Rightarrow \frac{28x - 21}{20x - 15 + 36} = \frac{7}{9}$$

$$\Rightarrow \frac{28x - 21}{20x + 21} = \frac{7}{9}$$

$$\Rightarrow \frac{4x - 3}{20x + 21} = \frac{1}{9}$$

$\Rightarrow 36x - 27 = 20x + 21$

$\Rightarrow 36x - 20x = 21 + 27$

$\Rightarrow 16x = 48$

$\Rightarrow x = 3$

Original quantity of liquid A

$= 7x = 7 \times 3 = 21$ litres

49. (3) Milk in first vessel

$= \frac{5}{8} = 0.625$

Milk in second vessel

$= \frac{2}{3} = 0.66$

Milk in third vessel $= \frac{3}{5} = 0.6$

Milk in fourth vessel

$= \frac{7}{11} = 0.636$

50. (2) Let x kg of nickel be mixed.

$\therefore \frac{20 + x}{100 + x} = \frac{3}{11}$

$\Rightarrow 220 + 11x = 300 + 3x$

$\Rightarrow 11x - 3x = 300 - 220$

$\Rightarrow 8x = 80$

$\Rightarrow x = 10$ kg.

51. (1) In first alloy, zinc $= \frac{1}{3}$

In second alloy, zinc $= \frac{2}{5}$

In the new alloy, zinc $= \frac{5}{13}$

By the rule of Alligation,

$\therefore$ Required ratio

$= \left(\frac{2}{5} - \frac{5}{13}\right) : \left(\frac{5}{13} - \frac{1}{3}\right)$

$= \frac{26 - 25}{65} : \frac{15 - 13}{39}$

$= \frac{1}{65} : \frac{2}{39} = \frac{1}{5} : \frac{2}{3} = 3 : 10$

52. (4) Let x litres of liquid P be mixed to 7 litres of liquid Q.

According to the question,

$$x \times \frac{10}{7} + \frac{5}{7} \times 7 = x + 7$$

$$\Rightarrow \frac{10x}{7} + 5 = x + 7$$

$\Rightarrow 10x + 35 = 7x + 49$

$\Rightarrow 10x - 7x = 49 - 35$

$\Rightarrow 3x = 14$

$\Rightarrow x = \frac{14}{3} = 4\frac{2}{3}$ litres

53. (1) By the rule of alligation,

$\therefore$ Required ratio $= \frac{1}{10} : \frac{1}{14}$

$= 14 : 10 = 7 : 5$

54. (4) Capacity of each container

$= x$ litre (let)

In first container,

Milk $= \frac{3x}{4}$ litres,

Water $= \frac{x}{4}$ litres

In second container,

Milk $= \frac{5x}{7}$ litres,

Water $= \frac{2x}{7}$ litres

On mixing both,

Quantity of milk $= \frac{3x}{4} + \frac{5x}{7}$

$= \frac{21x + 20x}{28} = \frac{41x}{28}$ litres

Quantity of water $= \frac{x}{4} + \frac{2x}{7}$

$= \frac{7x + 8x}{28}$ litres $= \frac{15x}{28}$ litres

$\therefore$ Required ratio

$= \frac{41x}{28} : \frac{15x}{28} = 41 : 15$

55. (4) Let the volume of each glass be $= x$ litres.

$\therefore$ Required ratio

= Alcohal : water

$= \left(\frac{2x}{3} + \frac{3x}{5}\right) : \left(\frac{x}{3} + \frac{2x}{5}\right)$

$= \left(\frac{10x + 9x}{15}\right) : \left(\frac{5x + 6x}{15}\right)$

$= 19 : 11$

56. (4) Quantity of remaining acid

= Initial quantitiy

$$\left(1 - \frac{\text{Quantity taken out}}{\text{Total initial quantity}}\right)^n$$

$= 10\left(1 - \frac{2}{10}\right)^2 = 10 \times \left(\frac{4}{5}\right)^2$

$= 10 \times \frac{4}{5} \times \frac{4}{5} = \frac{32}{5}$ litres

Required ratio $= \frac{32}{5} : 10$

$= 32 : 50$

$= 16 : 25$

57. (4) G = 19W and C = 9W

Let 1 gm of gold is mixed with x gm of copper such that $(x + 1)$ gm of alloy is formed.

$\therefore 19W + 9Wx = (x + 1) \times 15W$

$\Rightarrow 19 + 9x = 15x + 15$

$\Rightarrow 15x - 9x = 19 - 15 \Rightarrow 6x = 4$

$\Rightarrow x = \frac{2}{3}$

$\therefore$ Gold : Copper $= 1 : \frac{2}{3}$

$= 3 : 2$

58. (2) In 80 litres of mixture,
Milk : Water = 27 : 5

$\therefore$ Milk $\Rightarrow \frac{27}{32} \times 80$

= 67.5 litres

Water $\Rightarrow 80 - 67.5$

= 12.5 litres

Let x litres of water is mixed.
According to question,

$$\frac{67.5}{12.5 + x} = \frac{3}{1}$$

$\Rightarrow 37.5 + 3x = 67.5$

$\Rightarrow 3x = 67.5 - 37.5 = 30$

$\Rightarrow x = 10$ litres

59. (3) By the rule of alligation

liquid I In mixture I, liquid I In mixture II,

$\frac{3}{8}$ $\frac{6}{7}$

$\frac{7}{10}$

$\frac{6}{7} - \frac{7}{10}$ $\frac{7}{10} - \frac{3}{8}$

$= \frac{60 - 49}{70} = \frac{11}{70}$ $= \frac{28 - 15}{40} = \frac{13}{40}$

$\therefore$ Required ratio $= \frac{11}{70} : \frac{13}{4}$

$= 11 \times 4 : 13 \times 7$

$= 44 : 91$

60. (3) Remaining acid

= Initial quantity

$$\left(1 - \frac{\text{quantity taken out}}{\text{Original quantity}}\right)$$

$$= 20\left(1 - \frac{4}{20}\right)^2$$

$$= 20\left(1 - \frac{1}{5}\right)^2$$

$$= 20 \times \frac{4}{5} \times \frac{4}{5}$$

= 12. 8 litres

$\therefore$ Required ratio = 12.8 : 20

= 128 : 200 = 16 : 25

61. (1) By the rule of alligation,

Mixture I Mixture II
Darjeeling tea Darjeeling tea

$\frac{4}{11}$ $\frac{2}{7}$

$\frac{6}{19}$

$\frac{6}{19} - \frac{2}{7}$ $\frac{4}{11} - \frac{6}{19}$

$= \frac{42 - 38}{19 \times 7}$ $= \frac{76 - 66}{11 \times 19}$

$= \frac{4}{19 \times 7}$ $= \frac{10}{11 \times 19}$

$\therefore$ Required ratio

$$= \frac{4}{19 \times 7} : \frac{10}{11 \times 19}$$

$$= \frac{4}{7} : \frac{10}{11}$$

= 44 : 70 = 22 : 35

62. (2) Let quantity of first variety of tea = $4x$ kg.

Quantity of second variety of tea = $5x$ kg.

Quantity of third variety of tea = $8x$ kg.

Let y kg of third variety of tea be mixed.

$\therefore$ Resultant ratio = $(4x + 5) : (5x + 10) : (8x + y)$

$$\therefore \frac{4x + 5}{5x + 10} = \frac{5}{7}$$

$\Rightarrow 28x + 35 = 25x + 50$

$\Rightarrow 28x - 25x = 50 - 35$

$\Rightarrow 3x = 15 \Rightarrow x = \frac{15}{3} = 5$

$$\therefore \frac{5x + 10}{8x + y} = \frac{7}{9}$$

$$\Rightarrow \frac{5 \times 5 + 10}{8 \times 5 + y} = \frac{7}{9}$$

$$\Rightarrow \frac{35}{40 + y} = \frac{7}{9}$$

$\Rightarrow 40 + y = 9 \times 5$

$\Rightarrow y = 45 - 40 = 5$ kg.

$\therefore$ Required quantity of third variety of tea

$= 8x + y = 8 \times 5 + 5 = 45$ kg.

63. (4) Let there be 3 litres, 2 litres and 1 litre of mixtures in three vessels respectively.

Vessel I

In 1 litre of mixture,

Milk $= \frac{5}{7}$ litre, water $= \frac{2}{7}$ litre

Vessel II

In 1 litre of mixture,

Milk $= \frac{4}{5}$ litre, water $= \frac{1}{5}$ litre

Vessel III

In $\frac{1}{7}$ litre of mixture,

Milk $= \frac{4}{5} \times \frac{1}{7} = \frac{4}{35}$ litre

Water $= \frac{1}{35}$ litre

In new vessel,

Mixture $= 1 + 1 + \frac{1}{7}$

$= 2 + \frac{1}{7} = \frac{14 + 1}{7} = \frac{15}{7}$ litres

Water $= \frac{2}{7} + \frac{1}{5} + \frac{1}{35}$

$= \frac{10 + 7 + 1}{35} = \frac{18}{35}$ litre

Required percentage

$$= \frac{\frac{18}{35}}{\frac{15}{7}} \times 100$$

$$= \frac{18}{35} \times \frac{7}{15} \times 100 = 24\%$$

64. (1) In 729 ml of mixture,

$$\text{Milk} = \frac{7}{9} \times 729 = 567 \text{ ml}$$

$$\text{Water} = \frac{2}{9} \times 729 = 162 \text{ ml.}$$

Let x ml of water be mixed.

$$\therefore \frac{567}{162+x} = \frac{7}{3}$$

$\Rightarrow 162 \times 7 + 7x = 567 \times 3$

$\Rightarrow 1134 + 7x = 1701$

$\Rightarrow 7x = 1701 - 1134 = 567$

$$\Rightarrow x = \frac{567}{7} = 81 \text{ ml.}$$

65. (2) Let 3kg of first alloy and 4 kg of second alloy be mixed together.

$\therefore$ In 3 kg of mixture,

Tin = 1 kg.

Iron = 2 kg.

In 4 kg of mixture,

$$\text{Tin} = \frac{2}{5} \times 4 = \frac{8}{5} = 1.6 \text{ kg.}$$

$$\text{Iron} = \frac{3}{5} \times 4 = \frac{12}{5} = 2.4 \text{ kg.}$$

$\therefore$ Required ratio

= (1 + 1.6) : (2 + 2.4) = 2.6 : 4.4

= 13 : 22

66. (2) Let each vessel contain 1 litre of mixture.

$\therefore$ Total quantity of milk

$$= \frac{6}{7} + \frac{5}{7} + \frac{3}{4}$$

$$= \frac{24+20+21}{28} = \frac{65}{28} \text{ litre}$$

Total quantity of water

$$= \frac{1}{7} + \frac{2}{7} + \frac{1}{4}$$

$$= \frac{4+8+7}{28} = \frac{19}{28} \text{ litre}$$

$$\therefore \text{Required ratio} = \frac{65}{28} : \frac{19}{28}$$

= 65 : 19

67. (2) In 60 kg of alloy A,

$$\text{Lead} = \frac{3}{5} \times 60 = 36 \text{ kg.}$$

$$\text{Tin} = \frac{2}{5} \times 60 = 24 \text{ kg.}$$

In 100 kg of alloy B,

$$\text{Tin} = \frac{1}{5} \times 100 = 20 \text{ kg.}$$

In 160 kg of new alloy,

Tin = 24 + 20 = 44 kg.

68. (2) Let the capacity of each glass be 1 litre.

On mixing all three mixtures together,

$$\text{Acid} \Rightarrow \frac{2}{5} + \frac{3}{7} + \frac{4}{9}$$

$$= \frac{126+135+140}{315}$$

$$= \frac{401}{315} \text{ litre}$$

$$\text{Water} \Rightarrow \frac{3}{5} + \frac{4}{7} + \frac{5}{9}$$

$$= \frac{189+180+175}{315} = \frac{544}{315}$$

$\therefore$ Required ratio

$$= \frac{401}{315} : \frac{544}{315} = 401 : 544$$

69. (3) Let 5 kg of mixture be prepared.

$\therefore$ C.P. of 5 kg of mixture

= Rs. (2 × 35 + 3 × 40)

= Rs. (70 + 120)

= Rs. 190

Total S.P. of this mixture

= Rs. (46 + 4 × 55)

= Rs. (46 + 220) = Rs. 266

$\therefore$ Profit per cent

$$= \left(\frac{266-190}{190}\right) \times 100$$

$$= \frac{7600}{190} = 40\%$$

70. (3) In 20 litres of mixture,

$$\text{Milk} \Rightarrow \frac{3}{4} \times 20 = 15 \text{ litres}$$

$$\text{Water} \Rightarrow \frac{1}{4} \times 20 = 5 \text{ litres}$$

Let the quantity of milk added be x litres.

According to the question,

$$\frac{15+x}{5} = \frac{4}{1}$$

$\Rightarrow 15 + x = 4 \times 5$

$\Rightarrow x = 20 - 15 = 5$ litres

71. (1) Quantity of milk in the mixture = $5x$ litres

Quantity of water = x litres

According to the question,

On adding 5 litres of water,

$$\frac{5x}{x+5} = \frac{5}{2}$$

$\Rightarrow 10x = 5x + 25$

$\Rightarrow 5x = 25 \Rightarrow x = 5$

$\therefore$ Required quantity of milk

= 5 × 5 = 25 litres

72. (2) Remaining amount of milk = Initial quantity

$$\left(1 - \frac{\text{quantity taken out}}{\text{Initial quantity}}\right)^n$$

$$= 60\left(1 - \frac{12}{60}\right)^2$$

$$= 60\left(1 - \frac{1}{5}\right)^2$$

$$= 60 \times \frac{4}{5} \times \frac{4}{5} = 38.4 \text{ litres}$$

Quantity of water = 60 – 38.4

= 21.6 litres

$\therefore$ Required ratio

= 38.4 : 21.6 = 16 : 9

73. (3) Let the quantity of spirit in the mixture be x litres.

$\therefore$ Quantity of water

= $(x - 3)$ litres

According to the question,

$$\frac{x}{x-3} = \frac{3}{2}$$

$\Rightarrow 3x - 9 = 2x$

$\Rightarrow 3x - 2x = 9$

$\Rightarrow x = 9$ litres

74. (2) In 49 kg. of mixture,

$$\text{Tea of Assam} \Rightarrow \left(\frac{5}{7} \times 49\right) \text{ kg.}$$

= 35 kg.

Tea of Darjeeling $\Rightarrow$ (49 – 35) kg.

= 14 kg.

Let x kg. of Darjeeling tea be added.

$$\therefore \frac{35}{14+x} = \frac{2}{1}$$

$\Rightarrow 28 + 2x = 35$

$\Rightarrow 2x = 35 - 28 = 7$

$$\Rightarrow x = \frac{7}{2} = 3.5 \text{ kg.}$$

75. (3) Let the volumes of three containers be 3 litres, 4 litres and 5 litres respectively.

Container–I

Milk = $\frac{4 \times 3}{5} = \frac{12}{5}$ litres,

Water = $\frac{3}{5}$ litre

Container–II

Milk = $\frac{4 \times 3}{4}$ = 3 litres,

Water = 1 litre

Container–III

Milk = $\frac{5 \times 5}{7} = \frac{25}{7}$ litres

Water = $\frac{10}{7}$ litres

∴ Required ratio in container–IV

$= \left(\frac{12}{5} + 3 + \frac{25}{7}\right) : \left(\frac{3}{5} + 1 + \frac{10}{7}\right)$

$= \left(\frac{84 + 105 + 125}{35}\right) : \left(\frac{21 + 35 + 50}{35}\right)$

$= \frac{314}{35} : \frac{106}{35}$

= 157 : 53

76. (2) By the rule of alligation,

Variety–I Rs. 12 Variety–II Rs. 7

Rs. 8

8 – 7 = 1 12 – 8 = 4

∴ Required ratio = 1 : 4

77. (2) In original mixture,

Milk = $\frac{3}{4} \times 36$ = 27 litres

Water = $\frac{1}{4} \times 36$ = 9 litres

On adding 15 litres of milk,

Required ratio = (27 + 15) : 9

= 42 : 9 = 14 : 3

78. (2) In 25 litres of mixture,

Quantity of milk = $\frac{4}{5} \times 25$

= 20 litres

Quantity of water = 5 litres

On adding 3 litres of water,

Required ratio = 20 : 8 = 5 : 2

79. (2) In 2 litres of first container,

Spirit = $\frac{8}{5}$ litre, Water = $\frac{2}{5}$ litre

In 3 litres of second container,

Spirit = $3 \times \frac{11}{15} = \frac{11}{5}$ litres

Water = $3 \times \frac{4}{15} = \frac{4}{5}$ litre

In 4 litres of third container,

Spirit = $4 \times \frac{7}{10} = \frac{14}{5}$ litres

Water = $4 \times \frac{3}{10} = \frac{6}{5}$ litres

∴ Required ratio

$= \left(\frac{8}{5} + \frac{11}{5} + \frac{14}{5}\right) : \left(\frac{2}{5} + \frac{4}{5} + \frac{6}{5}\right)$

$= \frac{33}{5} : \frac{12}{5}$ = 33 : 12 = 11 : 4

80. (1) In 1 litre of first bottle,

Quantity of acid = $\frac{2}{5}$ litre

Quantity of water = $\frac{3}{5}$ litre

In 3 litres of second bottle,

Quantity of acid = $\frac{3}{3}$ = 1 litre

Quantity of water = 2 litres

In the resulting mixture,

Acid : Water

$= \left(\frac{2}{5} + 1\right) : \left(\frac{3}{5} + 2\right)$

= 7 : 13

$= \frac{2+5}{5} : \frac{3+10}{5}$

81. (4)

Type–I Type–II

Copper ⇒ $\frac{8}{11}$ Copper ⇒ $\frac{15}{22}$

$\frac{5}{7}$

$\frac{5}{7} - \frac{15}{22}$ $\frac{8}{11} - \frac{5}{7}$

$= \frac{110-105}{154} = \frac{5}{154}$ $= \frac{56-55}{77} = \frac{1}{77}$

∴ Required ratio = $\frac{5}{154} : \frac{1}{77}$

= 5 : 2

TYPE-IX

1. (1) Let the income of A, B and C be ₹ 3x, ₹ 7x and ₹ 4x respectively and their expenses be ₹ 4y, ₹ 3y and ₹ 5y respectively.

∴ 3x = 2400

⇒ x = 800

∴ 4y = 2400 – 300 = 2100

⇒ y = 525

∴ B's saving = (7x – 3y)

= ₹ (7 × 800 – 3 × 525)

= ₹ (5600 – 1575)

= ₹ 4025

and C's savings = ₹ (4x – 5y)

= ₹ (3200 – 2625) = ₹ 575

2. (4) Income in the second year

= ₹ 45000

Income in the first year

= ₹ 30000

Expense in the first year

= ₹ 25000

Expense in the second year

= ₹ 45000

∴ Total saving

= 75000 – 70000 = ₹ 5000

3. (4) Given

$\frac{\text{Monthly income of A}}{\text{Monthly income of B}} = \frac{5}{6}$

∴ Monthly income of A

= 5x

and that of B = 6x (x is a constant)

According to the question

$\frac{5x - 1800}{6x - 1600} = \frac{3}{4}$

20x – 7200 = 18x – 4800

2x = 2400

∴ x = 1200

∴ Monthly income of B

= 1200 × 6 = ₹ 7200

4. (1) Let income of two persons be 5x and 3x.

and their expenses be 9y and 5y respectively.

Then, 5x – 9y = 1300 ..(i)

and 3x – 5y = 900 ..(ii)

By 9 × (ii) – 5 × (i), we get

27x – 45y = 8100

25x – 45y = 6500

– + –

2x = 1600

⇒ x = 800

Now, income of first person
= 5x = 5 × 800 = ₹ 4000
and that of second person
= 3x = 3 × 800 = ₹ 2400

5. (4) Let the annual income of A and B be ₹ $4x$ and $3x$ respectively. Also let their annual expenditures be ₹ $3y$ and $2y$ respectively
According to question,
$4x - 3y = 600$ ...(i)
$3x - 2y = 600$ ...(ii)
From equation (i) and (ii)
$4x - 3y = 3x - 2y \Rightarrow x = y$
From equation (i)
$4x - 3x = 600 \Rightarrow x = 600$
Annual income of A
$= 4x = 4 \times 600 =$ ₹ 2400

6. (1) Income of A = ₹ 7x ;
B = ₹ 9x and C = ₹ 12x
Expenses of A = ₹ 8y ;
B = ₹ 9y and C = ₹ 15y

$\therefore 7x - 8y = \frac{1}{4} \times 7x$

$\Rightarrow 7x - \frac{7x}{4} = 8y$

$\Rightarrow \frac{21x}{4} = 8y \Rightarrow 21x = 32y.$

$\therefore$ A's saving $= \frac{1}{4} \times 7x$

$= \frac{1}{4} \times \frac{32}{3}y = \frac{8}{3}y$

B's saving $= 9x - 9y$

$= 9 \times \frac{32}{21}y - 9y$

$= \frac{96y - 63y}{7}$

$= \frac{33y}{7}$

C's saving $= 12x - 15y$

$= 12 \times \frac{32}{21}y - 15y$

$= \frac{128y - 105y}{7}$

$= \frac{23y}{7}$

$\therefore$ Required ratio

$= \frac{8}{3}y : \frac{33}{7}y : \frac{23}{7}y$

= 56 : 99 : 69

7. (3) Let the income of P and Q be ₹ $3x$ and $4x$ respectively.
Again, let their expenditures be ₹ $2y$ and $3y$ respectively.
According to the question.
$3x - 2y = 6000$ ...(i)
and $4x - 3y = 6000$ ...(ii)
From equations (i) and (ii)
$3x - 2y = 4x - 3y$
or, $4x - 3x = 3y - 2y$
or, $x = y$
From equation (i),
$\Rightarrow 3x - 2x = 6000$
$x = 6000$
The income of P = ₹ $3x$
= ₹ (3 × 6000) = ₹ 18000

8. (3) Let his expenditures be ₹ $26x$ and savings be ₹ $3x$.
$\therefore 26x + 3x = 7250$
$\Rightarrow 29x = 7250$

$\Rightarrow x = \frac{7250}{29} = 250$

$\therefore$ Savings = $3x$ = ₹ 750

9. (2) Let the monthly salary of A, B & C be $2x$, $3x$ and $5x$
now, $5x - 2x = 12{,}000$
$\Rightarrow 3x = 12000$ or $x = 4000$
$\therefore$ Monthly salary of B = 3 × 4000
= 12,000
$\Rightarrow$ Annual salary of B
= 12000 × 12 = ₹ 144000

10. (1) Let the income of two persons be ₹ $5x$ and ₹ $3x$ respectively and their expenditures be ₹ $9y$ and $5y$ respectively.
As given,
$5x - 9y = 2600$ ...(i)
$3x - 5y = 1800$ ...(ii)
By 5 × (i) – 9 × (ii) we get
$25x - 27x = 13000 - 16200$
$\Rightarrow -2x = -3200$

$\Rightarrow x = \frac{3200}{2} = 1600$

$\therefore$ First person's income
= ₹(1600 × 5) = ₹ 8000
Second person's income
= $3x$ = ₹ (1600 × 3)
= ₹ 4800

11. (3) Let the income of two persons (A and B) be ₹ $2x$ and ₹ $3x$ respectively. Again let the expenditures of A and B be ₹ $5y$ and ₹ $9y$ respectively.
$\therefore 2x - 5y = 600$ ...(i)
$3x - 9y = 600$ ...(ii)
From equations (i) and (ii),
$2x - 5y = 3x - 9y$
$\Rightarrow x = 4y$
From equation (i),
$2 \times 4y - 5y = 600$
$\Rightarrow 3y = 600$
$= y = 200$
$\therefore x = 4 \times 200 = 800$
$\therefore$ A's income = $2x$ = 2 × 800
= ₹ 1600
B's income = $3x$ = 3 × 800
= ₹ 2400

12. (3) Rice : Wheat
= 4 × 5 : 3 × 6
= 20 : 18 = 10 : 9
$\therefore$ Total cost of rice

$= \frac{10}{19} \times 380 =$ ₹ 200

13. (2) Let the income of A be ₹ $5x$ and that of B be ₹ $6x$.
According to the question,
$6x - 5x = 1100$
$\Rightarrow x = 1100$
$\therefore$Total income = $5x + 6x$
= ₹ $11x$
= ₹ (11×1100) = ₹ 12100

14. (1) Let the income of A and B be ₹ $5x$ and ₹ $3x$ respectively.
Let the expenses of A, B and C be ₹ $8y$, Rs. $5y$ and ₹ $2y$ respectively. Then,
$2y = 2000$

$\Rightarrow y = \frac{2000}{2} = 1000$

B saves = ₹ 700
$\therefore 3x - 5y = 700$
$\Rightarrow 3x - 5 \times 1000 = 700$
$\Rightarrow 3x = 700 + 5000 = 5700$

$\Rightarrow x = \frac{5700}{3} = 1900$

$\therefore$ A's saving = ₹ $(5x - 8y)$
= ₹ (5×1900–8×1000)
= ₹ (9500 – 8000) = ₹ 1500

15. (4) Let the income of man be ₹ = $11x$ and his expenditure be ₹ $10x$.
$\therefore$ Savings = x = ₹ 9000
$\therefore$ Monthly income of man

$= \frac{11 \times 9000}{12} =$ ₹ 8250

16. (1) Income of the family

$= \frac{10}{7} \times 10500 =$ ₹ 15000

Savings = 15000 – 10500
= ₹ 4500

17. (2) Let the monthly income of A and B be ₹ $4x$ and ₹ $3x$ respectively and their expenditures be ₹ $3y$ and Rs. $2y$ respectively.
$\therefore 4x - 3y = 6000$
and $3x - 2y = 6000$
$\Rightarrow 4x - 3y = 3x - 2y$

$\Rightarrow x = y$
$\therefore 4x - 3y = 6000$
$\Rightarrow x = 6000$
$\Rightarrow$ A's monthly income = $4x$
= ₹ 24000

18. (2) Let A's and B's weekly income be ₹ $9x$ and ₹ $7x$ and their expenditures be ₹ $4y$ and $3y$ respectively.
Then, $9x - 4y = 200$ ...(i)
and $7x - 3y = 200$ ...(ii)
$\Rightarrow 9x - 4y = 7x - 3y$
$\Rightarrow 9x - 7x = 4y - 3y$
$\Rightarrow 2x = y$ ...(iii)
From equation (i),
$9x - 4y = 200$
$\Rightarrow 9x - 8x = 200$
$\Rightarrow x = 200$
$\therefore$ Sum of their weekly income
$= 16x = 16 \times 200 =$ ₹ 3200

19. (1) A : B = 3 : 2 = 9 : 6
B : C = 3 : 2 = 6 : 4
$\therefore$ A : B : C = 9 : 6 : 4
$\therefore \frac{9x}{3} - \frac{4x}{4} = 1000$
$\Rightarrow 3x - x = 1000$
$\Rightarrow 2x = 1000$
$\Rightarrow x = 500$
$\therefore$ B's income = $6x = 6 \times 500$
= ₹ 3000

20. (4) Let the income of A and B be ₹ $2x$ and ₹ $3x$. and their expenditures be ₹ y and ₹ $2y$ respectively.
$\therefore 2x - y = 24000$ ...(i)
and $3x - 2y = 24000$ ...(ii)
By equation (i) × 2 – (ii),
$4x - 2y - 3x + 2y = 24000$
$\Rightarrow x = 24000$
$\therefore$ A's income = 2×24000
= ₹ 48000

21. (3) Let the annual income of A and B be ₹ $4x$ and ₹ $3x$ and their income be Rs. $3y$ and Rs. $2y$. respectively.
$\therefore 4x - 3y = 60000$ ...(i)
and $3x - 2y = 60000$ ...(ii)
Clearly, $4x - 3y = 3x - 2y$
$\Rightarrow x = y$
From equation (i),
$x = 60000$
$\therefore$ A's annual income
$= 4x = 4 \times 60000$
= ₹ 240000

22. (3) If the ratio of the income of A and B be $a : b$ and that of their expenses be $c : d$ and each saves ₹ x, then,

A's income $= \frac{ax(d-c)}{ad-bc}$

$= \frac{9 \times 500(7-8)}{9 \times 7 - 8 \times 8}$
$= 9 \times 500 =$ ₹ 4500

23. (2) Let Annual Income of A, B and C be x, $3x$ and $7x$
$x + 7x = 800000$
$\Rightarrow 8x = 800000$
$\Rightarrow x = 100000$
$\therefore$ B's monthly income

$= \frac{100000 \times 3}{12} =$ ₹ 25000

24. (4) Amit's income = ₹ $3x$ and his expenditure = ₹ $5y$
Veeri's income = ₹ $2x$ and his expenditure = ₹ $3y$
$\therefore 3x - 5y = 2x - 3y$
$\Rightarrow x = 2y$
$\therefore 3x - 5y = 1000$
$\Rightarrow 6y - 5y = 1000 \Rightarrow y = 1000$
$\therefore x = 2000$
$\therefore$ Amit's income
$= 3x = 3 \times 2000 =$ ₹ 6000

25. (3) Income of A and B
= ₹ $6x$ and $5x$
Expenses of A and B
= ₹ $4y$ and $3y$
$\therefore 6x - 4y = 400$ ...(i)
$5x - 3y = 400$ ...(ii)
By equation (i)× 3 – (ii) × 4
$\Rightarrow 18x - 12y - 20x + 12y$
$= 1200 - 1600$
$\Rightarrow 2x = 400 \Rightarrow x = 200$
$\therefore$ Total income
$= 6x + 5x = 11x =$ ₹ 2200

26. (1) x's income = Rs. $4a$
y's income = Rs. $3a$
x's expenditure = Rs. $12b$
y's expenditure = Rs. $7b$
$\therefore 4a - 12b = 3200$
$\Rightarrow a - 3b = 800$ ...(i)
Again, $3a - 7b = 3200$ ...(ii)
By equation (i) × 7 – (ii) × 3,

$$\begin{array}{r} 7a - 21b = 5600 \\ 9a - 21b = 9600 \\ - \quad + \quad - \\ \hline -2a = -4000 \end{array}$$

$\Rightarrow a = 2000$
$\Rightarrow x$'s income = $4a$
$= 4 \times 2000 =$ Rs. 8000

27. (1) Let incomes of A and B be Rs. $3x$ and Rs. $2x$ respectively. Let the expenditures of A and B be Rs. $5y$ and Rs. $3y$ respectively.
According to the question,
$3x - 5y =$ Rs. 1000 .... (i)
$2x - 3y =$ Rs. 1000 .... (ii)
By equation (i) × 2 – (ii) × 3,

$$\begin{array}{r} 6x - 10y = 2000 \\ 6x - 9y = 3000 \\ - \quad + \quad - \\ \hline -y = -1000 \end{array}$$

$\therefore y = 1000$
From equation (i),
$3x - 5 \times 1000 = 1000$
$\Rightarrow 3x = 1000 + 5000 =$ Rs. 6000
= A's income

28. (2) A's monthly income = Rs. $8x$
A's monthly expenditure= Rs. $5y$
B's monthly income = Rs. $5x$
B's monthly expenditure= Rs. $3y$
According to the question,
$8x - 5y = 12000$ ....(i)
$5x - 3y = 10000$ ....(ii)
By equation (i) × 3 – (ii) × 5,

$$\begin{array}{r} 24x - 15y = 36000 \\ 25x - 15y = 50000 \\ - \quad + \quad - \\ \hline -x = -14000 \end{array}$$

$\Rightarrow x = 14000$
Difference between monthly incomes of A and B = $8x - 5x$
= Rs. $3x$ = Rs. (3 × 14000)
= Rs. 42000

29. (4) Expenditure : Savings
= 61 : 6
Sum of the terms of ratio
= 61 + 6 = 67
Total monthly salary
= Rs. 8710
$\therefore$ Monthly savings

$= \text{Rs. } \left(\frac{6}{67} \times 8710\right)$
= Rs. 780

30. (3) Let A's income be Rs. $2x$.
$\therefore$ B's income = Rs. $(2x - 140)$
C's income = Rs. $3x$
$\therefore$ D's income = Rs. $(3x - 80)$
According to the question,
B : D = 1 : 2
$\therefore 2(2x - 140) = 3x - 80$
$\Rightarrow 4x - 280 = 3x - 80$
$\Rightarrow 4x - 3x = 280 - 80$
$\Rightarrow x =$ Rs. 200
$\therefore$ A's income = Rs. (2 × 200) = Rs. 400
B's income = Rs. (400 – 140)
= Rs. 260
C's income = Rs. (3 × 200)
= Rs. 600
D's income = Rs. (600 – 80)
= Rs. 520

TYPE-X

1. (2) Using Rule1,
Ratio of the values

$= 2 : \frac{3}{2} : \frac{4}{4}$

$= 4 : 3 : 2$

$\therefore$ Value of 50 paise coins

$= \frac{3}{9} \times 180 =$ ₹ 60

Numbers of 50 paise coins
= 120.

2. (1) The ratio of values of rupee, 50 paise and 25 paise coins = 13 : 11 : 7

$\therefore$ Ratio of their numbers
$= 13 \times 1 : 11 \times 2 : 7 \times 4$
$= 13 : 22 : 28$
Sum of the ratios
$= 13 + 22 + 28 = 63$

$\therefore$ Required number of 50 paise coins $= \frac{22}{63} \times 378 = 132$

3. (2) Ratio of values of 50 paise, 25 paise and 10 paise coins

$= \frac{2}{2} : \frac{3}{4} : \frac{5}{10} = 1 : \frac{3}{4} : \frac{1}{2}$

$= 4 : 3 : 2$
Sum of the ratios = 4 + 3 + 2 = 9
Value of 25 paise coins

$= \frac{3}{9} \times 90 =$ ₹ 30

Number of 25 paise coins
$= 30 \times 4 = 120$

4. (3) Ratio of the number of coins
= 8 : 5 :3
Ratio of their values

$= 8 : \frac{5}{2} : \frac{3}{4} = 32 : 10 : 3$

Sum of the ratios
= 32 + 10 + 3 = 45
$\therefore$ Value of one rupee coins

$= \frac{32}{45} \times 225 =$ ₹ 160

$\therefore$ Number of one rupee coins
= 160

5. (2) Ratio of number of 1 rupee, 50-paise and 25 paise coins
= 8 : 5 : 3
Ratio of their respective values

$= 8 : \frac{5}{2} : \frac{3}{4} = 32 : 10 : 3$

Sum of the ratios
= 32 + 10 + 3 = 45
Value of 50 paise coins

$= ₹ \left(\frac{10}{45} \times 112.5\right) = ₹ 25$

$\therefore$ Number of 50 paise coins
$= 25 \times 2 = 50$

6. (2) Ratio of the number of coins of Re. 1, 50 paise and 25 paise
= 3 : 8 : 20
Ratio of the values of these coins

$= 3 : \frac{8}{2} : \frac{20}{4} = 3 : 4 : 5$

$\therefore$ Value of 1 rupee coins

$= \frac{3}{12} \times 372 =$ ₹ 93

Value of 50 paise coins

$= \frac{4}{12} \times 372 =$ ₹ 124

Value of 25 paise coins

$= \frac{5}{12} \times 372 =$ ₹ 155

$\therefore$ Number of coins
$= 93 + 124 \times 2 + 155 \times 4$
$= 93 + 248 + 620 = 961$

7. (4) Respective ratio of the number of coins
$= 13 : 11 \times 2 = 13 : 22$
$\therefore$ Number of 1 rupee coins

$= \frac{13}{13 + 22} \times 210$

$= \frac{13}{35} \times 210 = 78$

8. (3) Ratio of the value of coins

$= \frac{1}{2} : \frac{2}{4} : \frac{3}{10} = 5 : 5 : 3$

$\therefore$ Value of the 10-paise coins

$= ₹ \left(\frac{3}{13} \times 6.50\right) = ₹ 1.5$

$\therefore$ Number of 10-paise coins
$= 1.5 \times 10 = 15$

9. (2) Let the number of each type of notes be x
$\therefore x + 5x + 10x = 640$
$\Rightarrow 16x = 640 \Rightarrow x = 40$
$\therefore$ Total number of notes
$= 3 \times 40 = 120$

10. (1) Let the number of coins of 1-rupee coin be x.
Total value of the coins of each kind is same, then the number of 50 paisa coins = $2x$ and the number of 25 paisa coins = $4x$.
According to the question.
$x + 2x + 4x = 175$

$7x = 175 \therefore x = \frac{175}{7} = 25$

$\therefore$ Total amount in bag
$= 25 + 25 + 25 =$ ₹ 75

11. (3) Ratio of values = 5 : 3 : 1
Ratio of their numbers
= 10 : 12 : 10 = 5 : 6 : 5
$\therefore$ Number of 50 paise coins

$= \frac{5}{16} \times 480 = 150$

Number of 25 paise coins

$= \frac{6}{16} \times 480 = 180$

Number of 10 paise coins

$= \frac{5}{16} \times 480 = 150$

12. (4) Ratio of their values =13:11:7
Ratio of their numbers
= 13 : 22 : 35
$\therefore 13x + 22x + 35x = 420$
$\Rightarrow 70x = 420 \Rightarrow x = 6$
$\therefore$ Number of 50 paise coins
$= 22x = 22 \times 6 = 132$

13. (2) Number of 1-rupee coins $= x$
Number of 50 paise coins = $4x$
Number of 25 paise coins = $2x$
$\therefore$ Ratio of their values

$= x : \frac{4x}{2} : \frac{2x}{4} = 2 : 4 : 1$

$\therefore$ Value of 50-paise coins

$= \frac{4}{7} \times 56 =$ ₹ 32

$\therefore$ Their number = 32 × 2 = 64

Aliter :

$(x)(1) + (4x)\left(\frac{1}{2}\right) + (2x)\left(\frac{1}{4}\right) = 56$

$x + 2x + \frac{1}{2}x = 56$

$\Rightarrow x = 56 \times \frac{2}{7} = 16$

$\Rightarrow$ No. of 50p coins = 4 × 16 = 64.

14. (3) Let the initial salaries of A, B and C be ₹ x, ₹ $3x$ and ₹ $4x$ respectively.

Respective ratio after corresponding increase

$$= \frac{x \times 105}{100} : \frac{3x \times 110}{100} : \frac{4x \times 115}{100}$$

$= 105 : 330 : 460$

$= 21 : 66 : 92$

15. (2) If the salaries of A, B and C be ₹ x, ₹ y and ₹ z respectively, then

$$\frac{x \times 20}{100} : \frac{y \times 15}{100} : \frac{z \times 25}{100}$$

$$\Rightarrow \frac{x}{5} : \frac{3y}{20} : \frac{z}{4} = 8 : 9 : 20$$

$\Rightarrow x : y : z = 40 : 60 : 80$

$= 2 : 3 : 4$

$\therefore$ A's salary $= \frac{2}{9} \times 72000$

= ₹ 16000

16. (3) Ratio of the values of one rupee, 50 paise and 25 paise coins $= 8 : 4 : 3$

Ratio of their number

$= 8 : 4 \times 2 : 3 \times 4 = 2 : 2 : 3$

Sum of ratios = 2 + 2 + 3 = 7

$\therefore$ Number of 50-paise coins

$= \frac{2}{7} \times 280 = 80$

TYPE-XI

1. (4) Orginal ratio of A, B and C

$= \frac{1}{2} : \frac{1}{3} : \frac{1}{4} = 6 : 4 : 3$

$\therefore$ Share of A

$= \frac{6}{13} \times 117 =$ ₹ 54

Share of B

$= \frac{4}{13} \times 117 =$ ₹ 36

and share of C

$= \frac{3}{13} \times 117 =$ ₹ 27

The ratio of A, B and C by mistake = 2 : 3 : 4

$\therefore$ Share of A $= \frac{2}{9} \times 117 =$ ₹ 26

Share of B $= \frac{3}{9} \times 117 =$ ₹ 39

Share of C $= \frac{4}{9} \times 117 =$ ₹ 52

Therefore, it is clear from above calculation that C gains maximum i.e. ₹ 25.

2. (3) According to question,

A : B = 2 : 1

B : C = 4 : 1

$\therefore$ A : B : C = 8 : 4 : 1

3. (1) A : B = 5 : 2

B : C = 7 : 13

$\therefore$ A : B : C

$= 5 \times 7 : 2 \times 7 : 2 \times 13$

$= 35 : 14 : 26$

Sum of the ratios

$= 35 + 14 + 26 = 75$

Total amount = ₹ 7500

$\therefore$ B's share = ₹ $\frac{14}{75} \times 7500$

= ₹ 1400

4. (2) A : B = 6 : 5, B : C = 10 : 9

A : B : C = 6 : 5
10 : 9

60 : 50 : 45

=12 : 10 : 9

According to the question

(12 + 10 + 9) units $\Rightarrow$ 1240

9 units $= \frac{1240}{31} \times 9$

$\Rightarrow$ ₹ 360

5. (1)

A : B = 2 : 3
B : C = 4 : 3
C : D = 2 : 3

A : B : C : D = 2×4×2 : 3×4×2 : 3×3×2 : 3×3×3

or, A : B : C : D = 16 : 24 : 18 : 27

Sum of the ratios

$= 16 + 24 + 18 + 27 = 85$

B's share = ₹ $\frac{24}{85} \times 3400$

= ₹ 960

D's share = ₹ $\frac{27}{85} \times 3400$

= ₹ 1080

The required sum

= ₹ (1080 + 960) = ₹ 2040

6. (1) A : B = 5 : 2

B : C = 7 : 13

A : B : C = 5×7 : 7×2 : 2×13

= 35 : 14 : 26

Sum of the ratios

$= 35 + 14 + 26 = 75$

A's share = ₹ $\frac{35}{75} \times 750$

= ₹ 350

7. (4) Ratio $= \frac{1}{2} : \frac{1}{4} : \frac{5}{16}$

$= 8 : 4 : 5$

Sum of ratios = 8 + 4 + 5 = 17

$\therefore$ Required answer

$= ₹ \left(\frac{8-4}{17}\right) \times 68000$

$= ₹ \frac{4}{17} \times 68000$

= ₹ 16000

8. (4) Ratio $= \frac{3}{5} : 2 : \frac{5}{3}$

$= 9 : 30 : 25$

Sum of ratios = 9 + 30 + 25

= 64

$\therefore$ Share of second worker

$= \frac{30}{64} \times 6400 =$ ₹ 3000

9. (2) $A = B \times \frac{2}{9} = \frac{2B}{9}$

$C = \frac{3A}{4}$; $A = \frac{4}{3}C$

$\therefore$ Ratio of A : B : C = 4 : 18 : 3

Share of A $= \frac{4}{25} \times 1250 =$ ₹ 200

Share of B $= \frac{18}{25} \times 1250 =$ ₹ 900

Share of C $= \frac{3}{25} \times 1250 =$ ₹ 150

10. (4) A's share $= 9000 \times \frac{4}{15}$

$= 600 \times 4 =$ ₹ 2400

C's share $= 9000 \times \frac{6}{15}$

$= 600 \times 6 =$ ₹ 3600

$\therefore$ Difference = 3600 – 2400

= ₹ 1200

11. (4) A : B = 3 : 4

B : C = 3 : 4

A : B : C = 9 : 12 : 16

$\therefore$ A's share $= \frac{9}{9+12+16} \times$ ₹ 370

= ₹ 90

12. (4) Let the amount to be distributed be ₹ x.

P : Q : R = 2 : 7 : 9

Sum of the ratios = 2+7 + 9 = 18

$\therefore P = \frac{2}{18} \times x = \frac{x}{9}$

$Q = \frac{7}{18}x$

$R = \frac{9x}{18} = \frac{x}{2}$

As given,

$\frac{x}{9} + \frac{7x}{18} = \frac{x}{2}$

Thus, we get no conclusion. Amount should necessarily be known.

13. (4) According to the question,
A : B = 5 : 12 = 10 : 24
B : C = 4 : 5.50 = 24 : 33
∴ A : B : C = 10 : 24 : 33
Sum of the ratios
= 10 + 24 + 33 = 67
Difference between the shares of C and B

$= ₹\left(\frac{33-24}{67} \times 2010\right)$

$= ₹\left(\frac{9}{67} \times 2010\right) = ₹\ 270$

14. (3) $\frac{2}{5}A + 40 = \frac{2}{7}B + 20$

$= \frac{9}{17}C + 10 = x$

$\therefore A = \frac{5}{2}(x-40), B = \frac{7}{2}(x-20)$

and, $C = \frac{17}{9}(x-10)$

$\therefore \frac{5}{2}(x-40) + \frac{7}{2}(x-20) + \frac{17}{9}(x-10)$
= 600
$\Rightarrow x = 100$

∴ A's share = ₹ $\frac{5}{2}(100 - 40)$
= ₹ 150

15. (2) When A gets 100 paise, B gets 90 Paise
When B gets 100 paise, C gets 110 paise
∴ When B gets 90 paise, C gets

$\frac{110}{100} \times 90$ = 99 paise

∴ A : B : C = 100 : 90 : 99
Sum of the ratios
= 100 + 90 + 99 = 289

∴ B' share = $\left(\frac{90}{289} \times 86700\right)$

= ₹ 27000

16. (1) A : B = 2 : 3
B : C = 4 : 5
∴ A : B : C = 8 : 12 : 15

∴ B's share = $\frac{12}{35} \times 7000$

= ₹ 2400

17. (3) Suppose amount received by men = 5x.
and amount received by women = 4x
According to question
5x + 4x = 180
⇒ 9x = 180 ⇒ x = 20
∴ Amount received by men
= ₹ 100
Amount received by women= ₹ 80
Suppose the number of men be y and that of women be (66 – y).
According to question

$\frac{\frac{100}{y}}{\frac{80}{66-y}} = \frac{3}{2}$

$\Rightarrow \frac{100}{y} \times \frac{66-y}{80} = \frac{3}{2}$

$\Rightarrow \frac{5(66-y)}{4y} = \frac{3}{2}$

$\Rightarrow 660 - 10y = 12y$
$\Rightarrow 22y = 660 \Rightarrow y = 30$

18. (2) B's share

$= \frac{3}{(2+3+4)} \times 738$

$= \frac{3}{9} \times 738$ = ₹ 246

19. (4) A × 0.5 = B × 0.6 = C × 0.75

$\Rightarrow \frac{A \times 5}{10} = \frac{B \times 6}{10} = C \times \frac{75}{100}$

$\Rightarrow \frac{A}{2} = \frac{B}{\frac{5}{3}} = \frac{C}{\frac{4}{3}}$

$\therefore A : B : C = 2 : \frac{5}{3} : \frac{4}{3}$

= 6 : 5 : 4
∴ C's share

$= \frac{4}{15} \times 1740$ = ₹ 464

20. (2) Amount received by y
= ₹ 100.
Amount received by x = ₹ 125.
Amount received by z

$= \frac{100 \times 100}{75} = ₹\ \frac{400}{3}$

∴ Required ratio

$= 125 : 100 : \frac{400}{3}$

$= 5 : 4 : \frac{16}{3} = 15 : 12 : 16$

21. (2) B = C + 8
A = C + 8 + 7 = C + 15
∴ C + 15 + C + 8 + C = 53
⇒ 3C + 23 = 53
⇒ 3C = 53 – 23 = 30
⇒ C = ₹ 10
∴ B = C + 8 = 10 + 8 = ₹ 18
A = C + 15 = 10 + 15
= ₹ 25
∴ A : B : C = 25 : 18 : 10

22. (2) A : B = 2 : 3 = 8 : 12
B : C = 4 : 5 = 12 : 15
∴ A : B : C = 8 : 12 : 15
Sum of ratios = 35

∴ A's share $= \frac{8}{35} \times 700$

= ₹ 160

B's share $= \frac{12}{35} \times 700$

= ₹ 240

C's share $= \frac{15}{35} \times 700$

= ₹ 300

23. (2) A : B : C = $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$

$= \frac{1}{2} \times 12 : \frac{1}{3} \times 12 : \frac{1}{4} \times 12$

[LCM of 2, 3 and 4 = 12]
= 6 : 4 : 3

A's share = $\frac{6}{13} \times 2600$

= ₹ 1200

B's share = $\frac{4}{13} \times 2600$

= ₹ 800

C's share = $\frac{3}{13} \times 2600$ = ₹ 600

24. (2) According to question,
P + Q + R = ₹ 300
Now, Q = P + 30
R = Q + 60
= P + 30 + 60 = P + 90
Hence, P + Q + R = ₹ 300
⇒ P + P + 30 + P + 90 = 300
⇒ 3P + 120 = 300

$\Rightarrow P = \frac{180}{3} = 60$

∴ Share of P = ₹ 60, Q = ₹ 90
R = ₹ 150
⇒ P : Q : R = 60 : 90 : 150
= 6 : 9 : 15
= 2 : 3 : 5 :

25. (3) $A \times \frac{1}{2} = B \times \frac{1}{3} = C \times \frac{1}{4}$

$\Rightarrow \frac{A}{2} = \frac{B}{3} = \frac{C}{4}$

$\therefore$ A : B : C = 2 : 3 : 4

$\therefore A \Rightarrow \frac{2}{9} \times 900 =$ ₹ 200

$B \Rightarrow \frac{3}{9} \times 900 =$ ₹ 300

$C \Rightarrow \frac{4}{9} \times 900 =$ ₹ 400

26. (3) A : B : C = 2 : 5 : 4
Sum of ratios = 2 + 5 + 4 = 11
Difference

$= \left(\frac{5}{11} - \frac{2}{11}\right) \times 126.50$

$= \frac{3}{11} \times 126.50 =$ ₹ 34.50

27. (2) B's share = Rs. b
A's share = Rs. $(b + 7)$
C's Share = Rs.$(b - 6)$
$\therefore b + b + 7 + b - 6 = 76$
$\Rightarrow 3b = 76 - 1 = 75$
$\Rightarrow b =$ Rs. 25
$\therefore$ A's share = 25 + 7 = Rs. 32
C's share = 25 – 6 = Rs. 19
$\therefore$ Required ratio = 32 : 25 : 19

28. (4) $A = \frac{1}{3}$ (B + C)

$\Rightarrow 3A = B + C$ ...(i)

$B = \frac{2}{3}$ (A + C)

$\Rightarrow 3B = 2A + 2C$ ...(ii)
From equation (i),
3A = B + C
$\Rightarrow 9A = 3B + 3C$
$\Rightarrow 9A = 2A + 2C + 3C$
$\Rightarrow 7A = 5C$ ...(iii)
From equation (ii),

$3B = 2\left(\frac{5C}{7}\right) + 2C$

$\Rightarrow 21B = 10C + 14C$
$\Rightarrow 21B = 24C$
$\Rightarrow 7B = 8C$ ...(iv)
From equations (iii) and (iv),

$C = \frac{7A}{5} = \frac{7B}{8}$

$\therefore \frac{A}{5} = \frac{B}{8} = \frac{C}{7}$

C's share $= \frac{7}{(5+8+7)} \times 3000$

$=$ ₹ $\left(\frac{7}{20} \times 3000\right) =$ ₹ 1050

29. (1) **Case I**

$A : B : C = \frac{1}{4} : \frac{1}{5} : \frac{1}{6}$

$= \frac{1}{4} \times 60 : \frac{1}{5} \times 60 : \frac{1}{6} \times 60$

[LCM of 4, 5 and 6 = 60]
= 15 : 12 : 10
Sum of ratios = 15 + 12 + 10
= 37

$\therefore$ C's share $= \frac{10}{37} \times 555$

= ₹ 150

Case II
A : B : C = 4 : 5 : 6
Sum of ratios = 4 + 5 + 6 = 15

$\therefore$ C's share $= \frac{6}{15} \times 555$

= ₹ 222
$\therefore$ Required answer
= ₹ (222 – 150) = ₹ 72

30. (1) Son : wife = 3 : 1 = 9 : 3
Wife : daughter = 3 : 1
$\therefore$ Son : wife : daughter
= 9 : 3 : 1
Sum of ratios = 9 + 3 + 1 = 13
If total wealth be ₹ x, then
Son's share – daughter's share
= ₹ 10,000

$\Rightarrow \frac{9x}{13} - \frac{x}{13} = 10{,}000$

$\Rightarrow \frac{9x - x}{13} = 10{,}000$

$\Rightarrow 8x = 13{,}00{,}00$

$\Rightarrow x = \frac{13{,}00{,}00}{8} =$ ₹ 16250

31. (2) A : B = 3 : 4
B : C = 3.5 : 3 = 7 : 6
$\therefore$ A : B : C = (3 × 7) : (4 × 7) : (4 × 6)
= 21 : 28 : 24
Sum of ratios = 21+28 + 24 = 73
$\therefore$ Difference between the shares of B and C

$= \left(\frac{28 - 24}{73}\right) \times 730$

= 4 × 10 = Rs. 40

32. (3) A : B : C : D = 7 : 6 : 3 : 5
Sum of ratios = 7+ 6 + 3 + 5 = 21
$\therefore$ Difference of shares of B and C
= Rs. 270
If the total amount be Rs. x, then

$\left(\frac{6-3}{21}\right)x = 270$

$\Rightarrow 3x = 21 \times 270$

$\Rightarrow x = \frac{21 \times 270}{3} =$ Rs. 1890

$\therefore$ D's share $= \frac{5}{21} \times 1890$

= Rs. 450

33. (4) B's capital = Rs. x
$\therefore$ A's capital = Rs. $2x$.
Ratio of equivalent capitals of A and B for 1 month

$= \left(2x \times 10 + \frac{3x}{2} \times 2\right) :$

$\left(x \times 8 + \frac{x}{2} \times 4\right)$

$= (20x + 3x) : (8x + 2x)$
$= 23x : 10x = 23 : 10$

34. (1) A's investment = Rs. $3x$
B's investment = Rs. $5x$
C's investment = Rs. $5x$
Ratio of the equivalent capitals of A, B and C for 1 month
$= (3x \times 12) : (5x \times 12) : (5x \times 6)$
$= 36x : 60x : 30x$
= 6 : 10 : 5

35. (3) Ratio of equivalent capitals of A, B and C for 1 month
= (16000 × 3 + 11000 × 9) : (12000 × 3 + 17000 × 9) : (21000 × 6)
= (48000 + 99000) : (36000 + 153000) : 126000
= 147000 : 189000 : 126000
= 49 : 63 : 42
= 7 : 9 : 6
Sum of ratios = 7 + 9 + 6 = 22
$\therefore$ Required difference

$= \text{Rs.}\left(\frac{9-6}{22} \times 26400\right)$

$= \text{Rs.}\ \frac{3 \times 26400}{22} =$ Rs. 3600

36. (4) A : C = 2 : 1 = 6 : 3
A : B = 3 : 2 = 6 : 4
$\therefore$ A : B : C = 6 : 4 : 3
$\therefore$ Sum of the terms of ratio
= 6 + 4 + 3 = 13
$\therefore$ B's share

$= \text{Rs.}\left(\frac{4}{13} \times 157300\right)$

= Rs. 48400

37. (1) Ratio = 8 : 4 : 7
Sum of the terms of ratio
= 8 + 4 + 7 = 19
$\therefore$ Share of 4 women

$= \text{Rs.} \left(\frac{7}{19} \times 380\right)$

= Rs.140

1 women's share = $\frac{140}{4}$

= Rs. 35

38. (2) Let the total amount be Rs. x.
It is given that,
A : B : C = 5 : 6 : 9
Sum of the terms of ratio
= 5 + 6 + 9 = 20

$\therefore$ A's share = Rs. $\frac{5x}{20}$

= Rs. $\frac{x}{4}$

$\therefore \frac{x}{4}$ = Rs. 450

$\Rightarrow x$ = Rs. (4 × 450)
= Rs. 1800

39. (1) According to the question,

$A = \frac{B}{2} = 3C \Rightarrow \frac{A}{1} = \frac{B}{2} = \frac{C}{\frac{1}{3}}$

$\therefore$ A : B : C = 1 : 2 : $\frac{1}{3}$

= 3 : 6 : 1
Sum of the terms of ratio
= 3 + 6 + 1 = 10

$\therefore$ C's share = Rs. $\left(\frac{1}{10} \times 490\right)$

= Rs. 49

40. (4) A : B = $\frac{1}{3} : \frac{1}{5}$ = 5 : 3

Sum of the terms of ratio
= 5 + 3 = 8
Total profit = Rs. 960
$\therefore$ Difference between their shares

$= \left(\frac{5}{8} - \frac{3}{8}\right)$ of 960

$= 960 \times \frac{1}{4}$ = Rs. 240

41. (2) Let the shares of three brothers be Rs. a, Rs. b and Rs. c respectively.
According to the question,

$b = \frac{-5}{13}(a + c)$

$\Rightarrow \frac{13b}{5} = a + c$ ..... (i)

$\therefore a + b + c = 1620$

$\Rightarrow \frac{13b}{5} + b = 1620$

$\Rightarrow \frac{13b + 5b}{5} = 1620$

$\Rightarrow 18b = 1620 \times 5$

$\Rightarrow b = \frac{1620 \times 5}{18}$ = Rs. 450

42. (3) Let total amount be Rs. x.
According to the question,

$\frac{x}{2} + \frac{x}{3} + 1200 = x$

$\Rightarrow x - \frac{x}{2} - \frac{x}{3} = 1200$

$\Rightarrow \frac{6x - 3x - 2x}{6} = 1200$

$\Rightarrow \frac{x}{6} = 1200 \Rightarrow x = 1200 \times 6$

= Rs. 7200

$\therefore$ A's share = Rs. $\left(\frac{7200}{2}\right)$

= Rs. 3600

43. (4) According to the question,
3A = 4B

$\Rightarrow \frac{A}{4} = \frac{B}{3} \Rightarrow$ A : B = 4 : 3

B's capital is twice C's capital.

$\therefore \frac{B}{C} = \frac{2}{1}$

B : C = 2 : 1

$\therefore$ A : B : C = 4 × 2 : 3 × 2 : 3 × 1
= 8 : 6 : 3

44. (1) A's share = $\frac{2}{9}$ of (B + C)'s share

$\therefore$ (B + C)'s share = $\frac{9}{2}$ A's share

According to the question,

$A + \frac{9A}{2} = 770$

$\Rightarrow \frac{2A + 9A}{2} = 770$

$\Rightarrow \frac{11A}{2} = 770$

$\Rightarrow A = \frac{770 \times 2}{11}$ = Rs. 140

45. (2) According to the question,
A : B = 3 : 4
B : C = 3.5 : 3
= 7 : 6
$\therefore$ A : B : C
= 3 × 7 : 4 × 7 : 4 × 6
= 21 : 28 : 24
Sum of the terms of ratio
= 21 + 28 + 24 = 73
$\therefore$ Difference between the shares of B and C

$= \text{Rs.} \left(\frac{28 - 24}{73}\right) \times 730$

= Rs. 40

46. (3) Ratio of the equivalent capitals of A and B for 1 month
= (4000 × 8 + 6000 × 4) : (5000 × 9 + 3000 × 3)
= (32000 + 24000) : (45000 + 9000)
= 56000 : 54000 = 28 : 27
Sum of the terms of ratio
= 28 + 27 = 55
A is an active partner.
Allowance got by A in 1 year
= Rs. 1200
Remaining profit
= Rs. (6700 – 1200) = Rs. 5500

$\therefore$ B's share = Rs. $\left(\frac{27}{55} \times 5500\right)$

= Rs. 2700

47. (3) According to the question,
Amount to be distributed in the ratio 7 : 10 : 13
= Rs. (15525 – 22 – 35 – 45)
= Rs. 15420
Sum of the terms of ratio
= 7 + 10 + 13 = 30

Sunil's share= Rs. $\left(\frac{7}{30} \times 15420\right)$

= Rs. 3598
Anil's share

$= \text{Rs.} \left(\frac{10}{30} \times 15420\right)$

= Rs. 5140
Jamil's share

$= \text{Rs.} \left(\frac{13}{30} \times 15420\right)$

= Rs. 6682
Ratio after respective increase in each share
= (3598 + 22 + 16) : (5140 + 35 + 77) : (6682 + 48 + 37)
= 3636 : 5252 : 6767
= 36 : 52 : 67

48. (1) According to the question,

$\frac{A}{2} = \frac{B}{3} = \frac{C}{6}$

$\therefore$ A : B : C = 2 : 3 : 6
Sum of the terms of ratio
= 2 + 3 + 6 = 11
Total amount = Rs. 1980

$\therefore$ B's share = Rs. $\left(\frac{3}{11} \times 1980\right)$

= Rs. 450

49. (1) Ratio of the equivalent capitals of A, B and C for 1 month
= 13000 × 12 : 17000 × 12 : 5000 × 12
= 13 : 17 : 5
Sum of the terms of ratio
= 13 + 17 + 5 = 35
Total profit = Rs. 1400

$\therefore$ B's share = Rs. $\left(\frac{17}{35}\times 1400\right)$

= Rs. 680

50. (1) According to the question,
A + B + C = 600 .... (i)
and

$$\frac{2A}{5}+40=\frac{2B}{7}+20$$

$$=\frac{9C}{17}+10$$

$$\therefore \frac{2A}{5}+40=\frac{2B}{7}+20$$

$$=\frac{2A}{5}+20=\frac{2}{7}B$$

$$\therefore B=\frac{7}{2}\left(\frac{2A}{5}+20\right)=\frac{7A}{5}+70$$

Again, $\frac{2A}{5}+40=\frac{9C}{17}+10$

$$\Rightarrow \frac{9C}{17}=\frac{2A}{5}+30$$

$$\Rightarrow C=\frac{17}{9}\left(\frac{2A}{5}+30\right)$$

$$=\frac{34A}{45}+\frac{170}{3}$$

$$\therefore A+\frac{7A}{5}+70+\frac{34A}{45}+\frac{170}{3}=600$$

$$\Rightarrow A+\frac{7A}{5}+\frac{34A}{45}=600-70-\frac{170}{3}$$

$$\Rightarrow \frac{45A+63A+34A}{45}$$

$$=530-\frac{170}{3}$$

$$\Rightarrow \frac{142A}{45}=\frac{1590-170}{3}=\frac{1420}{3}$$

$$\Rightarrow A=\frac{1420}{3}\times\frac{45}{142}=\text{Rs. } 150$$

TYPE-XII

1. (3) Let interior angle = I and exterior angle = E
According to questions,

$$\frac{I}{E}=\frac{2}{1}\Rightarrow 2E = I.1 \text{ or, } E=\frac{I}{2}$$

But I + E = 180°

$$I+\frac{I}{2}=180$$

$$\frac{3}{2}I=180$$

$$I=\frac{2}{3}\times 180$$

I = 120°
We know that each interior angle of a regular polygon of n sides is given by

$$I=\frac{n-2}{n}\times 180°$$

$$120°=\frac{n-2}{n}\times 180°$$

$$\Rightarrow \frac{n-2}{n}=\frac{120°}{180°}=\frac{2}{3}$$

$\Rightarrow 3n - 6 = 2n \Rightarrow n = 6$

2. (3) Required answer

$$\frac{6-x}{7-x}<\frac{16}{21}$$

Check through options

$$=\frac{6-3}{7-3}=\frac{3}{4}<\frac{16}{21}$$

3. (3) Let the numbers be 17x and 45x respectively.
According to the question,

$$\frac{1}{5}\text{ of } 45x-\frac{1}{3}\text{ of } 17x=15$$

$$\Rightarrow 9x-\frac{17x}{3}=15$$

$$\Rightarrow \frac{27x-17x}{3}=15$$

$\Rightarrow 10x = 15 \times 3$

$$\Rightarrow x=\frac{15\times 3}{10}=\frac{9}{2}$$

$\therefore$ The required number

$$=17x=\frac{17\times 9}{2}=\frac{153}{2}=76\frac{1}{2}$$

4. (1) Price of the third variety
= x per kg.
$\therefore$ 126 + 135 + 2x = 4 × 153
$\Rightarrow$ 261 + 2x = 612
$\Rightarrow$ 2x = 612 – 261 = 351

$$\Rightarrow x=\frac{351}{2}=₹\ 175.5$$

5. (4) Given ratio is total members : absentees = 5 : 3 i.e. $\frac{3}{5}$
Hence, Number of persons absent

$$=\frac{3}{5}\times 15=9$$

6. (3) **Case I,**

$$P : Q : R=\frac{1}{2}:\frac{1}{3}:\frac{1}{4}$$

= 6 : 4 : 3
Case II,
P : Q : R = 2 : 3 : 4
Clearly, R will gain.

7. (1) Ratio of first and second class fares = 3 : 1
Ratio of number of passengers
= 1 : 50
$\therefore$ Ratio of total amount
= 3 × 1 : 1 × 50 = 3 : 50
$\therefore$ Amount collected from second class passengers

$$=₹\left(\frac{50}{53}\times 1325\right)=₹\ 1250$$

8. (1) A : B = 3 : 2 = 9 : 6
B : C = 3 : 2 = 6 : 4
$\therefore$ A : B :C = 9 : 6 : 4
Total runs = 361
$\therefore$ Number of runs scored by A

$$=\frac{9}{(9+6+4)}\times 361$$

$$=\frac{9}{19}\times 361=171$$

9. (1)Let the number of failures
= 4x and that of passers = 25 x
$\therefore$ Total number of students
= 4x + 25x = 29 x
In case II
Number of students = 29x + 5
Number of failures = 4 x – 2
$\therefore$ Number of passers
= 29x + 5 – 4x + 2 = 25x +7
$\therefore$ According to the question,

$$\frac{25x+7}{4x-2}=\frac{22}{3}$$

$\Rightarrow 88x - 44 = 75x + 21$
$\Rightarrow 88x - 75x = 44 + 21$
$\Rightarrow 13x = 65$

$$\Rightarrow x=\frac{65}{13}=5$$

$\therefore$ Total number of students
= 29x = 29 × 5 = 145

10. (1) Sachin : Sourav = 3 : 2
Sourav : Vinod = 3 : 2
Ratio of the runs scored by Sachin, Sourav and Vinod respectively = 3 × 3 : 2 × 3 : 2 × 2
= 9 : 6 : 4
∴ Runs scored by Sachin
$= \frac{9}{19} \times 285 = 135$

11. (3) According to the question,
E + M = 170 ....(i)
E – M = 10 ....(ii)
Adding both the equations,
2E = 180 ⇒ E = 90
From equation (i),
M = 170 – 90 = 80
$\therefore \frac{E}{M} = \frac{9}{8} = 9 : 8$

12. (2) Let the initial weights of Mr. Gupta and Mrs. Gupta be $7x$ and $8x$ kg respectively.
∴ $7x + 8x = 120$
⇒ $15x = 120$
$\Rightarrow x = \frac{120}{15} = 8$
∴ Mr. Gupta's weight = 7 × 8
= 56 kg
Mrs. Gupta's weight
= 8 × 8 = 64 kg
Let Mrs. Gupta reduce her weight by y kg.
$\therefore \frac{56-6}{64-y} = \frac{5}{6}$
$\Rightarrow \frac{50}{64-y} = \frac{5}{6}$
⇒ $64 - y = 60$
⇒ $y = 64 - 60 = 4$ kg

13. (4) Let the original number of boys and girls be $5x$ and $3x$ respectively and that of new boys and girls be $5y$ and $7y$ respectively.
∴ $5x + 3x + 5y + 7y = 1200$
⇒ $2x + 3y = 300$ .....(i)
and, $\frac{5x+5y}{3x+7y} = \frac{7}{5}$
⇒ $25x + 25y = 21x + 49y$
⇒ $4x = 24y$
⇒ $x = 6y$ ..... (ii)
From equation (i),
$4x + 6y = 600$
⇒ $5x = 600 \Rightarrow x = 120$
∴ Original number of students
$= 8x = 960$

14. (3) CP of refrigerator = ₹ $5x$
CP of television = ₹ $3x$
∴ $2x = 5500$
$\Rightarrow x = \frac{5500}{2} = 2750$
∴ CP of refrigerator
= 5 × 2750 = ₹ 13750

15. (3) According to question,
Son : Daughter : Nephew
= 5x : 4x : x
But 5 sons : 4 daughters : 2 nephews
= 25x : 16x : 2x
and 25x + 16x + 2x = ₹ 8600
43x = ₹ 8600
x = ₹ 200
∴ Required answer
= 4 × 200 = ₹ 800

16. (2) A + B = 158
C = 158 – 101 = 57
Also B = 57 + 23 = 80
∴ The amount with A
= ₹ (158 – 80) = ₹ 78

17. (1) L = N + 5.72
M = L + 2.24
= N + 5.72 + 2.24
M = N + 7.96
L + M + N = 340.68
N + 5.72 + N + 7.96 + N
= 340.68 ⇒ 3N = 327
$\Rightarrow N = \frac{327}{3}$ = ₹ 109

18. (4) Ratio of the first and second class fares (total)
= 1 × 4 : 1 × 40
= 4 : 40 = 1 : 10
∴ Amount collected from the first class passengers
$= \frac{1}{11} \times 1100$ = ₹100

19. (3) Time taken is inversely proportional to relevant speeds.
∴ Required ratio $= \frac{1}{4} : \frac{1}{3} : \frac{1}{5}$
$= \frac{1}{4} \times 60 : \frac{1}{3} \times 60 : \frac{1}{5} \times 60$
= 15 : 20 : 12

20. (3) let the numbers be x and y where $x > y$.
$\therefore x - \frac{y}{2} = 5\left(y - \frac{y}{2}\right) = \frac{5y}{2}$
$\Rightarrow x = \frac{y}{2} + \frac{5y}{2} = 3y \Rightarrow \frac{x}{y} = \frac{3}{1}$

21. (2) Let the number of shirts of brand B be x.
Let the cost of a shirt of brand B be ₹ 1.
∴ Original cost = 4 × 2 + x
= ₹ (8 + x)
In case II,
$4 + 2x = (8 + x) \times \frac{140}{100} = (8 + x)\frac{7}{5}$
⇒ $20 + 10x = 56 + 7x$
⇒ $10x - 7x = 56 - 20 = 36$
⇒ $3x = 36 \Rightarrow x = 12$
∴ Required ratio
= 4 : 12 = 1 : 3

22. (1) Total students
= $6x + x = 7x$
$\therefore \frac{6x+6}{x-6} = \frac{9}{1}$
⇒ $6x + 6 = 9x - 54$
⇒ $9x - 6x = 54 + 6 = 60$
⇒ $3x = 60 \Rightarrow x = 20$
∴ Total number of students
= 7 × 20 = 140

23. (4) Weight of paper bundles
$= \left(\frac{22}{25} \times 36\right)$ kg
$= \left(\frac{22 \times 36 \times 1000}{25}\right)$ gm
= 31680 gm

24. (2) Numbers = $3x$ and $4x$
∴ $(4x)^2 = 8 \times (3x)^2 - 224$
⇒ $16x^2 = 72x^2 - 224$
⇒ $72x^2 - 16x^2 = 224$
$\Rightarrow 56x^2 = 224 \Rightarrow x^2 = \frac{224}{56} = 4$
⇒ $x = \sqrt{4} = 2$
∴ Numbers = 6 and 8

25. (2) If boys = x and girls = y, then
$y \times \frac{10}{100} = \frac{x}{20} \Rightarrow \frac{y}{10} = \frac{x}{20}$
$\Rightarrow \frac{x}{y} = \frac{20}{10} = \frac{2}{1} = 2 : 1$

26. (3) 5 steps of policeman = 7 steps of thief
∴ 8 steps of policeman $= \frac{7}{5} \times 8$
$= \frac{56}{5}$ steps of thief
∴ Required ratio $= \frac{56}{5} : 10$
= 56 : 50
= 28 : 25

27. (3) Marks obtained by A in English = $2x$ (let)
Marks obtained in Maths = $3x$
Marks obtained in Science = x
According to the question,
$2x + 3x + x = 180$
$\Rightarrow 6x = 180$
$\Rightarrow x = \frac{180}{6} = 30$
= Marks obtained in science

28. (4) 7 jumps of Tom ≡ 5 jumps of Jerry
$\therefore$ 8 jumps of Tom $\equiv \frac{5}{7} \times 8$
$= \frac{40}{7}$ jumps of Jerry
$\therefore$ Required ratio $= \frac{40}{7} : 6$
= 40 : 42 = 20 : 21

29. (1) Story books ⇒ 1512
Other books $\Rightarrow \frac{2}{7} \times 1512$
= 432
Additional story books = x
$\therefore \frac{1512 + x}{432} = \frac{15}{4}$
$\Rightarrow 6048 + 4x = 432 \times 15 = 6480$
$\Rightarrow 4x = 6480 - 6048 = 432$
$\Rightarrow x = \frac{432}{4} = 108$

30. (2) Time taken by P in covering 300 metre
$= \frac{300}{3} = 100$ seconds
Distance covered by Q in 100 seconds
= 5 × 100 = 500 metre
So, both reach at the same time.

31. (1) In the school,
Boys $\Rightarrow \frac{4}{7} \times 1554 = 888$
Girls $\Rightarrow \frac{3}{7} \times 1554 = 666$
After 30 days,
Girls = 666 + 30 = 696
If x boys leave the school, then,
According to the question,
$\frac{888 - x}{696} = \frac{7}{6}$
$\Rightarrow \frac{888 - x}{116} = 7$
$\Rightarrow 888 - x = 116 \times 7 = 812$
$\Rightarrow x = 888 - 812 = 76$

32. (2) $\frac{r_1}{r_2} = \frac{2}{3}$ and $\frac{h_1}{h_2} = \frac{5}{3}$
$\therefore$ Ratio of volumes of cylinders
$= \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2}$
$= \left(\frac{r_1}{r_2}\right)^2 \times \frac{h_1}{h_2}$
$= \left(\frac{2}{3}\right)^2 \times \frac{5}{3} = \frac{20}{27}$

33. (3) Tickets of type A ⇒ $3x$
Tickets of type B ⇒ $2x$
Tickets of type C ⇒ $5x$
According to the question,
$(3x \times 1000 + 2x \times 500 + 5x \times 200)$
$= 2.5 \times 10000000$
$\Rightarrow 30x + 10x + 10x = 250000$
$\Rightarrow 50x = 250000$
$\Rightarrow x = 5000$
Total number of tickets sold = $10x$
$= 10 \times 5000 = 50000$

34. (2) Total working hours of office = From 10 a.m. to 5 p.m.
= 7 hours
Lunch interval = 30 minutes
$\therefore$ Required ratio = 30 minutes : 7 hours
= 30 minutes : (7 × 60) minutes
= 1 : 14

35. (3) Ratio of the railway fares of airconditioned and ordinary sleeper classes = 4 : 1
Ratio of the corresponding number of passengers = 3 : 25
Corresponding compound ratio = 4 × 3 : 1 × 25
= 12 : 25
Sum of the terms of ratio
= 12 + 25 = 37
$\therefore$ Total fare of the passengers of airconditioned sleeper classes = Rs. $\left(\frac{12}{37} \times 37000\right)$
= Rs. 12000

36. (1) According to the question,
$\frac{(x-1)(x+1)}{(x+1)(x+2)} = \frac{5}{6}$
$\Rightarrow \frac{x-1}{x+2} = \frac{5}{6}$
$\Rightarrow 6x - 6 = 5x + 10$
$\Rightarrow 6x - 5x = 10 + 6$
$\Rightarrow x = 16$

37. (4) Let the C.P. be Rs. $4x$.
Its S.P. = Rs. $5x$.
Profit = Rs. $(5x - 4x)$ = Rs. x.
$\therefore$ Profit per cent $= \frac{x}{4x} \times 100$
= 25%

38. (3) Let the C.P. of article be Rs. x and marked price be Rs. y.
According to the question,
80% of y = 115% of x
$\Rightarrow y \times \frac{80}{100} = \frac{x \times 115}{100}$
$\Rightarrow 80y = 115x$
$\Rightarrow \frac{x}{y} = \frac{80}{115} = \frac{16}{23}$

39. (3) Rate of working
$\times \frac{1}{\text{Time taken}}$
$\therefore$ Ratio of days taken
$= \frac{1}{2} : \frac{1}{3} = 3 : 2$

40. (1) In selection process,
Selected candidates = $3x$
Unselected candidates = x
According to the question,
In case II,
Total applicants = $4x - 80$
Selected candidates = $3x - 40$
Unselected candidates
$= (4x - 80) - (3x - 40)$
$= 4x - 80 - 3x + 40$
$= x - 40$
$\therefore \frac{3x - 40}{x - 40} = \frac{4}{1}$
$\Rightarrow 4x - 160 = 3x - 40$
$\Rightarrow 4x - 3x = 160 - 40$
$\Rightarrow x = 120$
$\therefore$ Required total applicants
$= 4x = 4 \times 120 = 480$

41. (1) Let the number of the selected candidates be $4x$
Unselected candidates = x
According to the question,
Total new applicants = $5x - 90$
Selected candidates = $4x - 20$
Unselected candidates
$= 5x - 90 - 4x + 20$
$= x - 70$
$\therefore \frac{4x - 20}{x - 70} = \frac{5}{1}$
$\Rightarrow 5x - 350 = 4x - 20$
$\Rightarrow 5x - 4x = 350 - 20$
$\Rightarrow x = 330$
$\therefore$ Required number of total original applicants
$= 5x = 5 \times 330 = 1650$

❑❑❑

TEST YOURSELF

1. The sum of the squares of two positive numbers is greater than their product by 28. If the ratio of the numbers 2 : 3, find the numbers.

(1) 4 and 6 (2) 6 and 9

(3) 8 and 12 (4) None of these

2. 3 litres of a mixture containing wine and water in the ratio 3 : 7 and 4 litres of another mixture containing wine and water in the ratio 3 : 5 are mixed together. What is the ratio of wine and water in the resulting mixture ?

(1) 11 : 23 (2) 12 : 23

(3) 13 : 24 (4) 12 : 27

3. When the market price per kg of rice and wheat be in the ratio 3 : 2, the monthly expenses of a family towards rice and wheat are in the ratio 5 : 6. If the market price of rice and wheat becomes in the ratio 4 : 3, what will be the ratio of expenses towards them ? (Assume that amount of rice and wheat consumed remains unaltered.)

(1) 20 : 29 (2) 20 : 27

(3) 18 : 25 (4) 21 : 37

4. Three vessels of equal volumes contain water and syrup in the ratio 4 : 1, 5 : 2 and 7 : 3 respectively. When they are thoroughly mixed together in a large vessel, find the resulting ratio of water and syrup in the mixture. (Assume that in the mixture total volume remains unaltered).

(1) 11 : 30 (2) 19 : 11

(3) 31 : 11 (4) 11 : 35

5. A, B and C go into a business as partners with the agreement that their shares of profit will be in the proportion of their capitals. If A's capital : B's capital = 2: 3, and B's capital : C's capital = 2 : 5, find their shares in a profit of Rs. 3250.

(1) Rs. 520, Rs. 780, Rs. 1950

(2) Rs. 540, Rs. 760, Rs. 1950

(3) Rs. 540, Rs. 780, Rs. 1930

6. One morning after purchasing 6 litres of milk from a milk man, a householder found that the weight of this quantity of milk was 6.144 kg. If one litre of the pure milk weighs 1.032 kg and that of one litre of the pure water 1 kg. then how much water was added to milk ?

(1) 0.5 kg (2) 1.2 kg

(3) 0.05 kg (4) 1.5 kg

7. 5 men, 6 women and 7 boys finished a work in 3 days and got the remuneration of Rs. 2137.50 for it. If the work of 1 man, 1 woman, and 1 boy in one day be in the proportion of $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$, what sum did each man get on a day ?

(1) Rs. 196 (2) Rs. 197

(3) Rs. 198 (4) Rs. 199

8. Twenty years ago the ratio between the ages of Sita and Meena was 1 : 4 and at present it is 1 : 2. What is the age of Sita at present?

(1) 25 (2) 35

(3) 30 (4) None of these

9. A mixture contains alcohol and water in the ratio 4 : 3. If 5 litres of water is added to the mixture the ratio becomes 4 : 5. The quantity of alcohol in the given mixture is :

(1) 12 litres (2) 10 litres

(3) 14 litres (4) 16 litres

10. If $x : y = 8 : 9$, then $5x - 4y : 3x + 2y$ is equal to :

(1) 2 : 19 (2) 3 : 17

(3) 2 : 21 (4) None of these

11. Determine the fourth proportional to 9.6 m 7.2 m 28.8 m.

(1) 22.6 m. (2) 21.6 m.

(3) 23.6 m. (4) 20.6 m.

12. Find the mean proportional between 100 and 625.

(1) 350 (2) 225

(3) 250 (4) 275

13. Find the third proportional between 9 and 27.

(1) 36 (2) 54

(3) 27 (4) 81

14. If $A : B = 3 : 4$, $B : C = 8 : 10$ and $C : D = 15 : 17$, then find $A : B : C : D$.

(1) 9 : 12 : 15 : 17

(2) 9 : 15 : 12 : 17

(3) 9 : 17 : 12 : 15

(4) 9 : 15 : 17 : 12

15. If $A : B = 1 : 2$, $B : C = 3 : 4$, $C : D = 2 : 3$ and $D : E = 3 : 4$, then find $A : B : C : D : E$.

(1) 3 : 8 : 6 : 12 : 16

(2) 3 : 6 : 8 : 12 : 16

(3) 3 : 16 : 6 : 8 : 12

(4) 3 : 12 : 6 : 8 : 16

16. If $(2x + 3) : (5x - 38)$ be the duplicate ratio of $\sqrt{5} : \sqrt{6}$. Find the value of x.

(1) 8 (2) 32

(3) 16 (4) 18

17. If $(3x - 7) : (4x + 3)$ is sub-triplicate ratio of 8 : 27, find the value of x.

(1) 9 (2) 54

(3) 18 (4) 27

18. If $\frac{x}{y} = \frac{2}{5}$ find the ratio of $9x + 6y : 5x + 3y$.

(1) $\frac{48}{25}$ (2) $\frac{25}{48}$

(3) $\frac{3}{13}$ (4) $\frac{12}{25}$

19. What must be added to each term of the ratio 7 : 13, so that the ratio becomes 2 : 3.

(1) 4 (2) 5

(3) 6 (4) 7

20. What must be added to the numbers 10, 20, 30 and 50 so that the sums are proportional?

(1) 15 (2) 12

(3) 10 (4) 8

21. The ratio between two numbers is 3 : 4. If their LCM is 120, find the numbers.

(1) 35 and 40 (2) 25 and 35

(3) 25 and 30 (4) 30 and 40

22. If b is the mean proportional between a and c, then

$$\frac{a^2 - b^2 + c^2}{a^{-2} - b^{-2} + c^{-2}} = ?$$

(1) b^4 (2) $2b^2$
(3) $2b^3$ (4) $2b$

23. $\frac{4a+9b}{4a-9b} = \frac{4c+9d}{4c-9d}$ then $\frac{a}{b} = ?$

(1) $\frac{c^2}{d}$ (2) $\frac{c}{d}$
(3) $\frac{-2c}{d}$ (4) $\frac{c}{2d}$

24. If $P = \frac{4xy}{x+y}$, find the value of

$$\frac{P+2x}{P-2x} + \frac{P+2y}{P-2y}.$$

(1) 4 (2) 1
(3) 2 (4) 6

25. A shopkeeper mixes 12 kgs of rice at ₹ 8 per kg with 6 kgs of rice at ₹ 10 per kg. Find the cost per kg of the mixture.

(1) ₹ 8.67 (2) ₹ 8.50
(3) ₹ 7.67 (4) ₹ 7.50

26. In what ratio a trader should mix two varieties of tea one at ₹ 62 per kg and other at ₹ 72 per kg in order to obtain the mixture worth ₹ 65 per kg ?

(1) 4 : 3 (2) 7 : 3
(3) 8 : 3 (4) 3 : 8

27. In what proportion may three kinds of tea prices at ₹ 80, ₹ 70 and ₹ 50 per kg be mixed to produce a mixture worth ₹ 60 per kg?

(1) 2 : 2 : 3 (2) 2 : 1 : 3
(3) 1 : 2 : 3 (4) 1 : 1 : 3

28. In what proportion may three kinds of rice bought at ₹ 6, ₹ 10 and ₹ 14 be mixed to produce a mixture which would earn 40% on selling it at ₹ 11.20 per kg?

(1) 4 : 1 : 1 (2) 3 : 1 : 1
(3) 2 : 1 : 1 (4) 2 : 2 : 1

29. Find the proportion in which three types of sugar at ₹ 12, ₹ 14 and ₹ 20 may be mixed so as to obtain a mixture worth ₹ 15 per kg?

(1) 15 : 5 : 6 (2) 5 : 15 : 6
(3) 3 : 12 : 16 (4) 4 : 12 : 15

30. Two vessels A and B contain milk and water in the ratios 7 : 5 and 17 : 7 respectively. In what ratio mixture from two vessels should be mixed to get a new mixture containing milk and water in the ratio 5 : 3 ?

(1) 1 : 3 (2) 2 : 3
(3) 2 : 1 (4) 3 : 2

31. Two vessels A and B contain mixtures of milk and water in the ratios 4 : 1 and 9 : 11 respectively. They are mixed in the ratio of 3 : 2. Find the ratio of milk and water in the resulting mixture.

(1) 12 : 25 (2) 15 : 37
(3) 17 : 19 (4) 33 : 17

32. A person has two solutions of sugar with 30% and 50% concentration respectively. In what ratio should he mix two solutions to get 45% concentration in the resulting mixture ?

(1) 1 : 3 (2) 2 : 3
(3) 2 : 5 (4) 5 : 2

33. 49 litres of milk has 80% milk concentration. How much water be added to make its concentration 70% ?

(1) 6 litres (2) 7 litres
(3) 6.5 litres (4) 7.5 litres

34. 6 litres of milk and water mixture has 75% milk in it. How much milk should be added to the mixture to make it 90% pure ?

(1) 10 litres (2) 8 litres
(3) 9 litres (4) 12 litres

35. 12 litres of a mixture has wine and water in the ratio 2 : 3. How much water must be added to get wine to water ratio of 3 : 7 in the resultant mixture ?

(1) 4.5 litres (2) 3.5 litres
(3) 3 litres (4) 4 litres

36. 55 litres of a mixture has milk and water in the ratio 7 : 4. How much water must be added to get milk and water in the ratio 7 : 6 in the resulting mixture.

(1) 16 litres (2) 15 litres
(3) 12 litres (4) 10 litres

SHORT ANSWERS

1. (1)	**2.** (2)	**3.** (2)	**4.** (3)
5. (1)	**6.** (3)	**7.** (2)	**8.** (3)
9. (2)	**10.** (3)	**11.** (2)	**12.** (3)
13. (4)	**14.** (1)	**15.** (2)	**16.** (3)
17. (4)	**18.** (1)	**19.** (2)	**20.** (3)
21. (4)	**22.** (1)	**23.** (2)	**24.** (3)
25. (1)	**26.** (2)	**27.** (4)	**28.** (1)
29. (2)	**30.** (3)	**31.** (4)	**32.** (1)
33. (2)	**34.** (3)	**35.** (4)	**36.** (4)

EXPLANATIONS

1. (1) Let the numbers be $2x$ and $3x$.

$\therefore (3x)^2 + (2x)^2 - 2x \times 3x = 28$

$\Rightarrow 13x^2 - 6x^2 = 28$

$\Rightarrow 7x^2 = 28$

$\Rightarrow x^2 = \frac{28}{7}$; 4

$\Rightarrow x = \sqrt{4} = 2$

$\therefore$ Numbers are : 4 and 6

2. (2) In 3 litres of mixture,

Wine = $\frac{3 \text{″} 3}{10}$; $\frac{9}{10}$ litre

Water = $\frac{7}{10}$ ″ 3 ; $\frac{21}{10}$ litre

In 4 litres of mixture,

Wine = $\frac{3}{8}$ ″ 4 ; $\frac{3}{2}$ litres

Water = $\frac{5}{8}$ ″ 4 ; $\frac{5}{2}$ litres

In resulting mixture,
Wine : Water

$= \left(\frac{9}{10}\right) \frac{3}{2}\right) : \left(\frac{21}{10}\right) \frac{5}{2}\right)$

= 24 : 46 = 12 : 23

3. (2) Market price per kg :
Rice = Rs. $3x$
Wheat = Rs. $2x$
Monthly expenses :
Rice = Rs. $5y$

Wheat = Rs. $6y$

Amount of rice = $\frac{5y}{3x}$ kg

Amount of wheat = $\frac{6y}{2x}$ kg

New price :
Rice = Rs. $4z$/kg
Wheat = Rs. $3z$/kg
∴ Required ratio

$= \frac{5y \times 4z}{3x} : \frac{6y}{2x} \times 3z$

$= \frac{20}{3} : \frac{18}{2}$

= 20 : 27

4. (3) Let the capacity of each vessel be x litres.
∴ Ratio

$= \left(\frac{4x}{5} + \frac{5x}{7} + \frac{7x}{10}\right) : \left(\frac{x}{5} + \frac{2x}{7} + \frac{3x}{10}\right)$

$= \frac{56x + 50x + 49x}{70} : \frac{14x + 20x + 21x}{70}$

$= \frac{155x}{70} : \frac{55x}{70}$ = 31 : 11

5. (1) A : B = 2 : 3 = 4 : 6
B : C = 2 : 5 = 6 : 15
A : B : C = 4 : 6 : 15
A + B + C = 4 + 6 + 15 = 25

A's share = $\frac{4}{25} \times 3250$

= Rs. 520

B's share = $\frac{6}{25} \times 3250$

= Rs. 780

C's share = $\frac{15}{25} \times 3250$

= Rs. 1950

6. (3) Weight of 1 kg of impure milk

$= \frac{6.144}{6}$ = 1.024 kg

Weight of water

$= 6 - \frac{1.024}{1.032} \times 6$

= 6 – 5.95
= 0.05 kg

7. (2) Ratio of wages of 1 man, 1 woman and 1 boy

$= \frac{1}{2} : \frac{1}{3} : \frac{1}{4}$ = 6 : 4 : 3

Each man's wages

$= \frac{6}{13} \times \frac{2137.5}{5} \neq$ Rs. 197

8. (3) 20 years ago,
Sita's age = x years
Meena's age = $4x$ years

$\therefore \frac{x + 20}{4x + 20} = \frac{1}{2}$

$\Rightarrow 2x + 40 = 4x + 20$
$\Rightarrow 2x = 20 \Rightarrow x = 10$
∴ Sita's present age = 30 years

9. (2) $\frac{4x}{3x + 5} = \frac{4}{5}$

$\Rightarrow 20x = 12x + 20$
$\Rightarrow 8x = 20 \Rightarrow x = 2.5$
∴ Quantity of alcohol
= 4 × 2.5 = 10 litres

10. (3) $\frac{x}{y} = \frac{8}{9}$ (Given)

$\therefore \frac{5x + 4y}{3x + 2y} = \frac{5\frac{x}{y} + 4}{3\frac{x}{y} + 2}$

$= \frac{5 \times \frac{8}{9} + 4}{3 \times \frac{8}{9} + 2}$

$= \frac{40 + 36}{24 + 18} = \frac{4}{42} = \frac{2}{21}$

11. (2) Let the fourth proportional be x.
∴ 9.6 kg : 7.2 kg. : : 28.8 m : x m
or, 9.6 : 7.2 : : 28.8 : x

Then, $\frac{9.6}{7.2} = \frac{28.8}{x}$

$\Rightarrow 9.6 \times x = 7.2 \times 28.8$

$\Rightarrow x = \frac{7.2 \times 28.8}{9.6} = 21.6m$

12. (3) Let the mean proportional be x.
∴ 100 : x : x : 625

Then, $\frac{100}{x} = \frac{x}{625}$

$\Rightarrow x^2 = 100 \times 625$

$\Rightarrow x = \sqrt{100 \times 625} = 10 \times 25$

= 250

13. (4) Let the third proportional be x.
Since the third proportional to 9 and 27 is the same as fourth proportional to 9, 27, 27
∴ 9 : 27 : : 27 : x

$\therefore \frac{9}{27} = \frac{27}{x}$

$\Rightarrow 9 \times x = 27 \times 27$

$\Rightarrow x = \frac{27 \times 27}{9} = 81$

14. (1) $A : B = 3 : 4$ $B : C = 8 : 10$
$C : D = 15 : 17$
∴ $A : B : C : D = 3 \times 8 \times 15 : 4 \times 8 \times 15 : 4 \times 10 \times 15 : 4 \times 10 \times 17 = 9 : 12 : 15 : 17$

15. (2) $A : B = 1 : 2$
$B : C = 3 : 4$
$C : D = 2 : 3$
$D : E = 3 : 4$
∴ $A : B : C : D : E$
$= 1 \times 3 \times 2 \times 3 : 2 \times 3 \times 2 \times 3 : 2 \times 4 \times 2 \times 3 : 2 \times 4 \times 3 \times 3 : 2 \times 4 \times 3 \times 4 = 3 : 6 : 8 : 12 : 16$

16. (3) Since $(2x + 3) : (5x - 38)$ is the duplicate ratio of $\sqrt{5} : \sqrt{6}$, therefore

$\frac{2x+3}{5x-38} = \left(\frac{\sqrt{5}}{\sqrt{6}}\right)^2$

$\Rightarrow \frac{2x+3}{5x-38} = \frac{5}{6}$

$\Rightarrow 6(2x + 3) = 5(5x - 38)$
$\Rightarrow 12x + 18 = 25x - 190$
$\Rightarrow 25x - 12x = 18 + 190$
$\Rightarrow 13x = 208$

$\Rightarrow x = \frac{208}{13} = 16$

17. (4) Since $(3x - 7) : (4x + 3)$ is the sub-triplicate ratio of 8 : 27, therefore,

$\frac{3x-7}{4x+3} = \sqrt[3]{\frac{8}{27}} = \frac{2}{3}$

$\Rightarrow 3(3x - 7) = 2(4x + 3)$
$\Rightarrow 9x - 21 = 8x + 6$
$\Rightarrow 9x - 8x = 21 + 6$
$\Rightarrow x = 27$

18. (1) We have, $\frac{x}{y} = \frac{2}{5}$

$\therefore 9x + 6y : 5x + 3y = \frac{9x+6y}{5x+3y}$

$= \frac{9\frac{x}{y}+6}{5\frac{x}{y}+3}$

(On dividing Numerator and Denominator by y)

$= \frac{9\times\frac{2}{5}+6}{5\times\frac{2}{5}+3} = \frac{\frac{18+30}{5}}{2+3}$

$= \frac{48}{5\times5} = \frac{48}{25}$

19. (2) Let x be added to each term.

Then, $\frac{7+x}{13+x} = \frac{2}{3}$

$\Rightarrow 3(7 + x) = 2(13 + x)$

$\Rightarrow 21 + 3x = 26 + 2x$

$\Rightarrow 3x - 2x\ \ 26 - 21$

$\Rightarrow x = 5$

$\therefore$ 5 must be added to each term.

20. (3) Let x be added in each number to make them proportional.

$\therefore 10 + x : 20 + x :: 30 + x : 50 + x$

Then, $\frac{10+x}{20+x} = \frac{30+x}{50+x}$

$\Rightarrow (10 + x)(50 + x)$
$= (20 + x)(30 + x)$

$\Rightarrow 500 + 50x + 10x + x^2$
$= 600 + 20x + 30x + x^2$

$\Rightarrow 500 + 60x + x^2$
$= 600 + 50x + x^2$

$\Rightarrow 60x - 50x = 600 - 500 = 100$

$\Rightarrow 10x = 100$

$\Rightarrow x = \frac{100}{10} = 10$

21. (4) Let the numbers be $3x$ and $4x$.

Then, LCM of $3x$ and $4x$

$= 3 \times 4 \times x = 12x$

$\therefore 12x = 120$

$\Rightarrow x = 10$

So the numbers are $3x$

$= 3 \times 10 = 30$ and,

$4x = 4 \times 10 = 40$

22. (1) Here b is the mean proportional between a and c.

$\therefore a : b :: b : c$

$\Rightarrow \frac{a}{b} = \frac{b}{c} \Rightarrow b^2 = ac$

Now, $\frac{a^2-b^2+c^2}{a^{-2}-b^{-2}+c^{-2}}$

$= \frac{a^2-b^2+c^2}{\frac{1}{a^2}-\frac{1}{b^2}+\frac{1}{c^2}}$

$= \frac{a^2-ac+c^2}{\frac{1}{a^2}-\frac{1}{ac}+\frac{1}{c^2}}$

$= \frac{a^2-ac+c^2}{\frac{c^2-ac+a^2}{a^2c^2}}$

$= \frac{(a^2-ac+c^2)a^2c^2}{c^2-ac+a^2} = a^2c^2$

$= (ac)^2 = (b^2)^2 = b^4$

23. (2) Here, $\frac{4a+9b}{4a-9b} = \frac{4c+9d}{4c-9d}$

On applying componendo and dividendo, we have

$\frac{4a+9b+4a-9b}{4a+9b-4a+9b}$

$= \frac{4c+9d+4c-9d}{4c+9d-4c+9d}$

$\Rightarrow \frac{8a}{18b} = \frac{8c}{18d} \Rightarrow \frac{a}{b} = \frac{c}{d}$

24. (3) We have

$P = \frac{4xy}{x+y} = \frac{2x\times2y}{x+y}$

$\Rightarrow \frac{P}{2x} = \frac{2y}{x+y}$

and, $\frac{P}{2y} = \frac{2x}{x+y}$

Now, $\frac{P}{2x} = \frac{2y}{x+y}$

On applying componendo and dividendo, we have

$\frac{P+2x}{P-2x} = \frac{2y+x+y}{2y-x-y}$

$= \frac{x+3y}{y-x}$ ...(i)

Again, $\frac{P}{2y} = \frac{2x}{x+y}$

$\Rightarrow \frac{P+2y}{P-2y} = \frac{2x+x+y}{2x-x-y}$

$= \frac{3x+y}{x-y}$ ...(ii)

(i) and (ii)

$\frac{P+2x}{P-2x} + \frac{P+2y}{P-2y}$

$= \frac{x+3y}{y-x} + \frac{3x+y}{x-y}$

$= \frac{3x+y}{x-y} + \frac{x+3y}{y-x}$

$= \frac{3x+y}{x-y} - \frac{x+3y}{x-y}$

$= \frac{3x+y-x-3y}{x-y}$

$= \frac{2x-2y}{x-y} = 2$

25. (1) Total quantity of the mixture $= 12 + 6 = 18$ kgs.

Cost of 12 kgs of rice at ₹ 8 per kg = ₹ (12×8) = ₹ 96

Cost of 6 kgs of rice at ₹ 10 per kg

= ₹ (6×10) = ₹ 60

$\therefore$ Total cost of 18 kgs of the mixture

= ₹ $(96 + 60)$ = ₹ 156

$\therefore$ Cost per kg of the mixture

$= \frac{\text{Rs. } 156}{18 \text{ kgs}}$; ₹ 8.67 per kg

[Because cost of the mixture lies somewhere in the middle of ₹ 8 and ₹ 10, so this type of problem is known as **'Alligation medial'**].

26. (2) C.P. of 1 kg tea of Ist quality = ₹ 62

C.P. of 1 kg tea of 2nd quality = ₹ 72.

Mean Price = ₹ 65

Using Alligation Rule,

$$\frac{\text{Quantity of 1st tea}}{\text{Quantity of 2nd tea}} ; \frac{d-m}{m-c} ; \frac{7}{3}$$

Therefore, they must be mixed in the ratio of 7 : 3.

[Since this problem is the inverse of above type problem, it is called **'Alligation alternate'**].

27. (4) Write the prices in ascending or descending order as shown below :

Make pairs by choosing one from each side of the mean price and apply Alligation Rule. Then add the quantity obtained under each price. This will give the ratio in which the ingredients should be mixed.

So, Required ratio

= 10 : 10 : 30 or 1 : 1 : 3.

28. (1) SP of mixture

= ₹ 11.20 per kg.

Profit = 40%.

CP of mixture ; $11.20 \times \frac{100}{140}$

= ₹ 8 per kg.

Required ratio

= 8 : 2 : 2 or 4 : 1 : 1.

29. (2)

Required proportion= 5 : 5 : (3 + 1) or 5 : 5 : 4.

Note : We can find other alternatives too by adding multiples of the quantities obtained at I and II. This will give us infinite number of alternatives. Care must be taken not to mix up quantities of one pair with another.

For example,

(*i*)

I	5		3
II		(5×2)	(1×2)
	5	10	5

= 5 : 10 : 5 = 1 : 2 : 1

(*ii*)

I	5×2		3×2
II		5	1
	10	5	7

= 10 : 5 : 7

(*iii*)

I	5		3
II		5×3	1×3
	5	15	6

= 5 : 15 : 6

30. (3) First of all we write the fraction of milk present in three mixtures.

Mixture *A*.

Ratio of milk and water = 7 : 5.

Sum of the ratios = 7 + 5 = 12

$\therefore$ Fraction of milk = $\frac{7}{12}$

Similarly,

In mixture *B*,

Fraction of milk = $\frac{17}{24}$

In combination of *A* and *B*,

Fraction of milk = $\frac{5}{8}$

We now apply Alligation Rule on these fractions.

$\therefore$ Ratio of *A* & *B*

$= \frac{2}{24} : \frac{1}{24}$; 2 : 1.

31. (4) First of all we write the fraction of milk and water in each mixture.

	Milk	Water
A	$\frac{4}{5}$	$\frac{1}{5}$
B	$\frac{9}{20}$	$\frac{11}{20}$

Both A and B are mixed in the ratio 3 : 2.

$\therefore$ $(3A + 2B)$ will have ratio of milk and water as follows :

$$\text{Milk : Water} = \left(3'' \frac{4}{5}\right) \frac{2'' 9}{20} : \left(3'' \frac{1}{5}\right) \frac{2'' 11}{20}$$

$$= \left(\frac{12}{5}\right) \frac{9}{10} : \left(\frac{3}{5}\right) \frac{11}{10}$$

$$= \frac{33}{10} : \frac{17}{10}; \ 33:17$$

So, ratio of milk and water in the resulting mixture = 33 : 17

32. (1)

$$\therefore \frac{\text{30\% Concentrated Solution}}{\text{50\% Concentrated Solution}}$$

$$; \frac{5}{15}; \frac{1}{3}$$

Hence, the required ratio = 1 : 3

33. (2) The given milk has 80% concentration of milk.

Water to be added has 0% milk concentration.

Final concentration of solution is 70%.

By Alligation Rule,

So, water should be added to the given milk in the ratio 10 : 70 or 1 : 7.

$\therefore$ Quantity of water to be added

$$= \frac{1}{7}'' 49; \ 7 \text{ litres}$$

34. (3) The given solution has 75% milk.

Milk to be added has 100% milk.

By Alligation Rule

Ratio = 10 : 15 = 2 : 3

$\therefore$ Milk should be added to the given mixture in the ratio 3 : 2.

$\therefore$ Quantity of milk to be added

$$= \frac{3}{2}'' 6; \ 9 \text{ litres.}$$

35. (4) In the given mixture, wine : water = 2 : 3

Fraction of water in the given mixture $= \frac{3}{5}$

For water to be added, fraction = 1

Fraction of water in the resultant mixture $= \frac{7}{10}$

So, water must be added to the mixture in the ratio 1 : 3.

Quantity of water to be added

$$= \frac{1}{3}'' 12; \ 4 \text{ litres.}$$

36. (4) Milk : Water = 7 : 4

Sum of the ratios = 7 + 4 = 11

$\therefore$ Fraction of water in the given mixture $= \frac{4}{11}$.

For water to be added, fraction = 1.

Similarly,

Fraction of water in the resulting mixture $= \frac{6}{13}$.

By Alligation Rule.

So, water must be added to the mixture in the ratio $\frac{14}{143} : \frac{7}{13}$

$$= \frac{2}{11} : 1 = 2 : 11.$$

$\therefore$ Quantity of water to be added

$$= \frac{2}{11}'' 55; \ 10 \text{ litres.}$$

□□□

7 PERCENTAGE

Importance : For percentage it may be mentioned that in every chapter of arithmetic, percentage based questions are asked, hence practice and expertise is essential. Moreover by solving percentage questions we get idea of many other basic concepts.

Scope of questions : Percentage, based questions are mainly arithmetic and from sale, purchase, Profit & Loss, Discount, Interest, Number system, Alligation, Reduction in cost, Population based chapters.

Way to success : Deep study of percentage is required with complete accuracy and rechecking habit. Rechecking of answers is must for this chapter.

IMPORTANT POINTS

Percentage : Percentage refers to "Per hundred" i.e, 8% means 8 out of hundred or $\frac{8}{100}$. Percentage is denoted by '%'.

a represented as the per cent of b as, $\frac{a}{b}\times 100$

b% of a = $a\times\frac{b}{100}$

To Convert a fraction/Decimal into percentage multiply it by 100.

As 0.35 = $\frac{35}{100}$ = $\frac{35}{100}\times 100\%$ = 35%

To convert a per cent into fraction divide it by 100

As 12.5% = $\frac{12.5}{100}$ = $\frac{1}{8}$

Rule 1 : If x is reduced to x_0, then,

Reduce % = $\frac{x-x_0}{x}\times 100$

Rule 2 : If x is increased to x_1, then,

Increment% = $\frac{x_1-x}{x}\times 100$

Rule 3 : If an amount is increased by a% and then it is reduced by a% again, then percentage change will be a decrease of $\frac{a^2}{100}\%$

Rule 4 : If a number is increased by a% and then it is decreased by b%, then resultant change in percentage will be $\left(a-b-\frac{ab}{100}\right)\%$

(Negative for decrease, Positive for increase)

Rule 5 : If a number is decreased by a% and then it is increased by b%, then net increase or decrease per cent is

$$\left(-a+b-\frac{ab}{100}\right)\% \quad \begin{pmatrix}\text{Negative sign for decrease}\\ \text{Positive sign for increase}\end{pmatrix}$$

Rule 6 : If a number is first decreased by a% and then by b%, then net decrease per cent is $\left(-a-b+\frac{ab}{100}\right)\%$

(–ve sign for decrease)

Rule 7 : If a number is first increased by a% and then again increased by b%, then total increase per cent is $\left(a+b+\frac{ab}{100}\right)\%$

Rule 8 : If the cost of an article is increased by A%, then how much to decrease the consumption of article, so that expenditure remains same is given by

OR

If the income of a man is A% more than another man, then income of another man is less in comparison to the 1st man by

$$\left(\frac{A}{(100+A)}\times 100\right)\%$$

Rule 9 : If the cost of an article is decreased by A%, then the increase in consumption of article to maintain the expenditure will be?

OR

If 'x' is A% less than 'y', then y is more than 'x' by

Required% = $\left(\frac{A}{(100-A)}\times 100\right)\%$ (increase)

Rule 10 : If the length of a rectangle is increased by a% and breadth is increased by b%, then the area of rectangle will increase by

Required Increase = $\left(a+b+\frac{ab}{100}\right)\%$

Note: If a side is increased, take positive sign and if it is decreased, take negative sign. It is applied for two dimensional figures.

Rule 11 : If the side of a square is increased by a% then, its area will increase by

$$\left(2a+\frac{a^2}{100}\right)\% = \left(a+a+\frac{a.a}{100}\right)\%$$

The above formula is also implemented for circle where radius is used as side. This formula is used for two dimensional geometrical figures having both length and breadth equal.

Rule 12 : If the side of a square is decreased by a%, then the area of square will decrease by

$$\therefore \text{ Decrease} = \left(-2a+\frac{a^2}{100}\right)\%$$

This formula is also applicable for circles. where decrease % of radius is given.

Rule 13 : If the length, breadth and height of a cuboid are increased by a%, b% and c% respectively, then,

Increase% in volume

$$= \left[a+b+c+\frac{ab+bc+ca}{100}+\frac{abc}{(100)^2}\right]\%$$

Rule 14 : If every side of cube is increased by a%, then increase % in volume

$$= \left(3a+\frac{3a^2}{100}+\frac{a^3}{(100)^2}\right)\%$$

This formula will also be used in calculating increase in volume of sphere. where increase in radius is given.

Rule 15 : If a% of a certain sum is taken by 1st man and b% of remaining sum is taken by 2nd man and finally c% of remaining sum is taken by 3rd man, then if 'x' rupee is the remaining amount then,

$$\text{Initial amount} = \frac{100\times100\times100\,x}{(100-a)(100-b)(100-c)}$$

Rule 16 : If an amount is increased by a% and then again increased by b% and finally increased by c%, So, that resultant amount is 'x' rupees, then,

$$\text{Initial amount} = \frac{100\times100\times100\times x}{(100+a)(100+b)(100+c)}$$

Rule 17 : If the population/cost of a certain town/article, is P and annual increament rate is r%, then

(i) After 't' years population/cost = $P\left(1+\frac{r}{100}\right)^t$

(ii) Before 't' years population/cost = $\frac{P}{\left(1+\frac{r}{100}\right)^t}$

Rule 18 : If the population/cost of a town/article is P and it decreases/reduces at the rate of r% annually, then,

(i) After 't' years population/cost = $P\left(1-\frac{r}{100}\right)^t$

(ii) Before 't' years population/cost = $\frac{P}{\left(1-\frac{r}{100}\right)^t}$

Rule 19 : On increasing/decreasing the cost of a certain article by x%, a person can buy 'a' kg article less/more in 'y' rupees, then

Increased/decreased cost of the article = $\left(\frac{xy}{100\times a}\right)$

And initial cost

$= \frac{xy}{(100\pm x)a}$ [Negative sign when decreasing and positive sign when increasing]

Rule 20 : If a person saves 'R' rupees after spending x% on food, y% on cloth and z% on entertainment of his income then,

$$\text{Monthly income} = \frac{100}{100-(x+y+z)}\times R$$

Rule 21 : The amount of acid/milk is x% in 'M' litre mixture. How much water should be mixed in it so that percentage amount of acid/milk would be y%?

$$\text{Amount of water} = \frac{M(x-y)}{y}$$

Rule 22 : An examinee scored m% marks in an exam, and failed by p marks. In the same examination another examinee obtained n% marks and passed with q more marks than minimum, then

$$\therefore \text{Maximum marks} = \frac{100}{(n-m)}\times(p+q)$$

Rule 23 : In an examination, a% candidates failed in Maths and b% candidates failed in English. If c% candidate failed in both the subjects, then,

(i) Passed candidates in both the subjects
= 100 – (a + b – c)%

(ii) Percentage of candidates who failed in either subject
= (a + b – c)%

Rule 24 : In a certain examination passing marks is a%. If any candidate obtains 'b' marks and fails by 'c' marks, then,

$$\text{Total marks} = \frac{100(b+c)}{a}$$

Rule 25 : In a certain examination, 'B' boys and 'G' girls participated. b% of boys and g% of girls passed the examination, then,

Percentage of passed students of the total students = $\left(\frac{B.b+G.g}{B+G}\right)\%$

Rule 26 : If a candidate got A% votes in a poll and he won or defeated by 'x' votes, then, what was the total no. of votes which was casted in poll ?

$$\therefore \text{Total no. of votes} = \frac{50\times x}{(50-A)}$$

Rule 27 : If a number 'a' is increased or decreased by b%, then the new number will be $\left(\frac{100\pm b}{100}\right)\times a$

Rule 28 : If the present population of a town is P and the population increases or decreases at rate of R_1%, R_2% and R_3% in first, second and third year respectively.

then the population of town after 3 years = $P\left(1\pm\frac{R_1}{100}\right)\left(1\pm\frac{R_2}{100}\right)\left(1\pm\frac{R_3}{100}\right)$

'+' is used when population increases

'–' is used when population decreases.

The above formula may be extended for n number of years.

$\Rightarrow$ Population after 'n' years

$$= P\left(1\pm\frac{R_1}{100}\right)\left(1\pm\frac{R_2}{100}\right)\ldots\ldots\ldots\ldots\left(1\pm\frac{R_n}{100}\right)$$

Rule 29 : If two numbers are respectively x% and y% less than the third number, first number as a percentage of second is $\frac{100-x}{100-y}\times100\%$

Rule 30 : If two numbers are respectively x% and y% more than a third number the first as percentage of second is $\frac{100+x}{100+y}\times100\%$

Rule 31 : If the price of an article is reduced by a% and buyer gets c kg more for some Rs. b, the new price per kg of article = $\frac{ab}{100\times c}$ ❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. If 80% of A = 50% of B and B = x% of A, then the value of x is :
(1) 400 (2) 300
(3) 160 (4) 150
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If x is 80% of y, what percent of y is x ?
(1) 75% (2) 80%
(3) 100% (4) 125%
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

3. If 8% of x is the same as 4% of y, then 20% of x is the same as:
(1) 10% of y (2) 16% of y
(3) 80% of y (4) 50% of y
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

4. A student multiplied a number by $\frac{3}{5}$ instead of $\frac{5}{3}$. What is the percentage error in the calculation ?
(1) 44% (2) 34%
(3) 54% (4) 64%
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

5. If p% of p is 36, then p is equal to :
(1) 3600 (2) 600
(3) 60 (4) 15
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

6. 2 is what percent of 50?
(1) 2 (2) 2.5
(3) 4 (4) 5
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

7. $\frac{2}{3}$ is what percent of $\frac{1}{3}$?
(1) 50% (2) $33\frac{1}{3}\%$
(3) 150% (4) 200%
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

8. 0.15% of $33\frac{1}{3}\%$ of ₹ 10000 is :
(1) ₹ 5 (2) ₹ 150
(3) ₹ 0.05 (4) ₹ 105
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

9. 30% of x is 72. The value of x is:
(1) 216 (2) 240
(3) 480 (4) 640
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

10. If 15% of (A + B) = 25% of (A – B), then what per cent of B is equal to A?
(1) 10% (2) 60%
(3) 200% (4) 400%
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

11. What is 20% of 25% of 300?
(1) 150 (2) 60
(3) 45 (4) 15
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

12. If x% of $\frac{25}{2}$ is 150, then the value of x is :
(1) 1000 (2) 1200
(3) 1400 (4) 1500
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

13. If 50% of (x – y) = 30% of (x + y), then what per cent of x is y?
(1) 25% (2) $33\frac{1}{3}\%$
(3) 40% (4) 400%
(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & 13.11.2005 (Ist Sitting)

14. If 50 % of P = 25% of Q, then P = x% of Q. Find x.
(1) 0.5 (2) 2
(3) 50 (4) 0.005
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

15. If 20% of A = 50% of B, then what per cent of A is B ?
(1) 30% (2) 40%
(3) 25% (4) 15%
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

16. In a school 40% of the students play football and 50% play cricket. If 18% of the students neither play football nor cricket, the percentage of the students playing both is :
(1) 40% (2) 32%
(3) 22% (4) 8%
(SSC CPO S.I. Exam. 26.05.2005)

17. If 20% of (P + Q) = 50% of (P – Q), then find P : Q
(1) 7 : 8 (2) 7 : 3
(3) 7 : 5 (4) 5 : 7
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

18. 0.01 is what per cent of 0.1 ?
(1) 10 (2) $\frac{1}{10}$
(3) 100 (4) $\frac{1}{100}$
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

19. 65g is what per cent of 2 kg ?
(1) $\frac{13}{4}$ (2) $\frac{65}{2}$
(3) $\frac{15}{8}$ (4) $\frac{13}{8}$
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

20. Half of 1 per cent, written as a decimal, is
(1) 0.2 (2) 0.02
(3) 0.005 (4) 0.05
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

21. The time duration of 1 hour 45 minutes is what percent of a day?
(1) 7.218 % (2) 7.292 %
(3) 8.3 % (4) 8.24 %
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

22. 1.14 expressed as a per cent of 1.9 is
(1) 6% (2) 10%
(3) 60% (4) 90%
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

23. 32 is what per cent of 80 ?
(1) 24% (2) 25.6%
(3) 36% (4) 40%
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

24. If 90% of A = 30% of B and B = x% of A, then the value of x is
(1) 800 (2) 300
(3) 700 (4) 400
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

25. If 90% of A = 30% of B and B = 2x% of A, then the value of x is
(1) 450 (2) 400
(3) 300 (4) 150
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

26. If 30% of A is added to 40% of B, the answer is 80% of B. What percentage of A is B?

(1) 30% (2) 40%

(3) 70% (4) 75%

(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

27. If 40% of (A + B) = 60% of (A – B) then $\frac{2A-3B}{A+B}$ is

(1) $\frac{7}{6}$ (2) $\frac{6}{7}$

(3) $\frac{5}{6}$ (4) $\frac{6}{5}$

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

28. 0.001 is equivalent to

(1) 10% (2) 1%

(3) 0.01% (4) 0.1%

(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

29. What percent of 3.5 kg is 70 gms ?

(1) 3% (2) 4%

(3) 5% (4) 2%

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

30. One-third of 1206 is what percent of 134 ?

(1) 100% (2) 150%

(3) 200% (4) 300%

(SSC CISF Constable (GD) Exam. 05.06.2011)

31. If 120% of a is equal to 80% of b, then $\frac{b+a}{b-a}$ is equal to

(1) 5 (2) 6

(3) 7 (4) 8

(SSC CHSL DEO CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

32. If 20% of (A + B) = 50% of B, then value of $\frac{2A-B}{2A+B}$ is

(1) $\frac{1}{2}$ (2) $\frac{1}{3}$

(3) $\frac{1}{4}$ (4) 1

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

33. If x% of a is the same as y% of b, then z% of b will be

(1) $\frac{yz}{x}$% of a (2) $\frac{zx}{y}$% of a

(3) $\frac{xy}{z}$% of a (4) $\frac{y}{z}$% of a

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

34. If Y% of one hour is 1 minute 12 seconds, then Y is equal to

(1) 2 (2) 1

(3) $\frac{1}{2}$ (4) $\frac{1}{4}$

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

35. What percent of 3.6 kg is 72 gms. ?

(1) 32% (2) 22%

(3) 12% (4) 2%

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

36. 31% of employees pay tax in the year 2008. Non-tax paying employees are 20,700. The total number of employees is :

(1) 31,160 (2) 64,750

(3) 30,000 (4) 66,775

(SSC CHSL DEO & LDC Exam. 21.10.2012, IInd Sitting)

37. A team played 40 games in a season and won in 24 of them. What percent of games played did the team win?

(1) 70% (2) 40%

(3) 60% (4) 35%

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

38. If 125% of x is 100, then x is :

(1) 80 (2) 150

(3) 400 (4) 125

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

39. 498 is 17% less than the number by

(1) 610 (2) 580

(3) 600 (4) 620

(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

40. Given A is 50% larger than C and B is 25% larger than C, then A is what percent larger than B ?

(1) 25% (2) 50%

(3) 75% (4) 20%

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

41. In a big garden 60% of the trees are coconut trees, 25% of the number of coconut trees are mango trees and 20% of the number of mango trees are apple trees. If the number of apple trees are 1500, then the number of trees in the garden is :

(1) 48000 (2) 50000

(3) 51000 (4) 45000

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

42. The population of a village is 25,000. One fifth are females and the rest are males. 5% of males and 40% of females are uneducated. What percentage on the whole are educated?

(1) 75% (2) 88%

(3) 55% (4) 85%

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

43. What is to be added to 15% of 160 so that the sum may be equal to 25% of 240 ?

(1) 24 (2) 84

(3) 60 (4) 36

(SSC Multi-Tasking Staff Exam. 10.03.2013)

44. A number is divided into two parts in such a way that 80% of 1st part is 3 more than 60% of 2nd part and 80% of 2nd part is 6 more than 90% of the 1st part. Then the number is

(1) 125 (2) 130

(3) 135 (4) 145

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

45. In a college, 40% of the students were allotted group A, 75% of the remaining were given group B and the remaining 12 students were given group C. Then the number of students who applied for the group is

(1) 100 (2) 60

(3) 80 (4) 92

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

46. A box has 100 blue balls, 50 red balls, 50 black balls. 25% of blue balls and 50% of red balls are taken away. Percentage of black balls at present is

(1) 50% (2) 25%

(3) $33\frac{1}{3}$% (4) 40%

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

47. A dozen pairs of socks quoted at ₹ 180 are available at discount of 20%. How many pairs of socks can be bought for ₹ 48?
(1) 3 pairs (2) 4 pairs
(3) 2 pairs (4) 5 pairs
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

48. If three-fifth of sixty per cent of a number is 36, the number is
(1) 100 (2) 80
(3) 75 (4) 90
(SSC CPO S.I. Exam. 03.09.2006)

49. If 50% of (P – Q) = 30% of (P + Q) and Q = x% of P, then the value of x is :
(1) 30 (2) 25
(3) 20 (4) 50
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

50. Out of two numbers, 40% of the greater number is equal to 60% of the smaller. If the sum of the numbers is 150, then the greater number is
(1) 70 (2) 80
(3) 90 (4) 60
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

51. If 80% of a number added to 80 gives the result as the number itself, then the number is
(1) 200 (2) 300
(3) 400 (4) 500
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

52. If 120 is 20% of a number, then 120% of that number will be :
(1) 20 (2) 120
(3) 480 (4) 720
(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting) & (SSC SO Exam. 16.11.2003 & Data Entry & LDC Exam. 10.11.2013)

53. When 60 is subtracted from 60% of a number, the result is 60. The number is :
(1) 120 (2) 150
(3) 180 (4) 200
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

54. When 75% of a number is added to 75, the result is the same number. Find the number :
(1) 225 (2) 270
(3) 300 (4) 325
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

55. Two numbers are respectively 20% and 50% of a third number. What per cent is the first number of the second?
(1) 10% (2) 20%
(3) 30% (4) 40%
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

56. Two numbers are respectively 25% and 20% less than a third number. What per cent is the first number of the second ?
(1) 5% (2) 75%
(3) 80% (4) 93.75%
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

57. The sum of the numbers of boys and girls in a school is 150. If the number of boys is x, the number of girls becomes x% of the total number of students. The number of boys is :
(1) 90 (2) 50
(3) 40 (4) 60
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

58. 18% of which number is equal to 12% of 75 ?
(1) 50 (2) 100
(3) 2 (4) $\frac{3}{2}$
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

59. Difference of two numbers is 1660. If $6\frac{1}{2}$% of one number is $8\frac{1}{2}$% of the other number, the smaller number is
(1) 7055 (2) 5395
(3) 3735 (4) 2075
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

60. When 75 is added to 75% of a number, the answer is the number. Find 40% of that number.
(1) 100 (2) 80
(3) 120 (4) 160
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

61. The number that is to be added to 10% of 320 to have the sum as 30% of 230 is
(1) 37 (2) 32
(3) 23 (4) 73
(SSC CGL Tier-II Exam. 21.09.2014

62. If X is 20% less than Y, then find the values of $\frac{Y-X}{Y}$ and $\frac{X}{X-Y}$.
(1) $\frac{1}{5}, -4$ (2) $5, -\frac{1}{4}$
(3) $\frac{2}{5}, -\frac{5}{2}$ (4) $\frac{3}{5}, -\frac{5}{3}$
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

63. 1% of 1% of 25% of 1000 is
(1) 0.025 (2) 0.0025
(3) 0.25 (4) 0.000025
(SSC CHSL DEO & LDC Exam. 9.11.2014)

64. 25% of 120 + 40% + 380 = ? of 637
(1) $\frac{2}{7}$ (2) $\frac{1}{7}$
(3) $\frac{4}{7}$ (4) $\frac{3}{7}$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

65. In a village 30% of the population is literate. If the total population of the village is 6,600, then the number of illiterate is
(1) 1980 (2) 4620
(3) 2200 (4) 3280
(SSC CHSL DEO & LDC Exam. 16.11.2014)

66. If 8% of x = 4% of y, then 20% of x is
(1) 10% of y (2) 16% of y
(3) 40% of y (4) 80% of y
(SSC CHSL DEO Exam. 16.11.2014) (Ist Sitting)

67. If 40% of $\frac{4}{5}$ of $\frac{3}{4}$ of a number is 48, then what is 1% of the same number ?
(1) 20 (2) 2
(3) 10 (4) 1
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

68. The sum of (16% of 24.2) and (10% of 2.42) is
(1) 4.114 (2) 41.14
(3) 411.4 (4) 0.4114
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

69. What percent of 15 hours is 18 seconds ?

(1) 30% (2) $\frac{1}{30}$%

(3) 36% (4) $\frac{1}{36}$%

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

70. If x% of y% of 80 is the same as 25% of 900, then the value of xy is

(1) 30100 (2) 32500

(3) 28125 (4) 34200

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

71. A supply of juice lasts for 35 days. If its use is increased by 40% the number of days would the same amount of juice lasts, is

(1) 25 days (2) 30 days

(3) 24 days (4) 27days

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

72. If 60% of A = 30% of B, B = 40% of C, C = x% of A, then value of x is

(1) 200 (2) 500

(3) 800 (4) 300

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

73. In an office, 40% of the staff is female. 70% of the female staff and 50% of the male staff are married. The percentage of the unmarried staff in the office is

(1) 64 (2) 60

(3) 54 (4) 42

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

74. 50% of a number when added to 50 is equal to the number. The number is

(1) 50 (2) 75

(3) 100 (4) 150

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

75. $83\frac{1}{3}$% of Rs. 90 is equal to 60% of ?

(1) Rs. 123 (2) Rs. 124

(3) Rs. 122 (4) Rs. 125

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

76. 51% of a whole number is 714. 25% of that number is

(1) 350 (2) 450

(3) 550 (4) 250

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

77. Due to 25% fall in the rate of eggs, one can buy 2 dozen eggs more than before by investing Rs.162. Then the original rate per dozen of the eggs is

(1) Rs. 22 (2) Rs. 24

(3) Rs. 27 (4) Rs. 30

(SSC CGL Tier-II Online Exam.01.12.2016)

78. What per cent of a day is 30 minutes?

(1) 2.83 (2) 2.083

(3) 2.09 (4) 2.075

(SSC CGL Tier-II Online Exam.01.12.2016)

79. A basket contains 300 mangoes. 75 mangoes were distributed among some students. Find the percentage of mangoes left in the basket.

(1) 70% (2) 72%

(3) 76% (4) 75%

(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

80. The weights of two iron balls are 3.5 kg and 7.5 kg. What is the percentage weight of the first ball with respect to second ball?

(1) $46\frac{2}{3}$% (2) 35%

(3) $46\frac{1}{3}$% (4) 45%

(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

81. A store has an offer 'Buy 4 Get 1 Free'. What is the net percentage of discount?

(1) 25% (2) 33.3%

(3) 20% (4) Insufficient Data

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

82. If A earns 25% more than B then how much percent does B earns less than A :

(1) 15% (2) 20%

(3) 25% (4) 30%

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

83. What per cent of 1 day is 36 minutes?

(1) 25% (2) 2.5%

(3) 3.6% (4) 0.25%

(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

84. One number is 25% of another number. The larger number is 12 more than the smaller. The larger number is

(1) 48 (2) 16

(3) 4 (4) 12

(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

85. The number of students in a class is increased by 20% and the number now becomes 66. Initially the number was

(1) 45 (2) 50

(3) 55 (4) 60

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

86. A number is increased by 20%. To get back to the orignal number, the increased number is to be reduced by

(1) 20% (2) 21%

(3) $16\frac{2}{3}$% (4) $14\frac{1}{3}$%

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

87. A village lost 12% of its goats in a flood and 5% of remainder died from diseases. If the number left now is 8360, what was the original number before the flood?

(1) 1000 (2) 10000

(3) 1,00,000 (4) 8360

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

88. If A is equal to 20% of B and B is equal to 25% of C; then what per cent of C is equal to A?

(1) 10 (2) 15

(3) 5 (4) 20

(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (IST Sitting)

89. In a school there are 1500 students, 44% of them are girls. Monthly fee of each boy is Rs. 540 and the fee of each girl is 25% less than that of a boy. The sum of fees of boys and girls both is

(1) Rs. 720600 (2) Rs. 720800

(3) Rs. 720900 (4) Rs. 721000

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

90. In a marriage party 32% are women, 54% are men and there are 196 children. How many men are there in the marriage party?

(1) 756 (2) 448

(3) 332 (4) 324

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

91. $6\frac{1}{4}$% of 1600 + $12\frac{1}{2}$% of 800 equals

(1) 100 (2) 200

(3) 300 (4) 400

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

92. Refer the following data table and answer the following question.

	Boys	Girls
Medical	30	70
Engineering	75	25

What per cent of students who chose Engineering are girls?
(1) 26.32 (2) 12.5
(3) 25 (4) 33.33
(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

93. Refer the following data table and answer the following Question.

	Boys	**Girls**
Medical	35	60
Engineering	40	40

What per cent of students who chose Engineering are girls ?
(1) 40 (2) 22.86
(3) 50 (4) 100
(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

94. A boy found the answer for the question "subtract the sum of $\frac{1}{4}$ and $\frac{1}{5}$ from unity and express the answer in decimals" as 0.45. The percentage of error in his answer was
(1) $\left(\frac{100}{11}\right)\%$ (2) 50%
(3) 10% (4) $\left(\frac{200}{11}\right)\%$
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–II

1. If x is less than y by 25% then y exceed x by :
(1) $33\frac{1}{3}\%$ (2) 25%
(3) 75% (4) $66\frac{2}{3}\%$
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. If x is 10% more than y, then by what per cent is y less than x ?
(1) $9\frac{1}{11}\%$ (2) $7\frac{1}{11}\%$
(3) $8\frac{1}{11}\%$ (4) $10\frac{1}{11}\%$
(SSC CPO S.I. Exam. 07.09.2003)

3. If A's height is 10% more than B's height, by how much per cent less is B's height than that of A ?
(1) 10% (2) $10\frac{1}{9}\%$
(3) $10\frac{1}{11}\%$ (4) $9\frac{1}{11}\%$
(SSC CPO S.I. Exam. 26.05.2005)

4. B got 20% marks less than A. What per cent marks did A got more than B ?
(1) 20% (2) 25%
(3) 12% (4) 80%
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

5. If x earns 25% more than y. What percent less does y earn than x ?
(1) 16% (2) 10%
(3) 20% (4) 25%
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

6. The difference of two numbers is 20% of the larger number. If the smaller number is 20, the larger number is :
(1) 25 (2) 45
(3) 50 (4) 80
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

7. If a number x is 10% less than another number y and y is 10% more than 125, then x is equal to :
(1) 150 (2) 143
(3) 140.55 (4) 123.75
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

8. Two numbers are respectively $12\frac{1}{2}\%$ and 25% more than a third number. The first number as percentage of second number is
(1) 50 (2) 60
(3) 75 (4) 90
(SSC CPO S.I. Exam. 12.01.2003

9. Which number is 40% less than 90 ?
(1) 36 (2) 54
(3) 50 (4) 60
(SSC CPO S.I. Exam. 07.09.2003)

10. Two numbers are less than a third number by 30% and 37% respectively. The per cent by which the second number is less than the first is
(1) 10% (2) 7%
(3) 4% (4) 3%
(SSC SAS Exam 26.06.2010 (Paper-1)

11. A number when reduced by 10% gives 30. The number is
(1) $33\frac{1}{2}$ (2) $33\frac{1}{3}$
(3) 40 (4) 35
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

12. How much $66\frac{2}{3}\%$ of Rs. 312 exceeds Rs. 200?
(1) Rs. 96 (2) Rs. 4
(3) Rs. 8 (4) Rs. 104
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

13. A's income is 25% more than B's income. B's income is what per cent of A's income ?
(1) 80 (2) 75
(3) 50 (4) 25
(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

14. A's salary is 50% more than that of B. Then B's salary is less than that of A by
(1) 50% (2) $33\frac{1}{3}\%$
(3) $33\frac{1}{4}\%$ (4) $44\frac{1}{2}\%$
(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

15. If the salary of Manoj is 40% less than that of Subhash, then by how much percentage is the salary of Subhash more than that of Manoj?
(1) 60% (2) $66\frac{1}{4}\%$
(3) $66\frac{2}{3}\%$ (4) 65%
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

16. The percentage change in a number when it is first decreased by 10% and then increased by 10% is
(1) 0.1 % increase
(2) 1 % decrease
(3) 0.1 % decrease
(4) No changes
(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

17. x is 5 times longer than y. The percentage by which y is less than x is :
(1) 50% (2) 40%
(3) 80% (4) 70%
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

TYPE–III

1. A person who spends $66\frac{2}{3}\%$ of his income is able to save ₹ 1,200 per month. His monthly expenses (in ₹) is :
(1) 1,200 (2) 2,400
(3) 3,000 (4) 3,200
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The income of C is 20% more than B's and the income of B is 25% more than A's. Find by how much per cent is C's income more than A's ?
(1) 150% (2) 50%
(3) 25% (4) 35%
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. If A's income is 40% less than that of B, how much percent B's income is more than that of A?
(1) 60% (2) 40%
(3) 66.66% (4) 33.33%
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. What per cent decrease in salaries would exactly cancel out the 20 per cent increase?
(1) 20% (2) $16\frac{2}{3}\%$
(3) $33\frac{1}{3}\%$ (4) 18%
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

5. Income of A is 10% more than income of B. Let B's income be x% less than A's income. Find x.
(1) $9\frac{1}{11}\%$ (2) $10\frac{1}{11}\%$
(3) 11% (4) 10%
(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & 13.11.2005 (IInd Sitting) & (SSC CPO SI Exam. 12.12.2010 (Paper-I) & (SSC Investigater Exam. 12.09.2010)

6. If the income of Ram is $12\frac{1}{2}\%$ more than that of Shyam, the income of Shyam is less than that of Ram by
(1) $11\frac{1}{9}\%$ (2) $13\frac{1}{2}\%$
(3) $87\frac{1}{2}\%$ (4) $88\frac{1}{9}\%$
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

7. If 60% of A's income is equal to 75% of B's income, then B's income is equal to x% of A's income. The value of x is :
(1) 70 (2) 60
(3) 80 (4) 90
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. A person gave 20% of his income to his elder son, 30% of the remaining to the younger son and 10% of the balance, he donated to a trust. He is left with ₹ 10080. His income was :
(1) ₹ 50000 (2) ₹ 40000
(3) ₹ 30000 (4) ₹ 20000
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

9. Radha spends 40% of her salary on food, 20% on house rent, 10% on entertainment and 10% on conveyance. If her savings at the end of a month are ₹ 1500, then her salary per month (in ₹) is
(1) ₹ 8000 (2) ₹ 7500
(3) ₹ 6000 (4) ₹ 10000
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

10. If the monthly salary of an employee is increased by $2\frac{2}{3}\%$, he gets 72 rupees more. His monthly salary (in rupees) is
(1) 7200 (2) 3600
(3) 2700 (4) 2000
(SSC CPO S.I. Exam. 07.09.2003)

11. If the total monthly income of 16 persons is ₹ 80,800 and the income of one of them is 120% of the average income, then his income is
(1) ₹ 5,050 (2) ₹ 6,060
(3) ₹ 6,160 (4) ₹ 6,600
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

12. Mita's income is 25% more than that of Sita. What percent is Sita's income less than that of Mita ?
(1) 25% (2) 24%
(3) $22\frac{1}{2}\%$ (4) 20%
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

13. A man spends $12\frac{1}{2}\%$ of his salary on items of daily use and 30% of the remainder on house rent. After that he is left with ₹ 2940. How much is his salary ?
(1) ₹ 4800 (2) ₹ 5200
(3) ₹ 4500 (4) ₹ 4000
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

14. The monthly income of a person was ₹ 13,500 and his monthly expenditure was ₹ 9,000. Next year his income increased by 14% and his expenditure increased by 7%. The per cent increase in his savings was
(1) 7% (2) 21%
(3) 28% (4) 35%
(SSC CGL Prelim Exam. 08.02.2004 (IInd Sitting) & (SSC Section Officer Exam. 25.09.2005)

15. A worker suffers a 20% cut in his wages. He may regain his original wages by obtaining a rise of
(1) 27.5% (2) 25.0%
(3) 22.5% (4) 20.0%
(SSC CPO S.I. Exam. 05.09.2004)

16. Given that 10% of A's income = 15% of B's income = 20% of C's income. If sum of their income is ₹ 7800, then B's income is:
(1) ₹ 3600 (2) ₹ 3000
(3) ₹ 2400 (4) ₹ 1800
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

17. If A's income is 25% less than B's income, by how much percent is B's income more than that of A ?
(1) 25% (2) 30%
(3) $33\frac{1}{3}\%$ (4) $66\frac{2}{3}\%$
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

18. A's salary is 50% more than that of B. How much per cent is B's salary less than that of A?

(1) 50% (2) $33\frac{1}{3}$%

(3) 45% (4) $66\frac{2}{3}$%

(SSC CPO S.I. Exam. 03.09.2006)

19. Tulsiram's salary is 20% more than that of Kashyap. If Tulsiram saves ₹ 720 which is 4% of his salary, then Kashyap's salary is

(1) ₹ 15,000 (2) ₹ 12,000
(3) ₹ 10,000 (4) ₹ 22,000

(SSC CPO S.I. Exam. 06.09.2009)

20. A's salary is 40% of B's salary and B's salary is 25% of C's salary. What percentage of C's salary is A's salary ?

(1) 5% (2) 10%
(3) 15% (4) 20%

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

21. If A's income is 50% less than that of B's, then B's income is what per cent more than that of A ?

(1) 125% (2) 100%
(3) 75% (4) 50%

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

22. X's income is 20% more than that of Y. What per cent is Y's income less than X ?

(1) $83\frac{1}{3}$% (2) $16\frac{2}{3}$%

(3) $83\frac{2}{3}$% (4) $16\frac{1}{3}$%

(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC HSL DEO & LDC Exam. 27.11.2010)

23. The allowances of an empolyee constitutes 165% of his basic pay. If he receives ₹ 11925 as gross salary, then his basic pay is (in ₹) :

(1) 4000 (2) 5000
(3) 4500 (4) 5500

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

24. If Nita's salary is 25 per cent more than Papiya's salary, then the percentage by which Papiya's salary is less than Nita's salary is

(1) 15% (2) 20%
(3) 25% (4) 32%

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

25. The salary of a person is decreased by 25% and then the decreased salary is increased by 25%. His new salary in comparison with his original salary is

(1) the same (2) 6.25% more
(3) 6.25% less (4) 0.625% less

(SSC Data Entry Operator Exam. 02.08.2009)

26. Ram saves 14% of his salary while Shyam saves 22%. If both get the same salary and Shyam saves ₹ 1540, what is the savings of Ram?

(1) ₹ 990 (2) ₹ 980
(3) ₹ 890 (4) ₹ 880

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

27. A's salary is 25% more than B's salary. B's salary is how much less than A's salary ?

(1) 20 % (2) 24 %
(3) 25 % (4) 27.5 %

(SSC Section officer commercial Audit Exam. 16.11.2003 & SSC CPO S.I. Exam. 12.01.2003) & (SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

28. A man spends 75% of his income. His income increased by 20% and he increased his expenditure by 15%. His savings will then be increased by

(1) 33% (2) $33\frac{1}{3}$%

(3) 35% (4) 40%

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

29. Nitin's salary was reduced by 10% and then the reduced salary was increased by 10%. His new salary in comparison with his original salary is

(1) the same (2) 1% more
(3) 1% less (4) 5% less

(SSC Data Entry Operator Exam. 31.08.2008)

30. A man spends 40% of his monthly salary on food and one-third of the remaining on transport. If he saves ₹ 4,500 per month, which is equal to half the balance after spending on food and transport, his monthly salary is

(1) ₹ 11,250 (2) ₹ 22,500
(3) ₹ 25,000 (4) ₹ 45,000

(SSC Data Entry Operator Exam. 31.08.2008)

31. A saves 20% of his monthly salary. If his monthly expenditure is ₹ 6,000, then his monthly savings is

(1) ₹1,500 (2) ₹1,800
(3) ₹1,200 (4) ₹ 4,800

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

32. A's salary is increased by 10% and then decreased by 10%. Then, change in salary is

(1) 0% (2) 1% decrease
(3) 1% increase (4) 2% decrease

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

33. Kishan spends 30% of his salary on food and donates 3% in a Charitable Trust. He spends ₹ 2,310 on these two items, then total salary for that month is

(1) ₹ 6,000 (2) ₹ 8,000
(3) ₹ 9,000 (4) ₹ 7,000

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

34. A clerk received an annual salary of ₹ 3,660 in the year 1975. This was 20% more than his salary in 1974. What was his salary in 1974 ?

(1) ₹ 3,005 (2) ₹ 3,000
(3) ₹ 3,500 (4) ₹ 3,050

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

35. Out of his total income, Mr. Kapur spends 20% on house rent and 70% of the rest on house-hold expenses. If he saves ₹ 1,800, what is his total income (in rupees)?

(1) ₹ 7,800 (2) ₹ 7,000
(3) ₹ 8,000 (4) ₹ 7,500

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

36. Arbind spends 75% of his income and saves the rest. His income is increasesd by 20% and he increases his expenditure by 10%. Then the increase in savings in percentage is

(1) 55% (2) 52%

(3) 50% (4) 48%

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

37. The enhanced salary of a man becomes ₹ 24,000 after 20% increment. His previous salary was

(1) ₹ 20,000 (2) ₹ 21,000
(3) ₹ 16,000 (4) ₹ 18,000

(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

38. The salary of a person was reduced by 10%. By what per cent should his reduced salary be raised so as to bring it at par with his original salary ?

(1) 9% (2) $11\frac{1}{9}\%$

(3) $9\frac{1}{11}\%$ (4) 11%

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

39. If A's salary is 50% more than that of B, then B's salary is less than A's by

(1) 33% (2) $40\frac{1}{3}\%$

(3) $45\frac{1}{3}\%$ (4) $33\frac{1}{3}\%$

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

40. Mr. X spends 35% of his salary on food and 5% of his salary on children education. In January 2011, he spent ₹ 17, 600 on these two items. His salary for that month is

(1) ₹ 40, 000 (2) ₹ 44, 000

(3) ₹ 48, 000 (4) ₹ 46, 000

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

41. The monthly salaries of A and B together amount to Rs. 40,000. A spends 85% of his salary and B, 95% of his salary. If now their savings are the same, then the salary (in Rs.) of A is

(1) Rs. 10,000 (2) Rs. 12,000

(3) Rs. 16,000 (4) Rs. 18,000

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

42. 25% of annual salary of A is equal to eighty percent of annual salary of B. Monthly salary of B is 40% of the monthly salary of C. Annual salary of C is Rs. 6 lac. What is the monthly salary of A ?

(1) Rs. 60,000 (2) Rs. 62,000

(3) Rs. 64,000 (4) Rs. 56,000

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

43. Two numbers are less than a third number by 30% and 37% respectively. How much percent is the second number less than the first ?

(1) 10 (2) 4

(3) 3 (4) 7

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

44. A man spends 75% of his income. His income is increased by 20% and he increased his expenditure by 10%. His savings are increased by

(1) $37\frac{1}{2}\%$ (2) 50%

(3) 25% (4) 10%

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

45. Ram babu donated 3% of his income to a charity and deposited 12% of the rest in bank. If now he has Rs. 12804, then his income was :

(1) Rs. 17460 (2) Rs. 15000

(3) Rs. 7500 (4) Rs. 14550

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

46. Mukesh has twice as much money as Soham. Soham has 50% more money than Pankaj. If the average money with them is Rs.110, then Mukesh has

(1) Rs. 155 (2) Rs. 160

(3) Rs. 180 (4) Rs. 175

(SSC CGL Tier-II Online Exam.01.12.2016)

47. A man spends 75% of his income. His income increases by 20% and his expenditure also increases by 10%. Find the percentage increase in his savings.

(1) 25% (2) 50%

(3) 15% (4) 10%

(SSC CGL Tier-II Online Exam.01.12.2016)

48. Christy donated 10% of his income to an orphanage and deposited 20% of the remainder in his bank. If he has now Rs. 7200 left, what is his income.

(1) Rs. 10000 (2) Rs. 8000

(3) Rs. 9000 (4) Rs. 8500

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

49. The average salary of male employees in a firm was Rs. 5200 and that of females was Rs. 4200. The mean salary of all the employees was Rs. 5000. What is the percentage of female employees?

(1) 80% (2) 20%

(3) 40% (4) 30%

(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

50. In a factory, the salary of each worker is increased in the ratio 22 : 25 but the number of workers is decreased by $26\frac{2}{3}\%$.

The net effect on the salary is

(1) $11\frac{1}{9}\%$ decrease

(2) 20% increase

(3) $16\frac{2}{3}\%$ decrease

(4) 10% decrease

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

51. If the income of Mohan is 150% higher than that of Mahesh, then by what percent the income of Mahesh is less than that of Mohan ?

(1) 40% (2) 50%

(3) 60% (4) 45%

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

52. A man spends 60% of his income on different items. His income is increased by 20% and his expenditure is also increased by 10%. Find the percentage decrease in his savings?

(1) 10% (2) 15%

(3) 20% (4) 25%

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

53. P's salary is 25% higher than Q, what percentage is Q's salary lower than that of P ?

(1) 20 (2) 29

(3) 31 (4) $33\frac{1}{3}$

(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (IST Sitting)

54. If A's salary is 40% less than that of B, then how much percent is B's salary more than that of A?

(1) $33\frac{1}{3}$ (2) $66\frac{2}{3}$

(3) $33\frac{2}{3}$ (4) $66\frac{1}{3}$

(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

55. A's salary was decreased by 50% and subsequently increased by 50%. How much per cent does he lose?
(1) 25% (2) 50%
(3) $12\frac{1}{2}$% (4) No loss
(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

56. A man spends 15% of his income. If his expenditure is Rs. 75, his income (in rupees) is :
(1) 400 (2) 300
(3) 750 (4) 500
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

57. If A's salary is 30% more than that of B, then by how much percent is B's salary less than that of A ?
(1) 13.01% (2) 13.07%
(3) 23.07% (4) 23.01%
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

58. The average monthly salary of all the employees in a factory is Rs. 8840. If the average salary of all the officers is Rs. 15000 and that of the remaining employees is Rs. 8000, then what is the percentage of the officers among the employees?
(1) 10% (2) 12%
(3) $8\frac{1}{3}$% (4) 11%
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

59. The monthly salary of Mr. Sachdev gets increased by 5%, thereby his salary becomes ₹ 15,120 per annum. His earlier monthly salary (before the increase) was
(1) ₹ 1,320 (2) ₹ 1,200
(3) ₹ 1,240 (4) ₹ 1,440
(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE–IV

1. If A exceeds B by 40%, B is less than C by 20%, then A : C is :
(1) 28 : 25 (2) 26 : 25
(3) 3 : 2 (4) 3 : 1
(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC Section Officer Exam. 16.11.2003)

2. If 10% of m is the same as 20% of n, then m : n is equal to :
(1) 2 : 1 (2) 1 : 2
(3) 1 : 10 (4) 1 : 20
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

3. The ratio 5 : 4 expressed as a per cent equals :
(1) 125% (2) 80%
(3) 40% (4) 12.5%
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. The ratio of the number of boys and girls in a college is 3 : 2. If 20% of boys and 25% of girls are adults, the percentage of those students who are not adults, is
(1) 58% (2) 67.5%
(3) 78% (4) 82.5%
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC DEO Exam. 02.08.2009)

5. The ratio of the number of boys to that of girls in a school is 4 : 1. If 75% of boys and 70% of the girls are scholarship-holders, then the percentage of students who do not get scholarship is
(1) 50% (2) 28%
(3) 75% (4) 26%
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

6. Two numbers are in the ratio 2 : 3. If 20% of the smaller number added to 20 is equal to the sum of 10% of the larger number and 25, then the smaller number is
(1) 100 (2) 160
(3) 180 (4) 200
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

7. Two numbers are respectively 20% and 50% more than a third number. The ratio of the two numbers is
(1) 2 : 5 (2) 3 : 5
(3) 4 : 5 (4) 6 : 7
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003 & CPO SI Exam. 26.05.2005) & (SSC CGL Exam. 13.11.2005 (First Sitting)

8. The difference of two numbers is 45% of their sum. The ratio of the larger number to the smaller number is
(1) 20 : 9 (2) 9 : 20
(3) 29 : 11 (4) 11 : 29
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting) **&** (SSC CGL Exam. 27.07.2008 (IInd Sitting) & (SSC HSL DEO & LDC Exam. 27.11.2010) & (SSC CGL Tier-1 Exam. 26.06.2011 (Ist Sitting) & (SSC MTS Exam. 10.03.2013 (Patna)

9. If 30% of A = 0.25 of B = $\frac{1}{5}$ of C, then A : B : C is equal to :
(1) 5 : 6 : 4 (2) 5 : 24 : 5
(3) 6 : 5 : 4 (4) 10 : 12 : 15
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

10. In a class, the number of girls is 20% more than that of the boys. The strength of the class is 66. If 4 more girls are admitted to the class, the ratio of the number of boys to that of the girls is
(1) 1 : 2 (2) 3 : 4
(3) 1 : 4 (4) 3 : 5
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

11. The ratio of the number of boys and girls in a school is 3 : 2. If 20% of the boys and 30% of the girls are scholarship holders, then the percentage of students, who do not get scholarship, is
(1) 50% (2) 72%
(3) 75% (4) 76%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

12. The expenses on rice, fish and oil of a family are in the ratio 12 : 17 : 3. The prices of these articles are increased by 20%, 30% and 50% respectively. The total expenses of family on these articles are increased by
(1) $14\frac{1}{8}$% (2) $7\frac{1}{8}$%
(3) $56\frac{1}{8}$% (4) $28\frac{1}{8}$%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

13. If 20% of A = 30% of B = $\frac{1}{6}$ of C, then A : B : C is
(1) 2 : 3 : 16
(2) 3 : 2 : 16
(3) 10 : 15 : 18
(4) 15 : 10 : 18
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

14. The bus fare and train fare of a place from Kolkata were ₹ 20 and ₹ 30 respectively. Train fare has been increased by 20% and the bus fare has been increased by 10%. The ratio of new train fare to new bus fare is
(1) 11 : 18 (2) 18 : 11
(3) 5 : 3 (4) 3 : 5
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

15. The difference of two numbers is 15% of their sum. The ratio of the larger number to the smaller number is
(1) 23 : 17 (2) 11 : 9
(3) 17 : 11 (4) 23 : 11
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

16. The price of sugar is increased by 20%. If the expenditure on sugar has to be kept the same as earlier, the ratio between the reduction in consumption and the original consumption is
(1) 1 : 3 (2) 1 : 4
(3) 1 : 6 (4) 1 : 5
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

17. Rama's expenditures and savings are in the ratio 5 : 3. If her income increases by 12% and expenditure by 15%, then by how much per cent do her savings increase ?
(1) 12% (2) 7%
(3) 8% (4) 13%
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

18. The ratio of two numbers is 4:5 when the first is increased by 20% and the second is decreased by 20%, the ratio of the resulting numbers is
(1) 4 : 5 (2) 5 : 4
(3) 5 : 6 (4) 6 : 5
(SSC CPO S.I. Exam. 09.11.2008)

19. If 60% of A = $\frac{3}{4}$ of B, then A : B is
(1) 9 : 20 (2) 20 : 9
(3) 4 : 5 (4) 5 : 4
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

20. If A exceeds B by 60% and B is less than C by 20%, then A : C is
(1) 32 : 25 (2) 25 : 32
(3) 8 : 5 (4) 4 : 5
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

21. If 30% of (B – A) = 18% of (B + A), then the ratio A : B is equal to
(1) 4 : 1 (2) 1 : 4
(3) 5 : 4 (4) 5 : 9
(SSC CPO S.I. Exam.12.12.2010 (Paper-I)

22. The ratio of the number of boys and girls in a school is 3 : 2. If 20% of the boys and 25% of the girls are scholarship holders, then the percentage of the students, who do not get the scholarship, is :
(1) 78% (2) 75%
(3) 60% (4) 55%
(SSC CHSL DEO & LDC Exam. 27.11.2010)

23. When 60% of a number is subtracted from another number, the second number reduces to its 52%; the ratio of the first number to the second number is :
(1) 6: 5 (2) 5: 3
(3) 5: 4 (4) 4: 5
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

24. The population of a town is 3,11,250. The ratio between women and men is 43 : 40. If there are 24% literate among men and 8% literate among women, the total number of literate persons in the town is
(1) 41,800 (2) 48,900
(3) 56,800 (4) 99,600
(SSC Graduate Level Tier-II Exam.16.09.2012)

25. The prices of a school bag and a shoe are in the ratio 7 : 5. The price of a school bag is ₹ 200 more than the price of a shoe. Then the price of a shoe is
(1) ₹ 200 (2) ₹ 700
(3) ₹ 500 (4) ₹ 1,200
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

26. If 15% of x is same as 20 % of y then $x : y$ is
(1) 4 : 3 (2) 5 : 4
(3) 6 : 5 (4) 3 : 4
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

27. The ratio of the number of boys and girls in a school is 2 : 3. If 25% of the boys and 30% of the girls are scholarship holders, the percentage of the school students who are not scholarship holders is
(1) 72 (2) 36
(3) 54 (4) 60
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

28. Two numbers A and B are such that the sum of 5% of A and 4% of B is $\frac{2}{3}$ rd of the sum of 6% of A and 8% of B. The ratio A : B is
(1) 4 : 3 (2) 3 : 4
(3) 1 : 1 (4) 2 : 3
(SSC CGL Tier-I Exam. 19.10.2014)

29. In what ratio must 25% hydrochloric acid be mixed with 60% hydrochloric acid to get a mixture of 40% hydrochloric acid ?
(1) 5 : 12 (2) 4 : 3
(3) 3 : 4 (4) 12 : 5
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

30. If 50% of x = 30% y, then $x : y$ is
(1) 2 : 3 (2) 5 : 3
(3) 3 : 2 (4) 3 : 5
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

31. The ratio of the number of boys to that of girls in a village is 3 : 2. If 30% of boys and 70% of girls appeared in an examination, the ratio of the number of villagers, appreared in the examination to that not appeared in the same examination is
(1) 9 : 14 (2) 23 : 27
(3) 1 : 1 (4) 27 : 23
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

32. A milkman mixed some water with milk to gain 25% by selling the mixture at the cost price. The ratio of water and milk is respectively
(1) 5 : 4 (2) 4 : 5
(3) 1 : 5 (4) 1 : 4
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

33. The ratio of syrup and water in a mixture is 3 : 1, then the percentage of syrup in this mixture is :
(1) 75% (2) 25%
(3) $66\frac{2}{3}$% (4) $33\frac{1}{3}$%
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

34. There is a ratio of 5: 4 between two numbers. If 40 % of the first number is 12, then what would be 50 % of the second number?
(1) 12 (2) 24
(3) 18
(4) Data Inadequate
(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

35. If 10% of x is 3 times 15% of y, then find $x : y$.
(1) 7 : 2 (2) 9 : 2
(3) 8 : 3 (4) 11 : 4
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

36. The ratio between Ram's age and Rahim's age is 10:11. What is the age of Rahim in percentage of Ram's age ?
(1) $109\frac{1}{11}$% (2) 110%
(3) $111\frac{1}{9}$% (4) 111%
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

37. The ratio of the number of boys and girls in a school is 3:2. If 20% of the boys and 25% of the girls are scholarship holders, the percentage of the school students who are not scholarship holders is
(1) 56 (2) 78
(3) 70 (4) 80
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

38. If 35% of A's income is equal to 25% of B's income, then the ratio of A's income to B's income is
(1) 7 : 5 (2) 5 : 7
(3) 4 : 7 (4) 4 : 3
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

TYPE–V

1. A sample of 50 litres of glycerine is found to be adulterated to the extent of 20%. How much pure glycerine should be added to it so as to bring down the percentage of impurity to 5% ?
(1) 155 litres (2) 150 litres
(3) 150.4 litres (4) 149 litres
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

2. 1 litre of water is added to 5 litres of alcohol-water solution containing 40% alcohol strength. The strength of alcohol in the new solution will be
(1) 30% (2) 33%
(3) $33\frac{2}{3}$% (4) $33\frac{1}{3}$%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

3. If 4 litres of water is evaporated on boiling from 12 litres of salt solution containing 7 percentage salt, the percentage of salt in the remaining solution is
(1) 10.5% (2) 11.5%
(3) 12% (4) 13%
(SSC CPO S.I. Exam. 06.09.2009)

4. A vessel has 60 litres of solution of acid and water having 80% acid. How much water be added to make it a solution in which acid forms 60% ?
(1) 48 litres (2) 20 litres
(3) 36 litres
(4) None of these
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

5. 75 gm of sugar solution has 30% sugar in it. Then the quantity of sugar that should be added to the solution to make the quantity of the sugar 70% in the solution, is
(1) 125 gm (2) 100 gm
(3) 120 gm (4) 130 gm
(SSCCHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

6. A litre of pure alcohol is added to 6 litres of 30% alcohol solution. The percentage of water in the solution is
(1) 50% (2) 65%
(3) 60% (4) 40%
(SSC CHSL DEO& LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

7. An ore contains 25% of an alloy that has 90% iron. Other than this, in the remaining 75% of the ore, there is no iron. To obtain 60 kg of pure iron, the quantity of the ore needed (in kgs) is approximately :
(1) 250.57 (2) 266.67
(3) 275.23 (4) 300
(SSCCHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

8. How much water must be added to 100 ml of 80 per cent solution of boric acid to reduce it to a 50 per cent solution ?
(1) 30 ml (2) 40 ml
(3) 50 ml (4) 60 ml
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

9. In one litre of a mixture of alcohol and water, water is 30%. The amount of alcohol that must be added to the mixture so that the part of water in the mixture becomes 15% is :
(1) 1000 ml (2) 700 ml
(3) 300 ml (4) 900 ml
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

10. One type of liquid contains 20% water and the second type of liquid contains 35% of water. A glass is filled with 10 parts of first liquid and 4 parts of second liquid. The water in the new mixture in the glass is
(1) 37% (2) 46%
(3) $12\frac{1}{7}$% (4) $24\frac{2}{7}$%
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

11. 40 litres of a mixture of milk and water contains 10% of water, the water to be added, to make the water content 20% in the new mixture is :
(1) 6 litres (2) 6.5 litres
(3) 5.5 litres (4) 5 litres
(SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting) & (HSL DEO LDC Exam. 28.11.2010)

12. How much pure alcohol has to be added to 400 ml of a solution containing 15% of alcohol to change the concentration of alcohol in the mixture to 32% ?
(1) 60 ml (2) 100 ml
(3) 128 ml (4) 68 ml
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

13. In 50 gm alloy of gold and silver, the gold is 80% by weight. How much gold should be mixed to this alloy so that the weight of gold would become 95% ?
(1) 200 gm (2) 150 gm
(3) 50 gm (4) 10 gm
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

14. 200 litres of a mixture contains 15% water and the rest is milk. The amount of milk that must be added so that the resulting mixture contains 87.5% milk is
(1) 30 litres (2) 35 litres
(3) 40 litres (4) 45 litres
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

15. In what ratio must a mixture of 30% alcohol strength be mixed with that of 50% alcohol strength so as to get a mixture of 45% alcohol strength ?
(1) 1 : 2 (2) 1 : 3
(3) 2 : 1 (4) 3 : 1
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

16. The ratio in which two sugar solutions of the concentrations 15% and 40% are to be mixed to get a solution of concentration 30% is
(1) 2 : 3 (2) 3 : 2
(3) 8 : 9 (4) 9 : 8
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

17. 15 litres of a mixture contains alcohol and water in the ratio 1 : 4. If 3 litres of Water is mixed in it, the percentage of alcohol in the new mixture will be
(1) 15% (2) $16\frac{2}{3}$%
(3) 17% (4) $18\frac{1}{2}$%
(SSC Graduate Level Tier-I Exam. 21.04.2013)

18. In an alloy there is 12% of copper. To get 69 kg of copper, how much alloy will be required ?

(1) 424 kg (2) 575 kg

(3) 828 kg (4) $1736\frac{2}{3}$ kg

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

19. In what ratio must 25% of alcohol be mixed with 50% of alcohol to get a mixture of 40% strength alcohol ?

(1) 1 : 2 (2) 2 : 1

(3) 2 : 3 (4) 3 : 2

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

20. 20 litres of a mixture contains 20% alcohol and the rest water. If 4 litres of water be mixed in it, the percentage of alcohol in the new mixture will be

(1) $33\frac{1}{3}\%$ (2) $16\frac{2}{3}\%$

(3) 25% (4) $12\frac{1}{2}\%$

(SSC CGL Tier-II Exam. 21.09.2014)

21. 300 grams of sugar solution has 40% of sugar in it. How much sugar should be added to make it 50% in the solution?

(1) 40 gram (2) 10 gram

(3) 60 gram (4) 80 gram

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

22. A sugar solution of 3 litre contain 60% sugar. One liter of water is added to this solution. Then the percentage of sugar in the new solution is:

(1) 30 (2) 45

(3) 50 (4) 60

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

23. 8 litres of water is added to 32 litres of a solution containing 20% of alcohol in water. What is the approximate concentration of alcohol in the solution now ?

(1) 24% (2) 16%

(3) 8% (4) 12%

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

TYPE–VI

1. Price of sugar rises by 20%. By how much percent should the consumption of sugar be reduced so that the expenditure does not change?

(1) 20% (2) 10%

(3) $16\frac{2}{3}\%$ (4) 15%

(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC CGL Tier-I Exam. 19.06.2011 (Ist Sitting)

2. If food prices go up by 10%, by how much should a man reduce his consumption so as not to increase his expenditure?

(1) $9\frac{1}{11}\%$ (2) 10%

(3) $11\frac{1}{9}\%$

(4) The data is not sufficient

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. In the new budget, the price of kerosene oil rose by 25%. By how much per cent must a person reduce his consumption of kerosene oil so that his expenditure on it does not increase ?

(1) 20% (2) 25%

(3) 50% (4) 40%

(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CGL Exam. 13.11.2005 (IInd Sitting)

4. If the price of tea is increased by 20%, by how much per cent the consumption of tea be reduced so that there is no increase in the expenditure on it ?

(1) $83\frac{1}{3}\%$ (2) 20%

(3) $16\frac{2}{3}\%$ (4) $8\frac{1}{3}\%$

(SSC CPO S.I. Exam. 05.09.2004)

5. If the price of a commodity is decreased by 20% and its consumption is increased by 20%, what will be the increase or decrease in the expenditure on the commodity ?

(1) 4% increase (2) 4% decrease

(3) 8% decrease (4) 8% increase

(SSC CPO S.I. Exam. 16.12.2007)

6. The price of a certain item is increased by 15%. If a consumer wants to keep his expenditure on the item the same as before, how much per cent must he reduce his consumption of that item ?

(1) 15% (2) $13\frac{1}{23}\%$

(3) $16\frac{2}{3}\%$ (4) $10\frac{20}{23}\%$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

7. If the price of a commodity is increased by 50%, by what fraction must its consumption be reduced so as to keep the same expenditure on its consumption ?

(1) $\frac{1}{4}$ (2) $\frac{1}{3}$

(3) $\frac{1}{2}$ (4) $\frac{2}{3}$

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

8. If the price of rice be raised by 25%, the percent by which a house-holder must reduce his consumption of rice so as not to increase his expenditure on rice is

(1) 225% (2) 25.75%

(3) 25% (4) 20%

(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

9. If the duty on an article is reduced by 40% of its present rate, by how much per cent must its consumption increase in order that the revenue remains unaltered ?

(1) 60% (2) $62\frac{1}{3}\%$

(3) 72% (4) $66\frac{2}{3}\%$

(SSC CPO S.I. Exam. 09.11.2008)

10. Price of milk has increased by 20%. To keep the expenditure unchanged, the present consumption is to be reduced by :

(1) 20% (2) 18%

(3) 10% (4) $16\frac{2}{3}\%$

(SSC Multi-Tasking Staff Exam. 10.03.2013)

11. The price of a commodity rises from ₹ 6 per kg to ₹ 7.50 per kg. If the expenditure cannot increase, the percentage of reduction in consumption is

(1) 15% (2) 20%

(3) 25% (4) 30%

(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

12. Water tax is increased by 20% but its consumption is decreased by 20%. Then the increase or decrease in the expenditure of the money is
(1) 5% decrease (2) 4% decrease
(3) No change (4) 4% increase
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

13. Price of a commodity has increased by 60%. By what per cent must a consumer reduce the consumption of the commodity so as not to increase the expenditure ?
(1) 37% (2) 37.5%
(3) 40.5% (4) 60%
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

14. The price of petrol is increased by 25%. By how much per cent a car owner should reduce his consumption of petrol so that the expenditure on petrol would not be increased ?
(1) 25% (2) 30%
(3) 50% (4) 20%
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

15. If the price of petrol be raised by 20%, then the percentage by which a car owner must reduce his consumption so as not to increase his expenditure on petrol is
(1) $16\frac{1}{3}\%$ (2) $16\frac{2}{3}\%$
(3) $15\frac{2}{3}\%$ (4) $15\frac{1}{3}\%$
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

TYPE–VII

1. In an examination, there were 1000 boys and 800 girls. 60% of the boys and 50% of the girls passed. Find the percent of the candidates failed ?
(1) 46.4% (2) 48.4%
(3) 44.4% (4) 49.6%
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. In an examination, a student who gets 20% of the maximum marks fails by 5 marks. Another student who scores 30% of the maximum marks gets 20 marks more than the pass marks. The necessary percentage required for passing is :
(1) 32% (2) 23%
(3) 22% (4) 20%
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

3. In an examination a candidate must secure 40% marks to pass. A candidate, who gets 220 marks, fails by 20 marks. What are the maximum marks for the examination?
(1) 1200 (2) 800
(3) 600 (4) 450
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

4. A student has to obtain 33% of total marks to pass. He got 25% of total marks and failed by 40 marks. The number of total marks is
(1) 800 (2) 300
(3) 500 (4) 1000
(SSC CPO S.I. Exam. 12.01.2003

5. Two students appeared at an examination. One of them secured 9 marks more than the other and his marks were 56% of the sum of their marks. The marks obtained by them are :
(1) 42, 33 (2) 43, 34
(3) 41, 32 (4) 39, 30
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

6. In the annual examination Mahuya got 10% less marks than Supriyo in Mathematics. Mahuya got 81 marks. The marks of Supriyo are
(1) 90 (2) 87
(3) 88 (4) 89
(SSC CHSL DEO & LDC Exam. 20.10.2013)

7. A student has to secure 40% marks to pass. He gets 90 marks and fails by 10 marks. Maximum marks are :
(1) 200 (2) 225
(3) 250 (4) 275
(SSC CPO S.I. Exam. 26.05.2005)

8. In an examination, 65% of the students passed in Mathematics, 48% passed in Physics and 30% passed in both. How much per cent of students failed in both the subjects ?
(1) 17% (2) 43%
(3) 13% (4) 47%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

9. 72% of the students of a certain class took Biology and 44% took Mathematics. If each student took at least one subject from Biology or Mathematics and 40 took both, then the total number of students in the class is :
(1) 200 (2) 240
(3) 250 (4) 320
(SSC CPO S.I. Exam. 16.12.2007)

10. In an examination, a student had to obtain 33% of the maximum marks to pass. He got 125 marks and failed by 40 marks. The maximum marks were
(1) 500 (2) 600
(3) 800 (4) 1000
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

11. For an examination it is required to get 36 % of maximum marks to pass. A student got 113 marks and failed by 85 marks. The maximum marks for the examination are :
(1) 500 (2) 550
(3) 565 (4) 620
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

12. A student scored 32% marks in science subjects out of 300. How much should he score in language papers out of 200 if he is to get overall 46% marks ?
(1) 72% (2) 67%
(3) 66% (4) 60%
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

13. In an examination in which full marks were 500, A got 10% less than B. B got 25% more than C. C got 20% less than D. If A got 360 marks, what percentage of full marks was obtained by D ?
(1) 90% (2) 80%
(3) 50% (4) 60%
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

14. In an examination, 1100 boys and 900 girls appeared. 50% of the boys and 40% of the girls passed the examination. The percentage of candidates who failed
(1) 45% (2) 45.5%
(3) 50% (4) 54·5%
(SSC Multi-Tasking (Non-Technical) Staff Exam. 22.02.2011)

15. In an examination 80% of the boys passed in English and 85% passed in Mathematics, while 75% passed in both. If 45 boys failed in both, the number of boys who sat for the examination was
(1) 400 (2) 450
(3) 200 (4) 150
(SSC CPO SI Exam. 09.11.2008) & (SSC Constable (GD) Exam.12.05.2013)

16. In a class 60% of the student pass in Hindi and 45% pass in Sanskrit. If 25% of them pass in atleast one subject, what percentage of the students fail in both the subjects ?
(1) 80% (2) 75%
(3) 20% (4) 25%
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

17. In an examination 60% of the students pass in English, 70% pass in Hindi and 40% pass in both. What percent of students fail in both English and Hindi?
(1) 10% (2) 20%
(3) 25% (4) 30%
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

18. In an examination 70% of the candidates passed in English. 80% passed in Mathematics. 10% failed in both the subjects. If 144 candidates passed in both, the total number of candidates were :
(1) 125 (2) 200
(3) 240 (4) 375
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

19. A candidate who gets 20% marks in an examination fails by 30 marks but another candidate who gets 32% gets 42 marks more than the passing marks. Then the percentage of pass marks is :
(1) 52% (2) 50%
(3) 33% (4) 25%
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

20. In an examination there were 640 boys and 360 girls. 60% of boys and 80% of girls were successful. The percentage of failure was :
(1) 20% (2) 60%
(3) 30.5% (4) 32.8%
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

21. In an examination 34% failed in Mathematics and 42% failed in English. If 20% failed in both the subjects, the percentage of students who passed in both subjects was
(1) 54% (2) 50%
(3) 44% (4) 56%
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

22. A candidate secured 30% marks in an examination and failed by 6 marks. Another secured 40% marks and got 6 marks more than the bare minimum to pass. The maximum marks are
(1) 150 (2) 120
(3) 100 (4) 180
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

23. In an examination, 52% students failed in Hindi and 42% in English. If 17% failed in both the subjects, what percentage of students passed in both the subjects ?
(1) 38% (2) 33%
(3) 23% (4) 18%
(SSC CGL Prelim Exam. 08.02.2004 (Ist Sitting) & (SSC SAS Exam. 26.06.2010 (Paper-I) & (SSC GL Tier-II Exam. 16.09.2012)

24. In a group of students, 70% can speak English and 65% can speak Hindi. If 27% of the students can speak none of the the two languages, then what per cent of the group can speak both the languages ?
(1) 38% (2) 62%
(3) 28% (4) 23%
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

25. 25% of the candidates who appeared in an examination failed to qualify and only 450 candidates qualified. The number of candidates, who appeared in the examination, was
(1) 700 (2) 600
(3) 550 (4) 500
(SSC CPO S.I. Exam. 05.09.2004)

26. In two successive years 100 and 75 students of a school appeared at the final examination. Respectively, 75% and 60% of them passed. The average rate of pass is
(1) $68\frac{4}{7}\%$ (2) 78%
(3) $80\frac{1}{2}\%$ (4) 80%
(SSC CPO S.I. Exam. 03.09.2006)

27. A student has to secure minimum 35% marks to pass in an examination. If he gets 200 marks and fails by 10 marks, then the maximum marks are
(1) 300 (2) 400
(3) 500 (4) 600
(SSC CPO S.I. Exam. 03.09.2006)

28. A candidate who scores 30 per cent fails by 5 marks, while another candidate who scores 40 per cent marks gets 10 more than minimum pass marks. The minimum marks required to pass are
(1) 50 (2) 70
(3) 100 (4) 150
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

29. In an examination, 60% of the candidates passed in English and 70% of the candidates passed in Mathematics, but 20% failed in both of these subjects. If 2500 candidates passed in both the subjects, the number of candidates who appeared at the examination was
(1) 3000 (2) 3500
(3) 4000 (4) 5000
(SSC CGL Prelim Exam. 04.02.2007) (First Sitting)

30. In a test a student got 30% marks and failed by 25 marks. In the same test another student got 40% marks and secured 25 marks more than the essential minimum pass marks. The maximum marks for the test were
(1) 400 (2) 480
(3) 500 (4) 580
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

31. In an examination 80% candidates passed in English and 85% candidates passed in Mathematics. If 73% candidates passed in both these subjects, then what per cent of candidates failed in both the subjects ?
(1) 8% (2) 15%
(3) 27% (4) 35%
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

32. In an examination, 35% of the candidates failed in Mathematics and 25% in English. If 10% failed in both Mathematics and English, then how much percent of candidates passed in both the subjects ?
(1) 50% (2) 55%
(3) 57% (4) 60%
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

33. In an examination, 93% of students passed and 259 failed. The total number of students appearing at the examination was
(1) 3700 (2) 3850
(3) 3950 (4) 4200
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

34. 90% of the students in a school passed in English, 85% passed in Mathematics and 150 students passed in both the subjects. If no student failed in both the subjects, find the total number of students.
(1) 120 (2) 220
(3) 200 (4) 300
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

35. Three sets of 40, 50 and 60 students appeared for an examination and the pass percentage was 100, 90 and 80 respectively. The pass percentage of the whole set is
(1) $88\frac{2}{3}\%$ (2) $84\frac{2}{3}\%$
(3) $88\frac{1}{3}\%$ (4) $84\frac{1}{3}\%$
(SSC Graduate Level Tier-II Exam. 29.09.2013)

36. In an examination A got 25% marks more than B, B got 10% less than C and C got 25% more than D. If D got 320 marks out of 500, the marks obtained by A were
(1) 405 (2) 450
(3) 360 (4) 400
(SSC Graduate Level Tier-II Exam. 29.09.2013

37. In two successive years, 80 and 60 students of a school appeared at the final examination of which 60% and 80% passed respectively. The average rate of students passed (in percent) is
(1) 68% (2) $68\frac{4}{7}\%$
(3) 70% (4) $72\frac{3}{7}\%$
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

38. In an examination, 19% students fail in Mathematics and 10% students fail in English. If 7% of all students fail in both subjects, then the number of students passed in both subjects is
(1) 36 % of all students
(2) 64% of all students
(3) 71% of all students
(4) 78% of all students
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

39. A class has two sections, which contain 20 and 30 students. The pass percentage of these sections are 80% and 60% respectively. The pass percentage of whole class is
(1) 60 (2) 68
(3) 70 (4) 78
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

40. In an examination 75% candidates passed in English and 60% passed in Mathematics. 25% failed in both and 240 passed the examination. Find the total number of candidates.
(1) 492 (2) 300
(3) 500 (4) 400
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

41. In a quarterly examination a student secured 30% marks and failed by 12 marks. In the same examination another student secured 40% marks and got 28 marks more than minimum marks to pass. The maximum marks in the examination is
(1) 300 (2) 500
(3) 700 (4) 400
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

42. In an examination there are three subjects of 100 marks each. A student scores 60% in the first subject and 80% in the second subject. He scored 70% in aggregate. His percentage of marks in the third subject is
(1) 80 (2) 60
(3) 65 (4) 70
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

43. In an examination, a student must get 36% marks to pass. A student who gets 190 marks failed by 35 marks. The total marks in that examination is
(1) 450 (2) 810
(3) 500 (4) 625
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

44. A candidate who gest 20% marks in an examination, fails by 30 marks. But if he gets 32% marks, he gets 42 marks more than the minimum pass marks. Find the pass percentage of marks.
(1) 52% (2) 20%
(3) 25% (4) 12%
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

45. In an examination 73% of the candidates passed in quantitative aptitude test, 70% passed in General awareness and 64% passed in both. If 6300 failed in both subjects the total number of examinees was
(1) 60000 (2) 50000
(3) 30000 (4) 25000
(SSC CGL Tier-II Online Exam.01.12.2016)

46. In a certain school, 10% of the students have less than 75% attendance and are not allowed to sit in the exam, but 20% of the students who have less than 75% attendance are allowed to sit in the exam. What percent of the students in the school have less than 75% attendance ?
(1) 30% (2) 12.5%
(3) 15% (4) 10.5%
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

47. There are 1400 students in a school, 25% of them wear spectacles and $\frac{2}{7}$ of them wearing spectacles are boys. How many girls in the school do wear spectacles ?
(1) 250 (2) 100
(3) 200 (4) 300
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

48. If 60% of the students in a school are boys and the number of girls is 812, how many boys are there in the school?
(1) 1128 (2) 1218
(3) 1821 (4) 1281
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

49. A scored 72% in a paper with a maximum marks of 900 and 80% in another paper with a maximum marks of 700. If the result is based on the combined percentage of two papers, the combined percentage is
(1) 75.5% (2) 76%
(3) 76.5% (4) 77%
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

50. In an examination, 35% of total students failed in Hindi, 45% failed in English and 20% failed in both. Find the percentage of those students who passed in both the subjects ?
(1) 45% (2) 35%
(3) 20% (4) 40%
(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

51. The average marks obtained in a class of 50 students is 70%. The average of first 25 is 60% and that of 24 is 80%. What is the marks obtained by the last student?
(1) 90% (2) 60%
(3) 80% (4) 70%
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

52. Two students appeared for an examination. One of them secured 9 marks more than the other and his marks were 56% of the sum of their marks. The marks obtained by them are
(1) 40 and 31 (2) 72 and 63
(3) 42 and 33 (4) 68 and 59
(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

53. An engineering student has to secure 25% marks to pass. He gets 47 and fails by 43 marks. What are the maximum marks of the examination ?
(1) 385 marks (2) 410 marks
(3) 360 marks (4) 435 marks
(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

54. An examinee has to secure 40% marks to pass an examination. He secures 180 marks and fails by an equal number of marks. The total number of marks in the examination is
(1) 900 (2) 1000
(3) 1050 (4) 800
(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE–VIII

1. Salary of a person is first increased by 20%, then it is decreased by 20%. Percentage change in his salary is :
(1) 4% decreased
(2) 4% increased
(3) 8% decreased
(4) 20% increased
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. A number is increased by 20% and then it is decreased by 10%. Find the net increase or decrease per cent.
(1) 10% increase
(2) 10% decrease
(3) 8% increase
(4) 8% decrease
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

3. The tax imposed on an article is decreased by 10% and its consumption increases by 10%. Find the percentage change in revenue from it.
(1) 10% increase (2) 2% decrease
(3) 1% decrease (4) 11% increase
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

4. The price of an article was decreased by 10% and again reduced by 10%. By what per cent should the price have been reduced once, in order to produce the same effect as these two successive reductions ?
(1) 15% (2) 19%
(3) 20% (4) 25%
(SSC CPO S.I. Exam. 12.01.2003

5. If price of a book is first decreased by 25% and then increased by 20%, the net change in the price of the book will be
(1) 10% decrease
(2) 5% decrease
(3) no change
(4) 5% increase
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

6. The price of an article is reduced by 25% but the daily sale of the article is increased by 30%. The net effect on the daily sale receipts is
(1) $2\frac{1}{2}$% increase
(2) $2\frac{1}{2}$% decrease
(3) 2 % increase
(4) 2% decrease
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

7. Two successive price increases of 10% and 10% of an article are equivalent to a single price increase of
(1) 19% (2) 20%
(3) 21% (4) 22%
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

8. The price of an article was first increased by 10% and then again by 20%. If the last increased price be ₹ 33, the original price was
(1) ₹ 30 (2) ₹ 27.50
(3) ₹ 26.50 (4) ₹ 25
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

9. If a number is increased by 20% and the resulting number is again increased by 20%, what per cent is the total increase ?
(1) 48% (2) 44%
(3) 41% (4) 40%
(SSC SAS Exam 26.06.2010 (Paper-1)

10. A number is increased by 10% and then it is decreased by 10%. The net change in the number is
(1) no increase or decrease
(2) 2% decrease
(3) 1% increase
(4) 1% decrease
(SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting) & (SSC (South Zone) Investigator Exam. 12.09.2010) & CHSL DEO & LDC Exam. 04.11.2012)

11. A number is first increased by 10% and then it is further increased by 20%. The original number is increased altogether by
(1) 30% (2) 15%
(3) 32% (4) 36%
(SSC CGL Exam. 04.02.2007 (Ist Sitting) & (FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

12. When the price of an article was reduced by 20% its sale increased by 80%. What was the net effect on the sale?
(1) 44% increase
(2) 44% decrease
(3) 66% increase
(4) 75% increase
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

13. The length of a rectangle is increased by 10% and breadth decreased by 10% Then the area of the new rectangle is
(1) neither decreased nor increased
(2) increased by 1%
(3) decreased by 1%
(4) decreased by 10%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

14. When the price of cloth was reduced by 25%, the quantity of cloth sold increased by 20%. What was the effect on gross receipt of the shop?
(1) 5% increase (2) 5% decrease
(3) 10% increase (4) 10% decrease
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

15. The cost of an article worth ₹ 100 is increased by 10% first and again increased by 10%. The total increase in rupees is
(1) 20 (2) 21
(3) 110 (4) 121
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

16. The numerator of a fraction is increased by 20% and denominator is decreased by 20%. The value of the fraction becomes $\frac{4}{5}$. The original fraction is
(1) $\frac{2}{3}$ (2) $\frac{8}{15}$
(3) $\frac{7}{11}$ (4) $\frac{4}{5}$
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

17. If the numerator of a fraction is increased by 20% and the denominator is decreased by 5%, the value of the new fraction becomes $\frac{5}{2}$. The original fraction is
(1) $\frac{24}{19}$ (2) $\frac{3}{18}$
(3) $\frac{95}{48}$ (4) $\frac{48}{95}$
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

18. If a number is increased by 25% and the resulting number is decreased by 25%. then the percentage increase or decrease finally is
(1) no change
(2) decreased by $6\frac{1}{4}\%$
(3) increased by $6\frac{1}{4}\%$
(4) increased by 6%
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

19. The sum of two numbers is 520. If the bigger number is decreased by 4% and the smaller number is increased by 12%, then the numbers obtained are equal. The smaller number is
(1) 280 (2) 210
(3) 240 (4) 300
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

20. The price of an article is first decreased by 20% and then increased by 30%. If the resulting price is ₹ 416, the original price of the article is
(1) ₹ 350 (2) ₹ 405
(3) ₹ 400 (4) ₹ 450
(SSC Graduate Level Tier-I Exam. 19.05.2013)

21. A number increased by $22\frac{1}{2}\%$ gives 98. The number is
(1) 45 (2) 18
(3) 80 (4) 81
(SSC Graduate Level Tier-II Exam. 29.09.2013)

22. The price of an article is decreased by 10%. To restore its former value the new price must be increased by :
(1) 10% (2) 11%
(3) $9\frac{1}{11}\%$ (4) $11\frac{1}{9}\%$
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

23. A number reduced by 25% becomes 225. What per cent should it be increased so that it becomes 375?
(1) 25% (2) 30%
(3) 35% (4) 75%
(SSC CPO S.I. Exam. 05.09.2004)

24. A number is increased by 20% and then again by 20%. By what per cent should the increased number be reduced so as to get back the original number ?
(1) $30\frac{5}{9}\%$ (2) $19\frac{11}{31}\%$
(3) 40% (4) 44%
(SSC CGL Prelim Exam. 08.02.2004) (First Sitting)

25. The number of employees working in a farm is increased by 25% and the wages per head are decreased by 25%. If it results in x % decrease in total wages, then the value of x is
(1) 0% (2) 25%
(3) 20% (4) $\frac{25}{4}\%$
(SSC CGL Prelim Exam. 08.02.2004) (Second Sitting)

26. A number is first decreased by 10% and then increased by 10%. The number so obtained is 50 less than the original number. The original number is
(1) 5900 (2) 5000
(3) 5500 (4) 5050
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

27. If the income tax is increased by 19%, the net income is reduced by 1%. The rate of income tax is
(1) 6% (2) 4%
(3) 5% (4) 7.2%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

28. A man spends 75% of his income. His income increases by 20% and his expenditure also increases by 10%. The percentage of increase in his savings is
(1) 40% (2) 30%
(3) 50% (4) 25%
(SSC CGL Tier-I Exam. 19.10.2014)

29. If each side of a cube is increased by 10% the volume of the cube will increase by
(1) 30% (2) 10%
(3) 33.1% (4) 25%
(SSC CGL Tier-II Exam. 21.09.2014)

30. The strength of a school increases and decreases in every alternate year by 10%. It started with increase in 2000. Then the strength of the school in 2003 as compared to that in 2000 was
(1) increased by 8.9%
(2) decreased by 8.9%
(3) increased by 9.8%
(4) decreased by 9.8%
(SSC CGL Tier-II Exam. 21.09.2014)

31. The difference between the value of the number increased by 20% and the value of the number decreased by 25% is 36. Find the number.
(1) 7.2 (2) 0.8
(3) 720 (4) 80
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

32. A number is first decreased by 20%. The decreased number is then increased by 20%. The resulting number is less than the original number by 20. Then the original number is
(1) 200 (2) 400
(3) 500 (4) 600
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

33. A number is increased by x%; to get back to the original number, it is to be reduced by

(1) x% (2) $\frac{100x}{100+x}$%

(3) $\frac{10x}{100+x}$% (4) $\frac{x}{100+x}$%

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) (TF No. 8037731)

34. A number is decreased by 10% and the resulting number is again decreased by 20%. What is the final percentage of decrease?

(1) 25% (2) 26%
(3) 27% (4) 28%

(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

35. The price of an edible oil is increased by 25%. To maintain the budget, Sushma reduces the consumption of this oil by 20%. The increase in expenditure due to this edible oil is:

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

TYPE–IX

1. 8% of the voters in an election did not cast their votes. In this election, there were only two candidates. The winner by obtaining 48% of the total votes defeated his contestant by 1100 votes. The total number of voters in the election was :

(1) 21000 (2) 23500
(3) 22000 (4) 27500

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

2. In an election between two candidates, 75% of the voters cast their votes, out of which 2% votes were declared invalid. A candidate got 9261 votes which were 75% of the valid votes. The total number of voters enrolled in that election was

(1) 16000 (2) 16400
(3) 16800 (4) 18000

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

3. In an election between two candidates, the candidate getting 60% of the votes polled, is elected by a majority of 14,000 votes. The number of votes polled by the winning candidate is

(1) 28,000 (2) 32,000
(3) 42,000 (4) 46,000

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

4. In an office 40% of the staff is female, 40% of the females and 60% of the males voted for me. The percentage of votes I got was

(1) 24% (2) 42%
(3) 50% (4) 52%

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

5. In an election there were only two candidates. One of the candidates secured 40% of votes and is defeated by the other candidate by 298 votes. The total number of votes polled is

(1) 745 (2) 1460
(3) 1490 (4) 1500

(SSC Graduate Level Tier-II Exam.16.09.2012)

6. In an assembly election, a candidate got 55% of the total valid votes. 2% of the total votes were declared invalid. If the total number of voters is 104000, then the number of valid votes polled in favour of the candidate is:

(1) 56506 (2) 56650
(3) 56560 (4) 56056

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

7. Two candidates contested in an election. One got 60% of the votes and won by 1600 votes. What is the number of votes polled ?

(1) 9000 (2) 8000
(3) 10000 (4) 7500

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

8. In an election, three candidates contested. The first candidate got 40% votes and the second got 36% votes. If total number of votes polled were 36000, find the number of votes got by the 3rd candidate.

(1) 8040 (2) 8640
(3) 9360 (4) 9640

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

9. Two persons contested an election of Parliament. The winning candidate secured 57% of the total votes polled and won by a majority of 42,000 votes. The number of total votes polled is

(1) 5,00,000 (2) 6,00,000
(3) 3,00,000 (4) 4,00,000

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

10. In an election, a candidate who gets 84 % of the votes is elected by a majority of 476 votes. What is the total number of votes polled ?

(1) 900 (2) 810
(3) 600 (4) 700

(SSC CGL Tier-I Exam. 26.10.2014)

11. At an election there were two candidates. A candidate got 38% of votes and lost by 7200 number of votes. The total number of valid votes were

(1) 13000 (2) 13800
(3) 16200 (4) 30000

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

12. In a college election a candidate secured 62% of the votes and is elected by a margin of 144 votes. The total number of votes polled is :

(1) 925 (2) 600
(3) 1200 (4) 800

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

13. In an election 10% of the voters on the voters' list did not cast their votes and 60 voters cast their ballot papers blank. There were only two candidates. The winner was supported by 47% of all the voters in the list and he got 308 votes more than his rival. The number of voters on the list was

(1) 3600 (2) 6200
(3) 4575 (4) 6028

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

14. In an election, a candidate secures 40% of the votes but is defeated by the only other candidate by a majority of 298 votes. Find the total number of votes recorded.

(1) 1580 (2) 1490
(3) 1470 (4) 1530

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

TYPE–X

1. The present population of a city is 180000. If it increases at the rate of 10% per annum, its population after 2 years will be :
(1) 207800 (2) 227800
(3) 217800 (4) 237800
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

2. The value of an equipment depreciates by 20% each year. How much less will the value of the equipment be after 3 years ?
(1) 48.8% (2) 51.2%
(3) 54% (4) 60%
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

3. A district has 64000 inhabitants. If the population increases at the rate of $2\frac{1}{2}\%$ per annum, the number of inhabitants at the end of 3 years will be
(1) 70000 (2) 69200
(3) 68921 (4) 68911
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

4. The value of a property depreciates every year by 10% of its value at the beginning of the year. The present value of the property is ₹ 8100. What was its value 2 years ago ?
(1) ₹ 10,000
(2) ₹ $\left(\frac{90}{100}\right)^2 \times 8100$
(3) ₹ $\left(\frac{100}{110}\right)^2 \times 8100$
(4) ₹ 9801
(SSC CPO S.I. Exam. 07.09.2003)

5. The population of a town 2 years ago was 62,500. Due to migration to big cities, it decreases every year at the rate of 4%. The present population of the town is:
(1) 57,600 (2) 56,700
(3) 76,000 (4) 75,000
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

6. The population of a town increases every year by 4%. If its present population is 50,000, then after 2 years it will be
(1) 53,900 (2) 54,000
(3) 54,080 (4) 54,900
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

7. A man received ₹ 8,80,000 as his annual salary of the year 2007 which was 10% more than his annual salary in 2006. His annual salary in the year 2006 was
(1) ₹ 4,80,000 (2) ₹ 8,00,000
(3) ₹ 4,00,000 (4) ₹ 8,40,000
(SSC Data Entry Operator Exam. 02.08.2009)

8. Present population of a village is 67600. It has been increasing annually at the rate of 4%. What was the population of the village two years ago ?
(1) 62500 (2) 63000
(3) 64756 (4) 65200
(SSC CHSL DEO & LDC Exam. 27.11.2010)

9. The value of a machine depreciates by 5% every year. If its present value is ₹ 2,00,000, its value after 2 years will be
(1) ₹ 1,80,500 (2) ₹ 1,99,000
(3) ₹ 1,80,000 (4) ₹ 2,10,000
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

10. The value of a property decreases every year at the rate of 5%. If its present value is ₹ 4,11,540, what was its value 3 years ago ?
(1) ₹ 4,50,000 (2) ₹ 4,60,000
(3) ₹ 4,75,000 (4) ₹ 4,80,000
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

11. If the population of a town is 64000 and its annual increase is 10%, then its correct population at the end of 3 years will be :
(1) 80000 (2) 85184
(3) 85000 (4) 85100
(SSC (CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

12. The population of a village decreases at the rate of 20% per annum. If its population 2 years ago was 10,000, the present population is
(1) 4600 (2) 6400
(3) 7600 (4) 6000
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

13. If a man receives on one-fourth of his capital 3% interest, on two third 5% and on the remainder 11%, the percentage he receives on the whole is
(1) 4.5 (2) 5
(3) 5.5 (4) 5.2
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

14. The value of a machine is ₹ 6,250. It decreases by 10% during the first year, 20% during the second year and 30% during the third year. What will be the value of the machine after 3 years?
(1) ₹ 2,650 (2) ₹ 3,050
(3) ₹ 3,150 (4) ₹ 3,510
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

15. The value of a machine depreciates every year by 10%. If its present value is ₹ 50,000 then the value of the machine after 2 years is _____.
(1) ₹ 40,050 (2) ₹ 45,000
(3) ₹ 40,005 (4) ₹ 40,500
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

16. The value of a machine depreciates every year at the rate of 10% on its value at the beginning of that year. If the current value of the machine is ₹ 729, its worth 3years ago was:
(1) ₹1000 (2) ₹ 750.87
(3) ₹ 947.10 (4) ₹ 800
(SSC Graduate Level Tier-I Exam. 21.04.2013)

17. Raman's salary is increased by 5% this year. If his present salary is ₹ 1,806, the last year's salary was
(1) ₹ 1720 (2) ₹ 1620
(3) ₹1520 (4) ₹ 1801
(SSC Constable (GD) Exam. 12.05.2013)

18. In a town, the population was 8000. In one year, male population increased by 10% and female population increased by 8% but the total population increased by 9%. The number of males in the town was :
(1) 4000 (2) 4500
(3) 5000 (4) 6000
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

19. The population of a village was 9800. In a year, with the increase in population of males by 8% and that of females by 5%, the population of the village became 10458. What was the number of males in the village before increase ?
(1) 4200 (2) 4410
(3) 5600 (4) 6048
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

20. The population of a village has increased annually at the rate of 25%. If at the end of 3 years it is 10,000, the population in the beginning of the first year was
(1) 5120 (2) 5000
(3) 4900 (4) 4500
(SSC CPO S.I. Exam. 07.09.2003)

21. If population of women in a village is 90% of population of men, what is the population of men as a percentage of population of women ?
(1) 100% (2) 105%
(3) 108% (4) 111%
(SSC CISF Constable (GD) Exam. 05.06.2011)

22. The population of a town increases each year by 4% of its total at the beginning of the year. If the population on 1st January 2001 was 500000, what was it on 1st January, 2004 ?
(1) 562432 (2) 652432
(3) 465223 (4) 564232
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

23. The population of a village increases by 5% annually. If its present population is 4410, then its population 2 years ago was
(1) 4500 (2) 4000
(3) 3800 (4) 3500
(SSC CHSL DEO & LDC Exam. 9.11.2014)

24. A TV was bought at a price of ₹ 21,000. After one year the value of TV was depreciated by 5%. Find the value of the TV after one year.
(1) ₹ 19,950 (2) ₹ 20,950
(3) ₹ 18,950 (4) ₹ 17,950
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

25. From 1980-1990, the population of a country increased by 20%. From 1990-2000, the population of the country increased by 20%. From 2000-2010, the population of the country increased by 20%. Then the overall increased population (in percentage) of the country from 1980-2010 was
(1) 72.2 % (2) 60 %
(3) 72.8 % (4) 62.8 %
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

26. Of the 1000 inhabitants in a town 60% are males of whom 20% are literate. If of all the inhabitants, 25% are literate, then what percentage of the females of the town are ilterate ?
(1) 27.5 (2) 32.5
(3) 37.5 (4) 22.5
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

27. In a factory, the production of cycles rose to 48, 400 from 40,000 in 2 years. The rate of growth per annum is
(1) 9% (2) 8%
(3) 10.5% (4) 10%
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

28. The present price of a scooter is Rs. 7,290. If its value decreases every year by 10%, then its value 3 years back was
(1) Rs. 10, 500 (2) Rs. 8,000
(3) Rs. 10,000 (4) Rs. 11,500
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

29. The population of a town increases by 5% every year. If the present population is 9261, the population 3 years ago was
(1) 8000 (2) 5700
(3) 6000 (4) 7500
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

30. An epidemic broke out in a village in which 5% of the population died. Of the remaining, 20% fled out of panic. If the present population is 4655, then the population of the village originally was
(1) 6000 (2) 6125
(3) 5955 (4) 5995
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

31. The population of a town is 9000. It the number of females increases by 5% and the males by 7.5%, what will be the total population after increase. The number of females currently is 3000.
(1) 9600 (2) 9200
(3) 10500 (4) 9540
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

32. In a city, 40% of the people are illiterate and 60% are poor. Among the rich, 10% are illiterate. The percentage of the illiterate poor population is
(1) 36 (2) 60
(3) 40 (4) 50
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

33. The population of a city is 20000. It increases by 20% during the first year and 30% during the second year. The population after two years will be:
(1) 32000 (2) 40000
(3) 31200 (4) 30000
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

34. In a village panchayat society 574 names are enlisted as 'below poverty level'. If 14% of the villagers are below poverty level, the total number of villagers is
(1) 4100 (2) 4200
(3) 4000 (4) 3800
(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

TYPE–XI

1. The Government reduced the price of sugar by 10 per cent. By this a consumer can buy 6.2 kg more sugar for ₹ 837. The reduced price per kg of sugar is
(1) ₹ 12.50 (2) ₹ 13.00
(3) ₹ 13.50 (4) ₹ 14.00
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

2. The price of sugar is reduced by 20%. Now a person can buy 500g more sugar for ₹ 36. The original price of the sugar per kilogram was
(1) ₹ 14.40 (2) ₹ 18
(3) ₹ 15.60 (4) ₹ 16.50
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

3. A reduction of 10% in the price of sugar enables a housewife to buy 6.2 kg more for ₹ 1116. The reduced price per kg is
(1) ₹ 12 (2) ₹ 14
(3) ₹ 16 (4) ₹ 18
(SSC CPO S.I. Exam. 06.09.2009)

4. When the price of sugar decreases by 10%, a man could buy 1 kg more for ₹ 270. Then the original price of sugar per kg is
(1) ₹ 25 (2) ₹ 30
(3) ₹ 27 (4) ₹ 32
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

5. A reduction of 20% in the price of an apple enables a man to buy 10 apples more for ₹ 54. The reduced price of apples per dozen is
(1) ₹ 4.32 (2) ₹ 12.96
(3) ₹ 10.80 (4) ₹ 14.40
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

6. Due to an increase of 50% in the price of eggs, 4 eggs less are available for ₹ 24. The present rate of eggs per dozen is :
(1) ₹ 24 (2) ₹ 27
(3) ₹ 36 (4) ₹ 42
(SSC CHSL DEO & LDC Exam. 27.11.2010)

7. A reduction of 20% in the price of wheat enables Lalita to buy 5 kg more wheat for ₹ 320. The original rate (in rupees per kg) of wheat was
(1) 16 (2) 18
(3) 20 (4) 21
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

8. Due to an increase of 20% in the price of eggs, 2 eggs less are available for ₹ 24. The present rate of eggs per dozen is :
(1) ₹ 25.00 (2) ₹ 26.20
(3) ₹ 27.80 (4) ₹ 28.80
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

9. A reduction of 25% in the price of rice enables a person to buy 10 kg more rice for ₹ 600. The reduced per kg price of rice is
(1) ₹ 30 (2) ₹ 25
(3) ₹ 20 (4) ₹ 15
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

10. A reduction in the price of apples enables a person to purchase 3 apples for ₹ 1 instead of ₹1.25. What is the % of reduction in price (approximately) ?
(1) 20% (2) 25%
(3) 30% (4) $33\frac{1}{3}$%
(SSC Graduate Level Tier-I Exam. 21.04.2013)

11. A number, on subtracting 15 from it, reduces to its 80%. What is 40% of the number?
(1) 75 (2) 60
(3) 30 (4) 90
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

12. A reduction of 21% in the price of an item enables a person to buy 3 kg more for ₹ 100. The reduced price of item per kg is
(1) ₹ 5.50 (2) ₹ 7.50
(3) ₹ 10.50 (4) ₹ 7.00
(SSC CGL Tier-II Exam. 21.09.2014)

13. A reduction of 20% in the price of sugar enables a purchaser to obtain 8 kg more for Rs. 160. Then the price per kg before reduction was
(1) Rs. 5 (2) Rs. 6
(3) Rs. 10 (4) Rs. 4
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

14. The price of an item was increased by 10%. This reduced the monthly total sales by 20%. The overall effect on the value of monthly sales is a
(1) 10% increase
(2) 10% decrease
(3) 12% increase
(4) 12% decrease
(SSC CGL Tier-I Re-Exam, 30.08.2015)

15. The price of rice has increased by 60%. In order to restore the original price, the new price must be reduced by
(1) $33\frac{1}{3}$% (2) $37\frac{1}{2}$%
(3) 40% (4) 45%
(SSC CGL Tier-I (CBE) Exam.10.09.2016)

16. If the price of sugar increases by 20%, one can buy 2 kg less for Rs. 50. What is the amount of sugar that could be bought before price hike?
(1) 10 kg. (2) 12 kg.
(3) 14 kg. (4) 16 kg.
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

17. The price of an article is decreased by 10%. To restore it to its former value, the new price must be increased by :
(1) $9\frac{1}{11}$% (2) 10%
(3) 11% (4) $11\frac{1}{9}$%
(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

18. The salary of a person is reduced by 20%. To restore the previous salary, his present salary is to be increased by
(1) 20% (2) 25%
(3) 17.5% (4) 22.5%
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

19. Due to a price hike of 20%, 4 kg. less sugar is available for Rs. 120. What is the initial price per kg of sugar ?
(1) Rs. 5 per kg.
(2) Rs. 4 per kg.
(3) Rs. 6 per kg.
(4) Rs. 5.5 per kg.
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

20. In 2001, the price of a building was 80% of its original price. In 2002, the price was 60% of its original price. By what percent did the price decrease ?
(1) 15% (2) 20%
(3) 25% (4) 30%
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

TYPE–XII

1. In a school 70% of the students are girls. The number of boys are 510. Then the total number of students in the school is :
(1) 850 (2) 1700
(3) 1830 (4) 1900
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If 60% of the students in a school are boys and the number of girls is 972, how many boys are there in the school ?
(1) 1258 (2) 1458
(3) 1324 (4) 1624
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. If 70% of the students in a school are boys and the number of girls be 504, the number of boys is :
(1) 1176 (2) 1008
(3) 1208 (4) 3024
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. If the sales tax on a television set increases from $7\frac{1}{2}$% to 8%, what more amount will have to be paid for the television whose price (excluding sales taxes) is ₹ 19000 ?
(1) ₹ 190 (2) ₹ 95
(3) ₹ 180 (4) ₹ 90
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

5. A spider climbed $62\frac{1}{2}\%$ of the height of the pole in one hour and in the next hour it covered $12\frac{1}{2}\%$ of the remaining height. If pole's height is 192 m, then distance climbed in second hour is
(1) 3 m (2) 5 m
(3) 7 m (4) 9 m
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

6. Fresh fruit contains 68% water and dry fruit contains 20% water. How much dry fruit can be obtained from 100 kgs of fresh fruits ?
(1) 32 kgs. (2) 40 kgs.
(3) 52 kgs. (4) 80 kgs.
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

7. An individual pays 30% income tax. On this tax he has to pay a surcharge of 10%. Thus, the net tax rate, he has to pay, is
(1) 45% (2) 40%
(3) 33% (4) 27%
(SSC CPO S.I. Exam. 05.09.2004)

8. X has twice as much money as that of Y and Y has 50% more money than that of Z. If the average money of all of them is ₹ 110, then the money, which X has, is
(1) ₹ 55 (2) ₹ 60
(3) ₹ 90 (4) ₹ 180
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

9. p is six times as large as q. The per cent that q is less than p, is
(1) $83\frac{1}{3}\%$ (2) 70%
(3) $63\frac{1}{3}\%$ (4) 50%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

10. In the expression xy^2, the values of both variables x and y are decreased by 20%. By this, the value of the expression is decreased by
(1) 40% (2) 80%
(3) 48.8% (4) 51.2%
(SSC CPO S.I. Exam. 16.12.2007)

11. Two numbers are respectively 10% and 25% more than a third number. What per cent is the first of the second ?
(1) 88% (2) 65%
(3) 75% (4) 80%
(SSC CPO S.I. Exam. 06.09.2009)

12. A boy who was asked to find $3\frac{1}{2}\%$ of a sum of money misread the question and found $5\frac{1}{2}\%$ of it. His answer was ₹ 220. What would have been the correct answer ?
(1) ₹ 120 (2) ₹ 140
(3) ₹ 160 (4) ₹ 150
(SSC CPO S.I. Exam. 06.09.2009)

13. In a factory 60% of the workers are above 30 years and of these 75% are males and the rest are females. If there are 1350 male workers above 30 years, the total number of workers in the factory is
(1) 3000 (2) 2000
(3) 1800 (4) 1500
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

14. First and second numbers are less than a third number by 30% and 37% respectively. The second number is less than the first by
(1) 7% (2) 4%
(3) 3% (4) 10%
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

15. Rani's weight is 25% that of Meena's and 40% that of Tara's. What percentage of Tara's weight is equal to Meena's weight?
(1) 160% (2) 140%
(3) 120% (4) 100%
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

16. Out of 2500 people, only 60% have the saving habit. If 30% save with bank, 32% with post office and the rest with shares, the number of shareholders are
(1) 450 (2) 570
(3) 950 (4) 1250
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

17. The value of a commodity depreciates 10% annually. If it was purchased 3 years ago and its present value is ₹ 5,832, what was its purchase price ?
(1) ₹ 7200 (2) ₹ 7862
(3) ₹ 8000 (4) ₹ 8500
(SSC CPO S.I. Exam. 09.11.2008)

18. A and B are two fixed points 5 cm apart and C is a point on AB such that AC is 3 cm. If the length of AC is increased by 6%, the length of CB is decreased by
(1) 6% (2) 7%
(3) 8% (4) 9%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

19. If 24-carat gold is considered to be hundred per cent pure gold, then the percentage of pure gold in 22-carat gold is :
(1) $91\frac{3}{4}\%$ (2) $91\frac{2}{3}\%$
(3) $91\frac{1}{3}\%$ (4) $90\frac{2}{3}\%$
(SSC CHSL DEO & LDC Exam. 27.11.2010)

20. In a class, the average score of girls in an examination is 73 and that of boys is 71. The average score for the whole class is 71.8. Find the percentage of girls.
(1) 40% (2) 50%
(3) 55% (4) 60%
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

21. Shelf A has $\frac{4}{5}$ of the number of books that shelf B has. If 25% of the books in A are transferred to B and then 25% of the books from B are transferred to A, then the percentage of the total number of books that A will have is
(1) 25% (2) 50%
(3) 75% (4) 100%
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

22. Tickets for all but 100 seats in a 10,000 seat stadium were sold. Of the tickets sold, 20% were sold at half price and the remaining tickets were sold at the full price of ₹ 20. The total revenue from the ticket sales, in ₹ was
(1) 158400 (2) 178200
(3) 180000 (4) 198000
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

23. Neha's weight is 140% of Tina's weight. Mina's weight is 90% of Lina's weight. Lina weighs twice as much as Tina. If Neha's weight is x% of Mina's weight, then x is equal to :

(1) $64\frac{2}{9}$ (2) $77\frac{7}{9}$

(3) 90 (4) $128\frac{4}{7}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

24. The number of seats in a cinema hall is increased by 25%. The cost of each ticket is also increased by 10%. The effect of these changes on the revenue collection will be an increase of

(1) 37.5% (2) 45.5%
(3) 47.5% (4) 49.5%

(SSC Data Entry Operator Exam. 31.08.2008)

25. A man had a certain amount with him. He spent 20% of that to buy an article and 5% of the remaining on transport. Then he gifted ₹ 120. If he is left with ₹1,400, the amount he spent on transport is

(1) ₹ 76 (2) ₹ 61
(3) ₹ 95 (4) ₹ 80

(SSC Graduate Level Tier-II Exam.16.09.2012)

26. 31% of employees pay tax in the year 2008. Non-tax paying employees are 20,700. The total number of employees are :

(1) 31,160 (2) 64,750
(3) 30,000 (4) 66,775

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

27. A fruit seller had some apples. He sells 40% apples and still has 420 apples. Originally, he had :

(1) 588 apples (2) 600 apples
(3) 672 apples (4) 700 apples

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

28. Two numbers are more than the third number by 20% and 50% respectively. First number is what per cent of the second number ?

(1) 100% (2) 150%
(3) 80% (4) 120%

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC Data Entry Operator Exam. 02.08.2009)

29. A batsman scored 110 runs which included 3 boundaries and 8 sixes. What per cent of his total score, did he make by running between the wickets ?

(1) 45% (2) $45\frac{5}{11}$%

(3) $54\frac{6}{11}$% (4) 55%

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

30. The price of an article was increased by r%. Later the new price was decreased by r%. If the latest price was ₹1, then the original price was :

(1) ₹1 (2) ₹ $\frac{1-r^2}{100}$

(3) ₹ $\frac{\sqrt{1-r^2}}{100}$ (4) ₹ $\left(\frac{10000}{10000-r^2}\right)$

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

31. If a number x is 10% less than another number y and y is 10% more than 125, then x is equal to

(1) 150 (2) 143
(3) 140.55 (4) 123.75

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

32. An interval of 3 hours 40 minutes is wrongly estimated as 3 hours 45.5 minutes. The error percentage is

(1) 5.5% (2) 5.2%
(3) 5% (4) 2.5%

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

33. In a village, each of the 60% of families has a cow; each of the 30% of families has a buffalo and each of the 15% of families has both a cow and buffalo. In all there are 96 families in the village. How many families do not have a cow or a buffalo ?

(1) 20 (2) 24
(3) 26 (4) 28

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

34. A man invests a part of ₹ 10,000 at 5% and the remainder at 6%. The 5% investment yields annually ₹ 76.50 more than the 6% investment . The amount invested at 6% is

(1) ₹ 3,600 (2) ₹ 3,550
(3) ₹ 3,850 (4) ₹ 4,000

(SSC CPO S.I. Exam. 09.11.2008)

35. For every set of 19 kites sold, a vendor gives 1 kite extra, free of cost. In order to give a discount of 10%, the number of extra kites he should give in a sale of 27 kites to the nearest integer is

(1) 3 (2) 6
(3) 7 (4) 8

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

36. A number is divided into two parts in such a way that 80% of 1st part is 3 more than 60% of 2nd part and 80% of 2nd part is 6 more than 90% of the 1st part. Then the number is

(1) 125 (2) 130
(3) 135 (4) 145

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

37. A man invested ₹ 27,000 in $12\frac{1}{2}$% stock at 108, then his yield percentage is

(1) $18\frac{3}{4}$% (2) $11\frac{31}{54}$%

(3) 15% (4) $8\frac{1}{2}$%

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

38. The percentage of metals in a mine of lead ore is 60%. Now the percentage of silver is $\frac{3}{4}$% of metals and the rest is lead. If the mass of ore extracted from this mine is 8000 kg, the mass (in kg.) of lead is :

(1) 4763 (2) 4762
(3) 4764 (4) 4761

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

39. The sum of two positive numbers is 20% of the sum of their squares and 25% of the difference of their squares. If the numbers are x and y then, $\frac{x+y}{x^2}$ is equal to

(1) $\frac{1}{4}$ (2) $\frac{3}{8}$

(3) $\frac{1}{3}$ (4) $\frac{2}{9}$

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

40. A man bought some eggs of which 10% are rotten. He gives 80% of the remainder to his neighbours. Now he is left out with 36 eggs. How many eggs he bought ?

(1) 40 (2) 100
(3) 200 (4) 72

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

41. A man gives 50% of his money to his son and 30% to his daughter. 80% of the rest is donated to a trust. If he is left with Rs. 16,000 now, how much money did he have in the beginning?
(1) Rs. 40,000 (2) Rs. 8,00,000
(3) Rs. 80,000 (4) Rs. 4,00,000
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

42. A businessman's earning increases by 25% in one year but decreases by 4% in the next year. Going by this pattern, after 5 years, his total earnings would be Rs.72000. What is his present earning ?
(1) Rs. 10000 (2) Rs. 80000
(3) Rs. 40000 (4) Rs. 54000
(SSC CGL Tier-II Online Exam.01.12.2016)

43. The red blood cells in a blood sample grows by 10% per hour in first two hours, decreases by 10% in next one hour, remains constant in next one hour and again increases by 5% per hour in next two hours. If the original count of the red blood cells in the sample is 40000, find the **approximate** red blood cell count at the end of 6 hours.
(1) 40000 (2) 45025
(3) 48025 (4) 50025
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

44. A factory's yearly budget for the purchase of employees' protection shoes increased by 60% this year over last year. If the price of the shoes increased by 20% this year, then the number of shoes it can purchase this year is what percent greater than the number of shoes it purchased last year ?
(1) 40% (2) $33\frac{1}{3}\%$
(3) 42% (4) 48%
(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

45. A Set A consists of integers 27, 28, 30, 32, and 33. If integer k is included in the average of set A will increase by 30%. What is the value of integer K ?
(1) 68 (2) 79
(3) 84 (4) 92
(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

46. A person loses 75% of his money in the first bet, 75% of the remaining in the second and 75% of the remaining in the third bet and returns home with Rs. 2 only. His initial money was
(1) Rs. 64 (2) Rs. 128
(3) Rs. 256 (4) Rs. 512
(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

47. An army lost 10% of its men in war, 10% of the remaining died due to disease and 10% of the rest were declared disabled. Thus the strength of the army was reduced to 7,29,000 active men. The original strength of the army was
(1) 1500000 (2) 1000000
(3) 1200000 (4) 1100000
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

48. If the value of a company stock drops from Rs. 25 per share to Rs. 21 per share, the percentage decrease per share is :
(1) 4 (2) 8
(3) 12 (4) 16
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

49. Starting with 8000 workers, the company increases the number of workers by 5%, 10% and 20% at the end of first, second and third year respectively. The number of workers in the fourth year was
(1) 10188 (2) 11088
(3) 11008 (4) 11808
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

50. If "basis points" are defined so that 1 per cent is equal to 100 basis points, then by how many basis points is 82.5 per cent greater than 62.5 per cent ?
(1) 0.2 (2) 20
(3) 200 (4) 2000
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

51. In the last financial year, a car company sold 41,800 cars. In this year, the target is to sell 51,300 cars. By what per cent must the sale be increased ?
(1) $11\frac{9}{22}\%$ (2) $8\frac{9}{22}\%$
(3) $8\frac{11}{23}\%$ (4) $22\frac{8}{11}\%$
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

52. In a motor of 120 machine parts, 5% parts were defective. In another motor of 80 machine parts, 10% parts were defective. For the two motors considered together, the percentage of defective machine parts was
(1) 7 (2) 6.5
(3) 7.5 (4) 8
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

53. A line of length 1.5 metres was measured as 1.55 metres by mistake. What will be the value of error per cent ?
(1) 0.05% (2) $3\frac{7}{31}\%$
(3) $3\frac{1}{3}\%$ (4) 0.5%
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

54. A businessman imported Laptops, worth Rs. 210000, Mobile phones worth Rs. 100000 and Television sets worth Rs. 150000. He had to pay 10% duty on laptops, 8% on Phones and 5% on Television sets as a special case. How much total duty (in Rupees) he had to pay on all items as per above details?
(1) 36500 (2) 37000
(3) 37250 (4) 37500
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

55. A man spends $7\frac{1}{2}\%$ of his money and after spending 75% of the remaining he had Rs. 370 left. How much money did he have?
(1) Rs. 1200 (2) Rs. 1600
(3) Rs. 1500 (4) Rs. 1400
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

56. On a certain date, Pakistan has a success rate of 60% against India in all the ODIs played between the two countries. They lost the next 30 ODIs in a row to India and their success rate comes down to 30%. The total number of ODIs played between the two countries is
(1) 50 (2) 45
(3) 60 (4) 30
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

SHORT ANSWERS

TYPE-I

1. (3)	**2.** (4)	**3.** (1)	**4.** (4)
5. (3)	**6.** (3)	**7.** (4)	**8.** (1)
9. (2)	**10.** (4)	**11.** (4)	**12.** (2)
13. (1)	**14.** (3)	**15.** (2)	**16.** (4)
17. (2)	**18.** (1)	**19.** (1)	**20.** (3)
21. (2)	**22.** (3)	**23.** (4)	**24.** (2)
25. (4)	**26.** (4)	**27.** (1)	**28.** (4)
29. (4)	**30.** (4)	**31.** (1)	**32.** (1)

33. (2)	**34.** (1)	**35.** (4)	**36.** (3)
37. (3)	**38.** (1)	**39.** (3)	**40.** (4)
41. (2)	**42.** (2)	**43.** (4)	**44.** (3)
45. (3)	**46.** (3)	**47.** (2)	**48.** (1)
49. (2)	**50.** (3)	**51.** (3)	**52.** (4)
53. (2)	**54.** (3)	**55.** (4)	**56.** (4)
57. (4)	**58.** (1)	**59.** (2)	**60.** (3)
61. (1)	**62.** (1)	**63.** (1)	**64.** (1)
65. (2)	**66.** (1)	**67.** (2)	**68.** (1)
69. (2)	**70.** (3)	**71.** (1)	**72.** (2)
73. (4)	**74.** (3)	**75.** (4)	**76.** (1)
77. (3)	**78.** (2)	**79.** (4)	**80.** (1)
81. (3)	**82.** (2)	**83.** (2)	**84.** (2)
85. (3)	**86.** (3)	**87.** (2)	**88.** (3)
89. (3)	**90.** (1)	**91.** (2)	**92.** (3)
93. (3)	**94.** (4)		

TYPE-II

1. (1)	**2.** (1)	**3.** (4)	**4.** (2)
5. (3)	**6.** (1)	**7.** (4)	**8.** (4)
9. (2)	**10.** (1)	**11.** (2)	**12.** (3)
13. (1)	**14.** (2)	**15.** (3)	**16.** (2)
17. (3)			

TYPE-III

1. (2)	**2.** (2)	**3.** (3)	**4.** (2)
5. (1)	**6.** (1)	**7.** (3)	**8.** (4)
9. (2)	**10.** (3)	**11.** (2)	**12.** (4)
13. (1)	**14.** (3)	**15.** (2)	**16.** (3)
17. (3)	**18.** (2)	**19.** (1)	**20.** (2)
21. (2)	**22.** (2)	**23.** (3)	**24.** (2)
25. (3)	**26.** (2)	**27.** (1)	**28.** (3)
29. (3)	**30.** (2)	**31.** (1)	**32.** (2)
33. (4)	**34.** (4)	**35.** (4)	**36.** (3)
37. (1)	**38.** (2)	**39.** (4)	**40.** (2)
41. (1)	**42.** (3)	**43.** (1)	**44.** (2)
45. (2)	**46.** (3)	**47.** (2)	**48.** (1)
49. (2)	**50.** (*)	**51.** (3)	**52.** (1)
53. (1)	**54.** (2)	**55.** (1)	**56.** (4)
57. (3)	**58.** (2)	**59.** (2)	

TYPE-IV

1. (1)	**2.** (1)	**3.** (1)	**4.** (3)
5. (4)	**6.** (1)	**7.** (3)	**8.** (3)
9. (4)	**10.** (2)	**11.** (4)	**12.** (4)
13. (4)	**14.** (2)	**15.** (1)	**16.** (3)
17. (2)	**18.** (4)	**19.** (4)	**20.** (1)
21. (2)	**22.** (1)	**23.** (4)	**24.** (2)
25. (3)	**26.** (1)	**27.** (1)	**28.** (1)
29. (3)	**30.** (4)	**31.** (2)	**32.** (4)
33. (1)	**34.** (1)	**35.** (2)	**36.** (2)
37. (2)	**38.** (2)		

TYPE-V

1. (2)	**2**. (4)	**3.** (1)	**4.** (2)
5. (2)	**6.** (3)	**7.** (2)	**8.** (4)
9. (1)	**10.** (4)	**11.** (4)	**12.** (2)
13. (2)	**14.** (3)	**15.** (2)	**16.** (1)
17. (2)	**18.** (2)	**19.** (3)	**20.** (2)
21. (3)	**22.** (2)	**23.** (2)	

TYPE-VI

1. (3)	**2.** (1)	**3.** (1)	**4.** (3)
5. (2)	**6.** (2)	**7.** (2)	**8.** (4)
9. (4)	**10.** (4)	**11.** (2)	**12.** (2)
13. (2)	**14.** (4)	**15.** (2)	

TYPE-VII

1. (3)	**2.** (3)	**3.** (3)	**4.** (3)
5. (1)	**6.** (1)	**7.** (3)	**8.** (1)
9. (3)	**10.** (1)	**11.** (2)	**12.** (2)
13. (2)	**14.** (4)	**15.** (2)	**16.** (2)
17. (1)	**18.** (3)	**19.** (4)	**20.** (4)
21. (3)	**22.** (2)	**23.** (3)	**24.** (2)
25. (2)	**26.** (1)	**27.** (4)	**28.** (1)
29. (4)	**30.** (3)	**31.** (1)	**32.** (1)
33. (1)	**34.** (3)	**35.** (1)	**36.** (2)
37. (2)	**38.** (4)	**39.** (2)	**40.** (4)
41. (4)	**42.** (4)	**43.** (4)	**44.** (3)
45. (3)	**46.** (2)	**47.** (1)	**48.** (2)
49. (1)	**50.** (4)	**51.** (3)	**52.** (3)
53. (3)	**54.** (1)		

TYPE-VIII

1. (1)	**2.** (3)	**3.** (3)	**4.** (2)
5. (1)	**6.** (2)	**7.** (3)	**8.** (4)
9. (2) **13.** (3)	**10.** (4) **14.** (4)	**11.** (3) **15.** (2)	**12.** (1) **16.** (2)
17. (3)	**18.** (2)	**19.** (3)	**20.** (3)
21. (3)	**22.** (4)	**23.** (1)	**24.** (1)
25. (4)	**26.** (2)	**27.** (3)	**28.** (3)
29. (3)	**30.** (1)	**31.** (4)	**32.** (3)
33. (2)	**34.** (4)	**35.** (1)	

TYPE-IX

1. (4)	**2.** (3)	**3.** (3)	**4.** (4)
5. (3)	**6.** (4)	**7.** (2)	**8.** (2)
9. (3)	**10.** (4)	**11.** (4)	**12.** (2)
13. (2)	**14.** (2)		

TYPE-X

1. (3)	**2.** (1)	**3.** (3)	**4**. (1)
5. (1)	**6.** (3)	**7.** (2)	**8.** (1)
9. (1)	**10.** (4)	**11.** (2)	**12.** (2)
13. (2)	**14.** (3)	**15.** (4)	**16.** (1)
17. (1)	**18.** (1)	**19.** (3)	**20.** (1)
21. (4)	**22.** (1)	**23.** (2)	**24.** (1)
25. (3)	**26.** (2)	**27.** (4)	**28.** (3)
29. (1)	**30.** (2)	**31.** (1)	**32.** (2)
33. (3)	**34.** (1)		

TYPE-XI

1. (3)	**2.** (2)	**3.** (4)	**4.** (2)
5. (2)	**6.** (3)	**7.** (1)	**8.** (4)
9. (4)	**10.** (1)	**11.** (3)	**12.** (4)
13. (1)	**14.** (4)	**15.** (2)	**16.** (2)
17. (4)	**18.** (2)	**19.** (1)	**20.** (3)

TYPE-XII

1. (2)	**2.** (2)	**3.** (1)	**4.** (2)
5. (4)	**6.** (3)	**7.** (3)	**8.** (4)
9. (1)	**10.** (3)	**11.** (1)	**12.** (2)
13. (1)	**14.** (4)	**15.** (1)	**16.** (2)
17. (3)	**18.** (4)	**19.** (2)	**20.** (1)
21. (2)	**22.** (2)	**23.** (2)	**24.** (1)
25. (4)	**26.** (3)	**27.** (4)	**28.** (3)
29. (2)	**30.** (4)	**31.** (4)	**32.** (4)
33. (2)	**34.** (3)	**35.** (1)	**36.** (3)
37. (2)	**38.** (3)	**39.** (4)	**40.** (3)
41. (4)	**42.** (3)	**43.** (3)	**44.** (2)
45. (3)	**46.** (2)	**47.** (2)	**48.** (4)
49. (2)	**50.** (4)	**51.** (4)	**52.** (1)
53. (3)	**54.** (1)	**55.** (2)	**56.** (3)

EXPLANATIONS

TYPE-I

1. (3) According to question,

$$A \times \frac{80}{100} = B \times \frac{50}{100}$$

$$\therefore B = \frac{A \times 80}{50} = 1.6A$$

$\therefore$ B = 160% of A

$\therefore$ x = 160

2. (4) According to question,

$$y = \frac{100 \times 100}{80} \text{ of } x$$

$\therefore$ y = 125% of x

3. (1) $\frac{8x}{100} = \frac{4y}{100}$

$\Rightarrow y = 2x$

$\therefore$ 20% of x = 10% of y.

4. (4) Let x be the multiplicand.

$$\therefore \text{ Error} = \frac{5}{3}x - \frac{3}{5}x$$

$$= \frac{25x - 9x}{15} = \frac{16x}{15}$$

$\therefore$ Percentage error

$$= \frac{\frac{16x}{15}}{\frac{5}{3}x} \times 100$$

$$= \frac{16x}{15} \times \frac{3}{5x} \times 100 = 64\%$$

5. (3) p% of p = 36

$$\Rightarrow \frac{p}{100} \times p = 36$$

$\Rightarrow p^2 = 3600$

$\Rightarrow p = 60$

6. (3) Let 2 be x% of 50

$\Rightarrow$ x% of 50 = 2

$$\Rightarrow \frac{x}{100} \times 50 = 2 \Rightarrow \frac{x}{2} = 2$$

$\therefore$ x = 4

7. (4) Let x % of $\frac{1}{3} = \frac{2}{3}$

$$\Rightarrow x\% = \frac{2 \times 3}{3} = 2 \Rightarrow x = 200\%$$

8. (1) 0.15% of $33\frac{1}{3}$% of ₹ 10000

$$= \frac{0.15}{100} \times \frac{100}{300} \times 10000 = ₹5$$

9. (2) 30% of x = 72

$$\therefore x = \frac{72 \times 100}{30} = 240$$

10. (4) 15% of (A + B)
= 25% of (A – B)

$$\Rightarrow \frac{15}{100}(A + B) = \frac{25}{100}(A - B)$$

$\Rightarrow$ 15 (A + B) = 25 (A – B)

$\Rightarrow$ 15 A + 15 B = 25A – 25 B

$\Rightarrow$ 10 A = 40 B

$\Rightarrow$ A = 4 B

Now, let x% of B is equal to A

$$\therefore \frac{x}{100} \times B = A \Rightarrow \frac{x}{100} \times B = 4B$$

$\therefore$ x = 400%

11. (4) 20% of 25% of 300

$$= \frac{20}{100} \times \frac{25}{100} \times 300$$

$$= \frac{1}{5} \times \frac{1}{4} \times 300 = 15$$

12. (2) x% of $\frac{25}{2} = 150$

$$\Rightarrow \frac{x}{100} \times \frac{25}{2} = 150$$

$$\Rightarrow \frac{x}{8} = 150$$

$\Rightarrow$ x = 150 × 8 = 1200

13. (1) 50% of (x – y)
= 30% of (x + y)

$$\Rightarrow \frac{1}{2}(x - y) = \frac{3}{10}(x + y)$$

$$\Rightarrow \frac{x}{2} - \frac{3x}{10} = \frac{3}{10}y + \frac{y}{2}$$

$$\Rightarrow \frac{5x - 3x}{10} = \frac{3y + 5y}{10}$$

$$\Rightarrow \frac{x}{5} = \frac{4y}{5}$$

$\therefore$ x = 4y

$$\Rightarrow y = \frac{x}{4} \text{ or } \frac{x}{4} \times 100\% = 25x$$

Obviously, y is 25% of x

14. (3) $P \times \frac{50}{100} = Q \times \frac{25}{100}$

$\Rightarrow$ P × 50 = Q × 25

$$\Rightarrow P = \frac{Q \times 25}{50} \Rightarrow P = \frac{Q}{2}$$

P = Q x %

$$\therefore Q \times \frac{x}{100} = \frac{Q}{2}$$

$$\Rightarrow x = \frac{100}{2} = 50$$

15. (2) 20% of A = 50% of B

$$\Rightarrow 2A = 5B \Rightarrow A = \frac{5B}{2}$$

Let B is x % of A.

$$\therefore \frac{5B}{2} \times \frac{x}{100} = B$$

$$\Rightarrow x = \frac{200}{5} = 40\%$$

16. (4) Since 18% of the students neither play football nor cricket. It means 82% of the students either play football or cricket or both.

Using set theory

$\therefore n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$\Rightarrow 82 = 40 + 50 - n(A \cap B)$

$\Rightarrow n(A \cap B) = 90 - 82 = 8$

$\therefore$ 8% students play both games.

17. (2) $\frac{20(P + Q)}{100} = \frac{50}{100}(P - Q)$

$$\Rightarrow \frac{P + Q}{P - Q} = \frac{5}{2}$$

$$\Rightarrow \frac{2P}{2Q} = \frac{5 + 2}{5 - 2}$$

[By componendo & dividendo]

$$\Rightarrow \frac{P}{Q} = \frac{7}{3} \text{ or } 7 : 3$$

18. (1) Let x % × 0.1 = 0.01

$$\Rightarrow \frac{x}{100} \times 0.1 = 0.01$$

$$\Rightarrow x = \frac{0.01 \times 100}{0.1} = 10$$

19. (1) Required percentage

$$= \frac{65}{2000} \times 100 = \frac{13}{4}$$

[$\because$ 2kg = 2000g]

20. (3) 1% = $\frac{1}{100}$

$$\therefore \frac{1}{100} \times \frac{1}{2} = \frac{1}{200} = 0.005$$

21. (2) 1 hour 45 minutes

$= 1\frac{3}{4}$ hours $= \frac{7}{4}$ hours

1 day = 24 hours

$\therefore$ Required per cent

$$= \frac{\frac{7}{4}}{24} \times 100$$

$$= \frac{7}{4 \times 24} \times 100$$

= 7.292%

22. (3) Required percentage

$= \frac{1.14}{1.9} \times 100 = 60\%$

23. (4) Required percentage

$= \frac{32}{80} \times 100 = 40\%$

24. (2) $A \times \frac{90}{100} = \frac{B \times 30}{100}$

$\Rightarrow A \times 3 = B$

$\Rightarrow A \times x\% = A \times 3$

$\Rightarrow \frac{x}{100} = 3 \Rightarrow x = 300$

25. (4) $\frac{A \times 90}{100} = \frac{B \times 30}{100}$

$\Rightarrow 3A = B$

$\Rightarrow 3A = A \times \frac{2x}{100}$

$\Rightarrow 300 = 2x \Rightarrow x = 150$

26. (4) $A \times \frac{30}{100} + \frac{B \times 40}{100} = \frac{B \times 80}{100}$

$\Rightarrow A \times 30 = B \times 40$

$\Rightarrow \frac{A}{B} = \frac{40}{30} = \frac{4}{3}$

$\Rightarrow \frac{B}{A} = \frac{3}{4}$

$\Rightarrow \frac{B}{A} \times 100 = \frac{3}{4} \times 100 = 75\%$

27. (1) $(A + B) \times \frac{40}{100}$

$= (A - B) \times \frac{60}{100}$

$\Rightarrow 2(A + B) = 3(A - B)$

$\Rightarrow 2A + 2B = 3A - 3B$

$\Rightarrow A = 5B$

$\therefore \frac{2A - 3B}{A + B} = \frac{10B - 3B}{5B + B}$

$= \frac{7B}{6B} = \frac{7}{6}$

28. (4) $0.1\% = \frac{0.1}{100} = 0.001$

29. (4) Required percentage

$= \frac{70}{3.5 \times 1000} \times 100 = 2\%$

30. (4) $\frac{1}{3}$ of $1206 = 1206 \times \frac{1}{3} = 402$

$\therefore$ Required percent

$= \frac{402}{134} \times 100 = 300\%$

31. (1) $a \times \frac{120}{100} = b \times \frac{80}{100}$

$\Rightarrow \frac{b}{a} = \frac{120}{80} = \frac{3}{2}$

$\therefore \frac{b + a}{b - a} = \frac{\frac{b}{a} + 1}{\frac{b}{a} - 1} = \frac{\frac{3}{2} + 1}{\frac{3}{2} - 1} = \frac{\frac{5}{2}}{\frac{1}{2}} = 5$

32. (1) $(A + B) \times \frac{20}{100} = B \times \frac{50}{100}$

$\Rightarrow \frac{A + B}{5} = \frac{B}{2}$

$\Rightarrow 2A + 2B = 5B$

$\Rightarrow 2A = 3B$

$\Rightarrow \frac{2A}{B} = 3$ or $2A = 3B$

$\therefore \frac{2A - B}{2A + B} = \frac{2\frac{A}{B} - 1}{2\frac{A}{B} + 1} = \frac{3 - 1}{3 + 1}$

$= \frac{2}{4} = \frac{1}{2} = \frac{3B - B}{3B + B} = \frac{2B}{4B}$

33. (2) $\frac{ax}{100} = \frac{by}{100}$

$\Rightarrow b = \frac{ax}{y}$

$\therefore z\%$ of $b = \frac{ax}{y} \times \frac{z}{100}$

$= \frac{xz}{y}\%$ of a

34. (1) $60 \times 60 \times \frac{y}{100}$

= 1 minute 12 seconds

$\Rightarrow 36y = 72 \Rightarrow y = 2$

35. (4) Required percentage

$= \frac{72}{3.6 \times 1000} \times 100 = 2\%$

36. (3) Let the total number of employees be x.

$\therefore x \times \frac{69}{100} = 20700$

$\Rightarrow x = \frac{20700 \times 100}{69} = 30000$

37. (3) Required percentage

$= \frac{24}{40} \times 100 = 60\%$

38. (1) $x \times \frac{125}{100} = 100$

$\Rightarrow x = \frac{100 \times 100}{125} = 80$

39. (3) $x \times \frac{83}{100} = 498$

$\Rightarrow x = \frac{498 \times 100}{83} = 600$

40. (4) Let C = 100

Then, A = 150

B = 125

$\therefore$ Required percentage

$= \frac{150 - 125}{125} \times 100 = 20\%$

41. (2) If the number of trees in the garden be x, then

$x \times \frac{60}{100} \times \frac{25}{100} \times \frac{20}{100} = 1500$

$\Rightarrow x \times \frac{3}{5} \times \frac{1}{4} \times \frac{1}{5} = 1500$

$\Rightarrow x = \frac{1500 \times 5 \times 4 \times 5}{3}$

$= 50000$

42. (2) Males $= 25000 \times \frac{4}{5} = 20000$

Females = 5000

Educated males

$= 20000 \times \frac{95}{100} = 19000$

Educated females

$= \frac{5000 \times 60}{100} = 3000$

Total educated persons

= 22000

$\therefore$ Required per cent

$= \frac{22000}{25000} \times 100 = 88\%$

43. (4) Required number

$= \frac{240 \times 25}{100} - \frac{160 \times 15}{100}$

$= 60 - 24 = 36$

44. (3) First part = ₹ x and second part = ₹ y.

$\therefore \frac{x \times 80}{100} = \frac{y \times 60}{100} + 3$

$\Rightarrow \frac{4x}{5} = \frac{3y}{5} + 3$

$\Rightarrow 4x - 3y = 15$ ...(i)

Again,

$\frac{4y}{5} = \frac{9x}{10} + 6$

$\Rightarrow 8y = 9x + 60$

$\Rightarrow 8y - 9x = 60$ ...(ii)

By equation (i) × 8 + (ii) × 3,

$32x - 24y = 120$

$24y - 27x = 180$

$5x = 300 \Rightarrow x = 60$

From equation (i)

$4 \times 60 - 3y = 15$

$\Rightarrow 3y = 240 - 15 = 225$

$\Rightarrow y = \frac{225}{3} = 75$

$\therefore x + y = 60 + 75 = 135$

45. (3) Group A = 40%

Group B = $\frac{60 \times 75}{100} = 45\%$

Group C = 15%

If the total number of students be x, then

$\frac{x \times 15}{100} = 12$

$\Rightarrow x = \frac{12 \times 100}{15} = 80$

46. (3) After taking away respective balls,

Number of balls in the box

= 75 + 25 + 50 = 150

∴ Percentage of black balls

$= \frac{50}{150} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$

47. (2) ∵ S.P. of a dozen pairs of socks

$= \frac{180 \times 80}{100} =$ ₹ 144

∴ S.P. of 1 pair of socks

$= \frac{144}{12} =$ ₹ 12

∴ No of pairs available for

₹ 48 = $\frac{48}{12} = 4$

48. (1) Let the number be x.

$\therefore \frac{3}{5} \times \frac{60}{100} \times x = 36$

$\Rightarrow x = \frac{36 \times 5 \times 5}{3 \times 3} = 100$

49. (2) $\frac{P - Q}{2} = (P + Q) \times \frac{30}{100}$

$\Rightarrow 5(P - Q) = (P + Q) \times 3$

$\Rightarrow 5P - 3P = 5Q + 3Q$

$\Rightarrow 2P = 8Q$

$\Rightarrow P = 4Q = 4 \times \frac{P \times x}{100}$

$\Rightarrow \frac{4x}{100} = 1 \Rightarrow x = 25$

50. (3) Let greater number be x.

∴ Smaller number = 150 – x

According to the question,

$\frac{40 \times x}{100} = \frac{60(150 - x)}{100}$

$\Rightarrow 2x = 3 \times 150 - 3x$

$\Rightarrow 5x = 3 \times 150$

$\Rightarrow x = 90$

51. (3) Let the number be x. According to the question

80% of x + 80 = x

$\Rightarrow \frac{80x}{100} + 80 = x$

$\Rightarrow \frac{4x}{5} + 80 = x$

$\Rightarrow \frac{x}{5} = 80 \Rightarrow x = 400$

52. (4) Suppose number be x

20% of x = 120

$x \times \frac{20}{100} = 120$

$x = \frac{120 \times 100}{20} = 600$

$600 \times 120\% = 600 \times \frac{120}{100} = 720$

53. (2) Let the number be x. Then

x – 60% of x = 60

$\Rightarrow$ x – 0.60x= 60

$\Rightarrow$ 0.4x = 60

$\Rightarrow x = \frac{60}{0.4} \Rightarrow x = \frac{600}{4}$

x = 150

∴ The number is 150

54. (3) Let number be x.

∴ According to question,

75% of x + 75 = x

$\frac{3x}{4} + 75 = x \Rightarrow x - \frac{3x}{4} = 75$

x = 75 × 4 = 300

55. (4) Let the third number be x,

According to the question;

First number $= \frac{20}{100} \times x = \frac{x}{5}$

Second number $= \frac{50}{100} \times x = \frac{x}{2}$

∴ Required percentage

$= \frac{\frac{x}{5} \times 100}{\frac{x}{2}} = \frac{x}{5} \times \frac{2}{x} \times 100 = 40\%$

56. (4) **Rule :** If two numbers are respectively x% and y% less than the third number, first number as a percentage of second is $\frac{100 - x}{100 - y} \times 100\%$

∴ Required percentage

$= \frac{100 - 25}{100 - 20} \times 100\%$

$= \frac{75}{80} \times 100\% = 93.75\%$

57. (4) According to question

$x + \frac{x \times 150}{100} = 150$

$\Rightarrow x + \frac{3}{2}x = 150$

$\Rightarrow 2x + 3x = 2 \times 150 = 300$

$\Rightarrow 5x = 300 \Rightarrow x = 60$

58. (1) Let the number be x.

According to the question,

$x \times \frac{18}{100} = 75 \times \frac{12}{100}$

$\Rightarrow x = \frac{75 \times 12}{18} = 50$

59. (2) Let the numbers be x and y and $x > y$.

According to the question,

$6\frac{1}{2}\%$ of $x = 8\frac{1}{2}\%$ of y

or $\frac{13}{2}\%$ of $x = \frac{17}{2}\%$ of y

or $13x = 17y$

or $x = \frac{17}{13}y$

$\therefore \frac{17}{13}y - y = 1660$

or $\frac{17y-13y}{13} = 1660$

or $4y = 1660 \times 13$

or $y = \frac{1660 \times 13}{4} = 5395$

60. (3) If the number be x, then

$x \times \frac{75}{100} + 75 = x$

$\Rightarrow \frac{3x}{4} + 75 = x$

$\Rightarrow x - \frac{3x}{4} = 75$

$\Rightarrow \frac{x}{4} = 75$

$\Rightarrow x = 4 \times 75 = 300$

$\therefore$ 40% of 300

$= \frac{300 \times 40}{100} = 120$

61. (1) Number to be added $= x$ (let)

$\therefore \frac{320 \times 10}{100} + x = \frac{230 \times 30}{100}$

$\Rightarrow 32 + x = 69$

$\Rightarrow x = 69 - 32 = 37$

62. (1) X is 20% less than Y.
If Y = 100, X = 80

$\therefore \frac{Y - X}{Y} = \frac{100 - 80}{100}$

$= \frac{20}{100} = \frac{1}{5}$

$\frac{X}{X - Y} = \frac{80}{80 - 100}$

$= \frac{80}{-20} = -4$

63. (1) 1% of 1% of 25% of 1000

$= 1000 \times \frac{25}{100} \times \frac{1}{100} \times \frac{1}{100}$

$= 0.025$

64. (1) $\frac{120 \times 25}{100} + \frac{380 \times 40}{100}$

$= 637 \times ?$

$\Rightarrow 30 + 152 = 637 \times ?$

$\Rightarrow 182 = 637 \times ?$

$\Rightarrow ? = \frac{182}{637} = \frac{2}{7}$

65. (2) Population of the illiterate in the village
= (100 – 30)% of 6600

$= \frac{6600 \times 70}{100} = 4620$

66. (1) 8% of x = 4% of y

$\Rightarrow x \times \frac{8}{100} = \frac{y \times 4}{100}$

$\Rightarrow x = \frac{4}{8}y = \frac{y}{2}$

$\therefore$ 20% of $x = \frac{20}{100}$ of $\frac{y}{2}$

$= \frac{10}{100}$ of y

= 10% of y

67. (2) Let the number be x.

$\therefore x \times \frac{3}{4} \times \frac{4}{5} \times \frac{40}{100} = 48$

$\Rightarrow x \times \frac{3}{5} \times \frac{2}{5} = 48$

$\Rightarrow x = \frac{48 \times 5 \times 5}{3 \times 2} = 200$

$\therefore$ 1% of 200

$= 200 \times \frac{1}{100} = 2$

68. (1) Required sum

$= \frac{24.2 \times 16}{100} + \frac{2.42 \times 10}{100}$

$= 3.872 + 0.242$

$= 4.114$

69. (2) x% of 15 hours = 18 seconds

$\Rightarrow x$% of 15 × 60 × 60 seconds = 18 seconds

$\Rightarrow \frac{15 \times 60 \times 60 \times x}{100} = 18$

$\Rightarrow x = \frac{18}{15 \times 6 \times 6} = \frac{1}{30}$%

70. (3) $80 \times \frac{y}{100} \times \frac{x}{100}$

$= \frac{900 \times 25}{100}$

$\Rightarrow \frac{xy \times 80}{10000} = 9 \times 25$

$\Rightarrow xy = \frac{9 \times 25 \times 10000}{80}$

$= 28125$

71. (1) Required time $= \frac{35 \times 100}{140}$

= 25 days

72. (2) According to the question,

$\frac{60A}{100} = \frac{30B}{100}$

$\Rightarrow \frac{3A}{5} = \frac{3B}{10} = \frac{3}{10} \times \frac{40}{100}$ C

$\Rightarrow \frac{3A}{5} = \frac{3C}{25} = \frac{3}{25} \times A \times \frac{x}{100}$

$\Rightarrow \frac{3}{5} = \frac{3x}{2500}$

$\Rightarrow 5x = 2500$

$\Rightarrow x = \frac{2500}{5} = 500$

73. (4) Total staff strength in the office = 100 (let)
Females = 40
Males = 60

Married females $= \frac{40 \times 70}{100} = 28$

Unmarried females = 40 – 28 = 12
Unmarried males = 30
$\therefore$ Unmarried staff
= 30 + 12 = 42
i.e. 42%

74. (3) Let the number be x.
According to the question,

$\frac{x \times 50}{100} + 50 = x$

$\Rightarrow \frac{x}{2} + 50 = x$

$\Rightarrow x - \frac{x}{2} = 50$

$\Rightarrow \frac{x}{2} = 50$

$\Rightarrow x = 100$

75. (4) Let the required amount be Rs. x.
According to the question,

$90 \times 83\frac{1}{3}\% = x \times 60\%$

$\Rightarrow 90 \times \frac{250}{3} = x \times 60$

$\Rightarrow x = \frac{30 \times 250}{60}$ = Rs. 125

76. (1) Let the whole number be x.
According to the question,
51% of x = 714

$\Rightarrow \frac{x \times 51}{100} = 714$

$\Rightarrow x = \frac{714 \times 100}{51} = 1400$

$\therefore$ 25% of 1400

$= \frac{1400 \times 25}{100} = 350$

77. (3) Initial price of eggs = Rs. x per dozen (let).

New price = Rs. $\frac{3x}{4}$ per dozen

According to the question,

$$\frac{162}{\frac{3x}{4}} - \frac{162}{x} = 2$$

$$\Rightarrow \frac{162 \times 4}{3x} - \frac{162}{x} = 2$$

$$\Rightarrow \frac{216}{x} - \frac{162}{x} = 2$$

$$\Rightarrow \frac{54}{x} = 2$$

$\Rightarrow 2x = 54$

$\Rightarrow x$ = Rs. 27 per dozen

78. (2) Required per cent

$$= \frac{30}{24 \times 60} \times 100 \approx 2.083$$

79. (4) Initial number of mangoes = 300

Number of remaining mangoes = 300 – 75 = 225

Required per cent

$$= \frac{225}{300} \times 100 = 75\%$$

80. (1) Required per cent

$$= \left(\frac{3.5}{7.5} \times 100\right)$$

$$= \frac{3500}{75} = \frac{140}{3}$$

$$= 46\frac{2}{3}\%$$

81. (3) Discount percent

$$= \frac{1}{5} \times 100 = 20\%$$

82. (2) B's income = Rs. 100

$\therefore$ A's income = Rs. 125

$\therefore$ Required percent

$$= \frac{125 - 100}{125} \times 100$$

$$= \frac{2500}{125} = 20\%$$

83. (2) 1 day = 24 hours = (24 × 60) minutes

$\therefore$ Required per cent

$$= \frac{36}{24 \times 60} \times 100 = 2.5\%$$

84. (2) Let the larger number be x.

$\therefore$ Smaller number

$$= \frac{25x}{100} = \frac{x}{4}$$

According to the question,

$$x - \frac{x}{4} = 12$$

$$\Rightarrow \frac{3x}{4} = 12$$

$\Rightarrow 3x = 12 \times 4$

$$\Rightarrow x = \frac{12 \times 4}{3} = 16$$

85. (3) Initial number of students in the class = x

According to the question,

$$x \times \frac{120}{100} = 66$$

$$\Rightarrow x = \frac{66 \times 100}{120} = 55$$

86. (3) Required per cent

$$= \left(\frac{20}{100 + 20}\right) \times 100$$

$$= \frac{2000}{120} = \frac{50}{3} = 16\frac{2}{3}\%$$

87. (2) Number of goats before flood = x (let)

According to the question,

$$x \times \frac{88}{100} \times \frac{95}{100} = 8360$$

$$\Rightarrow x = \frac{8360 \times 100 \times 100}{88 \times 95}$$

= 10000

88. (3) Let, C = 100

$$\therefore B = 100 \times \frac{25}{100} = 25$$

$$\therefore A = \frac{20}{100} \times 25 = 5$$

$\therefore x\%$ of C = 5

$$\Rightarrow \frac{x}{100} \times 100 = 5$$

$\Rightarrow x = 5$

89. (3) Number of boys in the school

$$= \frac{1500 \times 56}{100} = 840$$

Number of girls = (1500 – 840) = 660

Monthly fee of each boy = Rs. 540

Monthly fee of each girl

$$= \text{Rs. } \left(\frac{540 \times 75}{100}\right) = \text{Rs. } 405$$

$\therefore$ Total monthly fee of boys and girls

= Rs. (840 × 540 + 660 × 405)

= Rs. (453600 + 267300)

= Rs. 720900

90. (1) Percentage of children

= (100 – 54 – 32)%

= 14%

According to the question,

$\because$ 14% ≡ 196

$$\therefore 1\% \equiv \frac{196}{14} = 14$$

$\therefore$ 54% ≡ 54 × 14 = 756 men

91. (2) Expression

$$= \frac{25}{4}\% \text{ of } 1600 + \frac{25}{2}\% \text{ of } 800$$

$$= \frac{1600 \times 25}{400} + \frac{800 \times 25}{200}$$

= 100 + 100 = 200

92. (3) Required percent

$$= \frac{25}{100} \times 100 = 25\%$$

93. (3) Required per cent

$$= \frac{40}{80} \times 100 = 50$$

94. (4) Correct answer

$$= 1 - \left(\frac{1}{4} + \frac{1}{5}\right)$$

$$= 1 - \left(\frac{5 + 4}{20}\right)$$

$$= 1 - \frac{9}{20} = \frac{11}{20}$$

Incorrect answer = 0.45 = $\frac{45}{100}$

$$= \frac{9}{20}$$

$$\text{Error} = \frac{11}{20} - \frac{9}{20} = \frac{2}{20} = \frac{1}{10}$$

$$\text{Percentage error} = \left(\frac{\frac{1}{10}}{\frac{11}{20}}\right) \times 100$$

$$= \frac{1}{10} \times \frac{20}{11} \times 100 = \frac{200}{11}\%$$

TYPE-II

1. (1) Let y be 100.

$\therefore x = 75$

$\therefore$ Required percentage

$$= \frac{25 \times 100}{75} = \frac{100}{3} = 33\frac{1}{3}\%$$

Aliter : Using Rule 9,

Required percentage

$$= \frac{25}{(100 - 25)} \times 100\%$$

$$= \frac{25}{75} \times 100\%$$

$$= 33\frac{1}{3}\%$$

2. (1) Using Rule 8,
Required per cent decrease

$$= \frac{10}{100+10} \times 100$$

$$= \frac{10}{110} \times 100 = 9\frac{1}{11}\%$$

3. (4) Using Rule 8,
If the first value is r% more than the second value, then second is $\left[\frac{r}{100+r} \times 100\right]$% less than the first value.
Here r = 10%.
∴ Required percentage

$$= \frac{10}{110} \times 100 = \frac{100}{11} = 9\frac{1}{11}\%$$

4. (2) Using Rule 9,
Required percentage

$$= \frac{20}{100-20} \times 100 = 25\%$$

5. (3) Using Rule 8,
Required percentage

$$= \frac{25}{100+25} \times 100 = 20\%$$

6. (1) Let the larger number be x
⇒ According to question,
x – 20 = 20% of x

or, $x - 20 = \frac{x}{5}$

or, $x - \frac{x}{5} = 20$

or, 5x – x = 20 × 5
or, 4x = 20 × 5
⇒ x = 5 × 5 = 25

7. (4) y is 10% more than 125

$$= 125 \times \frac{110}{100} = 137.5 = y$$

and x is 10% less than y

$$x = \frac{90}{100} \times y = \frac{90}{100} \times 137.5$$

= 123.75

8. (4) If the third number is 100, then the numbers are $100 + \frac{25}{2} = \frac{225}{2}$ and 125 respectively.
∴ First number as a percentage of the second

$$= \frac{225}{2 \times 125} \times 100 = 90$$

Rule : If two numbers are respectively x% and y% more than a third number the first as a percent of second is

$$\frac{100+x}{100+y} \times 100\%$$

9. (2) Required number

$$= 60\% \text{ of } 90 = \frac{90 \times 60}{100} = 54$$

10. (1) Third number = 100
First number = 70
Second number = 63
∴ Required percentage

$$= \frac{7}{70} \times 100 = 10$$

11. (2) Let the number be x

then, $x \times \frac{90}{100} = 30$

$$\Rightarrow x = \frac{3000}{90} = \frac{100}{3} = 33\frac{1}{3}$$

12. (3) According to the question,
Required difference

$$= \text{Rs. } \left(312 \times \frac{200}{3}\% - 200\right)$$

$$= \text{Rs. } \left(312 \times \frac{200}{300} - 200\right)$$

$$= \text{Rs. } (208 - 200) = \text{Rs. } 8$$

13. (1) Let B's income be Rs. 100.
∴ A's income = Rs. 125
∴ Required per cent

$$= \left(\frac{100}{125} \times 100\right) = 80\%$$

14. (2) Required per cent

$$= \left(\frac{r}{100+r} \times 100\right)\%$$

$$= \frac{50}{100+50} \times 100$$

$$= \frac{100}{3} = 33\frac{1}{3}\%$$

15. (3) Required per cent

$$= \frac{40}{100-40} \times 100$$

$$= \frac{40 \times 100}{60} = \frac{200}{3} = 66\frac{2}{3}\%$$

16. (2) Required per cent

$$= \left(-\frac{x^2}{100}\right)\%$$

$$= -\frac{10 \times 10}{100} = -1\%$$

Negative sign shows decrease.

17. (3) Length of Y = 1 foot
∴ Length of X = 5 feet
Required per cent

$$= \left(\frac{5-1}{5}\right) \times 100 = 80\%$$

TYPE-III

1. (2) Savings $= 100\% - 66\frac{2}{3}\%$

$= 33\frac{1}{3}\%$ $\because 33\frac{1}{3}\% \equiv$ ₹ 1200

$\therefore 100\% \equiv \frac{1200}{100} \times 3 \times 100$

= ₹ 3600
∴ Expenses = 3600 – 1200
= ₹ 2400

Aliter : Using Rule 20,
Here, R = ₹ 1200

$$x = 66\frac{2}{3}\%$$

Monthly income

$$= \frac{100}{100 - 66\frac{2}{3}} \times 1200$$

$$= \frac{100}{100 - \frac{200}{3}} \times 1200$$

$$= \frac{300}{100} \times 1200 = ₹\ 3600$$

Expenses = Income – savings
= 3600 – 1200 = 2400

2. (2) Suppose income of A = ₹ 100
∴ Income of B = ₹ 125
Income of C = ₹ 150
∴ Required percentage

$$= \frac{50 \times 100}{100} = 50\%$$

3. (3) Using Rule 9,
Required percentage

$$= \frac{x}{100-x} \times 100$$

$$= \frac{40}{60} \times 100 = \frac{200}{3}$$

= 66.66%

4. (2) Using Rule 8,

Tricky approach

Required answer

$$= \left(\frac{20}{100+20} \times 100\right)\%$$

$$= \left(\frac{20}{120} \times 100\right)\% = \frac{50}{3}\% = 16\frac{2}{3}\%$$

5. (1) Using Rule 8,

Tricky approach

$$x = \left(\frac{10}{100+10} \times 100\right)\%$$

$$= \left(\frac{1000}{110}\right)\% = \left(\frac{100}{11}\right)\% = 9\frac{1}{11}\%$$

Note : If A is r% more than B, then B is

$$\left(\frac{r}{100+r} \times 100\right)\% \text{ less than A.}$$

6. (1) Using Rule 8,

Tricky approach

$$\text{Required \%} = \frac{R \times 100}{100 \pm R}$$

$$\therefore \text{ Required \%} = \frac{12.5 \times 100}{100 + 12.5}$$

$$= \frac{1250}{112.5} = \frac{100}{9} = 11\frac{1}{9}$$

7. (3) Let A's income = ₹ a
and B's income = ₹ b
$a \times 60\% = b \times 75\%$
$\Rightarrow a \times 4 = 5 \times b$

$$\Rightarrow \frac{b}{a} = \frac{4}{5}$$

Now, $b = a \times x\%$

$$\Rightarrow \frac{b}{a} = \frac{x}{100} \Rightarrow \frac{x}{100} = \frac{4}{5}$$

$$\Rightarrow x = \frac{4}{5} \times 100 = 80$$

8. (4) Let income be ₹ 100
∴ Sum given to elder son
= 20% of ₹ 100 = ₹ 20
Remaining Sum = Rs. 80
Sum given to younger son
= 30% of ₹ 80 = ₹ 24
Remaining sum
= Rs. (80 – 24) = Rs. 56
Sum given to the trust
= 10% of ₹ 56 = ₹ 5.6
∴ Remaining sum
= ₹ (56 – 5.6) = ₹ 50.4
∴ When ₹ 50.4 remains, total income = ₹ 100
∴ When ₹ 10080 remains, total income

$$= \frac{100 \times 10080}{50.4} = ₹\ 20000$$

Aliter : Using Rule 20,
Here, R = ₹ 10080
x = 20%,
y = 30%
and z = 10%
Monthly income

$$= \frac{100}{100 - (20 + 24 + 5.6)} \times 10080$$

$$= \frac{1008000}{100 - 49.6}$$

$$= \frac{1008000}{50.4} = 20{,}000$$

9. (2) Radha's total percentage expenditure
= (40 + 20 + 10 + 10)% = 80%
Percentage savings
=100 – 80 = 20%
Now, 20% of her total salary
= 1500

$$\text{Her total salary} = \frac{1500 \times 100}{20}$$

= ₹ 7500
Aliter : Using Rule 20,
Here,
Monthly income

$$= \frac{100}{100 - (40 + 20 + 10 + 10)} \times 1500$$

$$= \frac{150000}{100 - 80}$$

$$= \frac{150000}{20} = ₹\ 7500$$

10. (3) Suppose monthly income = ₹ x

$$\text{Then, } \frac{8}{3}\% \text{ of } x = 72$$

$$\Rightarrow x \times \frac{8}{300} = 72$$

$$\Rightarrow \frac{72 \times 300}{8} = ₹\ 2700$$

11. (2) Let the required income be ₹ x
Average monthly income

$$= ₹\left(\frac{80800}{16}\right) = ₹\ 5050$$

$\therefore x = 120\%$ of 5050

$$= ₹\left(\frac{120}{100} \times 5050\right) = ₹\ 6060$$

12. (4) Using Rule 8,
Required percentage

$$= \frac{25}{100 + 25} \times 100 = 20\%$$

13. (1) Let man's salary be ₹ x.
∴ His expenditure on items of daily use

$$= \frac{25}{2}\% \text{ of } x$$

$$= \frac{25 \times x}{200} = \frac{x}{8}$$

So, remaining amount

$$= x - \frac{x}{8} = ₹\ \frac{7x}{8}$$

Expenditure on house rent

$$= 30\% \text{ of } ₹\ \frac{7x}{8}$$

$$= \frac{30}{100} \times \frac{7x}{8} = ₹\ \frac{21x}{80}$$

Now, remaining amount

$$= \frac{7x}{8} - \frac{21x}{80}$$

$$= \frac{70x - 21x}{80} = ₹\ \frac{49x}{80}$$

According to the question,

$$\therefore \frac{49x}{80} = 2940$$

$$\Rightarrow x = \frac{2940 \times 80}{49}$$

= ₹ 4800
Aliter : Using Rule 20,
His salary

$$= \frac{100 \times 2940}{100 - \left(\frac{25}{2} + 26.25\right)}$$

$$= \frac{100 \times 2940}{100 - (12.5 + 26.25)}$$

$$= \frac{294000}{61.25} = ₹\ 4800$$

14. (3) Original savings
= ₹ (13500 – 9000)
= ₹ 4500
New income = 114% of ₹ 13500
= ₹ (114 × 135)
= ₹ 15390
New expenditure
= 107% of ₹ 9000
= ₹ (107 × 90)

= ₹ 9630
New savings
= ₹ (15390 – 9630)
= ₹ 5760
∴ Percentage increase in savings

$= \frac{5760 - 4500}{4500} \times 100$

$= \frac{1260}{45} = 28\%$

15. (2) Using Rule 9,
Required percentage of increase

$= \frac{r}{100 - r} \times 100$

$= \frac{20}{100 - 20} \times 100$

$= \frac{20}{80} \times 100 = 25\%$

16. (3) 10% of A = 15% of B
= 20% of C
⇒ 10A = 15B = 20C

$\Rightarrow \frac{10A}{60} = \frac{15B}{60} = \frac{20C}{60}$

$\Rightarrow \frac{A}{6} = \frac{B}{4} = \frac{C}{3}$

∴ A : B : C = 6 : 4 : 3
∴ $6x + 4x + 3x = 7800$
⇒ $13x = 7800$

$\Rightarrow x = \frac{7800}{13} = 600$

∴ B's income = $4x$
= 600 × 4 = ₹ 2400

17. (3) Using Rule 9,

Tricky approach

Required percentage

$= \frac{25}{100 - 25} \times 100 = \frac{100}{3} = 33\frac{1}{3}\%$

18. (2) Using Rule 8,

Tricky approach

Required percentage

$= \left(\frac{50}{100 + 50} \times 100\right)\%$

$= \frac{50}{150} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$

19. (1) Let Tulsiram's salary be ₹ x.

$\therefore \frac{x \times 4}{100} = 720$

$\Rightarrow x = \frac{720 \times 100}{4}$

= ₹ 18000
∴ Kashyap's salary

$= ₹ \left(\frac{100}{120} \times 18000\right) = ₹ 15000$

20. (2) Let B's salary = ₹ 100
∴ C's salary = ₹ 400
and A's salary = ₹ 40
∴ Required percentage

$= \frac{40}{400} \times 100 = 10\%$

21. (2) Using Rule 9,

Tricky approach

Required percentage

$= \frac{50}{100 - 50} \times 100 = 100\%$

Otherwise ⇒ Let's B income
= ₹ 100 Þ A income = ₹ 50.

Required % $= \frac{100 - 50}{50} \times 100$

= 100%

22. (2) Using Rule 8,
∴ Required percentage

$= \frac{20}{100 + 20} \times 100$

$= \frac{50}{3} = 16\frac{2}{3}\%$

23. (3) Basic pay of the employee

$= 11925 \times \frac{100}{265} = ₹ 4500$

24. (2) Using Rule 8,
Required percentage

$= \frac{25}{100 + 25} \times 100 = \frac{25}{125} \times 100$

= 20%

25. (3) Effective change

$= (-25 + 25 - \frac{25 \times 25}{100})\%$

= –6.25%
The negative sign shows decrease.
Aliter : Using Rule 3,
Percentage decrease

$= \frac{a^2}{100}\% = \frac{(25)^2}{100}$

$= \frac{625}{100} = 6.25\%$

26. (2) If Shyam's salary be ₹ x, then

$\frac{22 \times x}{100} = 1540$

$\Rightarrow x = \frac{1540 \times 100}{22} = ₹ 7000$

∴ Ram's savings

$= \frac{14 \times 7000}{100} = ₹ 980$

27. (1) Using Rule 8,
Required percentage

$= \frac{25}{125} \times 100 = 20\%$

28. (3) Let man's income = ₹ 100
Savings = 100 – 75 = ₹ 25
New income = ₹ 120
Savings

$= 120 - \frac{75 \times 115}{100} = 120 - \frac{345}{4}$

$= \frac{480 - 345}{4} = ₹ \frac{135}{4}$

Increase in savings

$= \frac{135}{4} - 25 = ₹ \frac{35}{4}$

∴ Percentage increase

$= \frac{\frac{35}{4}}{25} \times 100 = 35\%$

29. (3) Let Nitin's initial salary be 100
After 10% reduction,
New salary = 90% of 100 = ₹ 90
Again after 10% increase

New salary $= \frac{90 \times 110}{100} = ₹ 99$

∴ Percentage decrease =1 %

30. (2) Suppose monthly income of the man is Rs. x.
Expenditure on food

= 40% of x = ₹ $\frac{2x}{5}$

Remaining amount $= x - \frac{2x}{5}$

= ₹ $\frac{3x}{5}$

Expenditure on transport

$= \frac{1}{3} \times \frac{3x}{5} = ₹ \frac{x}{5}$

Remaining amount

$= \frac{3x}{5} - \frac{x}{5} = \frac{2x}{5}$

According to question

$\frac{1}{2} \times \frac{2x}{5} = 4500$

∴ $x = 4500 \times 5$ = ₹ 22,500

31. (1) If the monthly income of A is ₹ x, then

$\frac{x \times 80}{100} = 6000$

$\Rightarrow x = \frac{6000 \times 100}{80} = ₹ 7500$

$\therefore$ Savings = 7500 – 6000
= ₹ 1500

32. (2) Using Rule 3,
Change in salary

$= -\frac{10 \times 10}{100} = -1\%$

Negative sign shows decrease.

33. (4) If the total salary of Kishan be ₹ x, then

$x \times \frac{33}{100} = 2310$

$\Rightarrow x = \frac{2310 \times 100}{33}$ = ₹ 7000

34. (4) Salary of clerk in 1974

$= \frac{3660 \times 100}{100 + 20}$ = ₹ 3050

35. (4) Total percentage of expenditure

$= \left(20 + \frac{80 \times 70}{100}\right)\% = 76\%$

If total income be ₹ x, then

$x \times \frac{24}{100} = 1800$

$\Rightarrow x = \frac{1800 \times 100}{24}$ = ₹ 7500

Aliter : Using Rule 20,
His monthly income

$= \frac{1800}{100 - (20 + 56)} \times 100$

$= \frac{180000}{100 - 76}$

$= \frac{180000}{24}$ = ₹ 7500

36. (3) Arbind's income = ₹ 100
Expenditure = ₹ 75
Savings = ₹ 25
New income = ₹120
Expenditure = 75 + 7.5 = ₹ 82.5
Savings = 120 – 82.5 = ₹ 37.5
Required percentage

$= \frac{37.5 - 25}{25} \times 100 = 50\%$

37. (1) Man's previous salary

$= 24000 \times \frac{100}{120}$ = ₹ 20000

38. (2) Using Rule 9,
Required per cent increase

$= \left(\frac{r}{100 - r} \times 100\right)\%$

$= \frac{10}{100 - 10} \times 100 = \frac{100}{9}$

$= 11\frac{1}{9}\%$

39. (4) Using Rule 8,
Required percentage

$= \frac{R}{100 + R} \times 100$

$= \frac{50}{100 + 50} \times 100$

$= \frac{50}{150} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$

40. (2) Pecentage of expenditure on food and education
= 35 + 5 = 40%
If the monthly salary of X be Rs. x, then

$\frac{x \times 40}{100} = 17600$

$\Rightarrow x \times 40 = 17600 \times 100$

$\Rightarrow x = \frac{1760000}{40}$ = ₹ 44000

41. (1) A's monthly salary = Rs. x
$\therefore$ B's monthly salary
= Rs. (40000 – x)
A spends 85% of his income.

$\therefore$ A's savings $= \frac{15x}{100}$ = Rs. $\frac{3x}{20}$

B's savings = (40000 – x) $\times \frac{5}{100}$

= Rs. $\left(\frac{40000 - x}{20}\right)$

$\therefore \frac{3x}{20} = \frac{40000 - x}{20}$

$\Rightarrow 3x = 40000 - x$

$\Rightarrow 4x = 40000$

$\Rightarrow x = \frac{40000}{4}$ = Rs. 10000

42. (3) C's monthly salary

$= \frac{600000}{12}$ = Rs. 50000

B's monthly salary

$= \frac{50000 \times 40}{100}$

= Rs. 20000

$\frac{1}{4}$ of A's monthly salary

$= \frac{20000 \times 80}{100}$

$\Rightarrow$ A's monthly salary
= Rs. (16000 × 4)
= Rs. 64000

43. (1) Let the third number be 100.
$\therefore$ First number = 70
Second number = 63
Required percent

$= \frac{70 - 63}{70} \times 100$

$= \frac{7}{70} \times 100 = 10\%$

44. (2) Man's income = Rs. 100 (let).

$\therefore$ Expenditure = Rs. 75
Savings = Rs. 25
New income = Rs. 120

Expenditure $= \frac{75 \times 110}{100}$

= Rs. 82.5
Savings = Rs. (120 – 82.5)
= Rs. 37.5
$\therefore$ Required percentage

$= \left(\frac{37.5 - 25}{25}\right) \times 100$

$= \frac{12.5 \times 100}{25} = 50\%$

45. (2) Let Ram Babu's salary be Rs. x.
Remaining amount after donations to charity

= Rs. $\frac{97x}{100}$

After depositing money in the bank,
Remaining amount

$= \frac{97x}{100} \times \frac{88}{100}$

$\therefore \frac{97x \times 88}{10000} = 12804$

$\Rightarrow x = \frac{12804 \times 10000}{97 \times 88}$

= Rs. 15000

46. (3) Amount with Soham
= Rs. x (let).
$\therefore$ Amount with Mukesh
= Rs. $2x$

Amount with Pankaj $= \frac{100x}{150}$

= Rs. $\frac{2x}{3}$

$\therefore$ Soham : Mukesh : Pankaj = x : $2x$: $\frac{2x}{3}$ = 3 : 6 : 2

Sum of the terms of ratio
= 3 + 6 + 2 = 11

∴ Amount with Mukesh

$= \text{Rs. } \left(\frac{6}{11} \times 330\right)$

= Rs. 180

47. (2) Let man's income be Rs. 100.

∴ Expenditure = Rs. 75

Savings = Rs. 25

Case–II,

Man's income = Rs. 120

$\text{Expenditure} = \left(\frac{75 \times 110}{100}\right)$

= Rs. 82.5

Savings = 120 – 82.5 = Rs. 37.5

∴ Percentage increase

$= \left(\frac{37.5 - 25}{25}\right) \times 100$

$= \frac{12.5}{25} \times 100 = 50\%$

48. (1) Christy's income = Rs. x (let)

Amount given to orphanage

$= \text{Rs. } \frac{x}{10}$

$\text{Remaining amount} = \text{Rs. } \frac{9x}{10}$

Remaining amount after depositing in bank

$= 80\% \text{ of } \frac{9x}{10}$

$= \text{Rs. } \left(\frac{9x}{10} \times \frac{80}{100}\right)$

$= \text{Rs. } \frac{18x}{25}$

According to the question,

$\frac{18x}{25} = 7200$

$\Rightarrow 18x = 25 \times 7200$

$\Rightarrow x = \frac{25 \times 7200}{18} = \text{Rs. } 10000$

49. (2) Let the number of male employees in the firm be x and that of female employees be y.

According to the question,

$\frac{5200 \times x + 4200 \times y}{x + y} = 5000$

$\Rightarrow 52x + 42y = 50(x + y)$

$\Rightarrow 52x + 42y = 50x + 50y$

$\Rightarrow 52x - 50x = 50y - 42y$

$\Rightarrow 2x = 8y$

$\Rightarrow x = 4y$

$\therefore x + y = 4y + y = 5y$

∴ Required percent

$= \frac{y}{5y} \times 100$

= 20%

50. (*) $22 : 25 = \frac{22}{25} \times 100 = 88\%$

∴ Percentage effect

$= \left(88 - \frac{80}{3} - \frac{88 \times 80}{300}\right)\%$

$= \left(88 - \frac{80}{3} - \frac{704}{30}\right)\%$

$= \left(\frac{2640 - 800 - 704}{30}\right)\%$

$= \frac{1136}{30} = 37.86\%$ increase

51. (3) Mahesh's income

= Rs. 100 (let).

∴ Mohan's income = Rs. 250

Required per cent

$= \left(\frac{250 - 100}{250}\right) \times 100\%$

$= \left(\frac{1500}{25}\right)\% = 60\%$

52. (1) Let person's income be Rs. 100.

Expenses = Rs. 60

Savings = Rs. 40

New income = Rs. 120

$\text{Expenses} = \text{Rs. } \left(\frac{120 \times 70}{100}\right)$

= Rs. 84

Savings = Rs. (120 – 84)

= Rs. 36

∴ Required percent decrease

$= \frac{40 - 36}{40} \times 100 = \frac{400}{40} = 10\%$

53. (1) Q,s salary = Rs. 100 (let).

∴ P's salary = 125

∴ Required per cent

$= \left(\frac{125 - 100}{125}\right) \times 100$

$= \frac{25 \times 100}{125} = 20\%$

54. (2) Required per cent

$= \left(\frac{40}{100 - 40}\right) \times 100$

$= \frac{4000}{60} = \frac{200}{3} = 66\frac{2}{3}\%$

55. (1) Effect on percentage

$= -\frac{x^2}{100}\%$

$= \left(\frac{-50 \times 50}{100}\right)\%$

= –25%

Negative sign shows decrease.

56. (4) Let the man's income be Rs. x.

According to the question,

$x \times \frac{15}{100} = 75$

$\Rightarrow x = \frac{75 \times 100}{15} = \text{Rs. } 500$

57. (3) B's salary = Rs. 100 (let)

∴ A's salary = Rs. 130

$\therefore \text{Required percent} = \frac{30}{130} \times 100$

$= \frac{300}{13} = 23.07\%$

58. (2) Number of officers = x.

Number of remaining employees = y.

According to the question,

$8840(x + y) = 15000x + 8000y$

$\Rightarrow 8840x + 8840y$

$= 15000x + 8000y$

$\Rightarrow 15000x - 8840x$

$= 8840y - 8000y$

$\Rightarrow 6160x = 840y$

$\Rightarrow \frac{x}{y} = \frac{840}{6160} = \frac{84}{616} = \frac{3}{22}$

∴ Required per cent

$= \frac{3}{25} \times 100 = 12\%$

59. (2) Let annual salary of Sachdev before increase be Rs. x.

According to the question,

$x \times \frac{105}{100} = 15120$

$\Rightarrow x = \frac{15120 \times 100}{105}$

= Rs. 14400

∴ Required monthly salary

$= \text{Rs. } \left(\frac{14400}{12}\right) = \text{Rs. } 1200$

TYPE-IV

1. (1) Let B = 100

∴ According to question,

A is 40% greater than B.

∴ A = 140

∴ B is 20% less than C

∴ 0.8C = 100

∴ C = 125

∴ A : C = 140 : 125 = 28 : 25

2. (1) 10% of m = 20% of n

$\Rightarrow \frac{10}{100} \times m = \frac{20}{100} \times n$

$\Rightarrow \frac{m}{n} = \frac{10}{5} = \frac{2}{1}$

∴ m : n = 2 : 1

3. (1) 5 : 4 when expressed as per cent $= \frac{5}{4} \times 100 = 125\%$

4. (3) Let the number of boys and girls in the college be $3x$ and $2x$ respectively. Number of minor boys

$= 3x \times \frac{80}{100} = \frac{12x}{5}$

Number of minor girls

$= 2x \times \frac{75}{100} = \frac{3x}{2}$

Total number of minor students

$= \frac{12x}{5} + \frac{3x}{2}$

$= \frac{24x + 15x}{10} = \frac{39x}{10}$

Required percentage

$= \frac{39x}{10 \times 5x} \times 100 = 78\%$

(As total students = $3x + 2x$)

5. (4) Let the number of boys and girls be $4x$ and x respectively.

Number of boys who hold scholarship.

$= \frac{75}{100} \times 4x = 3x$

and number of girls who hold scholarship

$= \frac{70 \times x}{100} = \frac{7x}{10}$

Number of students who do not hold scholarship

$= 5x - 3x - \frac{7x}{10} = 2x - \frac{7x}{10}$

$= \frac{20x - 7x}{10} = \frac{13x}{10}$

The required percentage

$= \frac{\frac{13x}{10}}{5x} \times 100$

$= \frac{13x}{10 \times 5x} \times 100 = 26\%$

6. (1) Let the numbers be $2x$ and $3x$.

According to the question,

$\left(\frac{20}{100} \times 2x\right) + 20$

$= \left(\frac{10}{100} \times 3x\right) + 25$

$\Rightarrow \frac{2x}{5} + 20 = \frac{3x}{10} + 25$

$\Rightarrow \frac{2x}{5} - \frac{3x}{10} = 25 - 20$

$\Rightarrow \frac{4x - 3x}{10} = 5 \Rightarrow x = 50$

∴ The smaller number

$= 2x = 100$

7. (3) Let the third number be 100.

∴ First number = 120

Second number = 150

∴ Required ratio

$= \frac{120}{150} = \frac{4}{5}$ or 4 : 5

8. (3) Let the numbers be x and y and x is greater than y. Then

$x - y = 45\%$ of $(x + y)$

$\Rightarrow x - y = \frac{45}{100}(x + y)$

$\Rightarrow x - y = \frac{9}{20}(x + y)$

$\Rightarrow 20x - 20y = 9x + 9y$

$\Rightarrow 20x - 9x = 20y + 9y$

$\Rightarrow 11x = 29y$

$\Rightarrow \frac{x}{y} = \frac{29}{11}$

or 29 : 11

9. (4) 30% of A = 25% of B

⇒ 30 A = 25 B

⇒ A : B = 25 : 30 = 5 : 6

Again,

25% of B = 20% of C

⇒ 25 B = 20C

⇒ 5B = 4C

⇒ B : C = 4 : 5

∴ A : B : C = 5 × 4 : 4 × 6 : 6 × 5

= 20 : 24 : 30 = 10 : 12 : 15

10. (2) Let number of boys be x.

Then, $x + \frac{120}{100}x = 66$

$\Rightarrow x + \frac{6x}{5} = 66$

$\Rightarrow \frac{5x + 6x}{5} = 66$

$\Rightarrow x = \frac{66 \times 5}{11} = 30$

∴ Number of girls

= 66 – 30 = 36

∴ New ratio = 30 : (36 + 4)

= 30 : 40 = 3 : 4

11. (4) Let the number of boys $= 3x$ and that of girls $= 2x$

Number of boys who do not hold scholarship = 80% of $3x$

$= 3x \times \frac{80}{100} = \frac{12x}{5}$

Number of girls who do not hold scholarship

$= 2x \times \frac{70}{100} = \frac{14x}{10}$

∴ Number of students who do not hold scholarship

$= \frac{12x}{5} + \frac{14x}{10} = \frac{24x + 14x}{10}$

$= \frac{38x}{10}$

∴ Required percentage

$= \frac{\frac{38x}{10}}{5x} \times 100$

$= \frac{38}{10 \times 5} \times 100 = 76\%$

12. (4) Let the initial expenses on rice, fish and oil be ₹ $12x$, ₹ $17x$ and ₹ $3x$ respectively.

∴Total expenditure

= ₹ $(12x + 17x + 3x)$

= ₹ $32x$

After increase,

Expenditure on rice

$= \frac{120}{100} \times 12x$ = ₹ $14.4x$

Expenditure on fish

$= \frac{130}{100} \times 17x$ = ₹ $22.1x$

Expenditure on oil

$= \frac{150}{100} \times 3x$ = ₹ $4.5x$

Total expenditure

= ₹ $(14.4\ x + 22.1x + 4.5\ x)$

= ₹ $41\ x$

Increase = ₹ $(41x - 32x)$

= ₹ $9x$

∴ Percentage increase

$= \frac{9x}{32x} \times 100 = \frac{225}{8} = 28\frac{1}{8}\%$

13. (4) 20 % of A = 30 % of B

$= \frac{1}{6}$ of C

$\Rightarrow \frac{20A}{100} = \frac{30B}{100} = \frac{C}{6}$

$\Rightarrow \frac{A}{5} = \frac{B}{\frac{10}{3}} = \frac{C}{6} = k$ (let)

$\Rightarrow A = 5k,\ B = \frac{10}{3}k,\ C = 6\ k$

$\therefore A : B : C = 5k : \frac{10k}{3} : 6\ k$

= 15 : 10 : 18

14. (2) Increased train fare

= ₹ $\left(\frac{120}{100} \times 30\right)$ = ₹ 36

Increased bus fare

= ₹ $\left(\frac{110}{100} \times 20\right)$ = ₹ 22

∴ Required ratio = 36 : 22

= 18 : 11

15. (1) Let the numbers be x and y where $x > y$. Then,

$x - y = \frac{15}{100}(x + y)$

$\Rightarrow x - y = \frac{3}{20}(x + y)$

$\Rightarrow 20x - 20y = 3x + 3y$

$\Rightarrow 20x - 3x = 20y + 3y$

$\Rightarrow 17x = 23y \Rightarrow \frac{x}{y} = \frac{23}{17}$

16. (3) The raised price = $\frac{120}{100}$ of the former price

∴ The householder must now consume $\frac{100}{120}$ of the original amount

∴ The reduction in consumption

$= \left(1 - \frac{100}{120}\right)$ of the original consumption = $\frac{1}{6}$ of the original consumption

i.e. 1 : 6

Aliter : Using Rule 8,

Required percentage

$= \left(\frac{20}{100 + 20}\right) \times 100$

$= \frac{20}{120} \times 100$

$= \frac{100}{6}\%$

Required ratio = 1 : 6

17. (2) Let Rama's expenditure

= $5x$

Savings = $3x$

∴ Rama's income = $5x + 3x = 8x$

After increase,

Rama's income = $\frac{112}{100} \times 8x$

= $8.96\ x$

Rama's expenditure

$= \frac{5x \times 115}{100} = 5.75x$

Rama's savings

= $(8.96x - 5.75x)$

= $3.21x$

∴ Rama's saving per cent

$= \left(\frac{3.21x - 3x}{3x}\right) \times 100$

$= \frac{0.21}{3} \times 100 = 7$

18. (4) Let the numbers be $4x$ and $5x$. After corresponding increase or decrease,

Required ratio

$= 4x \times \frac{120}{100} : 5x \times \frac{80}{100}$

= $12x : 10x$

= 6 : 5

19. (4) $\frac{A \times 60}{100} = B \times \frac{3}{4}$

$\Rightarrow A \times \frac{3}{5} = B \times \frac{3}{4}$

$\Rightarrow \frac{A}{B} = \frac{3}{4} \times \frac{5}{3} = 5 : 4$

20. (1) Let C = 100

∴ B = 80

$A = \frac{80 \times 160}{100} = 128$

∴ A : C = 128 : 100 = 32 : 25

21. (2) $(B - A) \times \frac{30}{100} = (B + A) \times \frac{18}{100}$

$\therefore \frac{B - A}{B + A} = \frac{18}{30} = \frac{3}{5}$

By componendo and dividendo,

$\frac{2B}{-2A} = \frac{3 + 5}{3 - 5} = \frac{8}{-2} = \frac{4}{-1}$

$\Rightarrow \frac{B}{A} = \frac{4}{1}$

⇒ A : B = 1 : 4

22. (1) Boys = 30, Girls = 20 (let)

Boys getting no scholarship = 24

Girls getting no scholarship = 15

Sum = 24 + 15 = 39

∴ Required percentage

$= \frac{39}{50} \times 100 = 78\ \%$

23. (4) Let the first number be x and second number be y.

$\therefore\ y - \frac{60x}{100} = \frac{52y}{100}$

$\Rightarrow 100y - 60x = 52y$

$\Rightarrow 48y = 60x$

$\therefore \frac{x}{y} = \frac{48}{60} = \frac{4}{5}$ or 4 : 5

24. (2) Women = $\frac{43}{83} \times 311250$

= 161250

Men = 311250 − 161250

= 150000

∴ Total number of literate persons

$= \frac{161250 \times 8}{100} + 150000 \times \frac{24}{100}$

= 12900 + 36000 = 48900

25. (3) $7x - 5x = 200$

$\Rightarrow 2x = 200 \Rightarrow x = 100$

∴ Price of a pair of shoes

= $5x$ = 5 × 100 = ₹ 500

26. (1) $x \times \frac{15}{100} = y \times \frac{20}{100}$

$\Rightarrow x \times 15 = y \times 20$

$\Rightarrow \frac{x}{y} = \frac{20}{15} = \frac{4}{3} = 4 : 3$

27. (1) Boys in school = $2x$
Girls = $3x$
Students who are not scholarship holders :

Boys $\Rightarrow \frac{2x \times 75}{100} = \frac{6x}{4}$

Girls $\Rightarrow \frac{3x \times 70}{100} = \frac{21x}{10}$

Total students who donot hold scholarship = $\frac{6x}{4} + \frac{21x}{10}$

$= \frac{30x + 42x}{20} = \frac{72x}{20} = \frac{18x}{5}$

$\therefore$ Required percentage

$= \frac{\frac{18x}{5}}{5x} \times 100 = 72\%$

28. (1) Numbers $\Rightarrow$ A and B

$\therefore \frac{A \times 5}{100} + \frac{B \times 4}{100}$

$= \frac{2}{3}\left(\frac{A \times 6}{100} + \frac{B \times 8}{100}\right)$

$\Rightarrow 5A + 4B = \frac{12A + 16B}{3}$

$\Rightarrow 15A + 12B = 12A + 16B$

$\Rightarrow 15A - 12A = 16B - 12B$

$\Rightarrow 3A = 4B$

$\Rightarrow \frac{A}{B} = \frac{4}{3} = 4 : 3$

29. (3) By alligation,

$\therefore$ Required ratio = 15 : 20
= 3 : 4

30. (4) 50% of x = 30% of y

$\Rightarrow \frac{x \times 50}{100} = \frac{y \times 30}{100}$

$\Rightarrow \frac{x}{y} = \frac{30}{50} = \frac{3}{5} = 3 : 5$

31. (2) Boys in the village = $3x$
Girls in the village = $2x$
Villagers who appeared in the examination

$= \frac{3x \times 30}{100} + \frac{2x \times 70}{100}$

$= \frac{9x}{10} + \frac{14x}{10} = \frac{23x}{10}$

Villagers who did not appear in the examination

$= \frac{3x \times 70}{100} + \frac{2x \times 30}{100}$

$= \frac{21x}{10} + \frac{6x}{10} = \frac{27x}{10}$

$\therefore$ Required ratio $= \frac{23x}{10} : \frac{27x}{10}$

= 23 : 27

32. (4) C.P. of 1 litre of milk= Rs. 100
$\therefore$ Mixture sold for Rs. 125

$= \frac{125}{100} = \frac{5}{4}$ litre

$\therefore$ Quantity of water $= \frac{5}{4} - 1$

$= \frac{1}{4}$ litre

$\therefore$ Required ratio $= \frac{1}{4} : 1$

= 1 : 4

33. (1) Percentage of syrup

$= \frac{3}{4} \times 100 = 75\%$

34. (1) Let the numbers be $5x$ and $4x$ respectively
According to the question,

$5x \times \frac{40}{100} = 12$

$\Rightarrow 2x = 12 \Rightarrow x = 6$

$\therefore$ $4x$ का 50% $= 4 \times 6 \times \frac{1}{2} = 12$

35. (2) According to the question,

$x \times \frac{10}{100} = 3 \times y \times \frac{15}{100}$

$\Rightarrow 10x = 45y$

$\Rightarrow \frac{x}{y} = \frac{45}{10} = \frac{9}{2}$

36. (2) Required per cent

$= \frac{11}{10} \times 100 = 110\%$

37. (2) Let the number of students in school be 100.
Boys $\Rightarrow$ 60
Girls $\Rightarrow$ 40
Students who do not hold scholarship :

Boys $\Rightarrow \frac{60 \times 80}{100} = 48$

Girls $\Rightarrow \frac{40 \times 75}{100} = 30$

Required answer = 48 + 30
= 78 i.e., 78%

38. (2) According to the question,
A × 35% = B × 25%

$\Rightarrow \frac{A}{B} = \frac{25}{35} = \frac{5}{7}$

TYPE-V

1. (2) Glycerine in mixture
= 40 litres
Water = 10 litres
Let x litres of pure glycerine is mixed with the mixture.

$\therefore \frac{40 + x}{50 + x} = \frac{95}{100} = \frac{19}{20}$

$\Rightarrow 800 + 20x = 950 + 19x$

$\Rightarrow x = 950 - 800 = 150$ litres.

2. (4) Alcohol in original solution

$= \frac{40}{100} \times 5 = 2$ litres

Water in original solution
= 3 litres
On adding 1 litre water, water becomes 4 litres.
Now, 6 litres of solution contains 2 litres of alcohol.
$\therefore$ 100 litres of solution contains

$= \frac{2}{6} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}$ % alcohol.

3. (1) In 12 litres salt solution,

$$\text{Salt} = \frac{7 \times 12}{100} = 0.84 \text{ units}$$

$$\text{Water} = \frac{93 \times 12}{100} = 11.16 \text{ units}$$

After evaporation,
Percentage of salt

$$= \frac{0.84}{8} \times 100 = 10.5\%$$

4. (2) In 60 litres of solution, Water

$$= \frac{60 \times 20}{100} = 12 \text{ litres}$$

On adding x litres of water,

$$\frac{12 + x}{60 + x} \times 100 = 40$$

$\Rightarrow 60 + 5x = 120 + 2x$
$\Rightarrow 3x = 60$
$\Rightarrow x = 20$ litres

5. (2) Sugar in original solution

$$= \frac{75 \times 30}{100} = 22.5 \text{ gm}$$

Let x gm of sugar be mixed.

$$\therefore \frac{22.5 + x}{75 + x} \times 100 = 70$$

$\Rightarrow 2250 + 100x = 75 \times 70 + 70x$
$\Rightarrow 2250 + 100x = 5250 + 70x$
$\Rightarrow 30x = 5250 - 2250 = 3000$

$$\Rightarrow x = \frac{3000}{30} = 100 \text{ gm}$$

6. (3) In 30% alcohol solution,

$$\text{Alcohol} = \frac{30}{100} \times 6 = 1.8 \text{ litres}$$

Water = 4.2 litres
On mixing 1 litre of pure alcohol,
Percentage of water

$$= \frac{4.2}{7} \times 100 = 60\%$$

7. (2) In 4 kg of ore, iron = 0.9 kg.
$\therefore$ Quantity of ore for 60 kg of iron

$$= \frac{60 \times 4}{0.9}$$

= 266.67 kg

8. (4) Let x ml of water be added.

$$\therefore \frac{20 + x}{100 + x} \times 100 = 50$$

$\Rightarrow 40 + 2x = 100 + x$
$\Rightarrow x = 60$ ml

9. (1) In 1 litre i.e. 1000 ml of mixture,
Alcohol = 700 ml.
Water = 300 ml.
Let x ml of alcohol is mixed.

$$\therefore \frac{300}{1000 + x} \times 100 = 15$$

$\Rightarrow 1000 + x = 2000$
$\Rightarrow x = 1000$ ml.

10. (4) In 10 litres of first type of liquid,

$$\text{Water} = \frac{1}{5} \times 10 = 2 \text{ litres}$$

In 4 litres of second type of liquid,

$$\text{Water} = 4 \times \frac{35}{100} = \frac{7}{5} \text{ litres}$$

Total amount of water

$$= 2 + \frac{7}{5} = \frac{17}{5} \text{ litres}$$

Required percentage

$$= \frac{\frac{17}{5}}{14} \times 100$$

$$= \frac{170}{7} = 24\frac{2}{7}\%$$

11. (4) Water content in 40 litres of

$$\text{mixture} = 40 \times \frac{10}{100}$$

= 4 litres
$\therefore$ Milk content = 40 – 4
= 36 litres
Let x litres of water is mixed.

$$\text{Then, } \frac{4 + x}{40 + x} = \frac{20}{100}$$

$$\Rightarrow \frac{4 + x}{40 + x} = \frac{1}{5}$$

$\Rightarrow 20 + 5x = 40 + x$
$\Rightarrow 4x = 20 \Rightarrow x = 5$ litres

12. (2) $\text{Alcohol} = \left(\frac{15}{100} \times 400\right)\text{ml}$

= 60 ml.
Water = 340 ml.
Let x ml of alcohol be added.

$$\text{Then, } \frac{60 + x}{400 + x} \times 100 = 32$$

$$\text{or } \frac{60 + x}{400 + x} = \frac{32}{100} = \frac{8}{25}$$

or $1500 + 25x = 3200 + 8x$
or $17x = 1700$
or $x = 100$ ml

13. (2) Initial quantity of gold

$$= \frac{50 \times 80}{100} = 40 \text{ gm}$$

Let 'x' gm be mixed.

$$(40 + x) = (50 + x) \times \frac{95}{100}$$

$$\Rightarrow 40 + x = (50 + x) \times \frac{19}{20}$$

$\Rightarrow 800 + 20x = 950 + 19x$
$\Rightarrow x = 150$ gm

14. (3) In 200 litres of mixture,

$$\text{Quantity of milk} = \frac{85}{100} \times 200$$

= 170 litres
Quantity of water = 30 litres
Let the quantity of additional milk added be x litres.
According to the question,

$$\frac{170 + x}{200 + x} \times 100 = 87.5$$

$\Rightarrow (170 + x) \times 100$
$= 17500 + 87.5x$
$\Rightarrow 100x - 87.5x$
$= 17500 - 17000$
$\Rightarrow 12.5x = 500$

$$\Rightarrow x = \frac{500}{12.5} = 40 \text{ litres}$$

15. (2) Let x litres of first mixture is mixed with y litres of the second mixture.
According to the question,

$$\frac{x \times \frac{30}{100} + y \times \frac{50}{100}}{x \times \frac{70}{100} + y \times \frac{50}{100}} = \frac{45}{55}$$

$$\Rightarrow \frac{0.3x + 0.5y}{0.7x + 0.5y} = \frac{9}{11}$$

$\Rightarrow 6.3x + 4.5y = 3.3x + 5.5y$
$\Rightarrow 6.3x - 3.3x = 5.5y - 4.5y$
$\Rightarrow 3x = y$

$$\Rightarrow \frac{x}{y} = 1:3$$

16. (1) Solution I Solution II

$\therefore$ Required ratio = 10 : 15 = 2 : 3

17. (2) Alcohol $= 15 \times \frac{1}{5} = 3$ litres

Water $= 15 \times \frac{4}{5} = 12$ litres

$\therefore$ Required percentage

$= \frac{3}{15+3} \times 100$

$= \frac{50}{3} = 16\frac{2}{3}\%$

18. (2) $\because$ 12 kg copper is contained in 100 kg of alloy

69 kg copper is contained in

$\therefore \frac{100}{12} \times 69 = 575$ kg of alloy

19. (3)

Alcohol I $\frac{1}{4}$ Alcohol II $\frac{1}{2}$

Mean value $\frac{2}{5}$

$\frac{1}{2} - \frac{2}{5} = \frac{5-4}{10} = \frac{1}{10}$

$\frac{2}{5} - \frac{1}{4} = \frac{8-5}{20} = \frac{3}{20}$

$\therefore$ Required ratio $= \frac{1}{10} : \frac{3}{20}$

$= 2 : 3$

20. (2) In 20 litres of mixture,

Alcohol $\Rightarrow \frac{20 \times 20}{100} = 4$ litres

Water $\Rightarrow$ 20 - 4 = 16 litres

On adding 4 litres of water,

Quantity of water $\Rightarrow 16 + 4$

$= 20$ litres

Quantity of mixture $= 24$ litres

$\therefore$ Required per cent

$= \frac{4}{24} \times 100 = \frac{50}{3} = 16\frac{2}{3}\%$

21. (3) In 300 gm of solution,

Sugar $= \frac{300 \times 40}{100} = 120$ gm.

Let x gm of sugar be mixed.

According to the question,

$\frac{120 + x}{300 + x} = \frac{1}{2}$

$\Rightarrow 240 + 2x = 300 + x$

$\Rightarrow 2x - x = 300 - 240$

$\Rightarrow x = 60$ gm.

22. (2) Quantity of sugar in the solution $= \frac{3 \times 60}{100} = 1.8$ units

On adding 1 litre of water,

$\therefore$ Required percent

$= \frac{1.8}{4} \times 100 = 45\%$

23. (2) In 32 litres of solution,

Alcohol $= \frac{32 \times 20}{100} = 6.4$ litres

Water $= 32 - 6.4 = 25.6$ litres

On adding 8 litres of water,

Required percent $= \frac{6.4}{40} \times 100 =$ 16%

TYPE-VI

1. (3) Using Rule 8,

Tricky approach

Required percentage decrease

$= \frac{\text{Increase}}{100 + \text{Increase}} \times 100$

$= \frac{20}{100+20} \times 100$

$= \frac{100}{6} = 16\frac{2}{3}\%$

2. (1) Using Rule 8,
Required answer

$= \frac{10}{(100+10)} \times 100$

$= \frac{10}{110} \times 100 = \frac{100}{11}\% = 9\frac{1}{11}\%$

3. (1) Using Rule 8,
Required reduction in consumption

$= \frac{x}{100 + x} \times 100\%$

where x = 25

$= \frac{25}{100+25} \times 100 = 20\%$

4. (3) Using Rule 8,
Reduction in consumption

$= \left\{\frac{R}{100+R} \times 100\right\}\%$

$= \left(\frac{20}{120} \times 100\right)\%$

$= \frac{50}{3}\% = 16\frac{2}{3}\%$

5. (2) Let the CP of each article = ₹ 100 and consumption = 100 units

Initial expenditure

= ₹ (100 × 100) = ₹ 10000

New price of article = ₹ 80

Consumption = 120 units

Expenditure = ₹ (120 × 80)

= ₹ 9600

Decrease = ₹ (10000 – 9600)

= ₹ 400

$\therefore$ Percentage decrease

$= \frac{400 \times 100}{10000} = 4\%$

Aliter : Using Rule 3,

Required percentage decrease

$= \frac{20^2}{100}\%$

= 4% decreases

6. (2) Using Rule 8,
If the price of a commodity increases by R%, then reduction in consumption, not to increase the expenditure is given by

$\left(\frac{R}{100+R} \times 100\right)\%$

$= \frac{15}{100+15} \times 100 = \frac{15}{115} \times 100$

$= \frac{300}{23} = 13\frac{1}{23}\%$

7. (2) Using Rule 8,
Required fractional decrease

$= \frac{R}{100+R} = \frac{50}{100+50} = \frac{1}{3}$

8. (4) Using Rule 8,
Percentage decrease

$= \frac{25}{125} \times 100 = 20\%$

9. (4) Using Rule 9,
Required increase percent

$= \frac{40}{100-40} \times 100$

$= \frac{40}{60} \times 100 = \frac{200}{3} = 66\frac{2}{3}\%$

10. (4) Using Rule 8,
Required percentage decrease

$$= \frac{20}{100+20} \times 100$$

$$= \frac{50}{3} = 16\frac{2}{3}\%$$

11. (2) Using Rule 2,
Percentage increase

$$= \frac{7.50-6}{6} \times 100 = 25\%$$

$\therefore$ Percentage decrease in consumption $= \frac{25}{125} \times 100 = 20\%$

12. (2) Using Rule 4,
Percentage effect

$$= \left(20 - 20 + \frac{20 \times -20}{100}\right)\%$$

$= -4\%$
Negative sign shows decrease.

13. (2) If the reduction in consumption be x%, then

$$60 - x - \frac{60x}{100} = 0$$

$$\Rightarrow 60 - x - \frac{3x}{5} = 0$$

$\Rightarrow 300 - 5x - 3x = 0$
$\Rightarrow 8x = 300$

$$\Rightarrow x = \frac{300}{8} = 37.5\%$$

Aliter : Using Rule 8,
Required percentage

$$= \frac{60}{160} \times 100\%$$

$$= \frac{300}{8} = \frac{75}{2} = 37.5\%$$

14. (4) Using Rule 8,
Required per cent

$$= \frac{25 \times 100}{125} = 20\%$$

15. (2) Using Rule 8,
Percentage decrease in the consumption of petrol

$$= \left(\frac{20}{100+20} \times 100\right)\%$$

$$= \frac{50}{3} = 16\frac{2}{3}\%$$

TYPE-VII

1. (3) Total candidates
= 1000 + 800 = 1800
The candidates who are passed

$$= 1000 \times \frac{60}{100} + 800 \times \frac{50}{100}$$

= 600 + 400 = 1000
The number of candidates who failed = 1800 – 1000 = 800
$\therefore$ Required percent

$$= \frac{800}{1800} \times 100 = 44.4\%$$

Aliter : Using Rule 25,
Percentage of passed students

$$= \left(\frac{B.b + G.g}{B+G}\right)\%$$

$$= \frac{1000 \times 60 + 800 \times 50}{1000 + 800}$$

$$= \frac{60000 + 40000}{1800}$$

$$= \frac{100000}{1800}$$

$$= \frac{500}{9} = 55.5$$

$\therefore$ Percentage of failed students
= 100 – 55.5 = 44.4%

2. (3) Let the maximum marks be x.
According to question,
20% of x + 5 = 30% of x –20
$\Rightarrow$ (30 –20)% of x = 25

$$\Rightarrow x = \frac{25 \times 100}{10} = 250$$

$\therefore$ Passing marks
= 20% of 250 + 5 = 55
$\therefore$ % Passing marks

$$= \frac{55}{250} \times 100 = 22\%$$

Aliter : Using Rule 22,
Here, m = 30%, n = 20%, p = 5 and q = 20
$\therefore$ Maximum marks

$$= \frac{100}{(n-m)} \times (p+q)$$

$$= \frac{100}{(30-20)} \times (5+20)$$

$$= \frac{100 \times 25}{10} = 250$$

Passing marks
= 20% of 250 + 5 = 55
$\therefore$ % of passing marks

$$= \frac{55}{250} \times 100 = 22\%$$

3. (3) **Tricky approach**
According to question,
40% $\Rightarrow$ 220 + 20
or 40% $\Rightarrow$ 240

$$\therefore 100\% \Rightarrow \frac{240}{40} \times 100 = 600$$

Aliter : Using Rule 24,
a = 40%, b = 220, c = 20

$$\text{Total Marks} = \frac{100(220+20)}{40}$$

$$= \frac{100 \times 240}{40} = 600$$

4. (3) Let the total marks be x.
According to the question,
25% of x + 40 = 33% of x
$\Rightarrow$ (33 – 25)% of x = 40
$\Rightarrow$ 8% of x = 40

$$\Rightarrow x = \frac{40 \times 100}{8} = 500$$

5. (1) Let the marks obtained by first student be x.
$\therefore$ Marks obtained by second student = x + 9
Sum of their marks
= 2x + 9
As given,
x + 9 = 56% of (2x + 9)

$$\Rightarrow x + 9 = \frac{56}{100} \times (2x+9)$$

$$\Rightarrow x + 9 = \frac{14}{25} \times (2x+9)$$

$\Rightarrow 25x + 225 = 28x + 126$
$\Rightarrow 3x = 225 - 126$

$$\Rightarrow x = \frac{99}{3} = 33$$

$\therefore$ Marks obtained are 42 and 33.

6. (1) Let marks obtained by Supriyo = x

$$\therefore \frac{9x}{10} = 81 \Rightarrow x = \frac{81 \times 10}{9} = 90$$

7. (3) Let the maximum marks be x.
According to the question,
40% of x = 90 + 10

$$\Rightarrow x = \frac{100 \times 100}{40} = 250$$

Aliter : Using Rule 24,
a = 40%, b = 90, c = 10
Maximum marks

$= \frac{(b+c)}{a} \times 100$

$= \frac{(90+10)}{40} \times 100 = 250$

8. (1) n (M) = 65, n (P) = 48, n(M∩P) = 30
∴ n(M∪P) = n(M) + n(P) – n(M∩P)
= 65 + 48 – 30 = 83
∴ Per cent of students passed = 83
∴ Per cent of students failed= 17
Method 2 :
Students passed only in Math
= 65 – 30 = 35%
Students passed only in Physics
= 48 – 30 = 18%
∴ Total passing %
= 35 + 18 + 30 = 83%
∴ Failed = 100 – 83 = 17%

9. (3) Let the number of students in the class be 100.
∴ Number of students in Biology = 72 and number of students in Maths = 44.
∴ Number of students opting for both subjects
= 72 + 44 – 100 = 16
∵ When 16 students opt for both subjects, total number of students = 100
∴ When 40 students opt for both subjects, total number of students $= \frac{100}{16} \times 40 = 250$

10. (1) Let the maximum marks be x.

$\therefore \frac{x \times 33}{100} = 125 + 40 = 165$

$\Rightarrow x = \frac{165 \times 100}{33} = 500$

Aliter : Using Rule 24,
a = 33%, b = 125, c = 40
Maximum marks

$= \frac{(b+c)}{a} \times 100$

$= \frac{(125+40)}{33} \times 100$

$= \frac{165 \times 100}{35} = 500$

11. (2) Let maximum marks be x, then,

$\frac{36 \times x}{100} = 113 + 85 = 198$

$\Rightarrow x = \frac{198 \times 100}{36} = 550$

Aliter : Using Rule 24,
a = 36%, b = 113, c = 85
Maximum marks

$= \frac{(b+c) \times 100}{a}$

$= \frac{(113+85) \times 100}{36}$

$= \frac{198 \times 100}{36} = 550$

12. (2) 46% of 500

$= \frac{500 \times 46}{100} = 230$

32% of 300 $= \frac{300 \times 32}{100} = 96$

Required marks = 230 – 96 = 134
Let x% of 200 = 134

$\Rightarrow \frac{200 \times x}{100} = 134$

$\Rightarrow 2x = 134$

$\Rightarrow x = \frac{134}{2} = 67\%$

13. (2) A = 360;

$B = \frac{360 \times 100}{90} = 400$

$C = \frac{400 \times 100}{125} = 320$

$D = \frac{320 \times 100}{80} = 400$

∴ Required percentage

$= \frac{400}{500} \times 100 = 80\%$

14. (4) Failed candidates

$= \frac{1100 \times 50}{100} + \frac{900 \times 60}{100}$

= 550 + 540 = 1090
∴ Required percentage

$= \frac{1090}{2000} \times 100 = 54.5\%$

Aliter : Using Rule 25,
B = 1100, b = 50%, G = 900, g = 40%
Percentage of failed candidates

$= \frac{(Bb + Gg)}{B + G}\%$

$= \frac{1100 \times 50 + 900 \times 40}{1100 + 900}$

$= \frac{55000 + 36000}{2000}$

$= \frac{91}{2} = 45.5\%$

15. (2) Successful boys in English or Maths or both
= 80 + 85 – 75 = 90%
Unsuccessful boys = 10%
∴ Total number of boys

$= \frac{100}{10} \times 45 = 450$

16. (2) 25% of students pass in at least one subject i.e.; they pass in one or both subjects.
∴ % of students who don't pass or fail in both subjects
= (100 – 25)% = 75%

17. (1) The percentage of students who pass in one or two or both subjects
= 60 + 70 – 40 = 90
∴ Percentage of failed students
= 100 – 90 = 10%

18. (3) Let total number of candidates = 100
70 candidates passed in English and 30 failed in it.
80 candidates passed in Maths and 20 failed in it.
10 candidates failed in English and Maths both.
∴ Out of 30 failed in English, 10 failed in Maths also.
∴ 30 – 10 = 20 failed in English alone.
Similarly,
20 – 10 = 10 failed in Maths alone.
∴ Total number of failures
= 20 + 10 + 10 = 40
∴ 100 – 40 = 60 candidates passed in both subjects.
Now, if 60 candidates pass, total strength = 100
∴ For 144 candidates, total strength $= \frac{100}{60} \times 144 = 240$

19. (4) Difference of percentages of maximum marks obtained by two candidates = 32% – 20% = 12%
Difference of scores between two candidates = 30 +42 = 72
∴ 12% of maximum marks = 72
∴ Maximum marks

$$= \frac{72 \times 100}{12} = 600$$

∴ Pass marks = 20% of 600 + 30
= 120 + 30 = 150
∴ Required percentage

$$= \frac{150}{600} \times 100 = 25\%$$

Aliter : Using Rule 22,
n = 32%, m=20%, p=30, q = 42.

$$\text{Full Marks} = \frac{100}{n-m} \times (p+q)$$

$$= \frac{100}{(32-20)} \times (30+42)$$

$$= \frac{100}{32} \times 72 = 600$$

Pass marks =20% of 600 + 30
= 120 + 30 = 150
∴ Required percentage

$$= \frac{150}{600} \times 100 = 25\%$$

20. (4) Total number of students = 640 + 360 = 1000
Number of successful boys = 60% of 640 = 384
Number of successful girls = 80% of 360 = 288
Total number of successful students = 384 + 288 = 672
Number of unsuccessful students = 1000 – 672 = 328
∴ Required percentage

$$= \frac{328 \times 100}{1000} = 32.8\%$$

Aliter : Using Rule 25,
B = 640, G = 360,
b = 60%, g = 80%
Percentage of passed students

$$= \left(\frac{Bb + Gg}{B + G}\right)\%$$

$$= \frac{640 \times 60 + 360 \times 80}{640 + 360}$$

$$= \frac{38400 + 28800}{1000}$$

$$= \frac{67200}{1000} = 67.2\%$$

∴ % of failed students
= 100 – 67.2%
= 32.8%

21. (3) Let total number of students = 100
Number of failures in Maths = 34
Number of failures in English = 42
Number of failures in both subjects = 20
Number of failures in Maths or English or both
= 34 + 42 – 20 = 56
Number of students who passed in both subjects
= 100 – 56 = 44
The required percentage = 44%
Aliter : Using Rule 23,
a = 34%, b = 42%, c = 20%
Passed candidates in both the subjects
= 100 – (a + b – c)
= 100 – (34 + 42 – 20)
= 100 – 56 = 44%

22. (2) Difference of percentage
= (40 – 30)% = 10%
Difference of marks = 6 + 6= 12
∵ 10% of total marks = 12

$$\text{Total marks} = \frac{12 \times 100}{10} = 120$$

Aliter : Using Rule 22,
Here, m = 30%, n = 40%,
p = 6, q = 6.
∴ Maximum Marks

$$= \frac{100}{(n-m)} \times (p+q)$$

$$= \frac{100}{(40-30)} \times (6+6)$$

$$= \frac{100}{10} \times 12 = 120$$

23. (3) Let the total number of students = 100
∴ Number of students who failed in Hindi or English or both
= 52 + 42 – 17 = 77
∴ Number of students who passed in both subjects
= 100 – 77 = 23%
∴ Required percentage = 23
Aliter : Using Rule 23,
a = 52%, b = 42%, c = 17%
Passed candidates
= 100 – (52 + 42 – 17)
= 100 – (94 – 17)
= 100 – 77 = 23%

24. (2) Let total number of students = 100
∴ 27 students speak none of the two languages.
It means only 73 students speak either Hindi or English or both.
Let x students speak both languages.

∴ 73 = 70 – x + x + 65 – x
⇒ x = 70 + 65 – 73 = 62%

25. (2) Clearly, 75 candidates qualify
∴ 75% of appearing candidates = 450
∴ Number of appearing candidates

$$= \frac{450 \times 100}{75} = 600$$

26. (1) Number of students passed in first year = 75
Number of students passed in second year $= \frac{60 \times 75}{100} = 45$
Total number of passed students = 75+45=120
Total number of appeared students =175
∴ Required percentage

$$= \frac{120}{175} \times 100 = 68\frac{4}{7}\%$$

27. (4) Let the maximum marks be x.
According to the question,
35% of x = 200 +10

$$\Rightarrow \frac{35x}{100} = 210$$

$$\Rightarrow x = \frac{210 \times 100}{35} = 600$$

Aliter : Using Rule 24,
a = 35%, b = 200, c = 10
Maximum Marks

$$= \frac{100 \times (b+c)}{a}$$

$$= \frac{100(200+10)}{35}$$

= 600 Marks

28. (1) Let the full marks in that examination were x.
According to the question,

$$\frac{30x}{100}+5=\frac{40x}{100}-10$$

$$\Rightarrow \frac{4x}{10}-\frac{3x}{10}=10+5$$

$$\Rightarrow \frac{x}{10}=15$$

$\therefore x = 150$

$\therefore$ Minimum pass marks

$$\frac{30}{100}\times 150+5=50$$

Aliter : Using Rule 22,
m = 30%, n = 40%,
p = 5, q = 10.
Maximum marks

$$=\frac{100}{(n-m)}\times(p+q)$$

$$=\frac{100}{(40-30)}\times(5+10)=150$$

$\therefore$ Minimum passing marks

$$=150\times\frac{30}{100}+5$$

= 45 + 5 = 50

29. (4) Let the total number of candidates = x
$\therefore$ Number of candidates passed in English = $0.6x$
Number of candidates passed in Maths = $0.7x$
Number of candidates failed in both subjects = $0.2x$
Number of candidates passed in atleast one subject
$= x - 0.2x = 0.8x$
$\therefore 0.6x + 0.7x - 2500 = 0.8x$
$\Rightarrow 1.3x - 0.8x = 2500$
$\Rightarrow 0.5x = 2500$

$$\Rightarrow x=\frac{2500}{0.5}=5000$$

30. (3) Let the maximum marks in the examination = x.
According to the question,

$$\frac{40x}{100}-\frac{30x}{100}=50$$

$$\Rightarrow \frac{10x}{100}=50$$

$$\Rightarrow x=\frac{50\times 100}{10}=500$$

Aliter : Using Rule 22,
m = 30%, n = 40%, p = 25 and q = 25

$\therefore$ Maximum marks

$$=\frac{100}{(n-m)}\times(p+q)$$

$$=\frac{100}{(40-30)}\times(25+25)$$

= 500

31. (1) Let total candidates be 'x'
Percentage of the candidates passing in English or Mathematics or both
$= n(E) + n(M) - n(E \cap M)$
= 80 + 85 − 73 = 92
$\Rightarrow$ Percentage of candidates who failed in both the subjects
= 100 − 92 = 8 or 8%

32. (1) Percentage of students who failed in Maths or English or both
= (25 + 35 − 10)% = 50%
$\therefore$ Required percentage
= (100 − 50)% = 50%
Aliter : Using Rule 23,
a = 35%, b = 25% and c = 10%
$\therefore$ Passed candidates in both the subjects.
= 100 − (a + b − c)%
= 100 − (35 + 25 − 10)%
= 100 − 50 = 50%

33. (1) If the total number of students be x, then
7% of x = 259

$$\Rightarrow \frac{x\times 7}{100}=259$$

$$\Rightarrow x=\frac{259\times 100}{7}=3700$$

34. (3) If the total number of students be x, then

$$x=\frac{90x}{100}+\frac{85x}{100}-150$$

$\Rightarrow 100x = 90x + 85x - 15000$
$\Rightarrow 175x - 100x = 15000$
$\Rightarrow 75x = 15000$
$\Rightarrow x = 200$

35. (1) Required percentage

$$=\frac{40\times 100+50\times 90+60\times 80}{40+50+60}$$

$$=88\frac{2}{3}\%$$

36. (2) If D gets 100 marks, then
Marks obtained by C = 125
Marks obtained by B

$$=\frac{125\times 90}{100}$$

Marks obtained by A

$$=\frac{125\times 90}{100}\times\frac{125}{100}$$

$$\because 100=\frac{125\times 125\times 90}{10000}$$

$$\therefore 320=\frac{125\times 125\times 90\times 320}{1000000}$$

= 450

37. (2) Total examinees
= 80 + 60 = 140
Total successful examinees

$$=\frac{80\times 60}{100}+\frac{60\times 80}{100}$$

= 48 + 48 = 96.
$\therefore$ Required percent

$$=\frac{96}{140}\times 100=\frac{480}{7}=68\frac{4}{7}\%$$

Aliter : Using Rule 25,
Let us take B = 80, G = 60 and b = 60%, g = 80%
$\therefore$ Percentage of passed candidates

$$=\left(\frac{Bb+Gg}{B+G}\right)\%$$

$$=\left(\frac{80\times 60+60\times 80}{80+60}\right)\%$$

$$=\frac{9600}{140}$$

$$=\frac{480}{7}=68\frac{4}{7}\%$$

38. (4) $n(A\cup B)$

$= n(A) + n(B) - n(A\cap B)$
= 19 + 10 − 7 = 22%
i.e. 22% of students are unsuccessful in either one or two subjects.
$\therefore$ Percentage of successful students = 100 − 22 = 78%
Aliter : Using Rule 24,
a = 19%, b = 10%, c = 7%
Passed students in both the subjects
= 100 − (a + b − c)
= 100 − (19 + 10 − 7)
= 100 − 22 = 78%

39. (2) Successful students in both classes

$$=\frac{20\times 80}{100}+\frac{30\times 60}{100}$$

= 16 + 18 = 34

∴ Required percentage

$= \frac{34}{50} \times 100 = 68\%$

OR

Required percentage

$= \frac{20 \times 80 + 30 \times 60}{50}$

$= \frac{1600 + 1800}{50} = \frac{3400}{50}$

= 68%

Aliter : Using Rule 25,

Let us take B = 20, G = 30, b = 80%, g = 60%

∴ Required percentage

$= \frac{Bb + Gg}{B + G}$

$= \left(\frac{20 \times 80 + 30 \times 60}{20 + 30}\right)\%$

$= \left(\frac{1600 + 1800}{50}\right)\%$

$= \frac{3400}{50}\% = 68\%$

40. (4) Failures in English
= 100 – 75 = 25
Failures in Maths = 100–60 = 40
Failures in both subjects = 25
Failures in English only
= 25 – 25 = 0
Failures n Maths only
= 40 – 25 = 15
Failures in one or both subjects
= 25 + 15 = 40
Percentage of successfuls
= 100 – 40 = 60
Let total students be x.

$\therefore x \times \frac{60}{100} = 240$

$\Rightarrow x = \frac{240 \times 100}{60} = 400$

41. (4) Maximum marks in the examination = x (let)

$\therefore \frac{40x}{100} - \frac{30x}{100} = 12 + 28$

$\Rightarrow \frac{10x}{100} = 40 \Rightarrow x = 40 \times 10$

= 400

Aliter : Using Rule 22,

Here, m = 30%, n = 40%, p = 12, q = 28

∴ Maximum marks

$= \frac{100}{(n - m)} \times (p + q)$

$= \frac{100}{(40 - 30)} \times (12 + 28)$

$= \frac{100 \times 40}{10} = 400$

42. (4) Total marks scored in all three subjects

$= \frac{300 \times 70}{100} = 210$

∴ Marks scored in third subject
= 210 – 60 – 80 = 70

43. (4) Let total marks in the exam be x.
According to the question,

$\frac{x \times 36}{100} = 190 + 35 = 225$

$\Rightarrow x \times 36 = 225 \times 100$

$\Rightarrow x = \frac{225 \times 100}{36} = 625$

Aliter : Using Rule 24,

a = 36%, b = 190, c = 35

Total marks $= \frac{(b + c) \times 100}{a}$

$= \frac{(190 + 35) \times 100}{36}$

$= \frac{225 \times 100}{36}$

$= \frac{25 \times 100}{4} = 625$

44. (3) Let the full marks of exam be x.
According to the question,

$\frac{x \times 32}{100} - \frac{x \times 20}{100} = 30 + 42$

$\Rightarrow \frac{12x}{100} = 72$

$\Rightarrow x = \frac{72 \times 100}{12} = 600$

∴ Minimum marks to pass

$= \frac{600 \times 20}{100} + 30$

= 120 + 30 = 150

∴ Required percentage

$= \frac{150}{600} \times 100 = 25\%$

Aliter : Using Rule 22,

Here, m = 20%, n = 32%, p = 30 and q = 42

Full Marks $= \frac{100}{(n - m)} \times (p + q)$

$= \frac{100}{(32 - 20)} \times (30 + 42)$

$= \frac{100 \times 72}{12} = 600$

∴ Passing Marks
= 20% of 600 + 30

$= \frac{20 \times 600}{100} + 30$

= 120 + 30 = 150

∴ Pass percentage $= \frac{150}{600} \times 100$

= 25%

45. (3) Percentage of students who pass in one or two or both subjects = 73 + 70 – 64 = 79%

∴ Unsuccessful students

⇒ 100 – 79 = 21%

If the total number of examinees be x, then

21% of x = 6300

$\Rightarrow x \times \frac{21}{100} = 6300$

$\Rightarrow x = \frac{6300 \times 100}{21} = 30000$

46. (2) Let the number of students with less than 75% attendance = y

Total students in school = x

According to the question,

$\frac{x}{10} + \frac{y}{5} = y$

$\Rightarrow \frac{x}{10} = y - \frac{y}{5} = \frac{4y}{5}$

$\Rightarrow \frac{x}{2} = 4y \Rightarrow \frac{y}{x} = \frac{1}{8}$

$\Rightarrow \frac{y}{x} \times 100 = \frac{100}{8} = 12.5\%$

47. (1) Number of students who wear spectacles

$= \frac{1400 \times 25}{100} = 350$

$\therefore$ Girls who wear spectacles

$= \left(1 - \frac{2}{7}\right)$ of 350

$= 350 \times \frac{5}{7} = 250$

48. (2) Percentage of boys = 60%

$\therefore$ Percentage of girls = 40%

Boys : Girls = 60 : 40 = 3 : 2

Number of girls = 812

$\therefore$ Number of boys

$= \frac{3}{2} \times 812 = 1218$

49. (1) Marks scored by A :

First subject $\Rightarrow \frac{900 \times 72}{100} = 648$

Second subject $\Rightarrow \frac{700 \times 80}{100}$

= 560

Total marks scored = 648 + 560

= 1208

Total maximum marks

= 900 + 700 = 1600

$\therefore$ Required per cent

$= \frac{1208}{1600} \times 100 = 75.5\%$

50. (4) Percentage of failures either in 1 subject or both subjects

= (35 + 45 – 20)% = 60%

$\therefore$ Percentage of the successful

= (100– 60)% = 40%

51. (3) Total marks of 50 students = 50 × 70 = 3500

Total marks of 25 students

= 25 × 60 = 1500

Total marks of 24 students

= 24 × 80 = 1920

$\therefore$ Marks obtained by last student

= 3500 – 1500 – 1920

= 80 i.e, 80%

52. (3) Let marks obtained by the first student be x.

$\therefore$ Marks obtained by the second student = $x - 9$

According to the question,

x = 56% of $(x + x - 9)$

$\Rightarrow x = \frac{(2x - 9) \times 56}{100}$

$\Rightarrow 100x = 112x - 504$

$\Rightarrow 112x - 100x = 504$

$\Rightarrow 12x = 504$

$\Rightarrow x = \frac{504}{12} = 42$

$\therefore$ Marks obtained by the second student = 42 – 9 = 33

53. (3) Maximum marks of examination = x (let)

According to the question,

25% of x = 47 + 43

$\Rightarrow \frac{x \times 25}{100} = 90$

$\Rightarrow \frac{x}{4} = 90 \Rightarrow x = 4 \times 90 = 360$

TYPE-VIII

1. (1) Using Rule 4,

Change in his salary

$= \left(20 - 20 - \frac{20 \times 20}{100}\right)\%$

$= \left(-\frac{400}{100}\right)\% = -4\%$

i.e. 4% decrease

Note : If A is first increased by x% and then decreased by y% the net % change

$= \left(x - y - \frac{xy}{100}\right)\%$

If the result is positive, the change indicates increase and if the result is negative, the change indicates decrease.

2. (3) Using Rule 4,

Net % change

$= \left(A + B + \frac{AB}{100}\right)\%$

Here, A = 20%, B = – 10%

$\therefore$ Net % change

$= 20 - 10 - \frac{200}{100}$

= 10 – 2= 8%

+ ve sign shows increase

3. (3) Using Rule 3,

Tricky approach

Required change

$= \frac{(10)^2}{100}\%$ decrease

= 1% decrease

4. (2) Using Rule 6,

A single equivalent reduction to reduction series of x%, y%

$= \left(x + y - \frac{xy}{100}\right)\%$

$= \left(10 + 10 - \frac{10 \times 10}{100}\right)\%$

$= (20 - 1)\% = 19\%$

5. (1) The net change in price

$= \left(-25 + 20 - \frac{25 \times 20}{100}\right)\%$

= (–25 + 20 – 5)% = – 10%

Negative sign shows decrease.

6. (2) Let the price of the article be ₹ 100 and the daily sale be 100 units.

$\therefore$ Revenue day = 100 × 100

= ₹ 10000

New receipts = 75 × 130

= ₹ 9750

Decrease = ₹ (10000 – 9750)

= ₹ 250

$\therefore$ % decrease

$= \frac{250}{10000} \times 100 = 2\frac{1}{2}\%$

Aliter : Using Rule 5,

Required change

$= \left(a - b - \frac{ab}{100}\right)\%$

$= \left(30 - 25 - \frac{30 \times 25}{100}\right)\%$

$= \left(5 - \frac{15}{2}\right) = -2.5\%$

$= 2\frac{1}{2}\%$ decrease.

7. (3) Using Rule 7,

Tricky approach

Single equivalent percentage increase in price

$= \left(10 + 10 + \frac{10 \times 10}{100}\right)\% = 21\ \%$

8. (4) Using Rule 7,

Tricky Approach

Effective increase percentage

$= \left(10 + 20 + \frac{20 \times 10}{100}\right)\% = 32\%$

$\therefore x \times \frac{132}{100} = 33$

$\Rightarrow x = \frac{33 \times 100}{132} =$ ₹ 25

9. (2) Using Rule 7,
Effective percentage increase

$$=\left(20+20+\frac{20\times 20}{100}\right)\% = 44\%$$

10. (4) Using Rule 4,
Net change

$$=\left(10-10-\frac{10\times 10}{100}\right)\%$$

= –1% = 1% decrease

11. (3) Using Rule 7,
Required percentage increase

$$=\left(10+20+\frac{10\times 20}{100}\right)\% = 32\%$$

12. (1) Using Rule 5,
Required effect

$$=\left(80-20-\frac{80\times 20}{100}\right)\%$$

= (60 – 16)% = 44%
Positive sign shows increase.

13. (3) Using Rule 7,
Net effect

$$=\left(x+y+\frac{xy}{100}\right)\%$$

$$=\left(10-10-\frac{10\times 10}{100}\right)\% = -1\%$$

Negative sign shows decrease.

14. (4) Using Rule 5,
Required per cent effect

$$=\left(20-25-\frac{20\times 25}{100}\right)\%$$

=(–5 – 5)% = – 10%
Negative sign shows decrease

15. (2) Using Rule 7,
Percentage effect

$$=\left(10+10+\frac{10\times 10}{100}\right)\% = 21\ \%$$

∴ Increase = ₹ 21

16. (2) Original fraction $=\frac{x}{y}$

$$\therefore \frac{\frac{120}{100}x}{y\times\frac{80}{100}}=\frac{4}{5}$$

$$\Rightarrow \frac{120x}{80y}=\frac{4}{5}\Rightarrow\frac{6x}{4y}=\frac{4}{5}$$

$$\Rightarrow \frac{x}{y}=\frac{4}{5}\times\frac{4}{6}=\frac{8}{15}$$

17. (3) Let original fraction be $\frac{x}{y}$

According to the question,

$$\frac{\frac{120}{100}x}{\frac{95y}{100}}=\frac{5}{2}\Rightarrow\frac{120x}{95y}=\frac{5}{2}$$

$$\Rightarrow \frac{x}{y}=\frac{5}{2}\times\frac{95}{120}=\frac{95}{48}$$

18. (2) Using Rule 4,
Effective value

$$=\left(x+y+\frac{xy}{100}\right)\%$$

$$=\left(25-25-\frac{25\times 25}{100}\right)\%$$

[Here, x = 25, y = –25]

= –6.25% = $6\frac{1}{4}$% decreased

(Negative value shows decrease).

19. (3) Larger number = x and smaller number = 520 – x

$$\therefore \frac{96x}{100}=\frac{(520-x)}{100}\times 112$$

$\Rightarrow 96x = 520 \times 112 - 112x$
$\Rightarrow 112x + 96x = 520 \times 112$
$\Rightarrow 208x = 520 \times 112$

$$\Rightarrow x=\frac{520\times 112}{208}=280$$

∴ Smaller number
= 520 – 280 = 240

20. (3) If the original price of article be ₹ x, then

$$x\times\frac{80}{100}\times\frac{130}{100}=416$$

$$\Rightarrow x=\frac{416\times 100\times 100}{80\times 130}=₹\ 400$$

Aliter : Using Rule 5,
Let the number be x
The number increases by

$$\left(-20+30-\frac{20\times 30}{100}\right)\% = 4\%$$

$$\Rightarrow \quad x+\frac{4x}{100}=416$$

$$\frac{104x}{100}=416$$

$$\boxed{x = 400}$$

21. (3) If the number be x, then

$$x\times\frac{245}{200}=98$$

$$\Rightarrow x=\frac{98\times 200}{245}=80$$

22. (4) Let the original price be ₹100
New price after 10% decrease
= ₹ 90
In order to restore the price to its original value, it must be increased by ₹ 10
% increase

$$=\frac{10}{90}\times 100=\frac{100}{9}=11\frac{1}{9}\%$$

Aliter : Using Rule 9,
Required %

$$=\frac{10}{100-10}\times 100\%$$

$$=\frac{100}{9}\% = 11\frac{1}{9}\%$$

23. (1) Clearly, 75% of the number = 225

$$\therefore \text{Number} = \frac{225\times 100}{75} = 300$$

Again, 125% of 300 = 375
Hence, the number should be increased by 25%

24. (1) Let the number be 100.
After 20% increase, number = 120
After 20% increase of 120, number

$$=120\times\frac{120}{100}=144$$

∴ Per cent decrease

$$=\frac{44}{144}\times 100$$

$$=\frac{275}{9}=30\frac{5}{9}\%$$

Aliter : Using Rule 7 and Rule 8,
Increase %

$$=\left(20+20+\frac{20\times 20}{100}\right)\% = 44\%$$

Required %

$$=\left(\frac{44}{100+44}\right)\times 100\%$$

$$=\frac{4400}{144}\%$$

$$=\frac{275}{9}\% = 30\frac{5}{9}\%$$

25. (4) Let the original number of employees be 100 and wages per head be ₹ 100.
Total wages = ₹ (100 × 100)
= ₹ 10000
New number of employees = 125
New wages per head = ₹ 75
Total new wages
= ₹ (125 × 75) = ₹ 9375
Decrease
= ₹ (10000 – 9375)
= ₹ 625
∴ Percentage decrease

$$= \frac{625}{10000} \times 100$$

$$= \frac{625}{100} = \frac{25}{4}\%$$

26. (2) Let original number be x.

$$\therefore \frac{90}{100}x \times \frac{110}{100} = x - 50$$

$$\Rightarrow \frac{99x}{100} = x - 50$$

$$\Rightarrow x - \frac{99x}{100} = 50$$

$$\Rightarrow \frac{x}{100} = 50$$

$\Rightarrow x = 5000$

Aliter : Using Rule 3,
Let the number be x

Decrease % = $\frac{10^2}{100}\% = 1\%$

⇒ x – 1% of x =x – 50

$\frac{x}{100} = 50$

⇒ $\boxed{x = 5000}$

27. (3) Let the income be ₹ x and the rate of income tax be y %
According to the question,

$$\frac{xy \times 1.19}{100} - \frac{xy}{100} = \left(x - \frac{xy}{100}\right) \times \frac{1}{100}$$

$$\Rightarrow 1.19\,xy - xy = x - \frac{xy}{100}$$

$$\Rightarrow 0.19\,y = 1 - \frac{y}{100}$$

$$\Rightarrow \frac{y}{100} + 0.19y = 1 \Rightarrow y\left(\frac{1+19}{100}\right) = 1$$

$$\Rightarrow y = \frac{100}{20} = 5\%$$

28. (3) Man's income = ₹ 100 (let)
Expenditure = ₹ 75
Savings = ₹ 25

New income = $\frac{100 \times 120}{100}$

=₹ 120

New expenditure = $\frac{75 \times 110}{100}$ = ₹ 82.5
Savings = 120 – 82.5 = ₹ 37.5
Increase in savings = 37.5 – 25
= ₹ 12.5
∴ Increase per cent

$= \frac{12.5}{25} \times 100 = 50\ \%$

29. (3) Single equivalent increase for 10% and 10%

$$= \left(10 + 10 + \frac{10 \times 10}{100}\right)\% = 21\%$$

Again, single equivalent increase for 21% and 10%

$$= \left(21 + 10 + \frac{21 \times 10}{100}\right)\%$$

= 31 + 2.1 = 33.1%
Aliter : Using Rule 14,
Increase % in volume

$$= \left(3 \times 10 + \frac{3 \times 10^2}{100} + \frac{10^3}{(100)^2}\right)\%$$

$$= \left(30 + 3 + \frac{1}{10}\right) = 33.1\%$$

Note : Volume of cube = $(\text{Edge})^3$

Hence, formula $\left(x + y + \frac{xy}{100}\right)\%$ should be used twice.

30. (1) Using Rule 4,
Increase in first year = 10%
Decrease in 2nd year = 10%
Effective result

$$= \left(10 - 10 - \frac{10 \times 10}{100}\right)\%$$

= –1%
Increase in 3rd year = 10%
∴ Effective result

$$= \left(10 - 1 - \frac{10 \times 1}{100}\right)\%$$

= (9 – 0.1)% = 8.9% (increase)

31. (4) Let the number be x.
∴ (20 + 25)% of x = 36

$$\Rightarrow \frac{45x}{100} = 36$$

$$\Rightarrow x = \frac{36 \times 100}{45} = 80$$

32. (3) Effective percentage

$$= \left(-20 + 20 - \frac{20 \times 20}{100}\right) = -4\%$$

If the number be x, then
4% of x = 20

$$\Rightarrow x \times \frac{4}{100} = 20$$

$$\Rightarrow x = \frac{20 \times 100}{4} = 500$$

Aliter : Using Rule 3,
Let the number be x

Decrease % = $\frac{20^2}{100} = 4\%$

x – 4% of x = x – 20

$\frac{4x}{100} = +20$

x = 500

33. (2)

Initial value $\xrightarrow{\text{increasing value}}$

$\frac{P \times x}{100}$ →increased value →P + $\frac{Px}{100}$

$$= P\left(\frac{100 + x}{100}\right)$$

∴ Required answer

$$= \left(\frac{x}{100 + x} \times 100\right)\%$$

34. (4) Effective percentage decrease

$$= \left(x + y + \frac{xy}{100}\right)\%$$

$$= \left(-10 - 20 + \frac{(-10) \times (-20)}{100}\right)\%$$

= (– 30 + 2)% = –28%

35. (1) Cost of edible oil = 100 per kg.
Consumption = 1 kg.
Again,
New price = 125 per kg.
Consumption = 0.8 kg.
Expenditure = Rs. (125 × 0.8)
= Rs. 100

OR

Percentage effect

$$= \left(x + y + \frac{xy}{100}\right)\%$$

$$= \left(25 - 20 - \frac{25 \times 20}{100}\right)\% = 0\%$$

TYPE-IX

1. (4) Let the total number of votes be 100.
Number of uncast votes = 8
∴ Number of votes polled = 92
Number of votes obtained by the winner = 48
∴ Number of votes obtained by the loser = 92 – 48 = 44
If the difference of win be 4 votes, total voters = 100
∴ When the difference be 1100 votes, total voters

$$= \frac{100}{4} \times 1100 = 27500$$

Aliter : Using Rule 21,
Here, x = 1100, A = 48
∴ Total number of votes

$$= \frac{50 \times x}{50 - A}$$

$$= \frac{50 \times 1100}{50 - 48}$$

$$= \frac{50 \times 1100}{2}$$

= 25 × 1100 = 27500

2. (3) Let the total number of voters enrolled be x.
Number of votes polled

$$= 75\% \text{ of } x = \frac{3x}{4}$$

Number of valid votes

$$= \frac{3x}{4} - \frac{2}{100} \times \frac{3x}{4} = \frac{3x}{4} - \frac{3x}{200}$$

$$= \frac{147x}{200}$$

Now, 75% of $\frac{147x}{200} = 9261$

or $\frac{3}{4}$ of $\frac{147x}{200} = 9261$

or $x = \frac{9261 \times 4 \times 200}{3 \times 147} = 16800$

3. (3) Difference of percentage of votes = 60% – 40% = 20%
∴ 20% of total votes = 14000
∴ 60% of total votes

$$= \frac{14000}{20} \times 60 = 42000$$

4. (4) Let total employees = 100
∴ Required percentage

$$= \frac{40 \times 40}{100} + \frac{60 \times 60}{100}$$

= 16 + 36 = 52%

5. (3) Let votes polled = x

$$\therefore \; x \times \left(\frac{60 - 40}{100}\right) = 298$$

$$\Rightarrow x \times \frac{1}{5} = 298$$

$$\Rightarrow x = 298 \times 5 = 1490$$

Aliter : Using Rule 26,
Total number of votes

$$= \frac{50 \times 298}{50 - 40} = 1490$$

6. (4) Number of valid votes

$$= 104000 \times \frac{98}{100} = 101920$$

∴ Valid votes received by the candidate

$$= \frac{101920 \times 55}{100} = 56056$$

7. (2) If the number of votes polled be x, then

$$\frac{x \times 20}{100} = 1600$$

$$\Rightarrow x = \frac{1600 \times 100}{20} = 8000$$

Aliter : Using Rule 26,
Total number of votes

$$= \frac{50 \times 1600}{50 - 60} = 8000$$

(–ve sign wil be neglected)

8. (2) Vote percentage of third candidate
= 100 – 40 – 36 = 24%
∴ Votes got by third candidate

$$= \frac{36000 \times 24}{100} = 8640$$

9. (3) Total votes polled = x
∴ (57 – 43)% of x = 42000

$$\Rightarrow x \times \frac{14}{100} = 42000$$

$$\Rightarrow x = \frac{42000 \times 100}{14} = 300000$$

Aliter : Using Rule 26,
Total number of votes

$$= \frac{50 \times 42000}{50 - 57}$$

$$= \frac{50 \times 42000}{-7} = 300000$$

(–ve sign will be neglected)

10. (4) Total number of votes polled = x

$$\therefore \frac{x \times 84}{100} - \frac{x \times 16}{100} = 476$$

$$\Rightarrow \frac{68x}{100} = 476$$

$$\Rightarrow x = \frac{476 \times 100}{68} = 700$$

Aliter : Using Rule 26,
Total number of votes

$$= \frac{50 \times 476}{50 - 84}$$

$$= \frac{50 \times 476}{34}$$

(–ve sign will be neglected)
= 700

11. (4) Number of valid votes = x (let)
∴ (62 – 38)% of x = 7200

$$\Rightarrow x \times \frac{24}{100} = 7200$$

$$\Rightarrow x = \frac{7200 \times 100}{24} = 30000$$

Aliter : Using Rule 26,
Total number of votes

$$= \frac{50 \times 7200}{(50 - 38)}$$

= 50 × 600 = 30000

12. (2) Total number of votes polled = x (let)
According to the question,

$$\frac{x \times 62}{100} - \frac{x \times (100 - 62)}{100} = 144$$

$$\Rightarrow \frac{62x}{100} - \frac{38x}{100} = 144$$

$$\Rightarrow \frac{24x}{100} = 144$$

$$\Rightarrow 24x = 144 \times 100$$

$$\Rightarrow x = \frac{144 \times 100}{24} = 600$$

Aliter : Using Rule 26,

Total number of votes

$$= \frac{50 \times 144}{(50-62)}$$

$$= \frac{50 \times 144}{12}$$

(–ve sign will be neglected)

= 600

13. (2) Total voters in the list = x

Votes got by the winner

$$= \frac{47x}{100}$$

Votes got by the loser

$$= x - \frac{x}{10} - 60 - \frac{47x}{100}$$

$$= \frac{9x}{10} - \frac{47x}{100} - 60$$

$$= \frac{90x - 47x}{100} - 60$$

$$= \frac{43x}{100} - 60$$

According to the question,

$$\frac{47x}{100} - \frac{43x}{100} + 60 = 308$$

$$\Rightarrow \frac{4x}{100} = 308 - 60 = 248$$

$$\Rightarrow x = \frac{248 \times 100}{4} = 6200$$

14. (2) Total votes polled = x

According to the question,

(60 – 40)% of x = 298

$$\Rightarrow x \times \frac{20}{100} = 298$$

$$\Rightarrow \frac{x}{5} = 298$$

$\Rightarrow x = 298 \times 5 = 1490$

TYPE-X

1. (3) Using Rule 17,

Required population after two years

$$= 180000\left(1 + \frac{10}{100}\right)^2$$

$$= 180000 \times \frac{11}{10} \times \frac{11}{10} = 217800$$

2. (1) If the present worth of the equipment be ₹ 100, then its price after 3 years

$$= 100 \times \left(\frac{80}{100}\right)^3 = ₹\ 51.2$$

∴ Depriciation = 48.8%

Aliter : Using Rule 18,

Let the price of equipment be ₹ 100

Its price after 3 years.

$$= 100\left(1 - \frac{20}{100}\right)^3$$

$$= 100 \times \left(\frac{80}{100}\right)^3 = ₹\ 51.2$$

Depriciation = 48.8%

3. (3) Using Rule 17,

$$P = P_0\left(1 + \frac{R}{100}\right)^T$$

$$= 64000\left(1 + \frac{5}{200}\right)^3$$

$$= 64000\left(\frac{41}{40}\right)^3$$

$$= \frac{64000 \times 41 \times 41 \times 41}{40 \times 40 \times 40}$$

= 68921

4. (1) Using Rule 18,

Suppose the value of property two years ago was ₹ x

According to question

$$\therefore x\left(1 - \frac{10}{100}\right)^2 = 8100$$

$$\Rightarrow x\left(\frac{90}{100}\right)^2 = 8100$$

$$\Rightarrow x = \frac{8100 \times 10 \times 10}{9 \times 9}$$

= ₹ 10000

5. (1) Using Rule 18,

Let the present population be P.

$$\therefore P = 62500\left(1 - \frac{4}{100}\right)^2$$

$$= 62500 \times \frac{24}{25} \times \frac{24}{25} = 57600$$

6. (3) Using Rule 17,

Required population

$$= 50000\left(1 + \frac{4}{100}\right)^2$$

$$= 50000 \times \frac{26}{25} \times \frac{26}{25} = 54080$$

7. (2) Using Rule 17,

Let the man's annual salary in 2006 be ₹ x.

$$\therefore \frac{110x}{100} = 880000$$

$$\Rightarrow x = \frac{880000 \times 100}{110} = ₹\ 800000$$

8. (1) Using Rule 17,

Population of the village two years ago

$$= \frac{P}{\left(1 + \frac{R}{100}\right)^2} = \frac{67600}{\left(1 + \frac{4}{100}\right)^2}$$

$$= \frac{67600 \times 25 \times 25}{26 \times 26} = 62500$$

9. (1) Using Rule 18,

$$A = P\left(1 - \frac{R}{100}\right)^T$$

$$= 200000\left(1 - \frac{5}{100}\right)^2$$

$$= 200000 \times \frac{19}{20} \times \frac{19}{20}$$

= ₹ 180500

10. (4) Using Rule 18,

Value of the property 3 years ago

$$= \frac{P}{\left(1 - \frac{R}{100}\right)^T} = \frac{411540}{\left(1 - \frac{5}{100}\right)^3}$$

$$= \frac{411540 \times 20 \times 20 \times 20}{19 \times 19 \times 19}$$

= ₹ 480000

11. (2) Using Rule 17,

Population of town

$$= P\left(1 + \frac{R}{100}\right)^T$$

$$= 64000\left(1 + \frac{10}{100}\right)^3$$

$$= 64000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$$

= 85184

12. (2) Using Rule 17,
Present population

$$= 10000\left(1-\frac{20}{100}\right)^2$$

$$= 10000 \times \frac{4}{5} \times \frac{4}{5} = 6400$$

13. (2) Required percent

$$= \frac{1}{4}\times 3+\frac{2}{3}\times 5+\left(1-\frac{1}{4}-\frac{2}{3}\right)\times 11$$

$$= \frac{3}{4}+\frac{10}{3}+\frac{11}{12}=\frac{9+40+11}{12}=5\%$$

14. (3) Using Rule 28,
Required price of the machine

$$= 6250\left(1-\frac{10}{100}\right)\left(1-\frac{20}{100}\right)\left(1-\frac{30}{100}\right)$$

$$= 6250\times\frac{90}{100}\times\frac{80}{100}\times\frac{70}{100}$$

= ₹ 3150

15. (4) Using Rule 18,
Required value

$$= 50000\left(1-\frac{10}{100}\right)^2$$

$$= 50000\times\frac{9\times 9}{100} = ₹\ 40500$$

16. (1) Using Rule 18,
If the price of machine 3years ago be ₹ x. then

$$729 = x\left(1-\frac{10}{100}\right)^3$$

$$\Rightarrow 729 = x\times\left(\frac{9}{10}\right)^3$$

$\Rightarrow x =$ ₹ 1000

17. (1) Using Rule 17,
Required Raman's salary

$$= \frac{100}{100+5}\times 1806$$

$$= \frac{100}{105}\times 1806 = ₹\ 1720$$

18. (1) **By Alligation Rule**

$\therefore$ Men : Women = 1 : 1

$\therefore$ Number of men

$$= \frac{1}{2}\times 8000 = 4000$$

19. (3) Let the number of males = x

$\therefore$ Number of females= 9800 – x

According to the question,

$$x\times\frac{108}{100}+(9800-x)\times\frac{105}{100}=10458$$

$\Rightarrow 108\ x + 9800 \times 105 - 105x = 1045800$

$\Rightarrow 3x + 1029000 = 1045800$

$\Rightarrow 3x = 1045800 - 1029000 = 16800$

$$\Rightarrow x = \frac{16800}{3} = 5600$$

20. (1) Using Rule 17,
Population in the beginning of the year

$$= \frac{\text{Population after 3 years}}{\left(1+\frac{\text{Rate}}{100}\right)^{\text{Time}}}$$

$$= \frac{10000}{\left(1+\frac{25}{100}\right)^3} = \frac{10000}{\left(\frac{5}{4}\right)^3}$$

$$= \frac{10000\times 64}{125} = 5120$$

21. (4) If the number of men be 100, then

Number of women = 90

$\therefore$ Required per cent

$$= \frac{100}{90}\times 100 \approx 111\%$$

22. (1) Using Rule 17,
Required population

$$= P\left(1+\frac{R}{100}\right)^T$$

$$= 500000\left(1+\frac{4}{100}\right)^3$$

$$= 500000\times\left(1+\frac{1}{25}\right)^3$$

$$= 500000\times\frac{26}{25}\times\frac{26}{25}\times\frac{26}{25}$$

= 562432

23. (2) Using Rule 17,
If the population of village two years ago be P_0, then

$$P = P_0\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow 4410 = P_0\left(1+\frac{5}{100}\right)^2$$

$$\Rightarrow 4410 = P_0\left(1+\frac{1}{20}\right)^2$$

$$\Rightarrow 4410 = P_0\left(\frac{21}{20}\right)^2$$

$$\Rightarrow 4410 = \frac{441P_0}{400}$$

$$\Rightarrow P_0 = \frac{4410\times 400}{441} = 4000$$

24. (1) Value of TV after one year
= 21000 × (100 – 5)%

$$= \frac{21000\times 95}{100} = \text{Rs. } 19950$$

25. (3) Using Rule 7,
Single equivalent increase for 20% and 20%

$$= \left(20+20+\frac{20\times 20}{100}\right)\%$$

= 44%

Single equivalent increase for 44% and 20%

$$= \left(44+20+\frac{44\times 20}{100}\right)\%$$

= (64 + 8.8) % = 72.8%

26. (2) Population of town = 1000

Males $\Rightarrow$ 600

Females $\Rightarrow$ 400

Literate males

$$\Rightarrow \frac{600\times 20}{100} = 120$$

Total literate inhabitants

$$= \frac{1000\times 25}{100} = 250$$

$\therefore$ Literate females
= 250 – 120 = 130

$\therefore$ Required percent

$$= \frac{130}{400}\times 100 = 32.5\%$$

27. (4) Using Rule 17,
If the rate of increase per annum be R%, then

$$A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow 48400 = 40000\left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow \frac{484}{400} = \left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow \frac{121}{100} = \left(\frac{11}{10}\right)^2 = \left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow 1 + \frac{R}{100} = \frac{11}{10}$$

$$\Rightarrow \frac{R}{100} = \frac{11}{10} - 1 = \frac{1}{10}$$

$$\Rightarrow R = \frac{100}{10} = 10\% \text{ per annum}$$

28. (3) Using Rule 18,

$$A = P\left(1-\frac{R}{100}\right)^3$$

$$\Rightarrow 7290 = P\left(1-\frac{10}{100}\right)^3 = P\left(\frac{9}{10}\right)^3$$

$$\Rightarrow 7290 = P \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10}$$

$$\Rightarrow P = \frac{7290 \times 10 \times 10 \times 10}{9 \times 9 \times 9}$$

= Rs. 10000

29. (1) Using Rule 17,

$$P = P_o\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow 9261 = P_o\left(1+\frac{5}{100}\right)^3$$

$$\Rightarrow 9261 = P_o\left(1+\frac{1}{20}\right)^3$$

$$\Rightarrow 9261 = P_o\left(\frac{21}{20}\right)^3$$

$$\Rightarrow P_o = \frac{9261 \times 20 \times 20 \times 20}{21 \times 21 \times 21}$$

= 8000

30. (2) Using Rule 28,
Original population of village = x (let)
According to the question,

$$x \times \frac{95}{100} \times \frac{80}{100} = 4655$$

$$\Rightarrow x = \frac{4655 \times 100 \times 100}{95 \times 80}$$

= 6125

31. (1) In the village,
Females = 3000
Males = 9000 – 3000 = 6000
After respective increases,
Population of village

$$= 3000 \times \frac{105}{100} + \frac{6000 \times 107.5}{100}$$

= 3150 + 6450 = 9600

32. (2) Let the population of the city be 100.
Total illiterate people = 40
Poor people = 60
Rich people = 40
Illiterate rich people

$$= \frac{40 \times 10}{100} = 4$$

∴ Illiterate poor people
= 40 – 4 = 36
∴ Required per cent

$$= \frac{36}{60} \times 100 = 60\%$$

33. (3) Population of city after two years

$$= P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)$$

$$= 20000\left(1+\frac{20}{100}\right)\left(1+\frac{30}{100}\right)$$

$$= 20000 \times \frac{120}{100} \times \frac{130}{100} = 31200$$

34. (1) Let the total population of village be x.
According to the question,

$$\frac{x \times 14}{100} = 574$$

$$\Rightarrow x = \frac{574 \times 100}{14} = 4100$$

TYPE-XI

1. (3) 10 per cent of ₹ 837

$$= \frac{10}{100} \times 837 = ₹\ 83.7$$

∴ Reduced per kg price

$$= \frac{83.7}{6.2} = ₹\ 13.50$$

Aliter : Using Rule 31,
Reduced price per kg

$$= \frac{10 \times 837}{100 \times 6.2} = ₹\ 13.50$$

2. (2) Let the original price of sugar = ₹ x /kg.
Reduced price of sugar
= 80% of x

$$= \frac{x \times 80}{100} = ₹\ \frac{4x}{5} \text{ kg}$$

$$\therefore \frac{36}{\frac{4x}{5}} - \frac{36}{x} = \frac{1}{2}$$

$$\Rightarrow \frac{45}{x} - \frac{36}{x} = \frac{1}{2}$$

$$\Rightarrow \frac{9}{x} = \frac{1}{2}$$

$\Rightarrow x = 9 \times 2 =$ ₹ 18/Kg
Aliter : Using Rule 31,

$$\text{New price} = \frac{20 \times 36}{100 \times \frac{500}{100}} = ₹\ 14.4$$

Let the original price be Rs x
A.T.Q.

$$x - \frac{20x}{100} = 14.4$$

$$\frac{80x}{100} = 14.4$$

$$x = \frac{144}{8} \quad x = 18$$

∴ Original price = ₹ 18

3. (4) Reduced price of 6.2kg of sugar
= 10% of ₹ 1116
= ₹ 111.6
∴ Reduced price per kg

$$= ₹\left(\frac{111.6}{6.2}\right) = ₹\ 18$$

Aliter : Using Rule 31,

New price = $\frac{10 \times 1116}{100 \times 6.2}$

$= \frac{1116}{62} =$ ₹ 18

4. (2) Let the original price of sugar be ₹ x/kg.

$\therefore$ New price = ₹ $\frac{9x}{10}$ /kg

$\therefore \frac{270}{\frac{9x}{10}} - \frac{270}{x} = 1$

$\Rightarrow \frac{300}{x} - \frac{270}{x} = 1 \Rightarrow \frac{30}{x} = 1$

$\Rightarrow x =$ ₹ 30 /kg

Aliter : Using Rule 31,

New price $= \frac{10 \times 270}{100 \times 1} =$ ₹ 27

Let the original price be Rs. x

$\Rightarrow x - \frac{10x}{100} = 27$

$\frac{90x}{100} = 27$

$x = \frac{2700}{90}$

$x = 30$

$\therefore$ Original price = ₹ 30 per kg.

5. (2) Let the original price of apples be ₹ x/ dozen

$\therefore$ New price = ₹ $\frac{4x}{5}$ /dozen

$\therefore \frac{54}{\frac{4x}{5}} - \frac{54}{x} = \frac{10}{12}$

$\Rightarrow 54\left(\frac{5}{4x} - \frac{1}{x}\right) = \frac{5}{6}$

$\Rightarrow 54\left(\frac{5-4}{4x}\right) = \frac{5}{6}$

$\Rightarrow \frac{54}{4x} = \frac{5}{6} \Rightarrow 4x = \frac{54 \times 6}{5}$

$\therefore \frac{4x}{5} = \frac{54 \times 6}{5 \times 5} =$ ₹ 12.96

Aliter : Using Rule 31,

Reduced price $= \frac{20 \times 54}{100 \times \frac{10}{12}}$

$= \frac{1080}{1000} \times 12$

= ₹ 12.96 per kg

6. (3) The original price of 1 egg = ₹ x

Present price = ₹ $\frac{3}{2}x$

$\therefore \frac{24}{x} - \frac{24}{\frac{3x}{2}} = 4$

$\Rightarrow \frac{24}{x}\left(1 - \frac{2}{3}\right) = 4$

$\Rightarrow \frac{8}{x} = 4 \Rightarrow x = 2$

$\therefore$ Present price of eggs per dozen = $12 \times \frac{3}{2} \times 2 =$ ₹ 36

Aliter : Using Rule 31,

New price $= \frac{50 \times 24}{100 \times \frac{4}{12}}$

= ₹ 36

7. (1) Original price of wheat = ₹ x /kg.

New price of wheat

= ₹ $\frac{4x}{5}$ /kg

$\therefore \frac{320}{\frac{4x}{5}} - \frac{320}{x} = 5$

$\Rightarrow 320\left(\frac{5}{4x} - \frac{1}{x}\right) = 5$

$\Rightarrow 320\left(\frac{5-4}{4x}\right) = 5$

$\Rightarrow \frac{320}{4x} = 5$

$\Rightarrow x = \frac{320}{4 \times 5} =$ ₹ 16

Aliter : Using Rule 31,

New price $= \frac{20 \times 320}{100 \times 5}$

$= \frac{1280}{100} =$ ₹ 12.8

Let the original price be ₹ x per kg.

$\Rightarrow x - \frac{20x}{100} = 12.8$

$80x = 12.8 \times 100$

$x = \frac{1280}{80}$

$x = 16$ per kg.

8. (4) Original rate = ₹ x per egg

New rate = ₹ $\frac{6x}{5}$ per egg

$\therefore \frac{24}{x} - \frac{24 \times 5}{6x} = 2$

$\Rightarrow \frac{24}{x} - \frac{20}{x} = 2$

$\Rightarrow \frac{4}{x} = 2 \Rightarrow x = 2$

$\therefore$ New rate = ₹ $\frac{12}{5}$ per egg.

$\therefore$ Rate per dozen of eggs

= ₹ $\left(\frac{12}{5} \times 12\right) =$ ₹ 28.80

Aliter : Using Rule 31,

New price/present price

$= \frac{20 \times 24}{100 \times \frac{2}{12}} =$ ₹ 28.80

9. (4) Let original price of rice per kg = ₹ x (let)

$\therefore$ New price of rice per kg

= ₹ $\frac{3x}{4}$

$\therefore \frac{600}{\frac{3x}{4}} - \frac{600}{x} = 10$

$\Rightarrow 600\left(\frac{4}{3x} - \frac{1}{x}\right) = 10$

$\Rightarrow 600\left(\frac{4-3}{3x}\right) = 10$

$\Rightarrow \frac{600}{3x} = 10$

$\Rightarrow x = \frac{600}{30} =$ ₹ 20

$\therefore$ New price $= \frac{3x}{4} = \frac{3 \times 20}{4}$

= ₹ 15/kg

Method 2 :

Quicker Approach

If the price of an article is reduced by a% and buyer gets c kg more for some ₹ b, the new price per kg of article = $\frac{ab}{100 \times c}$

$= \frac{25 \times 600}{100 \times 10}$ = ₹ 15

Aliter : Using Rule 31,
Reduced price per kg

$= \frac{25 \times 600}{100 \times 10}$ = ₹ 15

10. (1) Using Rule 1,
Percentage decrease

$= \frac{0.25}{1.25} \times 100 = 20\%$

11. (3) If the number be x, then

$x - 15 = \frac{4x}{5}$

$\Rightarrow 5x - 75 = 4x \Rightarrow x = 75$

$\therefore$ 40% of 75 $= \frac{75 \times 40}{100} = 30$

12. (4) Original price of article
= ₹ x per kg.

New price = ₹ $\frac{79x}{100}$ per kg

$\therefore \frac{100}{\frac{79x}{100}} - \frac{100}{x} = 3$

$\Rightarrow \frac{10000}{79x} - \frac{100}{x} = 3$

$\Rightarrow \frac{10000 - 7900}{79x} = 3$

$\Rightarrow \frac{2100}{79x} = 3$

$\Rightarrow \frac{700}{79x} = 1$

$\Rightarrow 79x = 700 \Rightarrow x = \frac{700}{79}$

$\therefore$ New price

$= \frac{79x}{100} = \frac{79}{100} \times \frac{700}{79}$

= ₹ 7 per kg

Aliter : Using Rule 31,
Reduced price per kg.

$= \frac{21 \times 100}{100 \times 3}$ = ₹ 7

13. (1) Let the original price of sugar be Rs. x per kg.

Reduced price

= Rs. $\frac{80x}{100}$ = Rs. $\frac{4x}{5}$ per kg.

According to the question,

$\frac{160}{\frac{4x}{5}} - \frac{160}{x} = 8$

$\Rightarrow \frac{40 \times 5}{x} - \frac{160}{x} = 8$

$\Rightarrow \frac{200}{x} - \frac{160}{x} = 8$

$\Rightarrow \frac{40}{x} = 8$

$\Rightarrow 8x = 40$

$\Rightarrow x = \frac{40}{8} = 5$ per kg.

Reduced Price

$= \frac{4x}{5} = \frac{4 \times 5}{5}$ = Rs. 4 per kg

Aliter : Using Rule 31,
Reduced price per kg.

$= \frac{21 \times 160}{100 \times 8}$ = Rs. 4

14. (4) Required percentage change

$= \left(10 - 20 + \frac{10 \times (-20)}{100}\right)\%$

= –12% Negative sign shows decrease.

Aliter : Using Rule 4,
Required percentage

$= \left(10 - 20 - \frac{10 \times 20}{100}\right)$

= (–10 – 2)
= 12% decrease.

15. (2) Required per cent

$= \frac{x}{100 + x} \times 100$

where x = 60%

$= \frac{60}{160} \times 100 = \frac{75}{2} = 37\frac{1}{2}\%$

16. (2) Let original price of sugar be Rs. x per kg.

New price

= Rs. $\left(\frac{120x}{100}\right)$ = Rs. $\left(\frac{6x}{5}\right)$ per kg.

According to the question,

$\frac{50}{x} - \frac{50}{\frac{6x}{5}} = 2$

$\Rightarrow \frac{50}{x} - \frac{50 \times 5}{6x} = 2$

$\Rightarrow \frac{50}{x} - \frac{125}{3x} = 2$

$\Rightarrow \frac{150 - 125}{3x} = 2$

$\Rightarrow 6x = 25$

$\Rightarrow x$ = Rs. $\frac{25}{6}$ kg.

$\therefore$ Required quantity of sugar

$= \frac{50}{x}$

$= \frac{50}{\frac{25}{6}} = \frac{50 \times 6}{25} = 12$ kg.

17. (4) Required per cent

$= \frac{\text{Decrease\%}}{100 - \text{Decrease\%}} \times 100$

$= \frac{10}{100 - 10} \times 100 = \frac{100}{9}$

$= 11\frac{1}{9}\%$

18. (2) Required percentage increase

$= \frac{x}{100 - x} \times 100$

$= \left(\frac{20}{100 - 20}\right) \times 100$

$= \frac{20}{80} \times 100 = 25\%$

19. (1) Original price of sugar
= Rs. x/kg. (let)

New price = Rs. $\frac{120x}{100}$ per kg.

= Rs. $\frac{6x}{5}$ per kg.

According to the question,

$$\frac{120}{x} - \frac{120}{\frac{6x}{5}} = 4$$

$$\Rightarrow \frac{120}{x} - \frac{120 \times 5}{6x} = 4$$

$$\Rightarrow \frac{120}{x} - \frac{100}{x} = 4$$

$$\Rightarrow \frac{30}{x} - \frac{25}{x} = 1$$

$$\Rightarrow \frac{5}{x} = 1$$

$\Rightarrow x$ = Rs. 5 per kg.

20. (3) Original price of building = Rs. 100 (let)

$\therefore$ Its price in 2001 = Rs. 80

Its price in 2002 = Rs. 60

Required percentage decrease

$$= \left(\frac{80-60}{80}\right) \times 100$$

$$= \frac{200}{8} = 25\%$$

TYPE-XII

1. (2) Percentage of boys = 100% – 70% = 30%

Let total no. of students be x

$\therefore$ According to question,

30% of x = 510

$$\therefore x = \frac{510}{30} \times 100 = 1700$$

2. (2) 40% of students = 972

$\therefore$ 60% of students

$$= \frac{972}{40} \times 60 = 1458$$

3. (1) Number of boys

$$= \frac{70}{30} \times 504 = 1176$$

4. (2) **Tricky approach**

Required sum

= 0.5% of 19000

$$= 19{,}000 \times \frac{0.5}{100}$$

$$= 19{,}000 \times \frac{5}{1000} = ₹\ 95$$

5. (4) Remaining height

$$\left(192 - \frac{125}{2}\% \text{ of } 192\right)$$

= 192 – 120 = 72 m

$\therefore$ Required distance (distance covered in second hour) then,

$$= \frac{25}{2}\% \text{ of } 72$$

$$= \frac{25 \times 72}{2 \times 100} = 9 \text{ m}$$

6. (3) Water in 100 kg fresh fruit = 68%

Water in dry fruit = 20%

Decrease = 48%

$\therefore$ Dry fruit obtained

= 100 – 48 = 52 kg.

7. (3) The net tax rate

$$= \left(30 + 30 \times \frac{10}{100}\right)\% = 33\%$$

8. (4) Let z have x

$\therefore$ Money with Y $= \frac{3}{2}x$ and

Money with X = $3x$

$$\therefore 3x + \frac{3x}{2} + x = 3 \times 110$$

$$\Rightarrow \frac{6x + 3x + 2x}{2} = 330$$

$\Rightarrow 11x = 2 \times 330$

$\Rightarrow x = \frac{2 \times 330}{11} = 60$ $\therefore$ Money with X = $3x$ = ₹ (3×60) = ₹180

9. (1) If a number is x% more than other, then the other number is less than the first number by

$$\frac{x}{100+x} \times 100\%$$

$\therefore$ Required answer

$$= \frac{500}{100+500} \times 100 = \frac{500}{600} \times 100$$

$$= \frac{250}{3} = 83\frac{1}{3}$$

Method 2 : Let $q = x$, $p = 6x$.

$p - q = 6x - x = 5x$

$$\text{In } \% = \frac{5x}{6x} \times 100 = 83\frac{1}{3}\%$$

10. (3) Let x = 10 and y = 10

$\therefore xy^2 = 10 \times 10 \times 10 = 1000$ units

Decreasing values of x and y by 20%,

Expression = $xy^2 = 8 \times 8 \times 8$ = 512

Decrease= 1000–512 = 488 units

Percentage decrease

$$= \frac{488}{1000} \times 100 = 48.8\%$$

11. (1)Using Rule 30,

If two numbers are respectively x% and y% more than a third number, the first as a per cent of second is

$$= \frac{100+x}{100+y} \times 100 = \frac{110}{125} \times 100$$

= 88%

12. (2) Let sum of money be x.

$$\therefore \frac{11}{2}\% \text{ of } x = 220$$

$$\Rightarrow x = \frac{220 \times 200}{11} = 4000$$

$$\therefore 3\frac{1}{2}\% \text{ of } 4000 = \frac{7}{2} \times \frac{4000}{100}$$

= ₹ 140

13. (1) Let the total number of workers in the factory be x.

$$\therefore x \times \frac{60}{100} \times \frac{75}{100} = 1350$$

$\Rightarrow x$

$$= \frac{1350 \times 100 \times 100}{60 \times 75} = 3000$$

14. (4) Let the third number = 100.

$\therefore$ First number = 70

Second number = 63

$\therefore$ Required per cent

$$= \frac{70-63}{70} \times 100 = 10\%$$

15. (1) Let Rani's weight be x kg.

$\therefore$ Meena's weight = $4x$ kg.

Tara's weight = $\frac{5x}{2}$ kg.

$\therefore$ Required percentage

$$= \frac{4x}{\frac{5x}{2}} \times 100 = 160\%$$

16. (2) Number of people who have the saving habit

$$= \frac{2500 \times 60}{100} = 1500$$

$\therefore$ Number of shareholders

= (100 – 62)% of 1500

$$= \frac{1500 \times 38}{100} = 570$$

17. (3) Using Rule 18,

Let the original price of the article be ₹ x.

According to the question,

$$5832 = x\left(1 - \frac{10}{100}\right)^3$$

$\Rightarrow 5832 = x \times \left(\frac{9}{10}\right)^3$

$x = \frac{5832 \times 10 \times 10 \times 10}{9 \times 9 \times 9}$

= ₹ 8000

18. (4)

Increase in AC = 6%

$\therefore$ Increased AC $= \frac{106}{100} \times 3$

= 3.18 cm

$\therefore$ Decreased CB = 5 – 3.18

= 1.82 cm.

$\therefore$ Decrease = 2 – 1.82

= 0.18 cm

$\therefore$ Percentage decrease

$= \frac{0.18}{2} \times 100 = 9\%$

19. (2) $\because$ 24 = 100%

$\therefore 22 = \frac{100}{24} \times 22 = 91\frac{2}{3}\%$

20. (1) Let the number of boys be x and that of girls be y.

Then, $71x + 73y = 71.8\,(x + y)$

$\Rightarrow 71.8x - 71x = 73y - 71.8y$

$\Rightarrow 0.8x = 1.2y$

$\Rightarrow \frac{x}{y} = \frac{1.2}{0.8} = \frac{12}{8} = \frac{3}{2}$

$\therefore \frac{x}{y} + 1 = \frac{3}{2} + 1 \Rightarrow \frac{x+y}{y} = \frac{5}{2}$

$\therefore$ Percentage of girls

$= \frac{y}{x+y} \times 100 = \frac{2}{5} \times 100 = 40\%$

21. (2) Let the number of books in shelf B be 100.

$\therefore$ Number of books in shelf A = 80

On transferring 25% i.e. $\frac{1}{4}$ of books of shelf A to shelf B.

B = 100 + 20 = 120

Again, on transferring $\frac{1}{4}$ of books of shelf B to shelf A.

A = 60 + $\frac{120}{4}$ = 90

$\therefore$ Required percentage

$= \frac{90}{180} \times 100 = 50\%$

22. (2) Total revenue earned

$= ₹\left(9900 \times \frac{20}{100} \times 10 + 9900 \times \frac{80}{100} \times 20\right)$

= ₹ (19800 + 158400)

= ₹ 178200

23. (2) Let Tina's weight = 1 kg

Lina's weight = 2 kg

Neha's weight = 1.4kg

Mina's weight = 1.8 kg.

$\therefore \frac{1.8x}{100} = 1.4$

$\Rightarrow x = \frac{1.4 \times 100}{1.8} = \frac{700}{9} = 77\frac{7}{9}$

24. (1) Let the number of seats initially in the cinema hall be 100 and the cost of each ticket be ₹ 100.

$\therefore$ Total revenue = 100 × 100

= ₹ 10000

In second condition,

Number of seats = 125

Cost of each ticket = ₹ 110

$\therefore$ New revenue

= 125 × 110 = ₹ 13750

Increase in revenue collection

= ₹. (13750 – 10000) = ₹ 3750

$\therefore$ Percentage increase

$= \frac{3750}{10000} \times 100 = 37.5\%$

Aliter : % Increase in revenue

$= \left(x + y + \frac{xy}{100}\right)\%$

$= \left(25 + 10 + \frac{25 \times 10}{100}\right)\% = 37.5\%$

25. (4) Total amount = ₹ x

$\therefore x - \frac{x}{5} - \frac{4x}{5} \times \frac{5}{100} - 120$

= 1400

$\Rightarrow x - \frac{x}{5} - \frac{x}{25} = 1520$

$\Rightarrow \frac{25x - 5x - x}{25} = 1520$

$\Rightarrow \frac{19x}{25} = 1520$

$\Rightarrow x = \frac{1520 \times 25}{19}$ = ₹ 2000

$\therefore$ Expenditure on transport

$= \frac{1}{25} \times 2000$ = ₹ 80

26. (3) Let the total number of employees be x.

$\therefore x \times \frac{69}{100} = 20700$

$\Rightarrow x = \frac{20700 \times 100}{69} = 30000$

27. (4) Let the fruit seller had originally x apples.

According to the question;

x – 40% of x = 420

$\Rightarrow x - \frac{40}{100} \times x = 420$

$\Rightarrow x - \frac{2x}{5} = 420$

$\Rightarrow \frac{5x - 2x}{5} = 420$

$\Rightarrow \frac{3x}{5} = 420$

$\therefore x = \frac{420 \times 5}{3} = 700$

Method–2 :

60% = 420 (Directly)

$\therefore$ 100% = 420 × $\frac{100}{60} = 700$

28. (3) Let third number = 100

First number = 120

Second number = 150

Required percentage

$= \frac{120}{150} \times 100 = 80\%$

Aliter : Using Rule 30,

Required percentage

$= \left(\frac{100 + 20}{100 + 50}\right) \times 100\%$

$= \frac{120}{150} \times 100\%$

$= \frac{4}{5} \times 100\%$

= 80%

29. (2) The batsman scored 3 × 4 + 8 × 6 = 60 runs by boundaries and sixes respectively. Then,

Runs scored by running

= 110 – 60 = 50

$\therefore$ Required percentage

$= \frac{50}{110} \times 100 = \frac{500}{11}$

$= 45\frac{5}{11}\%$

30. (4) Let the initial value be A.

When it is increased by r% it becomes :

A + r% of A $= \frac{A(r + 100)}{100}$

Now, when it is decreased by r%, it becomes

$\frac{A(r + 100)}{100} - r\%$ of

$$\frac{A(r+100)}{100}$$

$$= \frac{A(r+100)}{100}\left(1-\frac{r}{100}\right)$$

$$= \frac{A(r+100)(100-r)}{10000}$$

$$\therefore A\left(\frac{10000-r^2}{10000}\right) = 1$$

$$\Rightarrow A = ₹\frac{10000}{(10000-r^2)}$$

31. (4) $y = \frac{110}{100} \times 125 = 137.5$

$\therefore x = 90\%$ of y

$= \frac{90 \times 137.5}{100} = 123.75$

32. (4) Error = 5.5 minutes

$\therefore$ Error per cent

$= \frac{5.5}{3 \times 60 + 40} \times 100 = 2.5$ per cent

33. (2) Per cent of families having either a cow or a buffalo or both = 60 + 30 – 15 = 75

It means 25 per cent of families do not have a cow or a buffalo.

$\therefore$ Required number of families

$= 25\%$ of $96 = 96 \times \frac{25}{100} = 24$

34. (3) Let the amount invested at 6% = ₹ x

$\therefore$ Amount invested at 5%

= ₹ $(10000 - x)$

According to the question,

$$\frac{(10000-x)\times 5}{100} - \frac{x \times 6}{100} = 76.50$$

$\Rightarrow 50000 - 5x - 6x = 7650$

$\Rightarrow 50000 - 11x = 7650$

$\Rightarrow 11x = 50000 - 7650 = 42350$

$\Rightarrow x = \left(\frac{42350}{11}\right) =$ ₹ 3850

35. (1) Kites of ₹ 20 are available for ₹ 19.

Hence, discount = 5%

i.e. $\frac{1}{20} \times 100$

If one gets kites of ₹ 20 for ₹ 18, discount = 10%

$\therefore$ Required answer

20 kites $\rightarrow$ 2 kites

27 kites $\rightarrow = \frac{2}{20} \times 27 \approx 3$

36. (3) First part = ₹ x and second part = ₹ y.

According to question,

$$\frac{x \times 80}{100} = \frac{y \times 60}{100} + 3$$

$$\Rightarrow \frac{4x}{5} = \frac{3y}{5} + 3$$

$\Rightarrow 4x - 3y = 15$ ...(i)

Again,

$$\frac{4y}{5} = \frac{9x}{10} + 6$$

$\Rightarrow 8y = 9x + 60$

$\Rightarrow 8y - 9x = 60$ ...(ii)

By equation (i) × 8 + (ii) × 3,

$32x - 24y = 120$

$24y - 27x = 180$

$5x = 300 \Rightarrow x = 60$

From equation (i)

$4 \times 60 - 3y = 15$

$\Rightarrow 3y = 240 - 15 = 225$

$\Rightarrow y = \frac{225}{3} = 75$

$\therefore x + y = 60 + 75 = 135$

37. (2) Value of ₹ 100 stock = ₹ 108

$\because$ Income on investing ₹ 108 = ₹ $\frac{25}{2}$

$\therefore$ Income on investment of ₹ 27000

$= ₹\left(\frac{25}{2 \times 108} \times 27000\right)$

= ₹ 3125

$\therefore$ Gain per cent

$= \frac{3125}{27000} \times 100$

$= \frac{625}{54} = 11\frac{31}{54}\%$

38. (3) Required mass of lead

$= 8000 \times \frac{60}{100} \times \left(1 - \frac{3}{400}\right)$

$= 8000 \times \frac{60}{100} \times \frac{397}{400}$

= 4764 kg.

39. (4) According to the question,

$x + y = (x^2 + y^2) \times \frac{1}{5}$

Again, $x + y = (x^2 - y^2) \times \frac{1}{4}$

$\therefore \frac{x^2+y^2}{5} = \frac{x^2-y^2}{4}$

$\Rightarrow 5x^2 - 5y^2 = 4x^2 + 4y^2$

$\Rightarrow 5x^2 - 4x^2 = 5y^2 + 4y^2$

$\Rightarrow x^2 = 9y^2$

$\Rightarrow x = 3y$

$\therefore \frac{x+y}{x^2} = \frac{x^2+y^2}{5x^2}$

$= \frac{9y^2+y^2}{5 \times 9y^2} = \frac{10y^2}{45y^2} = \frac{2}{9}$

40. (3) Let the total number of eggs bought be x.

10% of eggs are rotten.

$\therefore$ Remaining eggs $= \frac{90x}{100}$

$= \frac{9x}{10}$

After giving 80% of eggs to the neighbour,

Remaining eggs $= \frac{9x \times 20}{10 \times 100}$

$= \frac{9x}{50}$

According to the question,

$\frac{9x}{50} = 36 \Rightarrow 9x = 36 \times 50$

$\Rightarrow x = \frac{36 \times 50}{9} = 200$

41. (4) Amount with man in the beginning = Rs. x (let).

Amount given to son and daughter = 80%.

Remaining amount

$= 20\%$ of $x =$ Rs. $\frac{x}{5}$

Remaining amount after donations to trust

$= \frac{x}{5} \times \frac{20}{100} =$ Rs. $\frac{x}{25}$

$\therefore \frac{x}{25} = 16000$

$\Rightarrow x = 16000 \times 25 =$ Rs. 400000

42. (3) Let the business man's present earning be Rs. x.

According to the question,

$$x \times \frac{125}{100} \times \frac{96}{100} \times \frac{125}{100} \times \frac{96}{100} \times \frac{125}{100} = 72000$$

$$\Rightarrow x \times \frac{5}{4} \times \frac{24}{25} \times \frac{5}{4} \times \frac{24}{25} \times \frac{5}{4} = 72000$$

$$\Rightarrow x \times \frac{9}{5} = 72000$$

$$\Rightarrow x = \frac{72000 \times 5}{9} = \text{Rs. } 40000$$

43. (3) Number of blood cells in first 6 hours

$$= 40000\left(1+\frac{10}{100}\right)^2\left(1-\frac{10}{100}\right)\left(1+\frac{5}{100}\right)^2$$

$$= 40000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{9}{10} \times \frac{21}{20} \times \frac{21}{20} = 480249 \approx 48025$$

44. (2) Let 100 pairs of shoes be bought for Rs. 100.

New budget = Rs. 160

New price = Rs. 1.20 pair of shoes

∴ Number of shoes bought

$$= \frac{160}{1.2} = \frac{1600}{12}$$

$$= \frac{400}{3} = 133\frac{1}{3}$$

∴ Percentage increase

$$= 33\frac{1}{3}\%$$

45. (3) Average of set A

$$= \frac{27+28+30+32+33}{5}$$

$$= \frac{150}{5} = 30$$

Case II,

$$\text{New average} = \frac{30 \times 130}{100} = 39$$

∴ 150 + k = 39 × 6 = 234

⇒ k = 234 – 150 = 84

46. (2) Initial amount with the man = Rs. x (let).

Remaining amount after first bet

$$= \text{Rs. } \frac{x}{4}$$

Remaining amount after second bet = Rs. $\frac{x}{16}$

Remaining amount after third bet

$$= \text{Rs. } \frac{x}{64}$$

$$\therefore \frac{x}{16} = 2 \Rightarrow x = 2 \times 64$$

= Rs. 128

47. (2) Initial number of soldiers in the army = x

According to the question,

$$x \times \frac{90}{100} \times \frac{90}{100} \times \frac{90}{100}$$

= 729000

$$\Rightarrow x = \frac{729000 \times 1000}{9 \times 9 \times 9}$$

= 1000000

48. (4) Required percentage decrease = $\left(\frac{25-21}{25}\right) \times 100$

$$= \frac{400}{25} = 16\%$$

49. (2) Required number of workers

$$= 8000 \times \frac{105}{100} \times \frac{110}{100} \times \frac{120}{100}$$

= 11088

50. (4) 1% ≡ 100 basis points

∴ 82.5% ≡ 8250 basis points

and 62.5% ≡ 6250 basis points

∴ Required difference

= 8250 – 6250

= 2000 basis points

51. (4) Percentage increase in sales

$$= \left(\frac{51300-41800}{41800}\right) \times 100$$

$$= \frac{9500}{418} = \frac{250}{11} = 22\frac{8}{11}\%$$

52. (1) Defective parts of 120 machine parts

$$= \frac{120 \times 5}{100} = 6$$

Defective parts of 80 machine parts

$$= \frac{80 \times 10}{100} = 8$$

Total defective parts

= 6 + 8 = 14

∴ Required percent

$$= \frac{14}{200} \times 100 = 7\%$$

53. (3) Error = (1.55 – 1.5) metre

= 0.55 metre

$$\therefore \text{Error per cent} = \frac{0.05}{1.5} \times 100$$

$$= \frac{50}{15} = \frac{10}{3} = 3\frac{1}{3}\%$$

54. (1) Duty payment :

Laptop ⇒ Rs. $\left(\frac{210000 \times 10}{100}\right)$

= Rs. 21000

Mobile phone

$$\Rightarrow \text{Rs. } \left(\frac{100000 \times 8}{100}\right)$$

= Rs. 8000

Television set

$$\Rightarrow \text{Rs. } \left(\frac{150000 \times 5}{100}\right)$$

= Rs. 7500

Total Duty Payment

= Rs. (21000 + 8000 + 7500)

= Rs. 36500

55. (2) Initial amount with the person = Rs. x (let)

After an expense of $\frac{15}{2}\%$.

Remaining amount

$$= \left(100-\frac{15}{2}\right)\% \text{ of } x.$$

$$= \left(\frac{200-15}{2}\right)\% \text{ of } x$$

$$= \text{Rs. } \frac{185x}{200} = \text{Rs. } \frac{37x}{40}$$

After an expense of 75% of it,

$$\text{Remaining amount} = \frac{37x}{40 \times 4}$$

$$= \text{Rs. } \frac{37x}{160}$$

According to the question,

$$\frac{37x}{160} = 370 \Rightarrow 37x = 370 \times 160$$

$$\Rightarrow x = \frac{370 \times 160}{37} = \text{Rs. } 1600$$

56. (3) Let the number of matches played between India and Pakistan in the first case be x.

Number of wins by Pakistan

$$= \frac{60x}{100} = \frac{3x}{5}$$

According to the question,

$$\frac{\frac{3x}{5}}{x+30} = \frac{30}{100}$$

$$\Rightarrow \frac{3x}{5(x+30)} = \frac{3}{10}$$

$$\Rightarrow \frac{x}{x+30} = \frac{1}{2}$$

⇒ 2x = x + 30

⇒ x = 30

∴ Total number of matches

= 30 + 30 = 60

❑❑❑

TEST YOURSELF

1. The value of a car at the beginning of a year is 10% less than the value of the same car at the beginning of the previous year. If the car is valued at Rs. 1,45,800 on 1st January, 2000, what was its value on 1st January, 1997 ?

(1) Rs. 200000 (2) Rs. 250000
(3) Rs. 185000 (4) None of these

2. In an examination 42% of the candidates failed in physics, 24% of the candidates failed in Chemistry and 14% of the candidates failed in both the subjects. If 72 candidates passed in both, find the total number of candidates in the examination.

(1) 120 (2) 130
(3) 150 (4) 160

3. The number of students appeared from a school for the Madhyamik Examination in three consecutive years are in the ratio 7 : 8 : 10 and 75%, 87.5% and 93.75% of the students of respective years were successful. What is the percentage of students who were successful during these three years taken together ?

(1) 85.5% (2) 86.5%
(3) 87% (4) 88.5%

4. An alloy contains 89% of copper; find how much copper is to be mixed to a sample of alloy so as to get 44 kgs of a new metal having 90% copper in it.

(1) 2 kg (2) 3 kg
(3) 2.5 kg (4) 4 kg

5. If the numerator of a fraction is increased by 150% and the denominator of the fraction is increased by 300% the resultant fraction is $\frac{5}{18}$. What is the original fraction?

(1) $\frac{4}{9}$ (2) $\frac{8}{9}$
(3) $\frac{6}{9}$ (4)None of these

6. An alloy of gold and silver weighs 50 gms. It contains 80% gold. How much gold should be added to the alloy so that percentage of gold is increased to 90?

(1) 45 gm (2) 40 gm
(3) 50 gm (4) None of these

7. 5% of income of A is equal to 15% of income of B and 10% of income of B is equal to 20% of income of C. If income of C is ₹ 2000, then total income of A, B and C is:

(1) 26,000 (2) 16,000
(3) 18,000 (4) 20,000

8. The population of a town is 10,000. If the males increases by 5% and the females by 6%, the population will be 10,540. How many females are there?

(1) 4000 (2) 4500
(3) 4800 (4) 5400

9. A reduction of 21% in the price of wheat enables a person to buy 10.5 kg more for ₹100. What is the reduced price per kg ?

(1) ₹ 2 (2) ₹ 3
(3) ₹ 2.50 (4) ₹ 3.50

10. Mahima secured 50% marks in Hindi, 60% in English and 70% in Maths as well as in science. What were her total marks if the maximum marks obtainable in each of these 4 subjects was 50?

(1) 175 (2) 150
(3) 125 (4) None of these

11. When 50 is subtracted from 50% of a number, result is 50. The number is :

(1) 150 (2) 400
(3) 200 (4) 300

12. A person makes a profit of ₹ 60000 in his business. 40% of the profit he reinvests in his business for its diversification. Of the remaining profit he distributes 30% as bonus to his employees, 20% he denotes in charity and rest on advertisement. Find the amount spent on advertisement.

(1) ₹ 18000 (2) ₹ 12000
(3) ₹ 16000 (4) ₹ 20000

13. If 60% of students in a school are boys and the total number of girls in the school is 460, find the number of boys in the school.

(1) 680 (2) 690
(3) 700 (4) 720

14. Find the total output of a coalmine, if after 24% wastage the net output is 68,400 tonnes.

(1) 95000 tonnes
(2) 85000 tonnes
(3) 90000 tonnes
(4) None of these

15. If A's salary is 50% more than B's then by what per cent B's salary is less than A's salary ?

(1) 50 % (2) 25%
(3) 23% (4) 33.3%

16. Quicklime contains 28.6% of oxygen by weight. Determine the weight of oxygen in 750 gm quicklime.

(1) 214.5 gm (2) 224.5 gm
(3) 234.5 gm (4) 235.5 gm

17. Price of a commodity has increased by 60%. By what per cent must a consumer reduce the consumption of the commodity so as not to increase the expenditure ?

(1) 35.5 % (2) 37.5 %
(3) 38.5 % (4) 25%

18. Sohan saves 14% of his salary while George saves 22%. If both get the same salary and George saves ₹ 1540, find the savings of Sohan.

(1) ₹ 950 (2) ₹ 960
(3) ₹ 980 (4) ₹ 990

19. In a quarterly examination, a student secured 30% marks and failed by 12 marks. In the same examination, another student secured 40% marks and got 28 marks more than bare minimum marks to pass. Find the pass percentage.

(1) 24% (2) 28%
(3) 25% (4) 33%

20. In an election between two candidates A and B, A got 65% of the total votes cast and won the election by 2748 votes. Find the total number of votes cast if no vote is declared invalid.

(1) 9160 (2) 9260
(3) 9060 (4) 9360

21. In an examination, 40% marks are required to pass. A obtains 10% less than the number of marks required to pass. B obtains $11\frac{1}{9}\%$ less than A and C, $41\frac{3}{17}$ per cent less than the number of marks obtained by A and B together. Marks obtained by C is

(1) 42 (2) 40
(3) 38 (4) 36

22. A reduction of 25% in the price of apples would enable a purchaser to get 2 kg apples more for Rs. 240. Find the original price per kg of apples.

(1) ₹ 35 (2) ₹ 30
(3) ₹ 40 (4) None of these

23. 10% of the soldiers of an army are killed in the battle. 10% of the remaining soldiers died of disease and 10% of the remaining men were disabled. Now only 729000 soldiers are left in the army. How many soldiers were there in all in the army in the beginning?

(1) 990000 (2) 9900000
(3) 9800000 (4) 1000000

24. From the salary of an officer 10% is deducted as house rent; 15% of the rest he spends on children's education; 10% of the balance he spends on clothes. After this expenditure, he is left with ₹ 2754. Find his salary.

(1) ₹ 4500 (2) ₹ 4000
(3) ₹ 4200 (4) None of these

25. The tax on an article decreases by 10% and its consumption increases by 10%. Find the effect per cent on its revenue.

(1) 1% increase (2) 2% decrease
(3) 1% decrease (4) 2% increase

26. In a direct election between two contestants for the post of secretary, 4% of the total votes cast are declared to be illegal. One contestant secures 55% of the valid votes and wins with a majority of 240 votes, find the total number of votes cast.

(1) 3500 (2) 2400
(3) 2200 (4) 2500

SHORT ANSWERS

1. (1)	**2.** (3)	**3.** (2)	**4.** (4)
5. (1)	**6.** (3)	**7.** (3)	**8.** (1)
9. (3)	**10.** (3)	**11.** (3)	**12.** (1)
13. (2)	**14.** (3)	**15.** (4)	**16.** (1)
17. (2)	**18.** (3)	**19.** (4)	**20.** (1)
21. (2)	**22.** (3)	**23.** (4)	**24.** (2)
25. (3)	**26.** (4)		

EXPLANATIONS

1. (1) Clearly, if the car is valued at Rs. 90 in 2000, it was valued at Rs. 100 in 1999.
∴ Value of the car in 1999

$$= \frac{145800 \times 100}{90}$$

In this way, value of car in 1997

$$= \frac{145800 \times 100 \times 100 \times 100}{90 \times 90 \times 90}$$

= Rs. 200000

2. (3) Percentage of students failed only in :
Physics = 42 – 14 = 28
Chemistry = 24 – 14 = 10
∴ Percentage of students who failed in Physics or Chemistry or both = 28 + 10 + 14 = 52
∴ Percentage of candidates who passed
= 100 – 52 = 48
If the total number of students be x, then

$$x \times \frac{48}{100} = 72$$

$$\Rightarrow x = \frac{72 \times 100}{48} = 150$$

3. (2) Number of successful students :

First Year $\Rightarrow \frac{7x \times 75}{100} = \frac{21x}{4}$

$= 5.25x$

Second year $\Rightarrow \frac{8x \times 87.5}{100} = 7x$

Third year $\Rightarrow \frac{10x \times 93.75}{100}$

$= 9.375x$
Total successful students
$= 21.625x$
Required percentage

$$= \frac{21.625x}{25x} \times 100 = 86.5\%$$

4. (4) In 100 gm of alloy,
Copper = 89 gm.
Let x gm. of copper be mixed.

$$\frac{89 + x}{11} = \frac{90}{10}$$

$\Rightarrow x = 99 - 89 = 10$gm
To get 44 kg of new alloy, copper to be mixed

$$= \frac{44 \times 1000 \times 100}{1100} = 4 \text{ kg.}$$

5. (1) Let original fraction be $\frac{x}{y}$.

$$\therefore \frac{x \times 250}{y \times 400} = \frac{5}{18}$$

$$\Rightarrow \frac{x}{y} = \frac{5}{18} \times \frac{400}{250} = \frac{4}{9}$$

6. (3) In original alloy,
Gold = 40 gm
Silver = 10 gm
Let x gm of gold is added.

$$\therefore \frac{40 + x}{50 + x} = \frac{90}{100} = \frac{9}{10}$$

$\Rightarrow 400 + 10x = 450 + 9x$
$\Rightarrow x = 50$ gm.

7. (3) $\frac{A \times 5}{100} = \frac{B \times 15}{100}$

$$\Rightarrow \frac{A}{B} = \frac{15}{5} = \frac{3}{1}$$

Again, $\frac{B \times 10}{100} = \frac{C \times 20}{100}$

$$\Rightarrow \frac{B}{C} = \frac{2}{1}$$

∴ A : B = 3 : 1 = 6 : 2
B : C = 2 : 1
∴ A : B : C = 6 : 2 : 1
∴ Total income = 9 × 2000
= Rs. 18000

8. (1) If the number of women be x, then men = 10000 – x

$$\therefore \frac{x \times 6}{100} + \frac{(10000 - x) \times 5}{100}$$

= 10540 – 10000 = 540
$\Rightarrow 6x + 50000 - 5x = 54000$
$\Rightarrow x = 4000$

9. (1) Original price of wheat
= Rs. x /kg.

New price = Rs. $\frac{79x}{100}$ per kg

$$\therefore \frac{100}{\frac{79x}{100}} - \frac{100}{x} = 10.5$$

$\Rightarrow 100\left(\frac{100-79}{79x}\right) = 10.5$

$\Rightarrow 100 \times 21 = 10.5 \times 79x$

$\Rightarrow \frac{79x}{100} = \frac{21}{10.5}$ = Rs.2.50 per kg

10. (3) Total marks obtained
= 25 + 30 + 70 = 125

11. (3) If the number be x, then

$\frac{x}{2} - 50 = 50$

$\Rightarrow \frac{x}{2} = 100$

$\Rightarrow x = 200$

12. (1) Total profit = ₹ 60000
Amount reinvested in business
= 40% of ₹ 60000
= ₹ 24000
Remaining amount of the profit
= 60% of ₹ 60000
= ₹ 36000
Bonus to employees
= 30% of ₹ 36000
= ₹ 10800
Donation for charity
= 20% of ₹ 36000 = ₹ 7200
Amount spent on advertisement
= ₹ (36000 – 10800 – 7200)
= ₹ 18000

13. (2) Let the total number of students be x.
Given,Number of boys

$= \frac{60}{100}x$. ..... (i)

Number of girls = 460
$\Rightarrow$ Number of boys = $x - 460$ ..... (ii)
From equations (i) and (ii),

$\Rightarrow x - 460 = \frac{60x}{100}$

$\Rightarrow 460 = \frac{40}{100}x$

$\Rightarrow x = \frac{460 \times 100}{40} = 1150$

$\therefore$ Number of boys = 1150 – 460
= 690.

14. (3) Let the total output be x tonnes.
Then, net output

$= x - \frac{24}{100} \times x = \frac{76x}{100}$

$\Rightarrow \frac{76}{100}x = 68{,}400$

$\Rightarrow x = \frac{68{,}400 \times 100}{76}$

= 90,000 tonnes.

15. (4) Let the salary of B = ₹ 100.
Then, salary of A

$= 100 + \frac{50}{100} \times 100$ = ₹. 150

$\therefore$ B's salary is ₹ 50 less than A's salary.
$\therefore$ Percentage of B's income less than A = $\frac{50}{150} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$.

Hence, B's salary is less than A's salary by 33.3%.

16. (1) 100 gm quicklime contains oxygen = 28.6 gm.
$\therefore$ 1 gm quicklime contains oxygen = $\frac{28.6}{100}$
Hence, 750 gm quicklime contains oxygen = $\frac{28.6}{100} \times 750$
= 214.5 gm.
Hence, weight of oxygen in 750 gm quicklime is 214.5 gm.

17. (2) Let the price of commodity be ₹ x per kg.
Increase in price = 60%
$\therefore$ Increased price of 1 kg
= ₹ $1.6x$
If ₹ $1.6x$ is price of 1 kg

x is price of $\frac{x}{(1.6)x} = \frac{10}{16}$kg

$\therefore$ In order to keep the expenditure same, consumption should be reduced by

$1 - \frac{10}{16} = \frac{16-10}{16} = \frac{6}{16}$kg

Percentage reduction in consumption

$= \frac{6}{16} \times 100 = \frac{75}{2}$ = 37.5%

18. (3) Let the total salary of each of them = ₹ x.

Sohan saves = ₹. $\frac{14}{100}x$

and George saves

$= \frac{22}{100}x = 1540$

$\Rightarrow x$ = ₹ 7000

$\therefore$ Sohan saves = $\frac{14}{100} \times 7000$

= ₹ 980

19. (4) Let the maximum marks be x.

A student scored = $\frac{30}{100}x$, and failed by 12 marks.

$\therefore$ Passing marks = $\frac{30}{100}x + 12$

Another student scored = $\frac{40}{100}x$ and got 28 marks more than passing marks.

$\therefore$ Passing marks = $\frac{40}{100}x - 28$

$\Rightarrow \frac{30}{100}x + 12 = \frac{40}{100}x - 28$

$\Rightarrow \frac{10}{100}x = 40 \Rightarrow x = 400$

$\therefore$ Maximum marks = 400
Hence, Passing marks

$= \frac{30}{100} \times 400 + 12 = 132$

$\therefore$ Pass percentage

$= \frac{132}{400} \times 100 = 33\%$

The pass percentage = 33%

20. (1) Let the total number of votes cast = x.
Number of votes got by

A = $\frac{65}{100}x$ ..... (i)

$\Rightarrow$ B got

$= x - \frac{65}{100}x = \frac{100x - 65x}{100} = \frac{35}{100}x$

A won the election by 2748 votes.
$\therefore$ Number of votes for A

$= \frac{35}{100}x + 2748$ ..... (ii)

Form equations (i) and (ii),

$\Rightarrow \frac{65}{100}x = \frac{35}{100}x + 2748$

$\Rightarrow \frac{30x}{100} = 2748$

$\Rightarrow x = \frac{2748 \times 100}{30} = 9160$

$\therefore$ Total number of votes cast
= 9160

21. (2) Suppose the maximum marks = 100
$\therefore$ Marks required to pass = 40
$\because$ A gets 10% less than pass marks.
$\therefore$ Marks secured by

$A = \frac{40 \times 90}{100} = 36$

$\because$ B gets $11\frac{1}{9}$% marks less than A.

$\therefore$ Marks secured dy B

$= \frac{36 \times \left(100 - 11\frac{1}{9}\right)}{100}$

$= \frac{36 \times \left(\frac{900-100}{9}\right)}{100}$

$= 36 \times \frac{800}{9} \times \frac{1}{100} = 32$

Total marks obtained by A and B = 36 + 32 = 68

$\because$ C gets $41\frac{3}{17}$% marks less than the marks obtained by A and B together.

$\therefore$ C's marks

$\frac{68 \times \left(100 - 41\frac{3}{17}\right)}{100}$

$= \frac{68 \times \left(100 - \frac{700}{17}\right)}{100}$

$= \frac{68 \times \frac{1000}{17}}{100}$

$= 68 \times \frac{1000}{17} \times \frac{1}{100} = 40$

22. (3) Let the original price be ₹ x per kg.

Reduction in price = ₹ $\frac{25}{100}x$

$\therefore$ Reduced price = $x - \frac{25}{100}x$

$= \frac{75}{100}x$ .... (i)

With ₹ 240, purchaser can purchase 2 kg more apples.

Now, 25% of 240

$= \frac{25}{100} \times 240$ = ₹ 60

$\Rightarrow$ Reduced price of 2 kg of apples = Rs. 60

$\therefore$ Reduced price of 1 kg of apples = ₹ 30 .... (ii)

From equations (i) and (ii),

$\frac{75}{100} \times x = 30$

$\Rightarrow x = \frac{30 \times 100}{75}$ = ₹40

The original price of 1 kg apples = Rs. 40.

23. (4) Let the total number of soldiers in all in the army in the beginning = 100.

$\therefore$ Number of soldiers killed in the battle

$= \frac{10}{100} \times 100 = 10$

$\therefore$ Remaining soldiers

= 100 – 10 = 90

Number of soldiers who died of disease = $\frac{10}{100} \times 90 = 9$

$\therefore$ Remaining soldiers = 90–9= 81

Number of disabled soldiers

$= \frac{10}{100} \times 81 = \frac{81}{10}$

$\therefore$ Remaining soldiers

$= 81 - \frac{81}{10} = \frac{810-81}{10} = \frac{729}{10}$

$\therefore$ If $\frac{729}{10}$ soldiers are left, then total number of soldiers = 100

$\therefore$ If 1 soldier is left, then total number of soldiers

$= \frac{100 \times 10}{729}$

$\because$ If 729000 soldiers are left, then total number of soldiers

$= \frac{100 \times 10 \times 729000}{729} = 1000000$.

24. (2) Let the salary be ₹ 100. Then, House rent = ₹ 10; Balance = ₹ (100 – 10) = ₹ 90.

Expenditure on children's education = 15% of ₹ 90

$= \frac{15 \times 90}{100}$ = ₹ $\frac{27}{2}$

Balance now = $\left(90 - \frac{27}{2}\right)$

$= \left(\frac{180-27}{2}\right)$ = ₹ $\frac{153}{2}$

Expenditure on clothes

$= \left(10\% \text{ of } \frac{153}{2}\right)$ = ₹ $\left(\frac{153}{20}\right)$

Now, balance

$= \left(\frac{153}{2} - \frac{153}{20}\right)$ = ₹ $\frac{1377}{20}$

If last balance is ₹ $\frac{1377}{20}$, then salary = ₹ 100.

If last balance is ₹ 2754, then salary

= ₹ $\left(\frac{100 \times 20}{1377} \times 2754\right)$

= ₹ 4000.

25. (3) Let the original consumption be 1 unit & tax on it be ₹ 100.

So, revenue = ₹ (100 × 1) = ₹ 100.

New consumption

$= \left(\frac{110}{100} \times 1\right) = \frac{11}{10}$ units.

Now, tax on 1 unit = ₹ 90

Tax on $\frac{11}{10}$ units

$= \left(90 \times \frac{11}{10}\right)$ = ₹ 99.

$\therefore$ Decrease in revenue = 1 %.

26. (4) Suppose total number of votes cast = x.

$\therefore$ Number of illegal votes = 4% of $x = \frac{4x}{100} = \frac{x}{25}$

$\therefore$ Number of valid votes

$= x - \frac{x}{25} = \frac{25x - x}{25} = \frac{24x}{25}$

Votes secured by the contestant who is defeated

$= \frac{24x}{25} - \frac{24x}{25} \times \frac{55}{100}$

$= \frac{24x}{25}\left(1 - \frac{55}{100}\right) = \frac{24x}{25} \times \frac{45}{100}$

According to the question,

$\frac{24x}{25} \times \frac{55}{100} - 240 = \frac{24x}{25} \times \frac{45}{100}$

$\Rightarrow \frac{24x}{25}\left(\frac{55}{100} - \frac{45}{100}\right) = 240$

$\Rightarrow \frac{24x}{25} \cdot \frac{10}{100} = 240$

$\Rightarrow \frac{24x}{250} = 240$

$\Rightarrow x = \frac{250 \times 240}{24} = 2500$

$\therefore$ Total number of votes cast = 2500

8 PROFIT AND LOSS

Importance : Profit and Loss questions are important from both examination point of view as well as in different, life situations. Different competitive exams include 1 or 2 questions.

Scope of questions : Asked questions are based on per cent Profit/Loss. cost price, selling price, price after increase or decrease in rates, cost price of certain number of things equal to S.P. of certain number of, how much price to increase to get certain profit.

Way to success : Practice is most important here, Remember all calculations on Profit/Loss are on cost price and not on selling price.

C.P. $\rightarrow$ Cost Price (Purchasing Price + Repairing/ Maintenance Cost, if any) S.P $\rightarrow$ Selling Price

RULE 1 : If S.P > C.P. then there will be profit

Profit = S.P. – C.P.

$$\text{Profit\%} = \frac{\text{Profit} \times 100}{\text{C.P.}}$$

Note: Both profit and loss are always calculated on cost price only.

RULE 2 : If C.P > S.P., then there will be Loss

$$\text{Loss} = \text{C.P.} - \text{S.P.},\ \text{Loss\%} = \frac{\text{Loss} \times 100}{\text{C.P.}}$$

RULE 3 : If an object is sold on r% Profit.

$$\text{then, S.P.} = \text{C.P}\left[\frac{100+\text{Profit\%}}{100}\right] \text{ or C.P.}$$

$$= \text{S.P.}\left[\frac{100}{100+\text{Profit\%}}\right]$$

Similarly, If an object is sold on r% loss, then

$$\text{S.P.} = \left[\frac{100-\text{Loss\%}}{100}\right] \text{ or C.P.} = \text{S.P.}\left[\frac{100}{100-\text{Loss\%}}\right]$$

RULE 4 : Successive Profits : If A sells an article to B at a% profit and B sells it to C at b% profit

OR

If a% and b% are two successive profits

$$\text{then Total Profit\%} = \left(a+b+\frac{ab}{100}\right)\%$$

If A sells an article to B at a% profit and B sells it to C at b% profit and if C paid ₹ x, then amount paid by

$$A = x \times \left(\frac{100}{100+a}\right)\left(\frac{100}{100+b}\right)$$

RULE 5 : If a% and b% are two successive losses then (negative sign shows loss and positive sign shows profit).

$$\text{Total loss\%} = \left(-a-b+\frac{ab}{100}\right)\%$$

RULE 6 : If a% profit and b% loss occur, simultaneously

then overall loss or profit% is $\left(a-b-\frac{ab}{100}\right)\%$

(-ve sign for loss, +ve sign for profit)

RULE 7 : If a% loss and b% profit occur then, total loss/profit is $\left(-a+b-\frac{ab}{100}\right)\%$ (negative sign for loss and positive sign for profit)

RULE 8 : If cost price of 'x' articles is equal to selling price of 'y' articles, then Selling Price = x, Cost Price = y

$$\text{Hence, Profit or Loss\%} = \frac{x-y}{y} \times 100$$

RULE 9 : On selling 'x' articles the profit or loss is equal to Selling of 'y' articles, then Profit% $\frac{y \times 100}{x-y}$

$$\text{Loss\%} = \frac{y \times 100}{x+y}$$

RULE 10 : If a man sells two similar objects, one at a loss of x% and another at a gain of x%, then he always incurrs loss in this transaction and loss% is $\frac{x^2}{100}\%$

RULE 11 : A man sells his items at a profit/loss of x%. If he had sold it for ₹ R more, he would have gained/lost y%. Then.

$$\text{C.P. of items} = \frac{R}{(y \pm x)} \times 100$$

'+' = When one is profit and other is loss.

'–' = When both are either profit or loss.

RULE 12 : If a man purchases 'a' items for ₹ x and sells 'b' items for ₹ y. then his profit or loss per cent is given by $\left(\frac{ay-bx}{bx}\right) \times 100\%$ OR

RULE 13 : If the total cost of 'a' articles having equal cost is ₹ x and the total selling price of 'b' articles is ₹ y, then in the transaction gain or loss per cent is given by

$$\left(\frac{ay-bx}{bx}\right) \times 100\%$$

Where positive value signifies 'profit' and negative value signifies 'loss'

RULE 14 : A dishonest shopkeeper sells his goods at C.P. but uses false weight, then his

$$\text{Gain\%} = \frac{\text{True weight} - \text{False weight}}{\text{False weight}} \times 100$$

$$\text{or Gain\%} = \frac{\text{Error}}{\text{True value} - \text{Error}} \times 100$$

RULE 15 : If A sells an article to B at a profit (loss) of r_1% and B sells the same article to C at a profit (loss) of r_2% then the cost price of article for C will be given by

C.P of article for C

$$= \text{C.P. of } A \times \left(1 \pm \frac{r_1}{100}\right)\left(1 \pm \frac{r_2}{100}\right)$$

(Positive and negative sign conventions are used for profit and loss.)

RULE 16 : If a vendor used to sell his articles at x% loss on cost price but uses y grams instead of z grams, then his profit or loss% is

$$\left[(100-x)\frac{z}{y} - 100\right]\%$$

(Profit or loss as per positive or negative sign).

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. A man buys a cycle for ₹ 1400 and sells it at a loss of 15%. What is the selling price of the cycle?
(1) ₹ 1202 (2) ₹ 1190
(3) ₹ 1160 (4) ₹ 1000
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. On selling an article for ₹ 651, there is a loss of 7%. The cost price of that article is
(1) ₹ 744 (2) ₹ 751
(3) ₹ 793 (4) ₹ 700
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

3. A milkman bought 70 litres of milk for ₹ 630 and added 5 litres of water. If he sells it at ₹ 9.00 per litre, his profit percentage is
(1) $8\frac{1}{5}\%$ (2) 7%
(3) $8\frac{2}{5}\%$ (4) $7\frac{1}{7}\%$
(SSC CISF Constable (GD) Exam. 05.06.2011)

4. In terms of percentage profit, which is the best transaction?

	C.P. (in ₹)	*Profit (In ₹)*
(I)	36	17
(II)	50	24
(III)	40	19
(IV)	60	29

(1) I (2) II
(3) III (4) IV
(SSC CPO S.I. Exam. 12.01.2003)

5. A man bought an old typewriter for ₹ 1200 and spent ₹ 200 on its repair. He sold it for ₹ 1680. His profit per cent is :
(1) 20% (2) 10%
(3) 8% (4) 16%
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

6. If the cost price is 95% of the selling price, what is the profit percent ?
(1) 4% (2) 4.75%
(3) 5% (4) 5.26%
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

7. A merchant buys an article for ₹ 27 and sells it at a profit of 10% of the selling price. The selling price of the article is :
(1) ₹ 29.70 (2) ₹ 30
(3) ₹ 37 (4) ₹ 32
(SSC CPO S.I. Exam. 26.05.2005)

8. If the cost price of an article is 80% of its selling price, the profit per cent is :
(1) 20 % (2) $22\frac{1}{2}\%$
(3) 24% (4) 25%
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

9. Krishnan bought a camera and paid 20% less than its original price. He sold it at 40% profit on the price he had paid. The percentage of profit earned by Krishnan on the original price was
(1) 22% (2) 32%
(3) 12% (4) 15%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

10. By what per cent must the cost price be raised in fixing the sale price in order that there may be a profit of 20% after allowing a commission of 10% ?
(1) 25% (2) $133\frac{1}{3}\%$
(3) $33\frac{1}{3}\%$ (4) 30%
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

11. By selling an article, a man makes a profit of 25% of its selling price. His profit per cent is
(1) 20% (2) 25%
(3) $16\frac{2}{3}\%$ (4) $33\frac{1}{3}\%$
(SSC CGLTier-I Exam. 16.05.2010 (First Sitting)

12. If there is a profit of 20% on the cost price of an article, the percentage of profit calculated on its selling price will be
(1) 24 (2) $16\frac{2}{3}$
(3) $8\frac{1}{3}$ (4) 20
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

13. A man purchased a bedsheet for ₹ 450 and sold it at a gain of 10% calculated on the selling price. The selling price of the bedsheet was
(1) ₹ 460 (2) ₹ 475
(3) ₹ 480 (4) ₹ 500
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

14. By selling an article for ₹ 960 a man incurs a loss of 4%; what was the cost price ?
(1) ₹1,000 (2) ₹ 784
(3) ₹ 498.4 (4) ₹ 300
(SSC CISF Constable (GD) Exam. 05.06.2011)

15. A salesman expects a gain of 13% on his cost price. If in a month his sale was ₹7,91,000, what was his profit ?
(1) ₹85,659 (2) ₹88,300
(3) ₹91,000 (4) ₹97,786
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

16. By selling a car for ₹ 64,000, Mr. Rao lost 20%. Then the cost price of the car is :
(1) ₹ 72,000 (2) ₹ 76,800
(3) ₹ 80,000 (4) ₹ 84,000
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

17. A retailer buys a radio for ₹ 225. His overhead expenses are ₹ 15. He sells the radio for ₹300. The profit per cent of the retailer is :
(1) 25% (2) $26\frac{2}{3}\%$
(3) 20% (4) $33\frac{1}{3}\%$
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting) & (SSC Constable & GD Exam. 12.05.2013)

18. An item when sold for ₹1,690 earned 30% profit on the cost price. Then the cost price is
(1) ₹ 507 (2) ₹ 630
(3) ₹1,300 (4) ₹ 130
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

19. A fan is listed at ₹150 and a discount of 20% is given. Then the selling price is
(1) ₹180 (2) ₹150
(3) ₹120 (4) ₹110
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

20. By selling 33 metres of cloth, a person gains the cost of 11 metres. Find his gain%.

(1) $33\frac{1}{3}\%$ (2) $33\frac{1}{2}\%$

(3) 33% (4) $34\frac{1}{3}\%$

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

21. While selling to the retailer, a company allows 30% discount on the marked price of their products. If the retailer sells those products at marked price, his profit % will be :

(1) 30% (2) $42\frac{1}{7}\%$

(3) 40% (4) $42\frac{6}{7}\%$

(SSC Multi-Tasking Staff Exam. 10.03.2013)

22. A merchant purchases a wrist watch for ₹ 450 and fixes its list price in such a way that after allowing a discount of 10%, he earns a profit of 20%. Then the list price of the watch is

(1) ₹ 650 (2) ₹ 700
(3) ₹ 550 (4) ₹ 600

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

23. The cost price of a radio is ₹ 600. The 5% of the cost price is charged towards transportation. After adding that, if the net profit to be made is 15%, then the selling price of the radio must be

(1) ₹ 704.50 (2) ₹ 724.50
(3) ₹ 664.50 (4) ₹ 684.50

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

24. If a shirt costs ₹ 64 after 20% discount is allowed, what was its original price in ₹ ?

(1) 76.80 (2) 80
(3) 88 (4) 86.80

(SSC Constable (GD) Exam. 12.05.2013)

25. The total cost of 8 buckets and 5 mugs is ₹ 92 and the total cost of 5 buckets and 8 mugs is ₹ 77. Find the cost of 2 mugs and 3 buckets.

(1) ₹ 35 (2) ₹ 70
(3) ₹ 30 (4) ₹ 38

(SSC Graduate Level Tier-I Exam. 19.05.2013)

26. If books bought at prices from ₹ 150 to ₹ 300 are sold at prices ranging from ₹ 250 to ₹ 350, what is the greatest possible profit that might be made in selling 15 books ?

(1) Cannot be determined
(2) ₹ 750
(3) ₹ 4,250
(4) ₹ 3,000

(SSC CHSL DEO & LDC Exam. 20.10.2013)

27. If there is a profit of 20% on the cost price, the percentage of profit on the sale price is

(1) $16\frac{2}{3}\%$ (2) 12 %

(3) $15\frac{1}{3}\%$ (4) 16 %

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

28. Nisha bought a number of oranges at 2 for a rupee and an equal number at 3 for a rupee. To make a profit of 20% she should sell a dozen for

(1) ₹ 6 (2) ₹ 8
(3) ₹ 10 (4) ₹ 12

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

29. There is a profit of 20% on the cost price of an article. The % of profit, when calculated on selling price is

(1) $16\frac{2}{3}\%$ (2) 20%

(3) $33\frac{1}{3}\%$ (4) None of these

(SSC CGL Tier-II Exam. 21.09.2014)

30. If selling price of an article is $1\frac{1}{3}$ of cost price, find gain %.

(1) 25% (2) $33\frac{1}{3}\%$

(3) 1.33% (4) $66\frac{2}{3}\%$

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

31. A merchant loses 10% by selling an article. If the cost price of the article is ₹ 15, then the selling price of the article is

(1) ₹ 13.20 (2) ₹ 16.50
(3) ₹ 12.30 (4) ₹ 13.50

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

32. Pooja wants to sell a watch at a profit of 20%. She bought it at 10% less and sold it at ₹ 30 less, but still she gained 20%. The cost price of watch is

(1) ₹ 240 (2) ₹ 220
(3) ₹ 250 (4) ₹ 225

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

33. A fruit merchant makes a profit of 25% by selling mangoes at a certain price. If he charges Re. 1 more on each mango, he would gain 50%. At first the price of one mango was

(1) Rs. 5 (2) Rs. 7
(3) Rs. 4 (4) Rs. 6

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

34. There is 10% loss if an article is sold at Rs. 270. Then the cost price of the article is

(1) Rs. 300 (2) Rs. 270
(3) Rs. 320 (4) Rs. 250

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

35. If bananas are bought at the rate of 4 for a rupee, how many must be sold for a rupee so as to gain $33\frac{1}{3}\%$?

(1) 2.5 (2) 2
(3) 3 (4) 4

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

36. By selling an article for Rs. 450, I lose 20%. For what price should I sell it to gain 20% ?

(1) Rs. 490 (2) Rs. 675
(3) Rs. 470 (4) Rs. 562.50

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

37. If the profit on selling an article for Rs. 425 is the same as the loss on selling it for Rs. 355, then the cost price of the article is

(1) Rs. 410 (2) Rs. 380
(3) Rs. 400 (4) Rs. 390

(SSC CGL Tier-II Online Exam.01.12.2016)

38. The C.P of 10 artices is equal to the S.P. of 15 articles. What is the profit or loss percentage ?
(1) 25.5% (2) 35%
(3) 10% (4) 33.3%
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

39. The selling price of 6 bananas is equal to the cost price of 8 bananas. Then the percentage of profit is :
(1) 20 (2) $33\frac{1}{3}$
(3) 25 (4) 30
(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

40. By selling a bag at Rs. 230, profit of 15% is made. The selling price of the bag, when it is sold at 20% profit would be
(1) Rs. 250 (2) Rs. 205
(3) Rs. 240 (4) Rs. 200
(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

41. A man gains 20% by selling an article for a certain price. If he sells it at double the price, the percentage of profi will be
(1) 40% (2) 100%
(3) 120% (4) 140%
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

42. A trader sold a cycle at a loss of 10%. If the selling price had been increased by Rs. 200, there would have been a gain of 6%. The cost price of the cycle is
(1) Rs. 1200 (2) Rs. 1205
(3) Rs. 1250 (4) Rs. 1275
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

43. The cost price of 25 books is equal to the selling price of 20 books. The profit per cent is
(1) 20% (2) 22%
(3) 24% (4) 25%
(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

44. If the selling price of 40 articles is equal to the cost price of 50 articles, the loss or gain per cent is
(1) 25% gain (2) 20% gain
(3) 25% loss (4) 20% loss
(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

45. By selling a tape-recorder for Rs. 1040 a man gains 4%. If he sells it for Rs. 950, his loss will be
(1) 5% (2) 4%
(3) 4.5% (4) 9%
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

46. If the cost price of 20 books is the same as selling price of 25 books, then the loss percentage is
(1) 20 (2) 25
(3) 22 (4) 24
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

47. By what fraction selling price (S.P.) must be multiplied to get the cost price (C.P.) if the loss is 20% ?
(1) $\frac{4}{5}$ (2) $\frac{8}{5}$
(3) $\frac{5}{4}$ (4) $\frac{6}{5}$
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

48. A store sells a watch for a profit of 25% of its cost price. Then the percentage of profit against selling price is :
(1) 22% (2) 20%
(3) 18% (4) 15%
(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (IST Sitting)

49. To make a profit of 20% the selling price of the goods is Rs. 240. The cost price of the goods is :
(1) Rs. 200 (2) Rs. 210
(3) Rs. 220 (4) Rs. 230
(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

50. The per cent profit made when an article is sold for Rs. 78 is twice as much as when it is sold for Rs. 69. The cost price of the article is
(1) Rs. 60 (2) Rs. 51
(3) Rs. 55.50 (4) Rs. 70
(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

51. The profit (in Rs.) after selling an article for Rs. 524 is the same as the loss (in Rs.) after selling it for Rs. 452. The cost price of the article is:
(1) Rs. 480 (2) Rs. 485
(3) Rs. 488 (4) Rs. 500
(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

TYPE–II

1. The cost price of 36 books is equal to the selling price of 30 books. The gain per cent is :
(1) 20% (2) $16\frac{4}{6}\%$
(3) 18% (4) $82\frac{2}{6}\%$
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The cost price of 15 articles is same as the selling price of 10 articles. The profit percent is :
(1) 30% (2) 40%
(3) 50% (4) 45%
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. The selling price of 5 articles is the same as the cost price of 3 articles. The gain or loss percent is :
(1) 20% gain (2) 25% gain
(3) 33.33% loss (4) 40% loss
(SSC CGL Prelim Exam. 27.02.2000 (IInd Sitting) & (SSC CGL Tier-I Exam. 16.05.2010 (IInd Sitting) & (SSC SAS Exam. 26.06.2010)

4. If the cost price of 15 tables be equal to the selling price of 20 tables, the loss per cent is :
(1) 20% (2) 30%
(3) 25% (4) 37.5%
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting) and SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

5. The cost price of 18 articles is equal to the selling price of 15 articles. The gain per cent is :
(1) 15% (2) 20%
(3) 25% (4) 18%
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

6. A person sells 400 mangoes at the cost price of 320 mangoes. His percentage of loss is
(1) 10% (2) 15%
(3) 20% (4) 25%
(SSC CHSL DEO & LDC Exam. 11.12.2011(Ist Sitting (Delhi Zone)

7. If the cost price of 50 oranges is equal to the selling price of 40 oranges, then the profit per cent is
(1) 5% (2) 10%
(3) 20% (4) 25%
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. If the cost price of 12 oranges is equal to selling price of 10 oranges, then the percentage of profit is

(1) $16\frac{2}{3}\%$ (2) 20%

(3) 18% (4) 25%

(SSC CGL Prelim Exam. 11.05.2003 (IInd Sitting) & (SSC SO (Commercial) Exam. 16.11.2003)

9. If the cost price of 10 articles is equal to the selling price of 9 articles, the gain or loss per cent is

(1) $11\frac{1}{9}\%$ profit

(2) $7\frac{6}{17}\%$ profit

(3) $11\frac{1}{9}\%$ loss

(4) $1\frac{12}{13}\%$ loss

(SSC CPO S.I. Exam. 07.09.2003)

10. A man sells 320 mangoes at the cost price of 400 mangoes. His gain percent is :

(1) 15% (2) 20%

(3) 25% (4) 10%

(SSC CGL Prelim Exam. 24.02.2002 & (SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

11. If the cost price of 12 pens is equal to the selling price of 8 pens, the gain per cent is :

(1) $33\frac{1}{3}\%$ (2) $66\frac{2}{3}\%$

(3) 25% (4) 50%

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

12. The cost price of 8 articles is equal to the selling price of 9 articles. The profit or loss per cent in the transaction is

(1) $12\frac{1}{2}\%$ loss (2) $12\frac{1}{2}\%$ profit

(3) $11\frac{1}{9}\%$ loss (4) $11\frac{1}{9}\%$ profit

(SSC CPO S.I. Exam. 05.09.2004)

13. A sold an article to B at 20% profit and B sold to C at 15% loss. If A sold it to C at the selling price of B, then A would make

(1) 5% profit (2) 2% profit

(3) 2% loss (4) 5% loss

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

14. If the cost price of 10 articles is equal to the selling price of 7 articles, then the gain or loss per cent is :

(1) 51% gain (2) $42\frac{6}{7}\%$ gain

(3) 35 % loss (4) $42\frac{6}{7}\%$ loss

(SSC CPO S.I. Exam. 26.05.2005)

15. Mahesh purchased a radio at $\frac{9}{10}$ of its selling price and sold it at 8% more than its original selling price. His gain per cent is :

(1) 20 % (2) 18%

(3) 10 % (4) 8 %

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

16. A coconut merchant finds that the cost price of 2750 coconuts is the same as the selling price of 2500 coconuts. The loss or gain per cent is

(1) 5% loss (2) 15% loss

(3) 20% gain (4) 10% gain

(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting) & (SSC CPO S.I. Exam. 03.09.2006)

17. If the cost price of 10 articles is equal to the selling price of 16 articles, then the loss per cent is

(1) 30% (2) 37.5%

(3) 42.5% (4) 45%

(SSC CISF ASI Exam. 29.08.2010 (Paper-1) & (SSC (South Zone) Investigator Exam 12.09.2010) & (SSC CHSL DEO & LDC Exam. 04.12.2011)

18. If the selling price of 4 articles is equal to the cost price of 5 articles, the profit percent is

(1) 20% (2) $22\frac{1}{2}\%$

(3) 25% (4) 30%

(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

19. The selling price of 10 oranges is the cost price of 13 oranges. Then the profit percentage is

(1) 30% (2) 10%

(3) 13% (4) 3%

(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

20. If the selling price of 10 articles is equal to the cost price of 11 articles, then the gain percent is

(1) 10% (2) 11%

(3) 15% (4) 25%

(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

21. If the cost price of 10 articles is equal to the selling price of 8 articles, then gain per cent is

(1) 10% (2) 8%

(3) 50% (4) 25%

(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

22. The cost price of 25 articles is equal to the selling price of 20 of them. The gain or loss percent is given by

(1) 20% loss (2) 25% gain

(3) 60% loss (4) 75% gain

(SSC CPO S.I. Exam. 12.01.2003) & (SSC CHSL DEO & LDC Exam. 04.12.2011) & FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

23. The cost price of 24 apples is the same as the selling price of 18 apples. The percentage of gain is :

(1) $12\frac{1}{2}\%$ (2) $14\frac{2}{3}\%$

(3) $16\frac{2}{3}\%$ (4) $33\frac{1}{3}\%$

(SSC CHSL DEO & LDC Exam. 27.11.2010)

24. The cost price of 400 lemons is equal to the selling price of 320 lemons. Then the profit percent is

(1) 15% (2) 20%

(3) 25% (4) 40%

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

25. The cost price of 20 oranges is same with selling price of 16 oranges. The profit percentage is

(1) 30% (2) 20%

(3) 25% (4) 16%

(SSC CPO S.I. Exam. 05.09.2004) & (SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

26. The selling price of 12 articles is equal to the cost price of 15 articles. The gain per cent is

(1) $6\frac{2}{3}\%$ (2) 20%

(3) 25% (4) 80%

(SSC CGL Tier-I Exam. 19.06.2011 & (SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

27. If the cost price of 18 articles is equal to the selling price of 16 articles, the gain or loss is
(1) 25% gain (2) 25% loss
(3) $12\frac{1}{2}$% loss (4) $12\frac{1}{2}$% gain
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

28. The cost price of 40 articles is the same as the selling price of 25 articles. Find the gain per cent.
(1) 65% (2) 60%
(3) 15% (4) 75%
(SSC Graduate Level Tier-II Exam.16.09.2012)

29. The cost price of a book is ₹ 150. At what price should it be sold to gain 20% ?
(1) ₹ 120 (2) ₹ 180
(3) ₹ 100 (4) ₹ 80
(SSC CHSL DEO & LDC Exam. 20.10.2013)

30. A cloth merchant on selling 33 metres of cloth obtains a profit equal to the selling price of 11 metres of cloth. The profit percent is
(1) 40% (2) 22%
(3) 50% (4) 11%
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

31. A shopkeeper buys 144 items at 90 paise each. On the way 20 items are broken. He sells the remainder at ₹ 1.20 each. His gain per cent correct to one place of decimal is
(1) 13.8% (2) 14.6%
(3) 14.8% (4) 15.8%
(SSC CGL Tier-II Exam. 21.09.2014)

32. If goods be purchased for ₹ 450 and one third sold at a loss of 10%. At what gain percent should the remainder be sold so as to gain 20% on the whole transaction ?
(1) 32% (2) 35%
(3) 28% (4) 30%
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

33. A shoe company sold 50 pairs of shoes on a day costing ₹ 189.50 each for ₹ 10,000. Then the profit obtained in ₹ is
(1) 522 (2) 525
(3) 573 (4) 612
(SSC CHSL DEO & LDC Exam. 16.11.2014)

34. Salim had to sell vegetables worth ₹ 5,750 for ₹ 4,500 due to heavy rainfall. What is the loss percentage that he has incurred ?
(1) 21.74% (2) 23.47%
(3) 20% (4) 23.45%
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

35. A shopkeeper purchases an article for Rs. 3,550 and spends Rs. 50 on it for its repair. If he then sold the article for Rs. 3,816, the percent of profit is
(1) 6% (2) 6.08%
(3) 7.38% (4) 7.49%
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

36. A shopkeeper buys two cameras at the same price. He sells one camera at a profit of 18% and the other at a price 10% less than the selling price of the first. His total profit or loss per cent is
(1) 12.1% profit (2) 12.1% loss
(3) 12.2% profit (4) 11.1% loss
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

37. A shopkeeper sold his goods at half the list price and thus lost 20%. If he had sold on the listed price, his gain percentage would be
(1) 60 % (2) 20 %
(3) 72 % (4) 35 %
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

38. By selling 20 metres of cloth a man gains the selling price of 4 metres of cloth. The gain percent is
(1) 25 (2) 30
(3) 35 (4) 20
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

39. Ten articles were bought for Rs. 8, and sold at 8 for Rs. 10. The gain percent is
(1) 54.75% (2) 57.25%
(3) 56.25% (4) 55%
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

40. If a shop–keeper purchases cashewnut at Rs. 250 per kg. and sells it at Rs. 10 per 50 grams, then he will have
(1) 25% Loss (2) 25% Profit
(3) 20% Profit (4) 20% Loss
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

41. Cost price of 100 books is equal to the selling price of 60 books. The gain percentage/loss percentage is
(1) $66\frac{3}{2}$% (2) 67%
(3) 66% (4) $66\frac{2}{3}$%
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378 and SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

42. If the cost price of 10 articles equals selling price of 9 articles, the gain or loss percent will be
(1) $11\frac{1}{9}$% loss (2) $1\frac{1}{9}$% loss
(3) $1\frac{1}{9}$% gain (4) $11\frac{1}{9}$% gain
(SSC CGL Tier-I Re-Exam, 30.08.2015)

43. Ritu purchased $2\frac{1}{2}$ dozen eggs at the rate of Rs. 20 per dozen. She found that 6 eggs were rotten. She sold the remaining eggs at the rate of Rs. 22 per dozen. Then her profit or loss percent is :
(1) 12% loss (2) 12% profit
(3) 10% loss (4) 10% profit
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

44. Ram sold two horses at the same price. In one he gets a profit of 10% and in the other he gets a loss of 10%. Then Ram gets
(1) 2% loss
(2) No loss or profit
(3) 1% loss
(4) 1% profit
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

45. A man purchases some oranges at the rate of 3 for Rs. 40 and the same quantity at 5 for Rs. 60. If he sells all the oranges at the rate of 3 for Rs. 50, find his gain or loss percent (to the nearest integer).
(1) 32% profit (2) 31% loss
(3) 34% loss (4) 31% profit
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

46. An article is sold at a profit of 25%. If the selling price is doubled, the profit will be :
(1) 200% (2) 50%
(3) 100% (4) 150%
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

47. A man purchased an article for Rs. 1500 and sold it at 25% above the cost price. If he has to pay Rs. 75 as tax on it, his net profit percentage will be :
(1) 20% (2) 25%
(3) 30% (4) 15%
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

48. If a man were to sell his hand–cart for Rs. 720, he would lose 25%. At what price must he sell it to gain 25%?
(1) Rs. 1200 (2) Rs. 960
(3) Rs. 1152 (4) Rs. 768
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

49. If the Cost Price of 25 chairs is equal to the selling price of 30 chairs, then the loss % is :
(1) 25% (2) 20%
(3) 5% (4) $16\frac{2}{3}\%$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

50. A fruit seller buys oranges at the rate of Rs. 10 per dozen and sells at the rate of Rs. 12 per dozen. His gain percent is :
(1) 20% (2) 15%
(3) 12% (4) $8\frac{1}{3}\%$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

51. If the cost price of 25 pens is equal to the selling price of 20 pens, then the profit per cent is
(1) 20% (2) 25%
(3) 15% (4) 5%
(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

52. A shopkeeper sells rice at 10% profit and uses weight 30% less than the actual measure. His gain per cent is
(1) $57\frac{2}{3}\%$ (2) $57\frac{1}{7}\%$
(3) $57\frac{2}{5}\%$ (4) $57\frac{3}{7}\%$
(SSC CGL Tier-II Online Exam.01.12.2016)

53. A man bought 4 dozen eggs at Rs. 24 per dozen and 2 dozen eggs at Rs. 32 per dozen. To gain 20% on the whole, he should sell the eggs at
(1) Rs. 16 per dozen
(2) Rs. 21 per dozen
(3) Rs. 32 per dozen
(4) Rs. 35 per dozen
(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (IST Sitting)

54. If 10% loss is made on selling price, then the percentage of loss on the cost price will be
(1) $11\frac{1}{9}\%$ (2) $9\frac{1}{11}\%$
(3) 10% (4) 11%
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

55. Sapna purchased a cycle for Rs. 1,000 and sold it for Rs. 1,200. Her gain in percentage is :
(1) 20% (2) 10%
(3) 12% (4) 40%
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

56. A dishonest shopkeeper professes to sell goods at his cost price but uses a false weight of 950 gms, for each kilogram. His gain per cent is :
(1) $6\frac{1}{4}\%$ (2) $5\frac{5}{19}\%$
(3) $5\frac{3}{17}\%$ (4) $6\frac{2}{7}\%$
(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

57. A dishonest dealer defrauds to the extent of x % in buying as well as selling his goods by using faulty weight. What will be the gain per cent on his outlay?
(1) $2x\%$ (2) $\left(\frac{10}{x}+x^2\right)\%$
(3) None of these (4) $\left(x+\frac{x^2}{100}\right)\%$
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–III

1. Oranges are bought at rate of 7 for ₹ 3. At what rate per hundred must they be sold to gain 33%?
(1) ₹ 56 (2) ₹ 60
(3) ₹ 58 (4) ₹ 57
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A man buys 12 articles for ₹ 12 and sells them at the rate of ₹ 1.25 per article. His gain percentage is :
(1) 20% (2) 25%
(3) 15% (4) 18%
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. 12 copies of a book were sold for ₹ 1800/- thereby gaining cost-price of 3 copies. The cost price of a copy is :
(1) ₹ 120/- (2) ₹ 150/-
(3) ₹ 1200/- (4) ₹ 1500/-
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. If I would have purchased 11 articles for ₹ 10 and sold all the articles at the rate of 10 for ₹ 11, the profit per cent would have been :
(1) 10% (2) 11%
(3) 21% (4) 100%
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

5. A person buys some pencils at 5 for a rupee and sells them at 3 for a rupee. His gain per cent wll be :
(1) $66\frac{2}{3}\%$ (2) $76\frac{2}{3}\%$
(3) $56\frac{2}{3}\%$ (4) $46\frac{2}{3}\%$
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

6. 100 oranges are bought for ₹ 350 and sold at the rate of ₹ 48 per dozen. The percentage of profit or loss is :
(1) 15% loss (2) 15% gain
(3) $14\frac{2}{7}\%$ loss (4) $14\frac{2}{7}\%$ profit
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

7. Oranges are bought at the rate of 10 for ₹ 25 and sold at the rate of 9 for ₹ 25. The profit percent is
(1) $9\frac{1}{11}\%$ (2) 10%
(3) $11\frac{1}{9}\%$ (4) $12\frac{1}{2}\%$
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

8. The cost price of two dozen bananas is ₹ 32. After selling 18 bananas at the rate of ₹ 12 per dozen, the shopkeeper reduced the rate to ₹ 4 per dozen. The per cent loss is
(1) 25.2% (2) 32.4%
(3) 36.5% (4) 37.5%
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

9. Some articles were bought at 6 for ₹ 5, and sold at 5 for ₹ 6. Gain per cent is :
(1) 5% (2) 6%
(3) 30% (4) 44%
(SSC CGL Prelim Exam. 08.02.2004 & 04.02.2007 (Ist & IInd Sitting)

10. Ramesh bought 10 cycles for ₹500 each. He spent ₹2,000 on the repair of all cycles. He sold five of them for ₹750 each and the remaining for ₹ 550 each. Then the total gain or loss % is
(1) Gain of $8\frac{1}{3}$%
(2) Loss of $8\frac{1}{3}$%
(3) Gain of $7\frac{2}{3}$%
(4) Loss of $7\frac{1}{7}$%
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

11. On selling 17 balls at ₹ 720, there is a loss equal to the cost price of 5 balls. The cost price of a ball is :
(1) ₹ 45 (2) ₹ 50
(3) ₹ 60 (4) ₹ 55
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

12. I purchased 120 exercise books at the rate of ₹ 3 each and sold $\frac{1}{3}$ of them at the rate of ₹ 4 each, $\frac{1}{2}$ of them at the rate of ₹ 5 each and the rest at the cost price. My profit per cent was
(1) 44% (2) $44\frac{4}{9}$%
(3) $44\frac{2}{3}$% (4) 45%
(SSC CPO S.I. Exam. 05.09.2004)

13. A person bought some articles at the rate of 5 per rupee and the same number at the rate of 4 per rupee. He mixed both the types and sold at the rate of 9 for 2 rupees. In this business he suffered a loss of ₹ 3. The total number of articles bought by him was
(1) 1090 (2) 1080
(3) 540 (4) 545
(SSC CPO S.I. Exam. 05.09.2004)

14. A man bought pencils at the rate of 6 for ₹ 4 and sold them at the rate of 4 for ₹ 6. His gain% in the transaction is :
(1) 75% (2) 80%
(3) 125% (4) 100%
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

15. Ravi buys some toffees at 2 for a rupee and sells them at 5 for a rupee. His loss percent is
(1) 120% (2) 90%
(3) 30% (4) 60%
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

16. A fruit seller buys lemons at 2 for a rupee and sells them at 5 for three rupees. His profit per cent is
(1) 10% (2) 15%
(3) 20% (4) 25%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

17. By selling a tape-recorder ₹ for 950, I lose 5%. What per cent shall I gain by selling it for ₹ 1040?
(1) 5 (2) 4
(3) 4.5 (4) 9
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

18. A person buys 100 cups at ₹ 10 each. On the way 10 cups are broken. He sells the remaining cups at ₹ 11 each. His loss per cent is
(1) $\frac{1}{2}$% (2) 1%
(3) $1\frac{1}{2}$% (4) 2%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

19. Mohan bought 25 books for ₹ 2,000 and sold them at a profit equal to the selling price of 5 books. The selling price of 1 book is
(1) ₹100 (2) ₹120
(3) ₹150 (4) ₹ 200
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

20. A shopman bought pens at the rate of 7 for ₹10 and sold them at a profit of 40%. How many pens would a customer get for ₹ 10 ?
(1) 6 (2) 4
(3) 5 (4) 3
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

21. By selling 12 oranges for ₹ 60, a man loses 25%. The number of oranges he has to sell for ₹ 100, so as to gain 25% is
(1) 10 (2) 11
(3) 12 (4) 15
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

22. A man buys a certain number of oranges at 20 for ₹ 60 and an equal number at 30 for ₹ 60. He mixes them and sells them at 25 for ₹ 60. What is gain or loss per cent ?
(1) Gain of 4%
(2) Loss of 4%
(3) Neither gain nor loss
(4) Loss of 5%
(SSC CPO S.I. Exam. 09.11.2008)

23. A fruit vendor bought bananas at the rate of 5 for a rupee and sold them 4 for a rupee. The percent gain or loss is
(1) $12\frac{1}{2}$% gain (2) 25% loss
(3) 25% gain (4) $12\frac{1}{2}$% loss
(SSC CPO S.I. Exam. 06.09.2009)

24. A man sold 20 apples for ₹ 100 and gained 20%. How many apples did he buy for ₹100?
(1) 20 (2) 22
(3) 24 (4) 25
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

25. A man purchased some eggs at 3 for ₹ 5 and sold them at 5 for ₹ 12. Thus he gained ₹ 143 in all. The number of eggs he bought is
(1) 210 (2) 200
(3) 195 (4) 190
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

26. A man bought oranges at the rate of 8 for ₹ 34 and sold them at the rate of 12 for ₹ 57. How many oranges should be sold to earn a net profit of ₹ 45 ?
(1) 90 (2) 100
(3) 135 (4) 150
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

27. A person bought 50 pens for ₹ 50 each. He sold 40 of them at a loss of 5%. He wants to gain 10% on the whole. Then his gain percent on the remaining pens should be
(1) 15% (2) 40%
(3) 50% (4) 70%
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

28. If toys are bought at ₹ 5 each and sold at ₹ 4.50 each, then the loss percent is :
(1) 10% (2) 11%
(3) 12% (4) 13%
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

29. By selling 14 watches of equal cost price at the rate of ₹ 450 each, there is a profit equal to the cost price of 4 watches. The cost price of a watch is
(1) ₹ 350 (2) ₹ 360
(3) ₹ 375 (4) ₹ 400
(SSC Data Entry Operator Exam. 31.08.2008)

30. A man buys some articles at ₹ P per dozen and sells them at ₹ $\frac{P}{8}$ per piece. His profit per cent is
(1) 30% (2) 40%
(3) 50% (4) 60%
(SSC Data Entry Operator Exam. 02.08.2009)

31. A vendor sells lemons at the rate of 5 for ₹ 14, gaining thereby 40%. For how much did he buy a dozen lemons ?
(1) ₹ 20 (2) ₹ 21
(3) ₹ 24 (4) ₹ 28
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

32. If I purchased 11 books for ₹ 100 and sold 10 books for ₹ 110, the percentage of profit per book sold is
(1) 10% (2) 11·5%
(3) 17·3% (4) 21%
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

33. A shop-keeper sold a sewing machine for ₹ 1,080 at a loss of 10%. At what price should he has to sold it so as to gain 10% on it ? (in ₹)
(1) 1,069 (2) 1,200
(3) 1,230 (4) 1,320
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

34. A fruit-seller buys some oranges and by selling 40% of them he realises the cost price of all the oranges. As the oranges being to grow over-ripe, he reduces the price and sells 80% of the remaining oranges at half the previous rate of profit. The rest of the oranges being rotten are thrown away. The overall percentage of profit is
(1) 80 (2) 84
(3) 94 (4) 96
(SSC CGL Tier-I Exam. 19.10.2014)

35. An item costing ₹ 200 is being sold at 10% loss. If the price is further reduced by 5%, the selling price will be
(1) ₹ 170 (2) ₹ 171
(3) ₹ 175 (4) ₹ 179
(SSC CGL Tier-II Exam. 21.09.2014)

36. By selling an article for ₹ 102, there is a loss of 15%, when the article is sold for ₹ 134.40, the net result in the transaction is
(1) 12% gain (2) 12% loss
(3) 10% loss (4) 15% gain
(SSC CGL Tier-II Exam. 21.09.2014)

37. Two toys are sold at ₹ 504 each. One toy brings the dealer a gain of 12% and the other a loss of 4%.The gain or loss per cent by selling both the toys is
(1) $3\frac{5}{13}\%$ Profit
(2) $4\frac{5}{13}\%$ Profit
(3) $5\frac{1}{13}\%$ Profit
(4) $2\frac{3}{13}\%$ loss
(SSC CGL Tier-II Exam. 21.09.2014)

38. A sold a horse to B for ₹ 4800 by losing 20%. B sells it to C at a price which would have given A a profit of 15%. B's gain is
(1) ₹ 1800 (2) ₹ 1900
(3) ₹ 2000 (4) ₹ 2100
(SSC CGL Tier-II Exam. 21.09.2014)

39. A fruit vendor buys apples at the rate of 10 for ₹ 100.How many should he sell for ₹ 100, so that he makes a profit of 25% ?
(1) 5 (2) 6
(3) 7 (4) 8
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

40. A table is sold at a profit of 13%. If it is sold for ₹ 25 more, profit is 18 %. Cost price of table is
(1) ₹ 100 (2) ₹ 500
(3) ₹ 200 (4) ₹ 1, 000
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

41. A man sold his watch at a loss of 5%. Had he sold it for ₹ 56.25 more, he would have gained 10%. What is the cost price of the watch (in ₹) ?
(1) 370 (2) 365
(3) 375 (4) 390
(SSC CHSL DEO & LDC Exam. 9.11.2014)

42. Kamala bought a bicycle for ₹ 1,650. She had to sell it at a loss of 8%. She sold it for
(1) ₹ 1, 581 (2) ₹ 1, 518
(3) ₹ 1, 510 (4) ₹ 1, 508
(SSC CHSL DEO & LDC Exam. 16.11.2014)

43. A table is sold at Rs. 1,800 at a loss of 10%. At what price should it be sold to earn a profit of 15%?
(1) ₹ 2,070 (2) ₹ 1,890
(3) ₹ 2,000 (4) ₹ 2,300
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

44. A manufacturer sells an item to a wholesale dealer at a profit of 18%. The wholesaler sells the same to a retailer at a profit of 20%. The retailer in turn sells it to a customer for ₹ 15045 thereby earning a profit of 25%. The cost price of the manufacturer is
(1) ₹ 8000 (2) ₹ 8500
(3) ₹ 9000 (4) ₹ 10000
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

45. A man sold an article at a gain of 5%. Had he sold it for Rs. 40 more, he would have gained 8%. The cost price of the article is
(1) Rs. 6,000 (2) Rs. 10,000
(3) Rs. 12,000 (4) Rs. 8,000
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

46. A radio is sold at a profit of 20%. Had it been sold for Rs. 60 more the profit would have been 30%. The cost price of the radio is
(1) Rs. 500 (2) Rs. 600
(3) Rs. 550 (4) Rs. 620
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

47. A dealer sold a bicycle at a profit of 10%. Had he bought the bicycle at 10% less price and sold it at a price Rs. 60 more, he would have gained 25%. The cost price of the bicycle was

(1) Rs. 2400 (2) Rs. 2600
(3) Rs. 2000 (4) Rs. 2200

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

48. If 3 articles are sold for the cost of 5 articles, then the profit percentage is :

(1) 50 (2) 60
(3) $66\frac{2}{3}$ (4) 65

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

49. A sold a watch at a gain of 5% to B and B sold it to C at a gain of 4%. If C paid Rs. 91 for it, the price paid by A is :

(1) Rs. 83.33 (2) Rs. 84.33
(3) Rs. 83 (4) Rs. 82.81

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

50. Arun buys one kilogram of apples for Rs. 120 and sells it to Swati gaining 25%. Swati sells it to Divya who again sells it for Rs. 198, making a profit of 10%. What is the profit percentage made by Swati?

(1) 25% (2) 20%
(3) 16.67% (4) 15%

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

51. A dealer sold an article at 6% loss. Had he sold it for Rs. 64 more, he would have made a profit of 10%. Then the cost of the article is

(1) Rs. 400 (2) Rs. 200
(3) Rs. 164 (4) Rs. 464

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

52. If percentage of profit made,when an article is sold for Rs.78, is twice as when it is sold for Rs.69, the cost price of the article is

(1) Rs. 49 (2) Rs. 51
(3) Rs. 57 (4) Rs. 60

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

53. A shopkeeper buys 80 articles for Rs. 2400 and sells them for a profit of 16%. Find the selling price of one article.

(1) Rs. 36.40 (2) Rs. 34.80
(3) Rs. 35.60 (4) Rs. 33.80

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

54. Ramesh sold a book at a loss of 30%. If he had sold it for Rs. 140 more, he would have made a profit of 40%. The cost price of the book is

(1) Rs. 280 (2) Rs. 200
(3) Rs. 260 (4) Rs. 300

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

55. By selling cloth at Rs. 9 per metre, a shopkeeper loses 10%. Find the rate at which it should be sold so as to earn profit of 15%.

(1) Rs.11.20 (2) Rs.11.30
(3) Rs.11.40 (4) Rs.11.50

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

56. A man bought 30 defective machines for Rs. 1000. He repaired and sold them at the rate of Rs. 300 per machine. He got profit of Rs. 150 per machine. How much did he spend on repairs ? (in Rupees)

(1) 5500 (2) 4500
(3) 3500 (4) 2500

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

57. Kamal has some apples. He sold 40% more than he ate. If he sold 70 apples, how many did he eat ?

(1) 18 (2) 42
(3) 50 (4) 90

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

58. A man bought 25 crates of oranges for Rs. 10,000. He lost 5 crates. In order to earn a total profit of 25% of the total cost, he would have to sell each of the remaining crates at

(1) Rs. 650 (2) Rs. 625
(3) Rs. 600 (4) Rs. 575

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

59. A man sells an article at 15% profit. If he had sold it for Rs. 6 more, he would have gained 18%. The man bought the article for

(1) Rs. 100 (2) Rs. 150
(3) Rs. 200 (4) Rs. 250

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

TYPE–IV

1. The ratio of cost price and selling price is 5 : 4, the loss per cent is :

(1) 20% (2) 25%
(3) 40% (4) 50%

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. The ratio of the C.P. and S.P. of an article is 20 : 21. What is the gain per cent ?

(1) 5% (2) 5.5%
(3) 6% (4) 6.25%

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CPO SI Exam. 03.09.2006 & SSC CISF ASI Exam. 29.08.2010)

3. The cash difference between selling prices of an article at a profit of 4% and 6% is ₹ 3. The ratio of the two selling prices is

(1) 51 : 52 (2) 52 : 53
(3) 51 : 53 (4) 52 : 55

(SSC CPO S.I. Exam. 12.01.2003

4. A milkman makes 20% profit by selling milk mixed with water at ₹ 9 per litre. If the cost price of 1 litre pure milk is ₹ 10, then the ratio of milk and water in the said mixture is

(1) 3 : 1 (2) 4 : 1
(3) 3 : 2 (4) 4 : 3

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

5. The prices of a refrigerator and a television set are in the ratio 5 : 3. If the refrigerator costs ₹ 5500 more than the television set, then the price of the refrigerator is:

(1) ₹ 27500 (2) ₹ 8250
(3) ₹ 13750 (4) ₹ 16500

(SSC CHSL DEO & LDC Exam. 21.10.2012, IInd Sitting)

6. Nita blends two varieties of tea—one costing ₹ 180 per kg and another costing ₹ 200 per kg in the ratio 5 : 3. If she sells the blended variety at ₹ 210 per kg, then her gain percent is

(1) 10% (2) 11%
(3) 12% (4) 13%

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

7. Partha earns 15 per cent on an investment but loses 10 per cent on another investment. If the ratio of two investments is 3 : 5, then the combined loss percent is

(1) $\frac{5}{4}\%$ (2) $\frac{4}{5}\%$

(3) $\frac{8}{5}\%$ (4) $-\frac{5}{8}\%$

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

8. The ratio of cost price and selling price of an article is 8 : 9. The profit per cent is

(1) 20% (2) 15%

(3) 12.5% (4) 10%

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

9. A shopkeeper earns a profit of 12% on selling a book at 10% discount on the printed price. The ratio of the cost price and the printed price of the book is

(1) 99 : 125 (2) 25 : 37

(3) 50 : 61 (4) 45 : 56

(SSC CGL Prelim Exam. 27.07.2008 (Ist Sitting) & (SSC CGL Exam.19.05.2013)

10. If an article is sold at 200% profit, then the ratio of its cost price to its selling price will be

(1) 1 : 2 (2) 2 : 1

(3) 1 : 3 (4) 3 : 1

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

11. An article is sold at 5% profit. The ratio of selling price and cost price will be

(1) 1 : 5 (2) 20 : 21

(3) 21 : 20 (4) 5 : 1

(SSC (South Zone) Investigator Exam 12.09.2010)

12. If the ratio of cost price and the selling price is 5 : 6, the gain per cent is

(1) 20% (2) $33\frac{1}{3}\%$

(3) 25% (4) 30%

(SSC CGL Prelim Exam. 11.05.2003 (IInd Sitting) & (SSC CPO S.I. Exam. 07.09.2003) & (SSC CPO S.I. Exam. 12.12.2010)

13. If the cost price and selling price of an article are in the ratio 10 : 11, then the percentage of profit is :

(1) 10% (2) 9%

(3) 3% (4) 1%

(SSC CGL Tier-I Exam.16.05.2010) & SSC CHSL DEO & LDC Exam. 27.11.2010)

14. The cost price : selling price of an article is $a : b$. If b is 200% of a then the percentage of profit on cost price is

(1) 75% (2) 125%

(3) 100% (4) 200%

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

15. A invests ₹ 64,000 in a business. After few months B joined him with ₹ 48,000. At the end of year, the total profit was divided between them in the ratio 2 : 1. After how many months did B join?

(1) 8 (2) 4

(3) 6 (4) 7

(SSC CHSL DEO & LDC Exam. 20.10.2013)

16. The ratio, in which tea costing ₹ 192 per kg is to be mixed with tea costing ₹ 150 per kg so that the mixed tea, when sold for ₹ 194.40 per kg, gives a profit of 20%, is

(1) 2 : 5 (2) 3 : 5

(3) 5 : 3 (4) 5 : 2

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

17. In what ratio Darjeeling Tea costing ₹ 320 per kg be mixed with Assam Tea costing ₹ 250 per kg so that there is a gain of 20% by selling the mixture at ₹ 324 per kg ?

(1) 1 : 2 (2) 2 : 3

(3) 3 : 2 (4) 2 : 5

(SSC SAS Exam 26.06.2010 (Paper-1)

18. The ratio of the quantities of sugar, in which sugar costing ₹ 20 per kg. and ₹ 15 per kg. should be mixed so that there will be neither loss nor gain on selling the mixed sugar at the rate of ₹ 16 per kg, is

(1) 2 : 1 (2) 1 : 2

(3) 4 :1 (4) 1 : 4

(SSC Data Entry Operator Exam. 31.08.2008)

19. The ratio in which the Darjeeling tea at ₹32 per kg is mixed with the Assam tea at ₹25 per kg so as to gain 20% by selling the mixture at ₹32.40 per kg is

(1) 4 : 3 (2) 3 : 4

(3) 5 : 2 (4) 2 : 5

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

20. In what ratio must a grocer mix tea at ₹ 60 a kg, and ₹ 65 a kg, so that by selling the mixture at ₹ 68.20 a kg, he may gain 10%?

(1) 3 : 2 (2) 3 : 4

(3) 3 : 5 (4) 4 : 5

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

21. 7 kg of tea costing ₹ 280 per kg is mixed with 9 kg of tea costing ₹ 240 per kg. The average price per kg of the mixed tea is

(1) ₹ 255.80 (2) ₹ 257.50

(3) ₹ 267.20 (4) ₹ 267.50

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

22. A shopkeeper bought 15kg of rice at the rate of ₹29 per kg and 25kg of rice at the rate of ₹20 per kg. He sold the mixture of both types of rice at the rate of ₹27 per kg. His profit in this transaction is

(1) ₹125 (2) ₹150

(3) ₹ 140 (4) ₹145

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

23. A, B and C are partners of a company. During a particular year A received one-third of the profit, B received one-fourth of the profit and C received the remaining ₹ 5,000. How much did A receive?

(1) ₹ 5,000 (2) ₹ 4,000

(3) ₹ 3,000 (4) ₹ 1,000

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

24. A, B and C entered into a partnership. A invested ₹ 2,560 and B ₹ 2,000. At the end of the year, they gained ₹ 1,105, out of which A got ₹ 320. C's capital was

(1) ₹ 4,280 (2) ₹ 2,840

(3) ₹ 4,820 (4) ₹ 4,028

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

25. A, B and C entered into partnership in a business. A got $\frac{3}{5}$ of the profit and B and C distributed the remaining profit equally. If C got ₹ 400 less than A, the total profit was
(1) ₹ 1600 (2) ₹ 1200
(3) ₹ 1000 (4) ₹ 800
(SSC CPO S.I. Exam. 09.11.2008)

26. ₹ 864 is divided among A, B and C such that 8 times A's share is equal to 12 times B's share and also equal to 6 times C's share. How much did B get ?
(1) ₹ 399 (2) ₹ 192
(3) ₹ 288 (4) ₹ 72
(SSC Graduate Level Tier-II Exam.16.09.2012)

27. At the beginning of a partnership business, the capital of B was $\frac{3}{2}$ times that of A. After 8 months B withdrew $\frac{1}{2}$ of his capital and after 10 months A withdrew $\frac{1}{4}$th of his capital. At the end of the year, if the profit incurred is ₹ 53,000, find the amount received by A.
(1) ₹ 30,800 (2) ₹ 32,000
(3) ₹ 30,000 (4) ₹ 23,000
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

28. A, B and C rent a pasture. A puts in 10 oxen for 7 months, B 12 oxen for 5 months and C 15 oxen for 3 months for grazing. If the rent of the pasture is ₹ 175/-, how much must C pay as his share of rent?
(1) ₹ 45/- (2) ₹ 50/-
(3) ₹ 55/- (4) ₹ 60/-
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

29. A, B, C enter into a partnership. A contributes ₹ 3,20,000 for 4 months, B contributes ₹ 5,10,000 for 3 months and C contributes ₹ 2,70,000 for 5 months. If the total profit be ₹ 1,24,800, then A's share in the profit is
(1) ₹ 38,400 (2) ₹ 45,900
(3) ₹ 40,500 (4) ₹ 41,500
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

30. A started a business with a capital of ₹ 1,00,000. One year later, B joined him with a capital of ₹ 2,00,000. At the end of 3 years from the start of the business, the profit earned was 84,000. The share of B in the profit exceeded the share of A by
(1) ₹ 10,000 (2) ₹ 12,000
(3) ₹ 14,000 (4) ₹ 15,000
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

31. A, B and C started a business by investing ₹ 40500, ₹ 45000 and ₹ 60000 respectively. After 6 months C withdrew ₹ 15000 while A invested ₹ 4500 more. In annual profit of ₹ 56100, the share of C will exceed that of A by
(1) ₹ 900 (2) ₹1100
(3) ₹ 3000 (4) ₹ 3900
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

32. In a business partnership among A, B, C and D, the profit is shared as follows:

$$\frac{\text{A's share}}{\text{B's share}} = \frac{\text{B's share}}{\text{C's share}}$$

$$= \frac{\text{C's share}}{\text{D's share}} = \frac{1}{3}$$

If the total profit is ₹ 4,00,000, then, the share of C is
(1) ₹ 1,12,500 (2) ₹ 1,37,500
(3) ₹ 90,000 (4) ₹ 2,70,000
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

33. A starts business with ₹ 3500/- and after 5 months, B joins with A as his partner. After a year, the profit is divided in the ratio 2 : 3. What is B's contribution in the capital?
(1) ₹ 8000/- (2) ₹ 8500/-
(3) ₹ 9000/- (4) ₹ 7500/-
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

34. A began business with ₹ 45000 and was joined afterwards by B with ₹ 54000. After how many months did B join if the profits at the end of the year were divided in the ratio 2 : 1 ?
(1) 4 (2) 5
(3) 6 (4) 7
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

35. A, B and C entered into a business and their investments ratio was 5 : 4 : 3. After 4 months B invested ₹ 1,000 more and after 8 months C invested ₹ 2,000 more. At the end of one year the profit ratio was 15 : 14 : 11, then the investment of C at the beginning was
(1) ₹ 3000 (2) ₹ 6000
(3) ₹ 4500 (4) ₹ 7500
(SSC CHSL DEO Exam. 27.10.2013 IInd Sitting)

36. A, B and C started a business with their investments in the ratio 1 : 2 : 4. After 6 months A increased his capital by 50% and B invested twice the amount as before, while C withdrew $\frac{1}{4}$ of his own investment. The ratio of their profits at the end of the year was
(1) 10 : 5 : 9 (2) 5 : 12 : 14
(3) 6 : 9 : 17 (4) 5 : 14 : 16
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

37. A total profit of ₹ 3,600 is to be distributed amongst A, B and C such that A : B = 5 : 4 and B : C = 8 : 9. The share of C in the profit is
(1) ₹ 1, 200 (2) ₹ 1, 500
(3) ₹ 1, 650 (4) ₹ 1, 700
(SSC CHSL DEO & LDC Exam. 9.11.2014)

38. Two types of tea costing ₹ 180 per kg and ₹ 280 per kg should be mixed in the ratio so that the mixture obtained, sold at ₹ 320 per kg to earn a profit of 20% is
(1) 3:13 (2) 1:13
(3) 4:13 (4) 2:13
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

39. A profit of 12% is made when a mobile phone is sold at ₹ P and there is 4% loss when the phone is sold at ₹ Q. Then Q : P is
(1) 1 : 1 (2) 4 : 5
(3) 6 : 7 (4) 3 : 1
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

40. If the ratio of cost price to selling price is 10 : 11, then the rate of per cent of profit is
(1) 1.1% (2) 0.1%
(3) 10% (4) 1%
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

41. If a sum of Rs. 1,170 was distributed among A, B and C in the ratio 2 : 3 : 4, by mistake, in place of $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$, who was benefited most and by how much ?

(1) B, Rs. 220 (2) C, Rs. 250
(3) B, Rs. 270 (4) A, Rs. 280

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

42. Costs of two watches were in the ratio of 16 : 23. The cost of first watch increases by 10% and that of second by Rs. 477. Now the costs of two watches are in a ratio of 11 : 20. The price of the second watch (in Rs.) in the beginning was

(1) 932 (2) 1219
(3) 1696 (4) 848

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

43. The liquids, X and Y are mixed in the ratio of 3 : 2 and the mixture is sold at Rs. 11 per litre at a profit of 10%. If the liquid X costs Rs. 2 more per litre than Y, the cost of X per litre is (in Rs.) :

(1) 10.80 (2) 11.75
(3) 9.50 (4) 11

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

44. In what proportion must water be added with milk to gain 20% by selling the mixture at cost price?

(1) 1 : 5 (2) 4 : 1
(3) 5 : 1 (4) 1 : 1

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

45. A and B invest in a business in the ratio 3 : 2. If 5% of the total profit goes to charity and A's share in profit is Rs. 8,550, then total profit is

(1) Rs. 15,760 (2) Rs.15,735
(3) Rs. 14,250 (4) Rs. 15,000

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

46. If the ratio of cost price and selling price of an article be 10:11, the profit percentage is

(1) 1% (2) 10%
(3) 5% (4) 8%

(SSC CGL Tier-I (CBE) Exam.10.09.2016)

47. A and B jointly made a profit of Rs.1650 and they decided to share it such that $\frac{1}{3}$ of A's profit is equal to $\frac{2}{5}$ of B's profit. Then profit of B is

(1) Rs. 700 (2) Rs. 750
(3) Rs. 850 (4) Rs. 800

(SSC CGL Tier-II Online Exam.01.12.2016)

48. 4% of the selling price of an article is equal to 5% of its cost price. Again 20% of the selling price is Rs.120 more than 22% of its cost price. The ratio of cost price and selling price is

(1) 2 : 3 (2) 3 : 2
(3) 4 : 5 (4) 5 : 4

(SSC CGL Tier-II Online Exam.01.12.2016)

49. Anil started a business with an investment of Rs. 25,000. After 3 months, Vishal joined his business with a capital of Rs. 30,000. At the end of the year, they have made a profit of Rs. 19,000. What will be Anil's share in the profit?

(1) Rs. 10,000 (2) Rs. 12,500
(3) Rs. 10,250 (4) Rs. 14,000

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

50. Instead of dividing 391 cookies among 3 children A, B , C in the ratio $\frac{1}{5}:\frac{1}{4}:\frac{1}{8}$, it was divided in to the ratio 5 : 4 : 8. Who gains the most and how many ?

(1) A, 21 cookies
(2) B, 78 cookies
(3) C, 99 cookies
(4) C, 78 cookies

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

51. If the ratio between the profit and selling price of an article is 1 : 5, then the ratio between the selling price and the cost price of that article is :

(1) 3 : 2 (2) 4 : 3
(3) 5 : 4 (4) 6 : 5

(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

52. If the loss per cent on an article is 15%, then the ratio of the cost price and the selling price will be :

(1) 17 : 20 (2) 20 : 17
(3) 23 : 15 (4) 15 : 23

(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

53. A, B and C enter into a partnership, investing Rs. 6000. A invests Rs. 1000 and B and C invests in the ratio of 2 : 3. Find the profit of C, when the annual profit is Rs. 2400.

(1) Rs. 600 (2) Rs.1200
(3) Rs.1800 (4) Rs.1950

(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

54. If the ratio of the cost price and the selling price of an article be 4 : 5, then the percentage of profit is :

(1) $27\frac{1}{2}$ (2) 25
(3) 15 (4) 10

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

55. A and B invest Rs. 3000 and Rs. 2400 respectively in a business. If after one year there is a loss of Rs. 720, how much loss will B bear? (Loss or profit is in proportion to their investments)

(1) Rs. 72 (2) Rs. 320
(3) Rs. 400 (4) Rs. 360

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

56. The ratio of cost price and selling price of an article is 20 : 21. Then gain per cent on it is

(1) 7 (2) 5
(3) 6 (4) 4

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

57. The ratio of cost price and selling price of an article is 25 : 26. The per cent of profit will be

(1) 26% (2) 25%
(3) 1% (4) 4%

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–V

1. Find the selling price of an article if a shopkeeper allows two successive discounts of 5% each on the marked price of ₹ 80.

(1) ₹ 70.20 (2) ₹ 70.10
(3) ₹ 72.00 (4) ₹ 72.20

(SSC CPO S.I. Exam. 12.01.2003)

2. An item costing ₹ 840 was sold by a shopkeeper at a gain of 10% and it was again sold by the new buyer at a loss of 5%. Final selling price of the item is :

(1) ₹ 877.80 (2) ₹ 798
(3) ₹ 924 (4) ₹ 37.80

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

3. A shopkeeper gains 20% while buying the goods and 30% while selling them. Find his total gain per cent.
(1) 50% (2) 36%
(3) 56% (4) 40%
(SSC CPO S.I. Exam. 26.05.2005)

4. Salary of a person is increased by 20%, then it is decreased by 20%. Change in his salary is :
(1) 4% decreased
(2) 4% increased
(3) 8% decreased
(4) neither decrease nor increase
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

5. A grocery dealer cheats to the extent of 10% while buying as well as selling by using false weight. What is his increase in the profit % ?
(1) 20% (2) 21%
(3) 22% (4) None of these
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

6. A balance of a trader weighs 20% less than it should be. Still the trader mark-up his goods to get the overall profit of 35%. What is mark-up on the cost price ?
(1) 7% (2) 8%
(3) 9% (4) 8.5%
(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

TYPE–VI

1. By selling an article for ₹ 240, a man incurs a loss of 10%. At what price should he sell it, so that he makes a profit of 20% ?
(1) ₹ 264 (2) ₹ 288
(3) ₹ 300 (4) ₹ 320
(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting) & SSC S.O. Exam. 16.11.2003)

2. By selling an article for ₹ 480 a person lost 20%. For what should he sell it to make a profit of 20%?
(1) ₹ 800 (2) ₹ 760
(3) ₹ 720 (4) ₹ 680
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. By selling an article for ₹ 72, there is a loss of 10%. In order to gain 5%, its selling price should be :
(1) ₹ 87 (2) ₹ 85
(3) ₹ 80 (4) ₹ 84
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. If an article is sold for ₹ 178 at a loss of 11%, what should be its selling price in order to earn a profit of 11%?
(1) ₹ 222.50 (2) ₹ 267
(3) ₹ 435 (4) ₹ 222
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. On selling an article for ₹ 105 a trader loses 9%. To gain 30% he should sell the article at
(1) ₹ 126 (2) ₹ 144
(3) ₹ 150 (4) ₹ 139
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

6. A shopkeeper bought 80kg of sugar at the rate of ₹ 13.50 per kg. He mixed it with 120kg of sugar costing ₹ 16 per kg. In order to make a profit of 20%, he must sell the mixture at
(1) ₹ 18 per kg
(2) ₹ 17 per kg
(3) ₹ 16.40 per kg
(4) ₹ 15 per kg
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

7. To gain 10% on selling sample milk at the cost price of pure milk, the quantity of water to be mixed with 50 kg. of pure milk is
(1) 2.5 Kg. (2) 5 Kg.
(3) 7.5 Kg. (4) 10 Kg.
(SSC CPO S.I. Exam. 09.11.2008)

8. By selling an article for ₹ 69, there is a loss of 8%, when the article is sold for ₹ 78, the gain or loss per cent is :
(1) neither loss nor gain
(2) 4% gain
(3) 4% loss
(4) 40% gain
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

9. A loss of 20% is incurred when 6 articles are sold for a rupee. To gain 20% how many articles should be sold for a rupee ?
(1) 1 (2) 2
(3) 3 (4) 4
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

10. By selling a plot of land for ₹ 45,000 a person loses 10%. At what price should he sell it to gain 15%?
(1) ₹ 50,000 (2) ₹ 55,000
(3) ₹ 57,500 (4) ₹ 60,000
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

11. A radio is sold for ₹ 990 at a profit of 10%. What would have been the actual profit or loss on it, had it been sold for Rs. 890 ?
(1) ₹ 10 loss (2) ₹ 10 profit
(3) ₹ 90 loss (4) ₹ 90 profit
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

12. By selling a table for ₹ 1140, a man loses 5%. in order to gain 5%, the table must be sold for
(1) ₹ 1260 (2) ₹ 1320
(3) ₹ 1180 (4) ₹ 1250
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

13. A radio dealer sold a radio at a loss of 2.5%. Had he sold it for ₹100 more, he would have gained $7\frac{1}{2}\%$. In order to gain $12\frac{1}{2}\%$, he should sell it for
(1) ₹ 1080 (2) ₹ 1125
(3) ₹ 850 (4) ₹ 925
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

14. By selling a fan for ₹ 600, a man loses 10%. To make a gain of 20%, the selling price of the fan should be
(1) ₹ 900 (2) ₹ 1000
(3) ₹ 700 (4) ₹ 800
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

15. A man sells a car to his friend at 10% loss. If the friend sells it for ₹ 54,000 and gains 20%, the original cost price of the car was
(1) ₹ 25,000 (2) ₹ 35,000
(3) ₹ 45,000 (4) ₹ 50,000
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

16. On selling an article for ₹ 170, a shopkeeper loses 15%. In order to gain 20%, he must sell that article at :
(1) ₹ 215.50 (2) ₹ 212.50
(3) ₹ 240 (4) ₹ 210
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

17. If a man were to sell his chair for ₹ 720, he would lose 25%. To gain 25% he should sell it for
(1) ₹ 1,200 (2) ₹ 1,000
(3) ₹ 960 (4) ₹ 900
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

18. By selling a basket for ₹ 19.50, a shopkeeper gains 30%. For how much should he sell it to gain 40% ?
(1) ₹ 21 (2) ₹ 21.50
(3) ₹ 24 (4) ₹ 23
(SSC CPO S.I. Exam. 06.09.2009)

19. A man bought 20 dozen eggs for ₹ 720. What should be the selling price of each egg if he wants to make a profit of 20% ?
(1) ₹ 3.25 (2) ₹ 3.30
(3) ₹ 3.50 (4) ₹ 3.60
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

20. By selling an article for ₹ 665, there is a loss of 5%. In order to make a profit of 12%, the selling price of the article must be
(1) ₹ 812 (2) ₹ 800
(3) ₹ 790 (4) ₹ 784
(SSC Data Entry Operator Exam. 31.08.2008)

21. By selling an article for ₹ 700 a man lost 30%. At what price should he have sold it to gain 30% ?
(1) ₹ 910 (2) ₹ 1200
(3) ₹ 1232 (4) ₹ 1300
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

22. If a man were to sell his wristwatch for ₹720, he would lose 25%. What price must he sell at for to gain 25% ?
(1) ₹960 (2) ₹900
(3) ₹1000 (4) ₹1200
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting) & 04.11.2012

23. An article was sold at a profit of 12%. If the cost price would be 10% less and selling price would be ₹ 5.75 more, there would be profit of 30%. Then at what price it should be sold to make a profit of 20% ?
(1) ₹ 115 (2) ₹ 120
(3) ₹ 138 (4) ₹ 215
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

24. By selling 80 ball pens for ₹ 140 a retailer loses 30%. How many ball pens should he sell for ₹104 so as to make a profit of 30%?
(1) 32 (2) 52
(3) 48 (4) 42
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

25. By selling 90 ball pens for ₹ 160 a person loses 20%. The number of ball pens, which should be sold for ₹ 96 so as to have a profit of 20% is
(1) 36 (2) 37
(3) 46 (4) 47
(SSC Constable (GD) Exam. 12.05.2013)

26. Sourav purchased 30 kg of rice at the rate of ₹ 10 per kg and 35 kg at the rate of ₹ 11 per kg. He mixed the two. At what price per kg (in ₹) should he sell the mixture to make a 30% profit in the transaction ?
(1) 12.5 (2) 13
(3) 13.7 (4) 14.25
(SSC Graduate Level Tier-II Exam. 29.09.2013

27. Mr. Y purchased a flat for ₹ 9,25, 000 and spent ₹ 35, 000 for its renovation. If he sold the flat for ₹ 10, 80, 000 then his profit percent is
(1) 15.0 (2) 17.5
(3) 20.0 (4) 12.5
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

28. The selling price of an article is $\frac{8}{5}$th of its cost price. Then the gain percentage is
(1) 20% (2) 28%
(3) 60% (4) 68%
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

29. 12 copies of a book were sold for Rs. 1800 thereby gaining cost price of 3 copies. The cost price of a copy of the book is :
(1) Rs. 120 (2) Rs. 150
(3) Rs. 1200 (4) Rs. 1500
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

30. After selling 5% of a quantity of sugar, 5 kg. of sugar remains. Find the total quantity of sugar.
(1) 19 kg. (2) $5\frac{5}{19}$ kg.
(3) 100 kg. (4) 95 kg.
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

TYPE–VII

1. If the sales tax be reduced from $3\frac{1}{2}\%$ to $3\frac{1}{3}\%$, what difference does it make to a person who purchases an article whose marked price is ₹ 8,400 ?
(1) ₹ 20 (2) ₹ 15
(3) ₹ 14 (4) ₹. 10
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

2. By selling an article at $\frac{2}{3}$ of the marked price, there is a loss of 10%. The profit percent, when the article is sold at the marked price, is
(1) 20% (2) 30%
(3) 35% (4) 40%
(SSC CPO S.I. Exam. 07.09.2003)

3. A tradesman allows a discount of 15% on the marked price. How much above the cost price must he mark his goods as to gain 19%?
(1) 34% (2) 40%
(3) 25% (4) 30%
(SSC CPO S.I. Exam. 09.11.2008)

4. Rita bought a television set with 20% discount on the labelled price. She made a profit of ₹ 800 by selling it for ₹ 16,800. The labelled price of the set was
(1) ₹ 18,000 (2) ₹ 20,000
(3) ₹ 20,800 (4) ₹ 24,000
(SSC CPO S.I. Exam. 09.11.2008)

5. The cost price of an article is ₹ 800. After allowing a discount of 10%, a gain of 12.5% was made. Then the marked price of the article is
(1) ₹ 1,000 (2) ₹ 1,100
(3) ₹ 1,200 (4) ₹ 1,300
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

6. A shopkeeper allows 23% commission on his advertised price and still makes a profit of 10%. If he gains ₹ 56 on one item, his advertised price of the item, (in ₹) is
(1) 820 (2) 780
(3) 790 (4) 800
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

7. At what per cent above the cost price, must a shop–keeper marks his goods so that he gains 20% even after giving a discount of 10% on the marked price ?
(1) 25% (2) 30%
(3) $33\frac{1}{3}\%$ (4) $37\frac{1}{2}\%$
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

8. The marked price of an article is 10% higher than cost price. A discount of 10% is given on marked price. In this kind of sale, the seller bears :
(1) no loss, no gain
(2) a loss of 5%
(3) a gain of 1%
(4) a loss of 1%
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

9. The marked price of an article is 50% above cost price. When marked price is increased by 20% and selling price is increased by 20%, the profit doubles. If original marked price is ₹ 300, then original selling price is
(1) ₹ 200 (2) ₹ 250
(3) ₹ 240 (4) ₹ 275
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

10. The cost of manufacture of a tape recorder is ₹ 1,500. The manufacturer fixes the marked price 20% above the cost of manufacture and allows a discount in such a way as to get a profit of 8%. The rate of discount is
(1) 12% (2) 8%
(3) 20% (4) 10%
(SSC CGL Tier-I Exam. 11.11.2012 (Ist Sitting) & (SSC MTS Exam. 17.03.2013 (Kolkata)

11. How much percent above the cost price should a shopkeeper mark his goods so as to earn a profit of 32% after allowing a discount of 12% on the marked price ?
(1) 50% (2) 40%
(3) 60% (4) 45%
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

12. A dealer purchased a washing machine for ₹7,660. After allowing a discount of 12% on its marked price, he still gains 10%. Find the marked price of the washing machine.
(1) ₹9,575 (2) ₹8,426
(3) ₹8,246 (4) ₹9,755
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

13. A publisher printed 2000 copies of a book at a cost of ₹ 70,000. He distributes 400 copies free as specimen copies. He gave 30% discount on printed price and the printed price of each book is ₹ 75. What is his gain or loss percentage ?
(1) 20% gain (2) 20% loss
(3) 10% loss (4) 10% gain
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

14. Richa purchased an article at $\frac{4}{5}$ of its list price and sold it at 20% more than the list price. Richa's profit percent was
(1) 50% (2) 40%
(3) 30% (4) 25%
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

15. To gain 8% after allowing a discount of 10%, by what per cent cost price should be hiked in the list price ?
(1) 9% (2) 11%
(3) 18% (4) 20%
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

16. A shopkeeper sold sarees at ₹ 266 each after giving 5% discount on labelled price. Had he not given the discount, he would have earned a profit of 12% on the cost price. What was the cost price of each saree?
(1) ₹ 280 (2) ₹ 260
(3) ₹ 240 (4) ₹ 250
(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

17. Arvind purchased a wrist watch with 30% discount on the labelled price. He sold it with 40% profit on the price he bought. What was his percent loss on the labelled price?
(1) 2% (2) 6%
(3) 4% (4) 8%
(SSC Graduate Level Tier-I Exam. 21.04.2013)

18. The profit percent of a book seller if he sells book at marked price after enjoying a commission of 25% on marked price will be :
(1) 30% (2) 25%
(3) 20% (4) $33\frac{1}{3}\%$
(SSC CHSL DEO& LDC Exam. 04.11.2012, Ist Sitting)

19. A shopkeeper offers a discount of 10% on his articles. The marked price of the article is ₹ 450. The selling price should be
(1) ₹ 395 (2) ₹ 410
(3) ₹ 405 (4) ₹ 400
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

20. A shopkeeper marked the selling price of his goods in such a way that after giving a discount of 10% he gains 17%. How much per cent above the cost price is the marked price?
(1) 36% (2) 27%
(3) 30% (4) 40%
(SSC Constable (GD) Exam. 12.05.2013 & (SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

21. A tradesman marks his goods 30% more than the cost price. If he allows a discount of $6\frac{1}{4}\%$, then his gain percent is
(1) $23\frac{3}{4}\%$ (2) 22%
(3) $21\frac{7}{8}\%$ (4) 30%
(SSC Graduate Level Tier-II Exam. 29.09.2013

22. A trader marked the price of a commodity so as to include a profit of 25%, but allowed a discount of 16% on the marked price. His actual profit will be
(1) 16% (2) 25%
(3) 5% (4) 9%
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

23. A got 30% concession on the label price of an article sold for ₹ 8,750 with 25% profit on the price he bought. The label price was
(1) ₹ 13,000 (2) ₹ 16,000
(3) ₹ 12,000 (4) ₹ 10,000
(SSC CHSL DEO & LDC Exam. 20.10.2013)

24. A shopkeeper allows a rebate of 12% on the marked price of an article such that the selling price is ₹ 440. Then the marked price of the article is
(1) ₹ 490 (2) ₹ 500
(3) ₹ 600 (4) ₹ 550
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

25. Pratap buys a watch at $\frac{4}{5}$ th of its marked price and sells it for 17% more than its marked price. His profit based on its cost is

(1) Rs. 20 (2) Rs. 25
(3) Rs. 37 (4) Rs. 17

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

26. Mohan purchased a bag with 20 percent discount on the labelled price. He sold it at 40 percent profit on the price he bought. The percentage of profit on the labelled price is :

(1) 20% (2) 12%
(3) 18% (4) 24%

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

27. The marked price of an article is Rs. 5000. But due to a special festive offer a certain per cent of discount is declared. Mr. X availed this opportunity and bought the article at reduced price. He then sold it at Rs. 5000 and thereby made a profit of $11\frac{1}{9}$ %. The percentage of discount allowed was

(1) 10 (2) $3\frac{1}{3}$
(3) $7\frac{1}{2}$ (4) $11\frac{1}{9}$

(SSC CGL Tier-II (CBE)z Exam. 30.11.2016)

TYPE–VIII

1. Profit after selling a commodity for ₹ 524 is the same as loss after selling it for ₹ 452. The cost price of the commodity is

(1) ₹ 480 (2) ₹ 500
(3) ₹ 488 (4) ₹ 485

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

2. A clock was sold for ₹ 144. If the percentage of profit was numerically equal to the cost price, the cost of the clock was

(1) ₹ 72 (2) ₹ 80
(3) ₹ 90 (4) ₹ 100

(SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting) & (SSC CPO SI. Exam. 16.09.2009) & (SSC CGL Tier-I Exam. 26.06.2011 (IInd Sitting)

3. By selling 144 hens Mahesh suffered a loss equal to the selling price of 6 hens. His loss per cent is

(1) 4% (2) 3%
(3) 9% (4) $4\frac{1}{2}$ %

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

4. If the profit per cent got on selling an article is numerically equal to its cost price in rupees and the selling price is ₹ 39, then cost price (in ₹) will be

(1) 20 (2) 22
(3) 28 (4) 30

(SSC CPO S.I. Exam. 09.11.2008)

5. By selling 1 dozen ball pens, a shopkeeper earned the profit equal to the selling price of 4 ball pens. His profit per cent is

(1) 50% (2) 40%
(3) $33\frac{1}{3}$ % (4) $31\frac{1}{4}$ %

(SSC Data Entry Operator Exam. 02.08.2009)

6. A merchant sold an article for ₹ 75 at a profit percent equal to its cost price. The cost price of the article was :

(1) ₹ 45 (2) ₹ 50
(3) ₹ 54 (4) ₹ 60

(SSC CHSL DEO & LDC Exam. 27.11.2010)

7. If the profit on selling an article for ₹ 425 is the same as the loss on selling it for ₹ 355, then the cost price of the article is

(1) ₹ 370 (2) ₹ 380
(3) ₹ 390 (4) ₹ 400

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

8. The loss incurred on selling 21 articles equals the selling price of 3 articles. Then the loss per cent is

(1) $9\frac{1}{11}$ % (2) 10%
(3) $12\frac{1}{2}$ % (4) $11\frac{1}{9}$ %

(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

9. A man sold 250 chairs and had a gain equal to selling price of 50 chairs. His profit per cent is :

(1) 20% (2) 25%
(3) 50% (4) 15%

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

10. On selling 17 balls at ₹ 720, there is a loss equal to the cost price of 5 balls. The cost price (in ₹) of a ball is

(1) 45 (2) 50
(3) 55 (4) 60

(SSC Graduate Level Tier-II Exam. 29.09.2013

11. A vendor loses the selling price of 4 oranges on selling 36 oranges. His loss per cent is

(1) $12\frac{1}{2}$% (2) 9%
(3) 10% (4) $11\frac{1}{2}$%

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

12. Last year Mr. A bought two paintings. This year he sold them for Rs. 20,000 each. On one, he made a 25% profit and on the other he had a 25% loss. Then his net profit or loss is

(1) He lost more than Rs. 2000
(2) He lost less than Rs. 2000
(3) He earned more than Rs. 2000
(4) He earned less than Rs. 2000

(SSC CGL Tier-II Online Exam.01.12.2016)

13. If the cost price of 28 articles is equal to the sale price of 21 articles, then the percentage of profit is :

(1) 12% (2) $33\frac{1}{3}$ %
(3) 20% (4) 22%

(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

14. If by selling an article for Rs. 390 a shopkeeper gains 20%, then the cost price is

(1) Rs. 370 (2) Rs. 325
(3) Rs. 350 (4) Rs. 300

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

15. Loss of 20% on selling price is equal to x% loss on cost price. What is the value of x?
(1) 20 (2) 20
(3) $16\frac{2}{3}$ (4) 16
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

16. An article is sold at a certain price. If it is sold at half of the previous selling price, then there is a loss of $25\frac{1}{2}\%$. The profit after selling the article at the previous selling price is:
(1) 51% (2) 49%
(3) $12\frac{3}{4}\%$ (4) $24\frac{1}{2}\%$
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

TYPE–IX

1. An article is sold at a loss of 10%. Had it been sold for ₹ 9 more, there would have been a gain of $12\frac{1}{2}\%$ on it. The cost price of the article is :
(1) ₹ 40 (2) ₹ 45
(3) ₹ 50 (4) ₹ 35
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. A man sold an article at a loss of 20%. If he has sold that article for ₹ 12 more he would have gained 10%. Find the cost price of that article :
(1) ₹ 60 (2) ₹ 40
(3) ₹ 30 (4) ₹ 22
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

3. If an article is sold for ₹ 178 at a loss of 11%, what should be its selling price in order to earn a profit of 11%?
(1) ₹ 222.50 (2) ₹ 267
(3) ₹ 222 (4) ₹ 220
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

4. A man sells an article at 10% loss. If he had sold it at ₹ 10 more, he would have gained 10%. The cost price of the article is
(1) ₹ 50 (2) ₹ 55
(3) ₹ 100 (4) ₹ 110
(SSC CPO S.I. Exam. 03.09.2006)

5. A book seller sells a book at a profit of 10%. If he had bought it at 4% less and sold it for ₹ 6 more, he would have gained $18\frac{3}{4}\%$. The cost price of the book is
(1) ₹ 130 (2) ₹ 140
(3) ₹ 150 (4) ₹ 160
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

6. A man sells his typewriter at 5% loss. If he sells it for ₹ 80 more, he will gain 5%. The cost price of the typewriter is
(1) ₹ 1,600 (2) ₹ 1,200
(3) ₹ 1,000 (4) ₹ 800
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

7. A businessman sells a commodity at 10% profit. If he had bought it at 10% less and sold it for ₹ 2 less, then he would have gained $16\frac{2}{3}\%$. The cost price of the commodity is
(1) ₹ 32 (2) ₹ 36
(3) ₹ 40 (4) ₹ 48
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

8. A cooker is sold at a gain of 16%. If it has been sold for ₹ 20 more, 20% would have been gained. The cost price of the cooker is
(1) ₹ 350 (2) ₹ 400
(3) ₹ 500 (4) ₹ 600
(SSC CPO S.I. Exam. 06.09.2009)

9. On selling an almirah for ₹ 2576, a person got a profit of 12%. Had it been bought for ₹ 100 less, the profit per cent would have been
(1) $11\frac{1}{9}\%$ (2) $13\frac{1}{3}\%$
(3) $17\frac{1}{11}\%$ (4) $17\frac{9}{11}\%$
(SSC SAS Exam 26.06.2010 (Paper-1)

10. A man sold an article at a loss of 20%. If he had sold it for ₹ 50 more, he would have gained 5%. The cost price of the article was
(1) ₹ 250 (2) ₹ 300
(3) ₹ 180 (4) ₹ 200
(SSC Data Entry Operator Exam. 31.08.2008)

11. When an article is sold at a gain of 20%, it yields ₹ 60 more than when it is sold at a loss of 20%. The cost price of the article is
(1) ₹ 200 (2) ₹ 150
(3) ₹ 140 (4) ₹ 120
(SSC Data Entry Operator Exam. 02.08.2009)

12. Aniruddha sold a bicycle at a gain of 8%. Had it been sold for ₹75 more, the gain would have been 14%. The cost price of the bicycle was
(1) ₹ 1200 (2) ₹ 1250
(3) ₹ 1350 (4) ₹ 1500
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

13. A book vendor sold a book at a loss of 20%. Had he sold it for ₹ 108 more, he would have earned a profit of 30%. Find the cost price of the book?
(1) ₹ 216 (2) ₹ 648
(3) ₹ 240 (4) ₹ 432
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

14. If an article is sold at 5% gain instead of 5% loss, the man gains ₹ 5 more. Find the cost price of that article
(1) ₹ 100 (2) ₹ 105
(3) ₹ 50 (4) ₹ 110
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

15. An article is sold at a gain of 15%. Had it been sold for ₹ 27 more, the profit would have been 20%. The cost price of the article is
(1) ₹ 500 (2) ₹ 700
(3) ₹ 540 (4) ₹ 545
(SSC Graduate Level Tier-II Exam. 29.09.2013

16. A man sells an article at a gain of 15%. If he had bought it at 10% less and sold it for ₹ 4 less, he would have gained 25%. The cost price of the article is
(1) ₹ 140 (2) ₹ 150
(3) ₹ 160 (4) ₹ 185
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

17. An article is sold at a loss of 10%. Had it been sold for ₹ 90 more, there would have been a gain of 5%. The original sale price of the article (in ₹) is :
(1) 540 (2) 600
(3) 628 (4) 650
(SSC Multi-Tasking Staff Exam. 10.03.2013)

18. A man sold an article at a loss of 20%. If he could sell it for ₹ 200 more , he would make a profit of 5%. The cost price of the article is
(1) ₹ 700 (2) ₹ 800
(3) ₹ 850 (4) ₹ 900
(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

19. A businessman bought an article and sold it at a loss of 5%. If he had bought it for 10% less and sold it for ₹ 33 more, he would have had a profit of 30%. The cost price of the article is
(1) ₹ 330 (2) ₹ 155
(3) ₹ 150 (4) ₹ 300
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

20. An article was sold at 16% gain. Had it been sold for ₹200 more, the gain would have been 20%. Then the cost price of the article is:
(1) ₹ 5000 (2) ₹ 4800
(3) ₹4500 (4) ₹ 5200
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

21. A man purchased 150 pens at the rate of ₹12 per pen. He sold 50 pens at a gain of 10%. The percentage gain at which he must sell the remaining pens so as to gain 15% on the whole outlay is
(1) $21\frac{1}{2}\%$ (2) 20%
(3) 17% (4) $17\frac{1}{2}\%$
(SSC Graduate Level Tier-II Exam.16.09.2012)

22. By selling 4 articles for 1 rupee, a man loses 4%. Had he sold three articles per rupee, the profit would have been :
(1) 30% (2) 28%
(3) 16% (4) 12%
(SSC Multi-Tasking Staff Exam. 10.03.2013)

23. A shopkeeper sells an article at a loss of $12\frac{1}{2}\%$. Had he sold it for ₹ 51.80 more, he would have earned a profit of 6%. The cost price of the article is
(1) ₹ 280 (2) ₹ 300
(3) ₹ 380 (4) ₹ 400
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

24. Mohan sold his watch at 10% loss. If he had sold it for ₹ 45 more, he would have made 5% profit. The selling price (in ₹) of the watch was
(1) 300 (2) 900
(3) 110 (4) 270
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

25. Yogita sold a plasma TV at 20% gain to Shyamla. Shyamla sold it to Deepa at 10% profit. If Deepa had to pay ₹ 33,000 for the plasma TV, find the cost price of the plasma TV for Yogita.
(1) ₹ 30,000 (2) ₹ 25,000
(3) ₹ 35,000 (4) ₹ 40,000
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

26. A sells a cycle to B at a profit of 20% and B sells it to C at a loss of 25%. If C bought the cycle for ₹ P, then the cost price of it for A was
(1) ₹ $\frac{1}{20}$ P (2) ₹ $\frac{9}{10}$ P
(3) ₹ $\frac{9}{20}$ P (4) ₹ $\frac{10}{9}$ P
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

27. The profit obtained by selling an article for Rs. 625 is same as the loss incurred if it is sold for Rs. 545. The price at which it is to be sold to realize a profit of Rs. 65 on the cost price is
(1) Rs. 640 (2) Rs. 630
(3) Rs. 650 (4) Rs. 660
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

28. There would be a 10% loss, if rice is sold at Rs. 54 per kg. To earn a profit of 20%, the price of rice per kg will be
(1) Rs. 65 (2) Rs. 70
(3) Rs. 63 (4) Rs. 72
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

29. A merchant has 1000 kg sugar, part of which sells at 8% profit and the rest at 18% profit. He gain 14% on the whole. The quantity sold at 8% profit is :
(1) 560 kg. (2) 600 kg.
(3) 640 kg. (4) 400 kg.
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

30. By selling 12 kg of potatoes for Rs. 63, a shopkeeper gains 5%. What does he gain or lose percent by selling 50 kg of the same potatoes for Rs. 247.50?
(1) 1% loss
(2) No profit, no loss
(3) 2.5% loss
(4) 1% profit
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

31. A shopkeeper sold an article at a loss of 20%. But if he could sell it at Rs. 200 more, he could earn a profit of 5%. The cost price of the article is
(1) Rs. 800 (2) Rs. 1,000
(3) Rs. 1,200 (4) Rs. 600
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

32. A shopkeeper purchases two items for Rs. 520. One of them is sold gaining 16% and the other at a loss of 10%, thus making no profit or loss. What is the selling price of the item sold at loss?
(1) Rs. 288 (2) Rs. 232
(3) Rs. 320 (4) Rs. 200
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

33. Sandeep sells an article at a loss of 10%. Had he bought it at 20% less and sold it for Rs. 55 more, he could have gained 40%. What is the cost price of the article ?
(1) Rs. 200 (2) Rs. 225
(3) Rs. 250 (4) Rs. 275
(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

34. A T.V was sold at a profit of 5%. If it had been sold at a profit of 10%, the profit would have been Rs. 1000 more. What is its cost price ?
(1) Rs. 20000 (2) Rs. 5000
(3) Rs. 10000 (4) Rs. 15000
(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

35. 5% more is gained by selling a watch for Rs. 350 than by selling it for Rs. 340. The cost price of the watch is
(1) Rs. 110 (2) Rs. 140
(3) Rs. 200 (4) Rs. 250
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

36. The profit earned by a shopkeeper by selling a bucket at a gain of 8% is Rs. 28 more than when he sells it at a loss of 8%. The cost price (in Rupees) of the bucket is
(1) 170 (2) 190
(3) 175 (4) 165
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–X

1. A sells a bicycle to B at a profit of 20%. B sells it to C at a profit of 25%. If C pays ₹ 225/- for it, the cost price of the bicycle for A is :

(1) ₹ 110 (2) ₹ 125
(3) ₹ 120 (4) ₹ 150

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. A saleable article passes successively in the hands of three traders. Each trader sold it further at a gain of 25% of the cost price. If the last trader sold it for Rs. 250 then what was the cost price for the first trader ?

(1) ₹ 128 (2) ₹ 150
(3) ₹ 192 (4) ₹ 200

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

3. A car worth ₹ 1,50,000 was sold by X to Y at 5% profit. Y sold the car back to X at 2% loss. In the entire transaction

(1) X gained ₹ 4,350
(2) Y lost ₹ 4,350
(3) X gained ₹ 3,150
(4) X lost ₹ 3,150

(SSC CPO S.I. Exam. 16.12.2007)

4. A manufacturer sells an article to a wholesale dealer at a profit of 10%. The wholesale dealer sells it to a shopkeeper at 20% profit. The shopkeeper sells it to a customer for ₹ 56,100 at a loss of 15%. Then the cost price of the article to the manufacturer is

(1) ₹ 25,000 (2) ₹ 10,000
(3) ₹ 50,000 (4) ₹ 55,000

(SSC Graduate Level Tier-II Exam.16.09.2012)

5. A sells an article to B making a profit of $\frac{1}{5}$ of his outlay. B sells it to C, gaining 20%. If C sells it for ₹ 600 and incurs a loss of $\frac{1}{6}$ of his outlay, the cost price of article for A is

(1) ₹ 600 (2) ₹ 500
(3) ₹ 720 (4) ₹ 800

(SSC Graduate Level Tier-II Exam.16.09.2012)

6. A sells a cycle to B at a profit of 5% and B sells it to C at a profit of 10%. If C pays ₹ 2310 for it, the cost price of A is

(1) ₹ 2000 (2) ₹ 2100
(3) ₹ 1900 (4) ₹ 2010

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

7. A sells a cycle to B at a profit of 10%, B sells to C at a profit of 20%. If C pays ₹ 264 for it, how much did A pay for it?

(1) ₹ 200 (2) ₹ 220
(3) ₹ 225 (4) ₹ 234

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

8. A man purchased an article and sold it to B at a profit of 25% and B sold it to C at a loss of 10% and C paid ₹675 for it. For how much did A purchase it (in ₹) ?

(1) 625 (2) 575
(3) 600 (4) 550

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

9. A sold a tape-recorder to B for ₹4,860 at a loss of 19%. Again B sold it to C at a price that would give A a profit of 17%. The gain% of B is

(1) $22\frac{2}{9}\%$ (2) $33\frac{1}{3}\%$
(3) $44\frac{4}{9}\%$ (4) $66\frac{2}{3}\%$

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

10. A piece of land came to a person through three middleman each gaining 20%. If the person purchased the land for ₹ 3,45,600 the original cost of the land was

(1) ₹ 1,00,000 (2) ₹ 1,50,000
(3) ₹ 1,75,800 (4) ₹ 2,00,000

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

11. A sells an article to B at a gain of 10%, B sells it to C at a gain of 5%. If C pays ₹ 462 for it, what did it cost to A ?

(1) ₹ 500 (2) ₹ 450
(3) ₹ 600 (4) ₹ 400

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

12. A sells an article to B at a gain of 10%. B sells it to C at a gain of $7\frac{1}{2}\%$. C disposes of it at a loss of 25%. If the prime cost to the manufacturer A was ₹ 3200 then the price obtained by C is

(1) ₹ 2800 (2) ₹ 2580
(3) ₹ 2670 (4) ₹ 2838

(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

13. A sells an article to B at a gain of 20% and B sells it to C at a gain of 10% and C sells it to D at a gain of $12\frac{1}{2}\%$. If D pays ₹ 29.70, A purchased the article for

(1) ₹ 40 (2) ₹ 10
(3) ₹ 20 (4) ₹ 30

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

14. A sells a suitcase to B at 10% profit. B sells it to C at 30% profit. If C pays ₹ 2,860 for it, then the price at which A bought it is

(1) ₹ 1,000 (2) ₹ 1,600
(3) ₹ 2,000 (4) ₹ 2,500

(SSC Graduate Level Tier-II Exam. 29.09.2013

TYPE–XI

1. A house and a shop were sold for ₹ 1 lakh each. In this transaction, the house sale resulted into 20% loss whereas the shop sale into 20% profit. The entire transaction resulted in :

(1) no loss no gain
(2) gain of ₹ $\frac{1}{24}$ lakh
(3) loss of ₹ $\frac{1}{12}$ lakh
(4) loss of ₹ $\frac{1}{18}$ lakh

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. A shopkeeper sells two T.V. sets at the same price. There is a gain of 20% on one TV and a loss of 20% on the other. State which of the following statement is correct :

(1) The shopkeeper makes no net gain or profit
(2) The shopkeeper loses by 2%
(3) The shopkeeper gains by 4%
(4) The shopkeeper loses by 4%

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

3. A man sells two articles at ₹ 99 each. On one he gains 10% and on the other he loses 10%. What is his gain or loss per cent on the whole transaction ?
(1) Loss, 1% (2) Loss, 1.5%
(3) Profit, 1% (4) Profit, 1.5%
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. A man sells two pipes at ₹ 12 each. He gains 20% on one and loses 20% on the other. In the whole transaction, there is
(1) neither loss nor gain
(2) profit of ₹ 1
(3) loss of ₹ 1
(4) Profit of ₹ 2
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting)

5. Kewal sells two tape recorders at the same price. On one, he gains 10% and on the other he loses 10%. The total gain or loss in the transaction is
(1) 1% gain
(2) 1% loss
(3) No loss or gain
(4) 2% loss
(SSC CPO S.I. Exam. 12.01.2003)

6. A person sells two machines at ₹ 396 each. On one he gains 10% and on the other he loses 10%. His profit or loss in the whole transaction is :
(1) no gain no loss
(2) 1% loss
(3) 1% profit
(4) 8% profit
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

7. A dealer sold two types of goods for₹ 10,000 each. On one of them, he lost 20% and on the other he gained 20%. His gain or loss per cent in the entire transaction was
(1) 2% loss (2) 2% gain
(3) 4% gain (4) 4% loss
(SSC Graduate Level Tier-II Exam.16.09.2012)

8. A television and a refrigerator were sold for ₹ 12,000 each. If the television was sold at a loss of 20% of the cost and the refrigerator at a gain of 20% of the cost, the entire transaction resulted in
(1) No loss or gain
(2) Loss of ₹ 1,000
(3) Gain of ₹ 1,000
(4) Loss of ₹ 1,200
(SSC CPO S.I. Exam. 07.09.2003)

9. A man had 100 kgs of sugar, part of which he sold at 7% profit and rest at 17% profit. He gained 10% on the whole. How much did he sell at 7% profit ?
(1) 65 kg (2) 35 kg
(3) 30 kg (4) 70 kg
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

10. A man bought two goats for ₹ 1008. He sold one at a loss of 20% and other at a profit of 44%. If each goat was sold for the same price, the cost price of the goat which was sold at loss, was :
(1) ₹ 648 (2) ₹ 360
(3) ₹ 568 (4) ₹ 440
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

11. Two bicycles were sold for ₹ 3990 each, gaining 5% on one and losing 5% on other. The gain or loss per cent on the whole transaction is :
(1) neither gain nor loss
(2) 2.5% gain
(3) 2.5% loss
(4) 0.25% loss
(SSC CPO S.I. Exam. 26.05.2005)

12. A man sold two watches for ₹ 240 each. On one he gains 20% and incurs a loss of 20% on another. What is his gain or loss per cent in this transaction ?
(1) 1% profit (2) 2% loss
(3) 4% profit (4) 4% loss
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

13. When the price of cloth was reduced by 25%, the quantity of cloth sold increased by 20%. What was the effect on gross receipt of the shop?
(1) 5% increase (2) 5% decrease
(3) 10% increase (4) 10% decrease
(SSC Multi-Tasking (Non-Technical) Staff Exam. 22.02.2011)

14. A cloth merchant sold half of his cloth at 20% profit, half of the remaining cloth at 20% loss and the rest was sold at his cost price. In the total transaction, his gain or loss will be
(1) 5% profit
(2) Neither loss nor gain
(3) 5% loss
(4) 10% profit
(SSC SAS Exam 26.06.2010 (Paper-1)

15. The total cost price of two watches is ₹ 840. One is sold at a profit of 16 per cent and the other at a loss of 12 per cent. There is no loss or gain in the whole transaction. The cost price of the watch on which the shopkeeper gains, is
(1) ₹ 360 (2) ₹ 370
(3) ₹ 380 (4) ₹ 390
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

16. A car and a jeep were sold for ₹ 121000 each. The car was sold at a loss of 20% while the jeep at a gain of 20%. The entire transaction resulted in
(1) neither loss nor gain
(2) gain of ₹ 1000
(3) loss of ₹ 10000
(4) gain of ₹ 500
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

17. Two-third of a consignment was sold at a profit of 5% and the remainder at a loss of 2%. If the total profit was ₹ 400, then the value of the consignment was
(1) ₹ 15,000 (2) ₹ 15,500
(3) ₹ 16,000 (4) ₹16,500
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

18. A man buys a field of agricultural land for ₹ 3,60,000. He sells one-third at a loss of 20% and two-fifths at a gain of 25%. At what price must he sell the remaining field so as to make an overall profit of 10 % ?
(1) ₹ 1,00,000 (2) ₹ 1,15,000
(3) ₹ 1,20,000 (4) ₹ 1,25,000
(SSC CPO S.I. Exam. 16.12.2007)

19. A trader bought two horses for ₹19,500. He sold one at a loss of 20% and the other at a profit of 15%. If the selling price of each horse is the same, then their cost price are respectively.
(1) ₹ 10,000 and ₹ 9,500
(2) ₹ 11,500 and ₹ 8,000
(3) ₹ 12,000 and ₹ 7,500
(4) ₹ 10,500 and ₹ 9,000
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

20. A person bought two articles A and B for ₹ 5,000. He sold A at 20% profit and B at 10% loss. He thus gained 2% on his outlay. The cost price of A was
(1) ₹ 3,000 (2) ₹ 2,500
(3) ₹ 2,000 (4) ₹ 3,500
(SSC Data Entry Operator Exam. 31.08.2008)

21. A man sold two articles at ₹ 375 each. On one, he gains 25% and on the other, he loses 25%. The gain or loss% on the whole transaction is
(1) 6% (2) $4\frac{1}{6}\%$
(3) 5% (4) $6\frac{1}{4}\%$
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

22. A man bought a horse and a carriage for ₹ 40,000. He sold the horse at a gain of 10 % and the carriage at a loss of 5%. He gained 1% on his whole transaction. The cost price of the horse was :
(1) ₹ 15000 (2) ₹ 16000
(3) ₹ 18000 (4) ₹ 20000
(SSC Multi-Tasking Staff Exam. 10.03.2013)

23. A person bought two bicycles for ₹ 1600 and sold the first at 10% profit and the second at 20% profit. If he sold the first at 20% profit and the second at 10% profit, he would get ₹ 5 more. The difference of the cost price of the two bicycles was :
(1) ₹ 50 (2) ₹ 40
(3) ₹ 25 (4) ₹ 75
(SSC Graduate Level Tier-I Exam. 21.04.2013)

24. A shopkeeper sells an article at 15% gain. Had he sold it for ₹18 more, he would have gained 18%. The cost price (in ₹) of the article is
(1) 540 (2) 318
(3) 600 (4) 350
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

25. Two items A and B are sold at a profit of 10% and 15% respectively. If the amount of profit received is the same, then the cost price of A and B may be
(1) ₹ 1,000, ₹ 1,500
(2) ₹ 5,000 ₹ 2,000
(3) ₹ 3,000, ₹ 2,000
(4) ₹ 3,000, ₹ 5,000
(SSC Graduate Level Tier-II Exam. 29.09.2013

26. A cloth merchant sold half of his cloth at 40% profit, half of remaining at 40% loss and the rest was sold at the cost price. In the total transaction his gain or loss will be
(1) 20% gain (2) 25% loss
(3) 10% gain (4) 15% loss
(SSC Multi-Tasking (Non-Technical) Staff Exam. 22.02.2011)

27. A man sells two chairs at ₹ 120 each and by doing so gains 25% on one chair and loses 25% on the other. His loss on the whole in ₹ is
(1) 20 (2) 16
(3) 25 (4) 30
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

28. A man purchases two fans for ₹ 2,160. By selling one fan at a profit of 15% and the other at a loss of 9% he neither gains nor loses in the whole transaction. Find the cost price of each fan in ₹.
(1) 710,1450 (2) 1530,630
(3) 810, 1350 (4) 1340,820
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

29. A shopkeeper purchased a TV for ₹ 2,000 and a radio for ₹ 750. He sells the TV at a profit of 20% and the radio at a loss of 5%. The total loss or gain is
(1) Gain ₹ 352.50
(2) Gain ₹ 362.50
(3) Loss ₹ 332
(4) Loss ₹ 300
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

30. Some toffees were bought at the rate of 11 for ₹ 10 and the same number at the rate of 9 for ₹ 10. If the whole lot was sold at one rupee per toffee, then the gain or loss in the whole transaction was
(1) loss of 1%
(2) gain of 1%
(3) neither gain nor loss
(4) gain of 1.5%
(SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting) & SSC CHSL DEO & LDC Exam. 04.12.2011(Ist Sitting)

31. A fruit seller buys some oranges at the rate of 4 for ₹ 10 and an equal number more at 5 for ₹ 10. He sells the whole lot at 9 for ₹ 20. What is his loss or gain per cent ?
(1) Loss per cent $1\frac{19}{81}\%$
(2) Gain percent $1\frac{19}{81}\%$
(3) No loss or no profit
(4) Loss per cent 2%
(SSC Graduate Level Tier-I Exam. 21.04.2013)

32. A shopkeeper blends two varieties of tea costing ₹ 18 and ₹ 13 per 100 gm in the ratio 7 : 3. He sells the blended variety at the rate of ₹ 18.15 per 100 gm. His percentage gain in the transaction is
(1) 10% (2) 12%
(3) 14% (4) 8%
(SSC CHSL DEO & LDC Exam. 20.10.2013)

33. Nikita bought 30 kg of wheat at the rate of ₹ 9.50 per kg and 40 kg of wheat at the rate of ₹ 8.50 per kg and mixed them. She sold the mixture at the rate of ₹ 8.90 per kg. Her total profit or loss in the transaction was :
(1) ₹ 2 loss (2) ₹ 2 profit
(3) ₹ 7 loss (4) ₹ 7 profit
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

34. Krishna purchased a number of articles at ₹10 for each and the same number for ₹ 14 each. He mixed them together and sold them for ₹ 13 each. Then his gain or loss percent is
(1) Loss $8\frac{1}{3}\%$ (2) Gain $8\frac{2}{3}\%$
(3) Loss $8\frac{2}{3}\%$ (4) Gain $8\frac{1}{3}\%$
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

35. A shopkeeper bought 15kg of rice at the rate of ₹29 per kg and 25kg of rice at the rate of ₹20 per kg. He sold the mixture of both types of rice at the rate of ₹27 per kg. His profit in this transaction is
(1) ₹125 (2) ₹150
(3) ₹ 140 (4) ₹145
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

36. A dealer sold $\frac{3}{4}$ th of his articles at a gain of 24% and the remaining at the cost price. Percentage of gain in the whole transaction is
(1) 15% (2) 18%
(3) 24% (4) 32%
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011) & SSC MTS Exam.10.03.2013, Patna (Ist Sitting)

37. A man buys a toy for ₹ 25 and sells it for ₹ 30. His gain per cent is
(1) 20% (2) 5%
(3) 10% (4) 2.5%
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

38. A man buys a table and a chair for Rs. 500. He sells the table at a loss of 10% and the chair at a gain of 10%. He still gains Rs.10 on the whole. The cost price of chair in rupees is :
(1) Rs. 200 (2) Rs. 250
(3) Rs. 300 (4) Rs. 350
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

39. Mr. Kapur purchased two toy cycles for Rs 750 each. He sold these cycles, gaining 6% on one and losing 4% on the other. The gain or loss per cent in the whole transaction is
(1) 1% loss (2) 1% gain
(3) 1.5% loss (4) 1.5% gain
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

40. A man bought 500 metres of electronic wire at 50 paise per metre. He sold 50% of it at a profit of 5%. At what per cent should he sell the remainder so as to gain 10% on the whole transaction?
(1) 13% (2) 12.5%
(3) 15% (4) 20%
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

41. A shopkeeper sold one-third of his goods at a loss of 15%. To get a profit of 10% on the whole transaction, he should sell the remaining articles at a profit of
(1) $22\frac{1}{2}\%$ (2) $16\frac{2}{3}\%$
(3) 15% (4) 25%
(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE–XII

1. The difference between the selling prices of an article at a profit of 15% and at a profit of 10% is ₹ 10. The cost price of the article is
(1) ₹ 100 (2) ₹ 120
(3) ₹ 150 (4) ₹ 200
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

2. The difference between the selling price and cost price of an article is ₹ 210. If the profit percent is 25, then the selling price of the article is
(1) ₹ 950 (2) ₹1,050
(3) ₹1,150 (4) ₹1,250
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

3. If the difference between the selling prices of an article at profit of 6% and 4% is ₹ 3, then the cost price of the article should be :
(1) ₹100 (2) ₹150
(3) ₹175 (4) ₹200
(SSC CHSL DEO & LDC Exam. 27.11.2010)

4. The difference between the selling prices of an article sold at 4% and 3% profits is Rs. 3. The cost price of the article is :
(1) Rs. 400 (2) Rs. 350
(3) Rs. 300 (4) Rs. 100
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

5. Rahul buys a book for ₹ 400 and sells it for ₹ 500. The difference between his profit as a percentage of the buying price and then as a percentage of the selling price is
(1) 25% (2) 5%
(3) 0% (4) 20%
(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE–XIII

1. A trader bought 10 kg of apples for ₹ 405 out of which 1 kg of apples were found to be rotten. If he wishes to make a profit of 10%, at what rate should he sell the remaining apples per kg?
(1) ₹ 45 (2) ₹ 49.50
(3) ₹ 50 (4) ₹ 51
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A reduction of 20% in the price of salt enabled a purchaser to obtain 4 kg. more for ₹ 100. The reduced price of salt per kg is :
(1) ₹ 4 (2) ₹ 5
(3) ₹ 6.25 (4) ₹ 6.50
(SSC CGL Prelim Exam. 11.05.2003)

3. If the cost of pins reduces by ₹ 4 per dozen, 12 more pins can be purchased for ₹ 48. The cost of pins per dozen after reduction is:
(1) ₹ 8 (2) ₹ 12
(3) ₹ 16 (4) ₹ 20
(SSC CPO S.I. Exam.16.12.2007) (First Sitting)

4. A tradesman sold an article at a loss of 20%. If the selling price had been increased by ₹ 100, there would have been a gain of 5%. The cost price of the article was :
(1) ₹ 200 (2) ₹ 25
(3) ₹ 400 (4) ₹ 250
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

5. If the price of eraser is reduced by 25% a person can buy 2 more erasers for a rupee. How many erasers are available for a rupee ?
(1) 8 (2) 6
(3) 4 (4) 2
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

6. A reduction of 15% in the price of apples would enable a purchaser to get 2 kg more apples for ₹ 240. The new price (per kg) of apples is
(1) ₹ 15 (2) ₹ 18
(3) ₹ 20 (4) ₹ 36
(SSC CPO S.I. Exam. 03.09.2006)

7. An increase of 20% in the price of mangoes enables a person to purchase 4 mangoes less for ₹ 40. The price of 15 mangoes before increase was
(1) ₹ 10 (2) ₹ 15
(3) ₹ 20 (4) ₹ 25
(SSC CPO S.I. Exam. 09.11.2008)

8. The reduction of ₹ 12 in the selling price of an article will change 5% gain into $2\frac{1}{2}\%$ loss. The cost price of the article is
(1) ₹ 140 (2) ₹ 160
(3) ₹ 80 (4) ₹ 100
(SSC Multi-Tasking Staff Exam. 17.03.2013 (Ist Sitting)

9. A tradesman marks his goods at 25 p.c. above the cost price. If he reduces the marked price by $12\frac{1}{2}$ p.c., then his profit will be

(1) $9\frac{3}{8}$ p.c. (2) $7\frac{3}{5}$ p.c.

(3) $6\frac{3}{8}$ p.c. (4) $5\frac{1}{3}$ p.c.

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

10. If a man reduces the selling price of a fan from Rs. 1,250 to Rs. 1,000, his loss increases by 20%. The cost price of the fan is

(1) Rs. 2,400 (2) Rs. 2,450

(3) Rs. 2,500 (4) Rs. 2,350

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

11. A manufacturer fixes his selling price at 33% over the cost of production. If cost of production goes up by 12% and manufacturer raises his selling price by 10%, his percentage profit is

(1) $28\frac{3}{8}\%$ (2) $30\frac{5}{8}\%$

(3) $36\frac{5}{9}\%$ (4) 35%

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

12. A reduction of 20% in the price of rice enables a buyer to buy 5 kg more for rupees 1200. The reduced price per kg of rice will be:

(1) 36 (2) 45

(3) 48 (4) 60

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

TYPE–XIV

1. A man wanted to sell an article with 20% profit; but he actually sold at 20% loss for ₹ 480. At what price he wanted to sell it to earn the profit?

(1) ₹ 720 (2) ₹ 840

(3) ₹ 600 (4) ₹ 750

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If a man estimates his loss as 20% of the selling price, then his loss per cent is :

(1) 20% (2) 25%

(3) $\frac{40}{3}\%$ (4) $\frac{50}{3}\%$

(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting) & (SSC CGL Exam. 19.06.2011)

3. If 3 toys are sold at the cost price of 4 toys of the same kind, the profit will be :

(1) 25% (2) $33\frac{1}{3}\%$

(3) $66\frac{2}{3}\%$ (4) 50%

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. A house worth ₹ 1,50,000 is sold by X at a 5% profit to Y, Y sells the house back to X at a 2% loss. Then in the entire transaction?

(1) X gains ₹ 4,350

(2) X loses ₹ 4,350

(3) X gains ₹ 3,150

(4) X loses ₹ 3,150

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

5. A book-seller bought 200 textbooks for ₹ 12,000. He wanted to sell them at a profit so that he got 20 books free. At what profit percent should he sell them?

(1) 10% (2) 11%

(3) 11.5% (4) 12%

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

6. By selling a table for ₹ 350 instead of ₹ 400, loss per cent increases by 5%. The cost price of table is :

(1) ₹ 1,050 (2) ₹ 417.50

(3) ₹ 435 (4) ₹ 1,000

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

7. If selling price of an article is $\frac{8}{5}$ times its cost price, the profit per cent on it is :

(1) 120% (2) 160%

(3) 40% (4) 60%

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

8. The price of a jewel, passing through three hands, rises on the whole by 65%. If the first and the second sellers earned 20% and 25% profit respectively, the profit earned by the third seller is

(1) 20% (2) 15%

(3) 10% (4) 5%

(SSC CPO S.I. Exam. 12.01.2003

9. A merchant fixes the sale price of his goods at 15% above the cost price. He sells his goods at 12% less than the fixed price. His percentage of profit is :

(1) $2\frac{1}{2}\%$ (2) $1\frac{1}{5}\%$

(3) $1\frac{1}{2}\%$ (4) 2%

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

10. A person sells a table at a profit of 10%. If he had bought the table at 5% less cost and sold for ₹ 80 more, he would have gained 20%. The cost price of the table is

(1) ₹ 3,200 (2) ₹ 2,500

(3) ₹ 2,000 (4) ₹ 200

(SSC CPO S.I. Exam. 07.09.2003)

11. Joseph's salary is reduced by 10%. In order to have his salary back to his original amount, it must be raised by

(1) 12.5% (2) $11\frac{1}{9}\%$

(3) 10% (4) 11%

(SSC CPO S.I. Exam. 07.09.2003) & (SSC S.O. (Commercial Audit) Exam. 16.11.2003)

12. A man bought a certain quantity of rice at the rate of ₹650 per quintal. 20% of the rice was spoiled. At what rate should he sell the remaining rice to gain 20% on the outlay?

(1) ₹775 (2) ₹850

(3) ₹890 (4) ₹975

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

13. A person sells an article for ₹ 75 and gains as much per cent as the cost price of the article in rupees. The cost price of the article is

(1) ₹ 37.50 (2) ₹ 40

(3) ₹ 50 (4) ₹ 150

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

14. An article is sold at a profit of 20%. If it had been sold at a profit of 25%, it would have fetched ₹ 35 more. The cost price of the article is :
(1) ₹ 650 (2) ₹ 700
(3) ₹ 750 (4) ₹ 800
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

15. A man gains 20% by selling an article for a certain price. If he sells it at double the price, the percentage of profit will be :
(1) 40% (2) 140%
(3) 100% (4) 120%
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

16. A dealer makes a profit of 20% even after giving a 10% discount on the advertised price of a scooter. If he makes a profit of ₹ 7500 on the sale of the scooter, the advertised price was
(1) ₹ 45000 (2) ₹ 47500
(3) ₹ 50000 (4) ₹ 52500
(SSC CPO S.I. Exam. 05.09.2004)

17. A man gets ₹ 13 more by selling an article at a profit of $12\frac{1}{2}$% and than selling it at a loss of $12\frac{1}{2}$%. The cost price of the article is :
(1) ₹ 25.50 (2) ₹ 38
(3) ₹ 52 (4) ₹ 65
(SSC CPO S.I. Exam. 26.05.2005)

18. By selling a table for ₹ 350 instead of ₹ 400, loss per cent increases by 5%. The cost price of the table is :
(1) ₹ 1050 (2) ₹ 417.50
(3) ₹ 435 (4) ₹ 1000
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

19. The percentage of loss when an article is sold at ₹ 50 is the same as that of the profit when it is sold at ₹ 70. The above-mentioned percentage of profit or loss on the article is
(1) 10% (2) $16\frac{2}{3}$%
(3) 20% (4) $22\frac{2}{3}$%
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

20. If an article is sold at a gain of 5% instead of being sold at a loss of 5%, one gets ₹ 5 more. What is the cost price of the article ?
(1) ₹ 100 (2) ₹ 105
(3) ₹ 50 (4) ₹ 110
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

21. Raghavan purchased a scooter at $\frac{13}{15}$ of its selling price and sold it at 12% more than its selling price. His gain is.
(1) 20% (2) 30%
(3) $38\frac{1}{13}$% (4) $29\frac{3}{13}$%
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

22. An article passing through two hands is sold at a profit of 38% at the original cost price. If the first dealer makes a profit of 20%, then the profit per cent made by the second is
(1) 15% (2) 12%
(3) 10% (4) 5%
(SSC CPO S.I. Exam. 03.09.2006)

23. If a manufacturer gains 10 per cent, wholesaler 15 per cent and retailer 25 per cent, then the production cost of an article, whose retail price is ₹ 1,265, is
(1) ₹ 700 (2) ₹ 750
(3) ₹ 800 (4) ₹ 900
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

24. A tradesman, by means of a false balance defrauds 10 per cent in buying goods and also defrauds 10 per cent in selling. His gain percent is
(1) 10% (2) 11%
(3) 21% (4) 100%
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

25. By selling 100 pencils, a shopkeeper gains the selling price of 20 pencils. His gain per cent is
(1) 25% (2) 20%
(3) 15% (4) 12%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

26. A dealer sold $\frac{3}{4}$ of his articles at a gain of 20% and the remaining at cost price. The gain per cent earned by him in the whole transaction is
(1) 13% (2) 14%
(3) 15% (4) 16%
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

27. An increase of ₹ 3 in the selling price of an article turns a loss of $7\frac{1}{2}$% into a gain of $7\frac{1}{2}$%. The cost price (in ₹) of the article is:
(1) 25 (2) 20
(3) 15 (4) 10
(SSC CPO S.I. Exam. 16.12.2007)

28. One trader calculates the percentage of profit on the buying price and another calculates on the selling price. When their selling prices are the same, then the difference of their actual profits is ₹ 85 and both claim to have made 20% profit. What is the selling price of each ?
(1) ₹ 1700 (2) ₹ 2100
(3) ₹ 2550 (4) ₹ 2750
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

29. A sells a article to B at a profit of 10% B sells the article back to A at a loss of 10%. In this transaction
(1) A neither loses nor gains
(2) A makes a profit of 11%
(3) A makes a profit of 20%
(4) B loses 20%
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

30. If the selling price of an article is doubled, then its loss per cent is converted into equal profit per cent. The loss per cent on the article is
(1) $26\frac{2}{3}$% (2) 33%
(3) $33\frac{1}{3}$% (4) 34%
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

31. A man sold some articles at a gain of 10%. He spent his total sale proceeds to purchase such articles again. This time, while selling them, he incurred a loss of 10%. His loss or gain in the transaction was
(1) 1% loss
(2) 1% gain
(3) no profit no loss
(4) 2% loss
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

32. A merchant finds his profit as 20% of the selling price. His actual profit percent is
(1) 20% (2) 22%
(3) 25% (4) 30%
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

33. A person sold a TV for ₹ 9,400 and he lost a particular amount. When he sold another TV of the same type at ₹ 10,600, his gain was double the former loss. What was the cost price of each TV ?
(1) ₹ 9,800 (2) ₹ 10,000
(3) ₹ 10,200 (4) ₹ 10,400
(SSC CPO S.I. Exam. 06.09.2009)

34. By selling a bicycle for ₹ 2,850, a shopkeeper gains 14%. If the profit is reduced to 8%, then the selling price will be
(1) ₹ 2,600 (2) ₹ 2,700
(3) ₹ 2,800 (4) ₹ 3,000
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

35. If the percentage of profit calculated on selling price of an article is 20%, percentage of profit calculated on cost price will be
(1) 16% (2) 24%
(3) 25% (4) 28%
(SSC (South Zone) Investigator Exam 12.09.2010)

36. If selling price of an article is reduced by 60%, then there is a loss of 10% on cost price. The initial profit percent was
(1) 70% (2) 80%
(3) 100% (4) 125%
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

37. X sells two articles for ₹ 4,000 each with no loss and no gain in the transaction. If one was sold at a gain of 25% the other is sold at a loss of
(1) 25% (2) $18\frac{2}{9}\%$
(3) 20% (4) $16\frac{2}{3}\%$
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

38. A dishonest shopkeeper, using a faulty balance makes a profit of 5% while buying as well as while selling his goods. His actual gain percent in the whole process amounts to
(1) 11% (2) 10%
(3) 10.25% (4) 10.5%
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

39. A man sells two articles for ₹ 5000 each neither losing nor gaining in the deal. If he sold one of them at a gain of 25%, the other article is sold at a loss of
(1) $15\frac{2}{3}\%$ (2) $16\frac{2}{3}\%$
(3) $17\frac{1}{3}\%$ (4) $18\frac{1}{3}\%$
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

40. By selling 60 articles a vendor gains the selling price of 15 articles. Find his gain percentage.
(1) 25 % (2) $33\frac{1}{3}\%$
(3) 20% (4) $28\frac{4}{7}\%$
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

41. If the total cost of 73 articles having equal cost is ₹ 5,110 and the total selling price of 89 such articles is ₹ 5,607, then in the transaction, there will be
(1) a loss of 15%
(2) a gain of 10%
(3) a loss of 10%
(4) a gain of 15%
(SSC Data Entry Operator Exam. 31.08.2008)

42. The percentage of profit, when an article is sold for ₹ 78, is twice than when it is sold for ₹ 69. The cost price of the article is :
(1) ₹ 49 (2) ₹ 51
(3) ₹ 57 (4) ₹ 60
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

43. A cloth merchant sold half of his cloth at 40% profit, half of remaining at 40% loss and the rest was sold at the cost price. In the total transaction his gain or loss will be
(1) 20% gain (2) 25% loss
(3) 10% gain (4) 15% loss
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

44. A person sold an article at 20% profit on the selling price. Afterwards, when the cost price reduced by 10%, then he also reduced the selling price by 10%. His percentage of profit on cost price will be
(1) 30% (2) 25%
(3) 22.5% (4) 12.5%
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

45. A fruit seller makes a profit of 20% by selling mangoes at a certain price. If he charges ₹ 1 more for each mango, he can make a profit of 40%. Find the selling price of a mango in the first case.
(1) ₹ 6 (2) ₹ 5
(3) ₹ 5.50 (4) ₹ 7
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

46. Dinesh bought two radios for ₹ 1,920. He sold one at a profit of 20% and the other at a loss of $6\frac{2}{3}\%$. If the selling price of both radios are same, the cost prices of the two radios are
(1) ₹ 800 and ₹ 1,120
(2) ₹ 840 and ₹ 1,080
(3) ₹ 860 and ₹ 1,060
(4) ₹ 900 and ₹ 1,020
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

47. Peter buys a table for ₹ 450 and spends ₹ 30 on its transportation. If he sells the table for ₹ 600 his gain percent will be
(1) 30% (2) 25%
(3) 28% (4) 24%
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

48. A loss of 19% gets converted into a profit of 17% when the selling price is increased by ₹ 162. The cost price of the article is
(1) ₹ 450 (2) ₹ 600
(3) ₹ 360 (4) ₹ 540
(SSC Graduate Level Tier-II Exam. 16.09.2012) & (SSC MTS Exam. 17.03.2013 (Kolkata

49. A trader purchases a watch and a wall clock for ₹ 390. He sells them making a profit of 10% on the watch and 15% on the wall clock. He earns a profit of ₹ 51.50. The difference between the original prices of the wall clock and the watch is equal to

(1) ₹ 80 (2) ₹ 120
(3) ₹ 110 (4) ₹100

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

50. A merchant fixed the selling price of his articles at ₹700 after adding 40% profit to the cost price. As the sale was very low at this price level, he decided to fix the selling price at 10% profit. Find the new selling price.

(1) ₹ 500 (2) ₹ 550
(3) ₹ 450 (4) ₹ 490

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

51. From 2008 to 2009, the sales of a book decreased by 80%. If the sales in 2010 were the same as in 2008, by what percent did it increase from 2009 to 2010 ?

(1) 120% (2) 400%
(3) 80% (4) 100%

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

52. A dishonest fruit vendor sells his goods at cost price but he uses a weight of 900 gm for a kg. weight. His gain per cent is:

(1) 12% (2) $11\frac{1}{9}$ %
(3) $10\frac{1}{9}$% (4) 10%

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

53. A shopkeeper bought 200 articles, each costing the same. He sold 30% of the articles at 20% profit and remaining at 10% profit. If the total profit made by him is ₹ 2600, find the cost price of one article.

(1) ₹ 200 (2) ₹ 1300
(3) ₹ 2600 (4) ₹ 100

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

54. A bought an article, paying 5% less than the original price. A sold it with 20% profit on the price he had paid. What percent of profit did A earn on the original price?

(1) 10% (2) 13%
(3) 14% (4) $\frac{17}{2}$ %

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

55. A dishonest grocer sells rice at a profit of 10% and also uses weights which are 20% less than the marked weight. The total gain earned by him will be

(1) 37.5% (2) 40%
(3) 30.5% (4) 35%

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

56. A trader sells two bullocks for ₹ 8,400 each, neither losing nor gaining in total. If he sold one of the bullocks at a gain of 20%, the other is sold at a loss of

(1) 20% (2) $18\frac{2}{9}$%
(3) $14\frac{2}{7}$% (4) 21%

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

57. Arun marks up the computer he is selling by 20% profit and sells them at a discount of 15%. Arun's net gain percent is

(1) 4% (2) 2%
(3) 3.5% (4) 2.5%

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

58. A man buys 3 cows and 8 goats in ₹ 47,200. Instead if he would have bought 8 cows and 3 goats, he had to pay ₹ 53,000 more. Cost of one cow is:

(1) ₹ 11,000 (2) ₹ 12,000
(3) ₹ 13,000 (4) ₹ 10,000

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

59. A retailer purchased radiosets at the rate of ₹ 400 each from a wholesaler. He raised the price by 30% and then allowed a discount of 8% on each set. His profit will be

(1) 19% (2) 78.4%
(3) 22% (4) 19.6%

(SSC Graduate Level Tier-I Exam. 21.04.2013)

60. A dishonest dealer professes to sell his goods at the cost price but uses a false weight of 850 g instead of 1 kg. His gain percent is

(1) $17\frac{12}{17}$% (2) $17\frac{11}{17}$%
(3) $71\frac{11}{17}$% (4) $11\frac{11}{17}$%

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

61. A tradesman sold an article at a loss of 20%. If the selling price had been increased by ₹ 100, there would have been a gain of 5%. The cost price of the article (in ₹) was

(1) 100 (2) 200
(3) 400 (4) 500

(SSC Graduate Level Tier-I Exam. 19.05.2013)

62. By selling 25 metres of cloth a trader gains the selling price of 5 metres of cloth. The gain percent of the trader in % is

(1) 25% (2) 20%
(3) 28% (4) 29%

(SSC Graduate Level Tier-II Exam. 29.09.2013)

63. Gita buys a plot of land for ₹ 96,000. She sells $\frac{2}{5}$ of it at a loss of 6%. She wants to make a profit of 10% on the whole transaction by selling the remaining land. The gain % on the remaining land is

(1) 20% (2) $20\frac{2}{3}$ %
(3) 14% (4) 7%

(SSC Graduate Level Tier-II Exam. 29.09.2013)

64. The cost of a house was ₹ X lakhs in 2005. After 3 years, the owner of the house sold it for 25% more than she paid it. But she has to pay a tax of 50% of the gain. The tax amount she has to pay is.

(1) $\frac{X}{2}$ (2) $\frac{X}{8}$
(3) $\frac{X}{4}$ (4) $\frac{X}{24}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

65. A milkman mixes water with milk and sells the mixture at the cost price of pure milk. The volume of water in litres to be mixed with each litre of milk to get a 25% profit is

(1) $\frac{1}{4}$ (2) $\frac{1}{5}$

(3) $1\frac{1}{4}$

(4) cannot be calculated without knowing the cost price of milk

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

66. A merchant bought 200 eggs, out of which 38 eggs were broken. He sold the remaining eggs at the rate of Rs. 4.80 per dozen and thus gained 8%. His total investment is

(1) Rs. 80 (2) Rs. 60

(3) Rs. 45 (4) Rs. 120

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

67. A trader marks his goods 20% above cost price but allows his customers a discount of 10%, the cost price of a blackboard, which is sold for Rs. 216, is

(1) Rs. 196 (2) Rs. 180

(3) Rs. 200 (4) Rs. 108

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

68. A fruit seller buys 240 apples for Rs. 600. Some of these apples are bad and are thrown away. He sells the remaining apples at Rs. 3.50 each and makes a profit of Rs.198. The per cent of apples thrown away are

(1) 6% (2) 8%

(3) 5% (4) 7%

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

69. Rohit sold his car at 10% below the cost price to Amit. Amit got the car repaired and spent Rs. 5,000. He then sold the car to Rajesh at 20% above the total cost, which is equal to Rs. 1,00,000. Find the original price of the car (nearest to hundred).

(1) Rs. 93,000 (2) Rs. 83,000

(3) Rs. 87,000 (4) Rs. 97,000

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

70. If the cost price of an item is $\frac{5}{9}$ of its marked price and the profit is 20%, then the percentage of discount is

(1) $70\frac{1}{3}\%$ (2) $63\frac{1}{3}\%$

(3) $33\frac{1}{3}\%$ (4) $66\frac{1}{3}\%$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

71. A shopkeeper bought 30 kg of rice at the rate of Rs. 70 per kg and 20 kg of rice at the rate of Rs. 70.75 per kg. If he mixed the two brands of rice and sold the mixture at Rs. 80.50 per kg, his gain is

(1) Rs. 450 (2) Rs. 510

(3) Rs. 525 (4) Rs. 485

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

72. The printed price of an article is 40% higher than its cost price. Then the rate of discount such that he gains 12% profit is

(1) 21% (2) 15%

(3) 20% (4) 18%

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

73. An article which is marked at Rs. 975 is sold for Rs. 897. The discount per cent is

(1) 10% (2) 12%

(3) 6% (4) 8%

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

74. A dealer marks his goods 20% above cost price and allows a discount of 10% to his customers. His gain percentage is

(1) 6% (2) 9%

(3) 7% (4) 8%

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

75. A house worth Rs. 1,50,000 is sold by X to Y at 5% profit. Y sells the house back to X at 2% loss. Then in the entire transaction :

(1) X gains Rs. 3150

(2) X loses Rs. 4350

(3) X loses Rs. 1350

(4) X gains Rs. 4350

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

76. A man sells an article at 5% above its cost price. If he had bought it at 5% less than what he had paid for it and sold it at Rs. 2 less, he would have gained 10%. The cost price of the article is

(1) Rs. 200 (2) Rs. 400

(3) Rs. 300 (4) Rs. 100

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

77. Simon purchased a bicycle for Rs. 6810. He had paid a VAT of 13.5%. The list price of the bicycle was

(1) Rs. 6000 (2) Rs. 6140

(3) Rs. 6696.50 (4) Rs. 5970.50

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

78. A shopkeeper has 11 books of same cost price. He sells the first book at a certain price, then he sells second book at a price which is Rs. 1 less than the selling price of first book and then he sells third book at a price which is Rs. 1 less than the selling price of second book. Following this pattern, he sold all 11 books. If he sells sixth book at its cost price. Find the overall percent profit or loss on selling all 11 books.

(1) 20% (2) 10%

(3) $9\frac{1}{11}$

(4) No profit No loss

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

79. If a commission at the rate of 10% is given to a bookseller on the marked price of a book by the publisher, the publisher gains 20%. If the commission is increased to 15%, then the gain percent would be:

(1) $16\frac{2}{3}\%$ (2) $13\frac{1}{3}\%$

(3) $15\frac{5}{6}\%$ (4) $12\frac{1}{2}\%$

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

80. By selling an umbrella for Rs. 30, a shop-keeper gains 20%. During a clearance sale, the shop-keeper allows a discount of 10%. Find his gain percent during the sale season.

(1) 8 (2) 7

(3) 9 (4) $7\frac{1}{2}$

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

81. A vegetable seller sells his vegetables at 20% profit. At the same time he uses false weights, which is 10% less than the actual weight. What will be his total gain percentage?

(1) 25% (2) 30%

(3) 33.33% (4) $18\frac{7}{9}\%$

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

82. Rama mixes 20% of kerosene to his petrol and then he sells the whole mixture at the price of petrol. If the cost price of the kerosense is 40% of the CP of petrol. What is the net profit% ?

(1) 11.11% (2) 11.5%

(3) 12.5% (4) 9.5%

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

83. Gopi goes from place A to B to buy an article costing 15% less at B, although he spends Rs. 150 on travelling, still he gains Rs. 150 compared to buying it at A. His profit percent is :

(1) 4.5 (2) 6

(3) 7.5 (4) 8

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

84. A dishonest dealer professes to sell his goods at cost price but uses a weight of 875 gms for the kilogram weight. His gain in percentage is a

(1) 17% (2) $14\frac{5}{7}\%$

(3) $14\frac{2}{7}\%$ (4) 14%

(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

85. A shopkeeper purchased 510 eggs at the rate of Rs. 20 per dozen. 30 eggs were broken on the way. In order to make a gain of 20%, he must sell the remaining eggs at the rate of

(1) Rs. 22.50 per dozen

(2) Rs. 25.50 per dozen

(3) Rs. 26 per dozen

(4) Rs. 26.50 per dozen

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

86. A sells a watch to B and makes a loss of 12%. B makes a profit of $12\frac{1}{2}\%$ by selling the watch to C. If A sells the watch to B at the cost of which C purchased it, then the percentage of loss or profit of A will be

(1) 1% loss (2) 1% profit

(3) 2% loss (4) 2% profit

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

87. A man buys 3 type-I cakes and 6 type-II cakes for Rs. 900. He sells type-I cakes at a profit of 15% and type-II cakes at a loss of 10%. If his overall profit is Rs.30, the cost price (in Rs.) of a type-I and of a type-II cakes is

(1) 100, 100 (2) 160, 70

(3) 180, 60 (4) 120, 90

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

88. A merchant buys 25 litres of milk daily at the rate of Rs. 12 per litre. He mixes 5 litres of water in it and sells at the rate Rs. 10.40 per litre. His gain is :

(1) 8% profit (2) 2% profit

(3) 4% profit (4) 6% profit

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

89. A trader had 22 quintals of wheat. He sold a part of it at 23% profit and the rest at 33% profit, so that he made a total profit of 27%. How much wheat did he sell at 33% profit?

(1) 1320 kg. (2) 440 kg.

(3) 880 kg. (4) 1760 kg.

(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

35. A shopkeeper buys a product of Rs. 150 per kg. 15% of product was damaged. At what price (per kg.) should he sell the remaining so as to earn a profit of 20%?

(1) Rs. $208\frac{15}{17}$ (2) Rs. $207\frac{13}{17}$

(3) Rs. $205\frac{5}{17}$ (4) Rs. $211\frac{13}{17}$

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

SHORT ANSWERS

TYPE-I

1. (2)	**2.** (4)	**3.** (4)	**4.** (4)
5. (1)	**6.** (4)	**7.** (2)	**8.** (4)
9. (3)	**10.** (3)	**11.** (4)	**12.** (2)
13. (4)	**14.** (1)	**15.** (3)	**16.** (3)
17. (1)	**18.** (3)	**19.** (3)	**20.** (1)
21. (4)	**22.** (4)	**23.** (2)	**24.** (2)
25. (1)	**26.** (4)	**27.** (1)	**28.** (1)
29. (1)	**30.** (2)	**31.** (4)	**32.** (3)
33. (1)	**34.** (1)	**35.** (3)	**36.** (2)
37. (4)	**38.** (4)	**39.** (2)	**40.** (3)
41. (4)	**42.** (3)	**43.** (4)	**44.** (1)
45. (1)	**46.** (1)	**47.** (3)	**48.** (2)
49. (1)	**50.** (1)	**51.** (3)	

TYPE-II

1. (1)	**2.** (3)	**3.** (4)	**4.** (3)
5. (2)	**6.** (3)	**7.** (4)	**8.** (2)
9. (1)	**10.** (3)	**11.** (4)	**12.** (3)
13. (2)	**14.** (2)	**15.** (1)	**16.** (4)
17. (2)	**18.** (3)	**19.** (1)	**20.** (1)
21. (4)	**22.** (2)	**23.** (4)	**24.** (3)
25. (3)	**26.** (3)	**27.** (4)	**28.** (2)
29. (2)	**30.** (3)	**31.** (3)	**32.** (2)
33. (2)	**34.** (1)	**35.** (1)	**36.** (3)
37. (1)	**38.** (1)	**39.** (3)	**40.** (4)
41. (4)	**42.** (4)	**43.** (1)	**44.** (3)
45. (1)	**46.** (4)	**47.** (1)	**48.** (1)
49. (4)	**50.** (1)	**51.** (2)	**52.** (2)
53. (3)	**54.** (2)	**55.** (1)	**56.** (2)
57. (3)			

TYPE-III

1. (4)	**2.** (2)	**3.** (1)	**4.** (3)
5. (1)	**6.** (4)	**7.** (3)	**8.** (4)
9. (4)	**10.** (4)	**11.** (3)	**12.** (2)
13. (2)	**14.** (3)	**15.** (4)	**16.** (3)
17. (2)	**18.** (2)	**19.** (1)	**20.** (3)
21. (3)	**22.** (2)	**23.** (3)	**24.** (3)

25. (3)	**26.** (1)	**27.** (4)	**28.** (1)
29. (1)	**30.** (3)	**31.** (3)	**32.** (4)
33. (4)	**34.** (2)	**35.** (2)	**36.** (1)
37. (1)	**38.** (4)	**39.** (4)	**40.** (2)
41. (3)	**42.** (2)	**43.** (4)	**44.** (2)
45. (4)	**46.** (2)	**47.** (1)	**48.** (3)
49. (1)	**50.** (2)	**51.** (1)	**52.** (4)
53. (2)	**54.** (2)	**55.** (4)	**56.** (3)
57. (3)	**58.** (2)	**59.** (3)	

TYPE-IV

1. (1)	**2.** (1)	**3.** (2)	**4.** (1)
5. (3)	**6.** (3)	**7.** (4)	**8.** (3)
9. (4)	**10.** (3)	**11.** (3)	**12.** (1)
13. (1)	**14.** (3)	**15.** (2)	**16.** (1)
17. (4)	**18.** (4)	**19.** (4)	**20.** (1)
21. (2)	**22.** (4)	**23.** (2)	**24.** (1)
25. (3)	**26.** (2)	**27.** (4)	**28.** (1)
29. (1)	**30.** (2)	**31.** (4)	**32.** (3)
33. (3)	**34.** (4)	**35.** (1)	**36.** (2)
37. (1)	**38.** (4)	**39.** (3)	**40.** (3)
41. (2)	**42.** (2)	**43.** (1)	**44.** (1)
45. (4)	**46.** (2)	**47.** (2)	**48.** (3)
49. (1)	**50.** (3)	**51.** (3)	**52.** (2)
53. (2)	**54.** (2)	**55.** (2)	**56.** (2)
57. (4)			

TYPE-V

1. (4)	**2.** (1)	**3.** (3)	**4.** (1)
5. (2)	**6.** (2)		

TYPE-VI

1. (4)	**2.** (3)	**3.** (4)	**4.** (4)
5. (3)	**6.** (1)	**7.** (2)	**8.** (2)
9. (4)	**10.** (3)	**11.** (1)	**12.** (1)
13. (2)	**14.** (4)	**15.** (4)	**16.** (3)
17. (1)	**18.** (1)	**19.** (4)	**20.** (4)
21. (4)	**22.** (4)	**23.** (3)	**24.** (1)
25. (1)	**26.** (3)	**27.** (4)	**28.** (3)
29. (1)	**30.** (2)		

TYPE-VII

1. (3)	**2.** (3)	**3.** (2)	**4.** (2)
5. (1)	**6.** (4)	**7.** (3)	**8.** (4)
9. (2)	**10.** (4)	**11.** (1)	**12.** (1)
13. (1)	**14.** (1)	**15.** (4)	**16.** (4)
17. (1)	**18.** (4)	**19.** (3)	**20.** (3)
21. (3)	**22.** (3)	**23.** (4)	**24.** (2)
25. (*)	**26.** (2)	**27.** (1)	

TYPE-VIII

1. (3)	**2.** (2)	**3.** (1)	**4.** (4)
5. (1)	**6.** (2)	**7.** (3)	**8.** (3)
9. (2)	**10.** (4)	**11.** (3)	**12.** (1)
13. (2)	**14.** (2)	**15.** (3)	**16.** (2)

TYPE-IX

1. (1)	**2.** (2)	**3.** (3)	**4.** (1)
5. (3)	**6.** (4)	**7.** (3)	**8.** (3)
9. (3)	**10.** (4)	**11.** (2)	**12.** (2)
13. (1)	**14.** (3)	**15.** (3)	**16.** (3)
17. (1)	**18.** (2)	**19.** (3)	**20.** (1)
21. (4)	**22.** (2)	**23.** (1)	**24.** (4)
25. (2)	**26.** (4)	**27.** (3)	**28.** (4)
29. (4)	**30.** (1)	**31.** (1)	**32.** (1)
33. (3)	**34.** (1)	**35.** (3)	**36.** (3)

TYPE-X

1. (4)	**2.** (1)	**3.** (3)	**4.** (3)
5. (2)	**6.** (1)	**7.** (1)	**8.** (3)
9. (3)	**10.** (4)	**11.** (4)	**12.** (4)
13. (3)	**14.** (3)		

TYPE-XI

1. (3)	**2.** (4)	**3.** (1)	**4.** (3)
5. (2)	**6.** (2)	**7.** (4)	**8.** (2)
9. (4)	**10.** (1)	**11.** (4)	**12.** (4)
13. (4)	**14.** (1)	**15.** (1)	**16**. (3)
17. (1)	**18.** (3)	**19.** (2)	**20.** (3)
21. (4)	**22.** (2)	**23.** (1)	**24.** (3)
25. (3)	**26.** (3)	**27.** (2)	**28.** (3)
29. (2)	**30.** (1)	**31**. (1)	**32.** (1)
33. (1)	**34.** (4)	**35.** (4)	**36.** (2)
37. (1)	**38.** (3)	**39.** (2)	**40.** (3)
41. (1)			

TYPE-XII

1. (4)	**2.** (2)	**3.** (2)	**4.** (3)
5. (2)			

TYPE-XIII

1. (2)	**2.** (2)	**3.** (2)	**4.** (3)
5. (1)	**6.** (2)	**7.** (4)	**8.** (2)
9. (1)	**10.** (3)	**11.** (2)	**12.** (3)

TYPE-XIV

1. (1)	**2.** (4)	**3.** (2)	**4.** (3)
5. (1)	**6.** (4)	**7.** (4)	**8.** (3)
9. (2)	**10.** (3)	**11.** (2)	**12.** (4)
13. (3)	**14.** (2)	**15.** (2)	**16.** (3)
17. (3)	**18.** (4)	**19.** (2)	**20.** (3)
21. (4)	**22.** (1)	**23.** (3)	**24.** (3)
25. (1)	**26.** (3)	**27.** (2)	**28.** (3)
29. (2)	**30.** (3)	**31**. (1)	**32.** (3)
33. (1)	**34.** (2)	**35.** (3)	**36.** (4)
37. (4)	**38.** (3)	**39.** (2)	**40.** (2)
41. (3)	**42.** (4)	**43.** (3)	**44.** (2)
45. (1)	**46.** (2)	**47.** (2)	**48.** (1)
49. (3)	**50.** (2)	**51.** (2)	**52.** (2)
53. (4)	**54.** (3)	**55.** (1)	**56.** (3)
57. (2)	**58.** (2)	**59.** (4)	**60.** (2)
61. (3)	**62.** (1)	**63.** (2)	**64.** (2)
65. (2)	**66.** (2)	**67.** (3)	**68.** (3)
69. (3)	**70.** (3)	**71.** (2)	**72.** (3)
73. (4)	**74.** (4)	**75.** (1)	**76.** (2)
77. (1)	**78.** (4)	**79.** (2)	**80.** (1)
81. (3)	**82.** (1)	**83.** (3)	**84.** (3)
85. (2)	**86.** (1)	**87.** (2)	**88.** (3)
89. (3)	**90.** (4)		

EXPLANATIONS

TYPE-I

1. (2) Using Rule 3,
Selling price

$$= 1400 \times \frac{100-15}{100}$$

$$= 1400 \times \frac{85}{100} = ₹\ 1190$$

2. (4) Let the C.P. of article be 'x'
$\because$ (100 – 7)% x = 651

$$\because x = \frac{651}{93} \times 100 = ₹\ 700$$

Aliter : Using Rule 3,

$$\text{C.P.} = \text{S.P.}\left(\frac{100}{100-\text{Loss\%}}\right)$$

$$= 651\left(\frac{100}{100-7}\right)$$

$$= \frac{651 \times 100}{93}$$

C.P. = Rs. 700

3. (4) CP of 75 litres of mixture of milk and water = ₹ 630
SP of 75 litres of mixture of milk and water = 9 × 75 = ₹ 675
Gain = 675 – 630 = ₹ 45

$$\text{Gain per cent} = \frac{45}{630} \times 100$$

$$= \frac{50}{7} = 7\frac{1}{7}\%$$

4. (4) Using Rule 1,
Case I : Percentage Profit

$$= \frac{17 \times 100}{36} \approx 47\%$$

Case II : Percentage Profit

$$= \frac{24 \times 100}{50} = 48\%$$

Case III : Percentage Profit

$$= \frac{19 \times 100}{40} = 47.5\%$$

Case IV : Percentage Profit

$$= \frac{29 \times 100}{60} = 48.3\%$$

Obviously, (4) is the best transaction.

5. (1) Using Rule 1,
Total cost of typewriter
= ₹ (1200 + 200) = ₹ 1400
S.P. = ₹ 1680
Profit = ₹ (1680 – 1400)
= ₹ 280

$$\therefore \text{Profit \%} = \frac{280}{1400} \times 100 = 20\%$$

6. (4) If the cost price be ₹ x, then

$$\text{S.P.} = \frac{100}{95}x = ₹\frac{20}{19}x$$

$$\therefore \text{Gain} = \frac{20x}{19} - x = ₹\frac{x}{19}$$

$$\therefore \text{Gain percent} = \frac{\frac{x}{19}}{x} \times 100$$

= 5.26%

Aliter : Using Rule 3,

$$\text{Here C.P.} = \frac{95}{100}\ \text{S.P.}$$

$$\text{C.P.} = \text{S.P.}\left(\frac{100}{100+\text{Profit\%}}\right)$$

$$\frac{95}{100}\ \text{S.P.}$$

$$= \text{S.P.}\left(\frac{100}{100+\text{Profit\%}}\right)$$

9500 + 95 profit% = 10000

$$\text{Profit \%} = \frac{500}{95}$$

Profit % = 5.26%

7. (2) $\text{S.P.} - \text{C.P.} = \frac{10\,\text{S.P.}}{100} = \frac{\text{S.P.}}{10}$

$$\Rightarrow \text{S.P.} - \frac{\text{S.P.}}{100} = \text{C.P.} = 27$$

$$\Rightarrow \text{S.P.} = \frac{27 \times 10}{9} = ₹\ 30$$

Aliter : Using Rule 1,

$$\text{C.P.} = 27,\ \text{Profit} = \frac{10}{100}$$

$$\text{S.P.} = \frac{\text{S.P.}}{10}$$

Profit = S.P. – C.P.

$$\frac{\text{S.P.}}{10} = \text{S.P.} - 27$$

$$27 = \text{S.P.} - \frac{\text{S.P.}}{10}$$

$$\text{S.P.} = \frac{27 \times 10}{9}$$

S.P. = ₹ 30

8. (4) Using Rule 1,
S.P. = ₹ 100
C.P. = ₹ 80
$\therefore$ Gain = ₹ 20
$\therefore$ Gain per cent

$$= \frac{20}{80} \times 100 = 25\%$$

9. (3) Let the original price be ₹ x.

$$= \frac{80}{100} \times x = ₹\frac{4x}{5}$$

$$\text{SP} = \frac{4x}{5} \times \frac{140}{100} = ₹\ \frac{28x}{25}$$

Gain on original price

$$= \frac{28x}{25} - x = \frac{3x}{25}$$

$$\therefore \text{Gain \%} = \frac{3x}{25x} \times 100$$

= 12%

10. (3) Let the CP = ₹ 100
Then, SP = ₹ 120
Let the marked price = ₹ x.
Then, 90% of x = ₹ 120
$\Rightarrow x$

$$= \frac{120 \times 100}{90} = \frac{400}{3} = 133\frac{1}{3}\%$$

Hence, the marked price is $33\frac{1}{3}\%$ above the cost price.

11. (4) Using Rule 1,
If the S.P. of article be x, then its

$$\text{CP} = x - \frac{x}{4} = ₹\ \frac{3x}{4}$$

$$\therefore \text{Gain \%} = \frac{\frac{x}{4}}{\frac{3x}{4}} \times 100$$

$$= \frac{100}{3} = 33\frac{1}{3}\%$$

12. (2) Using Rule 1,

Tricky Approach

If the cost price is ₹ 100, then selling price = ₹120 and gain = ₹ 20

$$\text{Required gain \%} = \frac{20}{120} \times 100$$

$$= \frac{50}{3} = 16\frac{2}{3}\%$$

13. (4) Let the S.P. of the bedsheet be Rs. x.

$\therefore\ 450 + \frac{10 \times x}{100} = x$

$\Rightarrow\ x - \frac{x}{10} = 450$

$\Rightarrow \frac{9x}{10} = 450$

$\Rightarrow\ x = \frac{450 \times 10}{9} = ₹\ 500$

Aliter : Using Rule 1,
C.P. = Rs. 450,

Profit = $\frac{10\text{S.P.}}{100} = \frac{\text{S.P.}}{10}$

Profit = S.P. – C.P.

$\frac{\text{SP}}{10} = \text{S.P.} - 450$

$450 = \text{S.P.} - \frac{\text{S.P.}}{10}$

S.P. = $\frac{450 \times 10}{9}$

S.P. = ₹ 500

14. (1) Using Rule 3,
C.P. of article

$= \frac{100}{100 - \text{loss per cent}} \times \text{S.P.}$

$= \frac{100}{96} \times 960 = ₹\ 1000$

15. (3) Using Rule 1,
Cost price

$= \frac{791000 \times 100}{113} = ₹\ 700000$

$\therefore$ Gain = 791000 – 700000
= ₹ 91000

16. (3) Using Rule 3,

Cost price = $\frac{64000 \times 100}{80}$

= ₹ 80000

17. (1) Using Rule 1,
Actual C.P. = 225 + 15 = ₹ 240
Gain = 300 – 240 = ₹ 60
$\therefore$ Gain per cent

$= \frac{60}{240} \times 100 = 25\%$

18. (3) Using Rule 3,
If the C.P. be x, then

$\frac{x \times 130}{100} = 1690$

$\Rightarrow x = \frac{1690 \times 100}{130} = ₹\ 1300$

19. (3) S.P. of the fan $= \frac{150 \times 80}{100}$

= ₹ 120

20. (1) Gain per cent

$= \frac{11}{33} \times 100 = \frac{100}{3} = 33\frac{1}{3}\%$

21. (4) If the marked price of the product be ₹ 100, then
C.P. = ₹ 70
S.P. retailer = ₹ 100
$\therefore$ Gain per cent

$= \frac{30}{70} \times 100 = \frac{300}{7}$

$= 42\frac{6}{7}\%$

22. (4) If the marked price of watch be x, then

$x \times \frac{90}{100} = \frac{450 \times 120}{100}$

$\Rightarrow x = \frac{450 \times 120}{90} = ₹\ 600$

23. (2) Actual C.P. of radio

$= 600 + \frac{600 \times 5}{100} = ₹\ 630$

$\therefore$ Required S.P.

$= \frac{630 \times 115}{100} = ₹\ 724.50$

24. (2) If the original cost of shirt be x, then

$x \times \frac{80}{100} = 64$

$\Rightarrow x = \frac{64 \times 100}{80} = ₹\ 80$

25. (1) C.P. of 1 bucket = x
C.P. of 1 mug = y
$\therefore\ 8x + 5y = 92$ .....(i)
$5x + 8y = 77$ .....(ii)
By using equation (i) × 5 – equation (ii) × 8,
$40x + 25y - 40x - 64y$
$= 460 - 616$
$\Rightarrow -39y = -156$
$\Rightarrow\ y = 4$
From equation (i),
$8x + 20 = 92$
$\Rightarrow\ 8x = 92 - 20 = 72$
$\Rightarrow\ x = 9$
$\therefore$ C.P. of 2 mugs and 3 buckets
$= 2 \times 4 + 3 \times 9$
$= 8 + 27 =$ ₹ 35

26. (4) Minimum cost price
= 150 × 15 = ₹ 2250
Maximum selling price
= 350 × 15 = ₹ 5250
Gain = 5250 – 2250 = ₹ 3000
[150 being the lowest & 350 being the highest price]

27. (1) Cost price = ₹ x

S.P. = $\frac{120x}{100}$ = ₹ $\frac{6x}{5}$

Gain = ₹ $\frac{x}{5}$

$\therefore$ Required gain per cent

$= \frac{\frac{x}{5}}{\frac{6x}{5}} \times 100$

$= \frac{100}{6} = \frac{50}{3}$

$= 16\frac{2}{3}\%$

28. (1) Total oranges bought = 12 (let)
$\therefore$ Their cost price = 3 + 2
= ₹ 5
For profit of 20%,

S. P. = $\frac{5 \times 120}{100}$ = ₹ 6

29. (1) C.P. of article = ₹ x

S.P. = $\frac{120x}{100}$ = ₹ $\frac{6x}{5}$

Gain = $\frac{6x}{5} - x = \frac{6x - 5x}{5}$

= ₹ $\frac{x}{5}$

$\therefore$ Gain per cent

$= \frac{\text{Gain}}{\text{S.P.}} \times 100$

$= \frac{\frac{x}{5}}{\frac{6x}{5}} \times 100 = \frac{50}{3} = 16\frac{2}{3}\%$

30. (2) C.P. of article = ₹ x (let)

S.P. of article = ₹ $\frac{4x}{3}$

Gain = $\frac{4x}{3} - x = \frac{4x - 3x}{3}$

= ₹ $\frac{x}{3}$

$\therefore$ Gain per cent = $\frac{\frac{x}{3}}{x} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$

31. (4) S.P. of article

$= \frac{(100 - \text{loss}\%)}{100} \times \text{C.P.}$

$= \frac{100-10}{100} \times 15 = \frac{90 \times 15}{100}$

= ₹ 13.50

32. (3) C.P. of watch = Rs. x (let)

$\therefore$ S.P. = $\frac{120x}{100}$ = Rs. $\frac{6x}{5}$

Case II,

C.P. = Rs. $\frac{9x}{10}$

S.P. = Rs. $\left(\frac{6x}{5} - 30\right)$

According to the question,

$\frac{6x}{5} - 30 = \frac{9x}{10} \times \frac{120}{100} = \frac{27x}{25}$

$\Rightarrow \frac{6x}{5} - \frac{27x}{25} = 30$

$\Rightarrow \frac{30x - 27x}{25} = 30$

$\Rightarrow 3x = 30 \times 25$

$\Rightarrow x = \frac{30 \times 25}{3}$ = Rs. 250

33. (1) Original price of 1 mango = Rs. x (let).

$\therefore$ C.P. of 1 mango = $\frac{100x}{125}$

= Rs. $\frac{4x}{5}$

Case II,

According to the question,

$x + 1 = \frac{4x}{5} \times \frac{150}{100}$

$\Rightarrow x + 1 = \frac{6x}{5} \Rightarrow \frac{6x}{5} - x = 1$

$\Rightarrow \frac{x}{5} = 1 \Rightarrow x$ = Rs. 5

34. (1) C.P. of article = Rs. x (let).

According to the question.

$\frac{x \times 90}{100} = 270$

$\Rightarrow x = \frac{270 \times 100}{90}$ = Rs. 300

35. (3) S.P. of 4 bananas

$= \left(100 + \frac{100}{3}\right)\%$ of Re. 1

= Rs. $\frac{400}{300}$ = Rs. $\frac{4}{3}$

$\because$ Number of bananas sold for Rs. $\frac{4}{3} = 4$

$\therefore$ Number of bananas sold for Re. 1

$= \frac{4}{4} \times 3 = 3$

36. (2) C.P of article

$= \frac{100}{100 - 20} \times 450$

$= \frac{100 \times 450}{80}$ = Rs. 562.5

$\therefore$ To gain 20%

S.P. = $\frac{562.5 \times 120}{100}$ = Rs. 675

37. (4) Let the C.P. of article be Rs. x.

According to the question,

$425 - x = x - 355$

$\Rightarrow 2x = 425 + 355 = 780$

$\Rightarrow x = \frac{780}{2}$ = Rs. 390

38. (4) Let C.P. of each article be Re. 1.

C.P. of 15 articles = Rs. 15

Their S.P. = Rs. 10

$\therefore$ Loss percent

$= \frac{15-10}{15} \times 100$

$= \frac{100}{3} = 33.3\%$

39. (2) Let the C.P. of each banana be Re. 1.

$\therefore$ C.P. of 6 bananas = Rs. 6

Their S.P = Rs. 8

$\therefore$ Profit per cent

$= \frac{8-6}{6} \times 100$

$= \frac{200}{6} = \frac{100}{3} = 33\frac{1}{3}\%$

40. (3) Let the C.P. of bag be Rs. x. According to the question,

$x \times \frac{115}{100} = 230$

$\Rightarrow x = \frac{230 \times 100}{115}$ = Rs. 200

For profit of 20%,

S.P. of bag = Rs. $\left(\frac{200 \times 120}{100}\right)$

= Rs. 240

41. (4) Let the cost price of article be Rs. 100.

$\therefore$ First S.P. = Rs. 120

When the selling price be Rs. 240,

Profit = Rs. (240 – 100)

= Rs. 140

$\therefore$ Profit percent

$= \frac{140}{100} \times 100 = 140\%$

42. (3) Let the C.P. of cycle be Rs. x.

Case I,

S.P. of cycle = Rs. $\left(\frac{90x}{100}\right)$

= Rs. $\frac{9x}{10}$

Case II,

106% of $x = \frac{9x}{10} + 200$

$\Rightarrow \frac{106x}{100} - \frac{9x}{10} = 200$

$\Rightarrow \frac{106x - 90x}{100} = 200$

$\Rightarrow \frac{16x}{100} = 200$

$\Rightarrow x = \frac{200 \times 100}{16}$

= Rs. 1250

43. (4) Let the cost price of each book be Re. 1.

$\therefore$ C.P. of 20 books = Rs. 20

S.P. of 20 books = Rs. 25

$\therefore$ Profit per cent

$= \left(\frac{25-20}{20}\right) \times 100$

$= \frac{5 \times 100}{20} = 25\%$

44. (1) Let C.P. of each article be Re. 1.
∴ C.P. of 40 articles = Rs. 40
S.P. of 40 articles = Rs. 50
∴ Profit per cent

$$= \left(\frac{50-40}{40}\times 100\right)\% = 25\%$$

45. (1) C.P. of taperecorder

$$= \text{Rs. } \left(\frac{100}{104}\times 1040\right)$$

= Rs. 1000
On selling for Rs. 950,
Loss = Rs. (1000 – 950)
= Rs. 50

$$\therefore \text{ Loss per cent} = \frac{50\times 100}{1000}$$

= 5%

46. (1) Let the C.P. of each book be Re. 1.
∴ Total C.P. of 25 books
= Rs. 25
Their S.P. = Rs. 20
∴ Loss per cent

$$= \left(\frac{25-20}{25}\right)\times 100$$

$$= \frac{5}{25}\times 100 = 20\%$$

47. (3) According to the question,

$$\frac{80}{100} \text{ of C.P.} = \text{S.P.}$$

$$\Rightarrow \frac{4}{5} \text{ of C.P.} = \text{S.P.}$$

$$\Rightarrow \text{C.P.} = \text{S.P.} \times \frac{5}{4}$$

48. (2) Let the C.P. of the watch be Rs. 100.
∴ Its S.P. = Rs. 125
∴ Profit per cent on its S.P.

$$= \frac{\text{Profit}}{\text{S.P}}\times 100$$

$$= \frac{25}{125}\times 100 = 20\%$$

49. (1) C.P. of article

$$= \left(\frac{100}{100+\text{profit}\%}\right)\times \text{S.P.}$$

$$= \text{Rs. } \left(\frac{100}{120}\times 240\right)$$

= Rs. 200

50. (1) Let the C.P. of article be Rs. x.
According to the question,
$78 - x = 2\,(69 - x)$
$\Rightarrow 78 - x = 138 - 2x$
$\Rightarrow 2x - x = 138 - 78$
$\Rightarrow x$ = Rs. 60

51. (3) Let the C.P. of article be Rs. x.
According to the question,
$524 - x = x - 452$
$\Rightarrow 2x = 524 + 452 = 976$

$$\Rightarrow x = \frac{976}{2} = \text{Rs. } 488$$

TYPE-II

1. (1) Using Rule 8,
Required profit

$$= \frac{36-30}{30}\times 100 = 20\%$$

2. (3) Suppose the C.P. of each article is ₹ 1
Then C.P. of 10 articles = ₹ 10
S.P. of 10 articles = ₹ 15
∴ Profit = ₹ 5

$$\%\text{ profit} = \frac{5\times 100}{10} = 50\%$$

Aliter : Using Rule 8,
Here, x = 15, y = 10

$$\text{Profit\%} = \frac{x-y}{y}\times 100$$

$$= \left(\frac{15-10}{10}\right)\times 100$$

= 50%

3. (4) Let C.P. be ₹ 1
C.P. of 3 articles = ₹ 3
= S.P. of P. of 5 articles.

$$\text{Loss\%} = \frac{(5-3)}{5}\times 100$$

= 2 × 20 = 40%
Aliter : Using Rule 8,
Here, x = 3, y = 5

$$\text{Loss \%} = \left(\frac{x-y}{y}\right)\times 100$$

$$= \left(\frac{3-5}{5}\right)\times 100 = -40\%$$

(–ve sign shows loss)
= 40 %

4. (3) Let the cost price of one table = x
∴ Cost price of 15 tables
= 15x
and cost price of 20 tables
= 20x
According to the question
Selling price of 20 tables
= cost price of 15 tables = 15x
∴ Loss = 20x – 15x = 5x

$$\therefore \text{Loss\%} = \frac{5x\times 100}{20x} = 25\%$$

Aliter : Using Rule 8,
Here, x = 15, y = 20

$$\text{Loss \%} = \frac{x-y}{y}\times 100$$

$$= \left(\frac{15-20}{20}\right)\times 100$$

$$= \frac{-5}{20}\times 100$$

= –25%
(–ve sign shows loss)
= 25%

5. (2) Gain % = $\frac{18-15}{15}\times 100$

$$= \frac{3}{15}\times 100 = 20\%$$

Aliter : Using Rule 8,
Here, x = 18, y = 15

$$\text{Gain\%} = \left(\frac{x-y}{y}\right)\times 100$$

$$= \left(\frac{18-15}{15}\right)\times 100$$

$$= \frac{3}{15}\times 100$$

= 20%

6. (3) Using Rule 8,
Loss per cent

$$= \frac{400-320}{400}\times 100$$

$$= \frac{80}{400}\times 100 = 20\%$$

7. (4) Let the C.P. of one orange = 1
∴ C.P. of 40 oranges = ₹ 40
and S.P. of 40 oranges = ₹ 50
∴ Profit = (50 – 40) = ₹ 10

$$\therefore \text{Profit \%} = \frac{10}{40}\times 100 = 25\%$$

Aliter : Using Rule 8,
Here, x = 50, y = 40

$$\text{Profit \%} = \left(\frac{x-y}{y}\right)\times 100$$

$$= \left(\frac{50-40}{40}\right)\times 100$$

= 25%

8. (2) Let C.P. of each orange be ₹ 1
Then, C.P. of 10 oranges = ₹ 10
S.P. of 10 oranges = ₹ 12

$$\text{Gain \%} = \left(\frac{2}{10}\times 100\right)\% = 20\%$$

Aliter : Using Rule 8,
Here, x = 12, y = 10

$$\text{Profit \%} = \left(\frac{x-y}{y}\right)\times 100$$

$$= \left(\frac{12-10}{10}\right)\times 100$$

$$= 20\%$$

9. (1) Required profit per cent

$$= \frac{10-9}{9}\times 100$$

$$= \frac{1}{9}\times 100 = 11\frac{1}{9}\%$$

Aliter : Using Rule 8,
Here, x = 10, y = 9

$$\text{Profit \%} = \left(\frac{x-y}{y}\right)\times 100$$

$$= \left(\frac{10-9}{9}\right)\times 100$$

$$= \frac{1}{9}\times 100$$

$$= 11\frac{1}{9}\%$$

10. (3) Gain per cent

$$= \frac{400-320}{320}\times 100$$

$$= \frac{80}{320}\times 100 = 25\%$$

Aliter : Using Rule 8,
Here, x = 400, y = 320

$$\text{Profit \%} = \left(\frac{x-y}{y}\right)\times 100$$

$$= \left(\frac{400-320}{320}\right)\times 100$$

$$= \frac{80}{320}\times 100 = 25\%$$

11. (4) Let the CP of each pen be ₹ 1.
∴ CP of 8 pens = ₹ 8
SP of 8 pens = ₹ 12

$$\therefore \text{Gain \%} = \frac{4}{8}\times 100 = 50\%$$

Aliter : Using Rule 8,
Here, x = 12, y = 8

$$\text{Profit \%} = \left(\frac{x-y}{y}\right)\times 100$$

$$= \left(\frac{12-8}{8}\right)\times 100$$

$$= \frac{4}{8}\times 100 = 50\%$$

12. (3) Let the CP of each article be ₹ 1
∴ CP of 9 articles = ₹ 9
∴ SP of 9 articles = ₹ 8
∴ Loss = ₹ 1

$$\therefore \text{Loss \%} = \frac{1}{9}\times 100$$

$$= \frac{100}{9} = 11\frac{1}{9}\%$$

Aliter : Using Rule 8,
Here, x = 8, y = 9

$$\text{Loss \%} = \left(\frac{y-x}{y}\right)\times 100$$

$$= \left(\frac{9-8}{9}\right)\times 100$$

$$= \frac{100}{9} = 11\frac{1}{9}\%$$

13. (2) C.P. of article for A = Rs. 100

$$\text{A's S.P.} = \frac{100\times 120}{100}$$

= Rs. 120

$$\text{B's S.P.} = \frac{120\times 85}{100}$$

= Rs. 102
= C.P. for C
∴ Required profit percent = 2%

14. (2) Let C.P. of each article be ₹ 1
Then, C.P. of 7 articles = ₹ 7
S.P. of 7 articles = ₹ 10

$$\therefore \text{Gain \%} = \frac{10-7}{7}\times 100 = \frac{300}{7}$$

$$= 42\frac{6}{7}\%$$

Aliter : Using Rule 8,
Here, x = 10, y = 7

$$\text{Profit \%} = \left(\frac{x-y}{y}\right)\times 100$$

$$= \left(\frac{10-7}{7}\right)\times 100$$

$$= \frac{300}{7} = 42\frac{6}{7}\%$$

15. (1) Using Rule 1,
Let the original selling price of radio = ₹ 100
∴ C.P. of radio = ₹ 90
∴ New selling price = ₹ 108

$$\therefore \text{Gain per cent} = \frac{18}{90}\times 100$$

= 20%

16. (4) Let CP of each coconut be ₹ 1.
∴ CP of 2500 coconuts = ₹. 2500
SP of 2500 coconuts = ₹ 2750

$$\therefore \text{Gain \%} = \frac{2750-2500}{2500}\times 100$$

= 10%

Aliter : Using Rule 8,
Here, x = 2750, y = 2500

$$\text{Gain \%} = \left(\frac{x-y}{y}\right)\times 100$$

$$= \left(\frac{2750-2500}{2500}\right)\times 100$$

$$= \frac{250}{2500}\times 100 = 10\%$$

17. (2) If the CP of A articles be equal to SP of B articles, then

$$\text{Loss percent} = \frac{B-A}{B}\times 100$$

$$= \frac{16-10}{16}\times 100 = \frac{6}{16}\times 100$$

= 37.5%

Aliter : Using Rule 8,
Here, x = 10, y = 16

$$\text{Loss \%} = \left(\frac{y-x}{y}\right)\times 100$$

$$= \left(\frac{16-10}{16}\right)\times 100$$

$$= \frac{600}{16} = 37.5\%$$

18. (3) If the CP of each article be ₹ 1 then
CP of 4 articles = ₹ 4
SP of 4 articles = ₹ 5
∴ Profit percent

$$= \frac{5-4}{4}\times 100 = 25\%$$

Aliter : Using Rule 8,
Here, x = 5, y = 4

$$\text{Profit \%} = \left(\frac{x-y}{y}\right)\times 100$$

$$= \left(\frac{5-4}{4}\right)\times 100$$

$$= \frac{100}{4} = 25\%$$

19. (1) Let the CP of 1 orange = ₹ 1
∴ SP of 10 oranges = ₹ 13

∴ Gain percent = $\frac{13-10}{10} \times 100$

= 30%

Aliter : Using Rule 8,
Here, x = 13, y = 10

Profit % = $\left(\frac{x-y}{y}\right) \times 100$

$= \left(\frac{13-10}{10}\right) \times 100$

$= \frac{300}{10} = 30\%$

20. (1) Let the C.P. of each article be ₹ 1.
∴ C.P. of 10 articles = ₹ 10
and S.P. of 10 articles = ₹ 11
∴ Profit percent

$= \frac{11-10}{10} \times 100 = 10\%$

Aliter : Using Rule 8,
Here, x = 11, y = 10

Profit % = $\left(\frac{x-y}{y}\right) \times 100$

$= \left(\frac{11-10}{10}\right) \times 100$

$= \frac{100}{10} = 10\%$

21. (4) Profit percent

$= \frac{10-8}{8} \times 100 = 25\%$

Aliter : Using Rule 8,
Here, x = 10, y = 8

Gain % = $\left(\frac{x-y}{y}\right) \times 100$

$= \left(\frac{10-8}{8}\right) \times 100$

$= \frac{200}{8} = 25\%$

22. (2) Percentage profit

$= \frac{25-20}{20} \times 100 = 25\%$

Aliter : Using Rule 8,
Here, x = 25, y = 20

Gain % = $\left(\frac{x-y}{y}\right) \times 100$

$= \left(\frac{25-20}{20}\right) \times 100$

$= \frac{500}{20} = 25\%$

23. (4) Let the CP of 1 apple = ₹.1
∴ CP of 18 apples = ₹ 18
SP of 18 apples = ₹ 24

∴ Gain percent = $\frac{6}{18} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$

Aliter : Using Rule 8,
Here, x = 24, y = 18

Gain % = $\left(\frac{x-y}{y}\right) \times 100$

$= \left(\frac{24-18}{18}\right) \times 100$

$= \frac{6}{18} \times 100 = 33\frac{1}{3}\%$

24. (3) Profit percent

$= \frac{400-320}{320} \times 100$

$= \frac{80}{320} \times 100 = 25\%$

Aliter : Using Rule 8
Here, x = 400, y = 320

Gain % = $\left(\frac{x-y}{y}\right) \times 100$

$= \left(\frac{400-320}{320}\right) \times 100$

$= \frac{80}{320} \times 100 = 25\%$

25. (3) Gain per cent

$= \frac{20-16}{16} \times 100 = 25\%$

Aliter : Using Rule 8,
Here, x = 20, y = 16

Gain % = $\left(\frac{x-y}{y}\right) \times 100$

$= \left(\frac{20-16}{16}\right) \times 100$

$= \frac{4}{16} \times 100 = 25\%$

26. (3) Gain per cent

$= \frac{15-12}{12} \times 100 = 25\%$

Aliter : Using Rule 8,
Here, x = 15, y = 12

Gain % = $\left(\frac{x-y}{y}\right) \times 100$

$= \left(\frac{15-12}{12}\right) \times 100$

$= \frac{3}{12} \times 100 = 25\%$

27. (4) Percentage profit

$= \frac{18-16}{16} \times 100$

$= \frac{25}{2} = 12\frac{1}{2}\%$

Aliter : Using Rule 8,
Here, x = 18, y = 16

Gain % = $\left(\frac{x-y}{y}\right) \times 100$

$= \left(\frac{18-16}{16}\right) \times 100$

$= \frac{2}{16} \times 100$

$= \frac{25}{2} = 12\frac{1}{2}\%$

28. (2) Gain per cent

$= \frac{40-25}{25} \times 100$

$= \frac{15}{25} \times 100 = 60\%$

Aliter : Using Rule 8,
Here, x = 40, y = 25

Gain % = $\left(\frac{x-y}{y}\right) \times 100$

$= \left(\frac{40-25}{25}\right) \times 100$

$= \frac{15}{25} \times 100 = 60\%$

29. (2) S.P. of book

$= \frac{150 \times 120}{100} =$ ₹ 180

Aliter : Using Rule 3,

S.P. = C.P. $\left(\frac{100+\text{Profit}\%}{100}\right)$

$= \frac{150\times(100+20)}{100}$

$= \frac{150\times120}{100}$ = ₹180

30. (3) S.P. of 33 metres of cloth
= C.P. of 33 metres of cloth + S.P. of 11 metres of cloth
∴ S.P. of 22 metres of cloth
= C.P. of 33 metres of cloth

∴ Gain per cent = $\frac{33-22}{22}\times100$

= 50%

Aliter : Using Rule 9,
Here, x = 33, y = 11

Profit % = $\frac{y\times100}{x-y}$

$= \frac{11\times100}{33-11}$

$= \frac{11\times100}{22}$ = 50%

31. (3) Using Rule 1,
20 items are broken out of 144 items.
∴ C.P. of 124 items

= ₹ $\left(\frac{144\times90}{100}\right)$ = ₹ 129.60

Total S.P. = ₹ (1.20 × 124)
= ₹ 148.8
∴ Gain = ₹ (148.80 – 129.60)
= ₹ 19.20
∴ Gain per cent

$= \frac{19.20}{129.60}\times100$ = 14.8%

32. (2) Let the required gain % = x.

∴ $150\times\frac{90}{100}+300\times\frac{(100+x)}{100}$

$= \frac{450\times120}{100}$

⇒ 135 + 3 (100 + x) = 540
⇒ 3 (100 + x) = 540 – 135 = 405

∴ 100 + x = $\frac{405}{3}$ = 135

⇒ x = 135 – 100 = 35%

33. (2) Using Rule 1,
C.P. of 50 pairs of shoes
= ₹ (50 × 189.50)
= ₹ 9475
Their S.P. = ₹ 10000
Gain = ₹ (10000 – 9475) = ₹ 525

34. (1) Using Rule 2,
Loss per cent

$= \frac{\text{Loss}}{\text{C.P.}}\times100$

$= \frac{5750-4500}{5750}\times100$

$= \frac{125000}{5750}$ = 21.74%

35. (1) Using Rule 1,
Actual C.P. of article
= Rs. (3550 + 50)
= Rs. 3600
Gain = 3816 – 3600 = Rs. 216
∴ Gain percent

$= \frac{216}{3600}\times100$ = 6%

36. (3) C.P. of each camera
= Rs. x (let)
S.P. of first camera

= Rs. $\frac{118x}{100}$

S.P. of second camera

$= \frac{118x}{100}\times\frac{90}{100}$

= Rs. $\frac{1062x}{1000}$

Profit = $\frac{118x}{100}+\frac{1062x}{1000}-2x$

$= \frac{1180x+1062x-2000x}{1000}$

= Rs. $\frac{242x}{1000}$

∴ Gain per cent

$= \frac{242x}{1000\times2x}\times100$ = 12.2%

37. (1) Marked price of article = Rs. x and C.P. = Rs. 100 (let)

∴ $\frac{x}{2}$ = 80 ⇒ x = Rs. 160

Gain on selling at the marked price = 60%

38. (1) S.P. of 20 metre of cloth
= C.P of 20 metre of cloth + S.P of 4 metre of cloth
⇒ S.P of (20 – 4 = 16) metre of cloth
= C.P of 20 metre of cloth

∴ Gain% = $\frac{20-16}{16}\times100$

$= \frac{100}{4}$ = 25%

Aliter : Using Rule 9,
Here, x = 20, y = 4,

Gain % = $\frac{y\times100}{x-y}$

$= \frac{4\times100}{20-4}$

$= \frac{4}{16}\times100$ = 25%

39. (3) Let 40 articles (LCM of 8 and 10) be bought.
∴ C.P of 40 articles

$= \frac{8\times40}{10}$ = Rs. 32

Their S.P. = $\frac{10\times40}{8}$ = Rs. 50

∴ Profit percet = $\frac{50-32}{32}\times100$

$= \frac{1800}{32}$ = 56.25%

Aliter : Using Rule 13,
Here, a = 10, x = 8
b = 8, y = 10

Gain% = $\left(\frac{ay-bx}{bx}\right)\times100\%$

$= \left(\frac{10\times10-8\times8}{8\times8}\right)\times100\%$

$= \frac{36}{64}\times100$

$= \frac{1800}{32}$ = 56.25%

40. (4)Using Rule 2,
∵ C.P. of 1000 gm of cashew nut
= Rs. 250
∴ C.P. of 50 gm of cashew nut

$= \frac{250}{1000}\times50$ = Rs. 12.5

S.P. of 50 gm of cashew nut
= Rs. 10
∴ Loss per cent

$= \frac{12.5-10}{12.5}\times100$ = 20%

41. (4) C.P. of each book = Re. 1
∴ C.P. of 60 books = Rs. 60
Their S.P. = Rs. 100
∴ Gain per cent

$= \frac{100-60}{60} \times 100$

$= \frac{200}{3} = 66\frac{2}{3}\%$

Aliter : Using Rule 8,
Here, x = 100, y = 60

$\text{Gain \%} = \left(\frac{x-y}{y}\right) \times 100$

$= \left(\frac{100-60}{60}\right) \times 100$

$= \frac{200}{3} = 66\frac{2}{3}\%$

42. (4) Let C.P. of each article be Re. 1.
∴ C.P. of 9 articles = Rs. 9
∴ S.P. of 9 articles = Rs. 10
∴ Profit percent

$= \frac{10-9}{9} \times 100 = \frac{100}{9} = 11\frac{1}{9}\%$

Aliter : Using Rule 8
Here, x = 10, y = 9

$\text{Gain \%} = \left(\frac{x-y}{y}\right) \times 100$

$= \left(\frac{10-9}{9}\right) \times 100$

$= \frac{1}{9} \times 100 = 11\frac{1}{9}\%$

43. (1) Using Rule 2,

C.P. of $2\frac{1}{2}$ dozen or 30 eggs =

$\frac{20}{12} \times 30$ = Rs. 50

Their S.P i.e. S.P. of 24 eggs
= 22 × 2 = Rs. 44
∴ Loss = Rs. (50 – 44) = Rs. 6

∴ Loss % = $\frac{6}{50} \times 100 = 12\%$

44. (3) Using Rule 10,
Here, selling prices are same, Profit-loss percent are same.
In such transactions, there is always loss.

Loss percent = $\frac{10 \times 10}{100} = 1\%$

45. (1) Let the man buy in all 30 oranges.
∴ C.P. of 15 oranges at 3 for Rs.

$40 = \frac{40}{3} \times 15$ = Rs. 200

Again, C.P. of 15 oranges at 5 for

Rs. 60 = $\frac{60}{5} \times 15$ = Rs. 180

∴ Total C.P. = Rs. (200 + 180)
= Rs. 380
S.P. of 30 oranges

$= \frac{50}{3} \times 30$ = Rs. 500

∴ Profit = Rs. (500 – 380)
= Rs. 120

∴ Profit % = $\frac{120}{380} \times 100$

= 31.58% ≈ 32%

46. (4) Using Rule 1,
C.P. of article = Rs. 100 (let).
∴ S.P. = Rs. 125
New S.P. = Rs. 250
∴ Profit percent

$= \frac{250-100}{100} \times 100 = 150\%$

47. (1) Using Rule 1,
S.P. of article

$= \frac{1500 \times 125}{100}$ = Rs. 1875

Net S.P. after paying tax
= Rs. (1875 – 75) = Rs. 1800
∴ Profit = 1800 – 1500
= Rs. 300

∴ Profit percent = $\frac{300}{1500} \times 100$

= 20%

48. (1) Using Rule 3,
C.P. of hand-cart

$= \frac{100}{75} \times 720$ = Rs. 960

For 25% profit

S.P. = $\frac{125}{100} \times 960$

= Rs. 1200

49. (4) Using Rule 8,
Let the cost of each chair be Re. 1.
∴ C.P. of 30 chairs = Rs. 30.
Their S.P. = Rs. 25
∴ Loss per cent

$= \frac{30-25}{30} \times 100$

$= \frac{50}{3} = 16\frac{2}{3}\%$

50. (1) Using Rule 8,
Profit percent

$= \frac{12-10}{10} \times 100$

$= \frac{2 \times 100}{10} = 20\%$

51. (2) Let the C.P. of each pen be Re. 1.
∴ C.P. of 20 pens = Rs. 20
∴ S.P. of 20 pens = Rs. 25
∴ Profit per cent

$= \frac{(25-20)}{20} \times 100$

$= \frac{500}{20} = 25\%$

52. (2) Let C.P. of 1 kg. of rice be Rs. 100.
According to the question,
∵ S.P. of 700 gm. of rice
= Rs. 110
∴ S.P. of 1000 gm. of rice

$= \frac{110}{700} \times 1000$

$= \frac{1100}{7}$ = Rs. $157\frac{1}{7}$

∴ Profit per cent = $57\frac{1}{7}\%$

53. (3) C.P. of 4 dozens of eggs at the rate of Rs. 24 per dozen
= Rs. (24 × 4) = Rs. 96
C.P. of 2 dozens of eggs at Rs. 32 per dozen
= Rs. (32 × 2) = Rs. 64
Total C.P. of 6 dozens of eggs
= Rs. (96 + 64)
= Rs. 160
S.P. for 20% profit

$= \left(\frac{160 \times 120}{100}\right)$

= Rs. 192

∴ S.P. per dozen = $\frac{192}{6}$

= Rs. 32

54. (2) According to the question,

$\text{Loss\%} = \frac{\text{C.P.} - \text{S.P.}}{\text{S.P.}}$

Where C.P. = Rs. x
S.P. = Rs. y

$\Rightarrow \frac{10}{100} = \frac{x-y}{y} = \frac{1}{10}$

$\Rightarrow 10x - 10y = y$

$\Rightarrow 10x = 11y$

At C.P.,

Loss% = $\frac{x-y}{x} \times 100$

$= \frac{x - \frac{10}{11}x}{x} \times 100$

$= \frac{11x - 10x}{11x} \times 100 = \frac{100}{11}$

$= 9\frac{1}{11}\%$

55. (1) C.P. of cycle = Rs. 1000
Its S.P. = Rs. 1200
Profit = Rs. (1200 – 1000)
= Rs. 200
∴ Profit per cent

$= \frac{200}{1000} \times 100 = 20\%$

56. (2) Profit per cent

$= \frac{\text{Error}}{\text{True weight} - \text{error}} \times 100$

$= \left(\frac{50}{1000-50}\right) \times 100$

$= \frac{50 \times 100}{950} = \frac{100}{19} = 5\frac{5}{19}\%$

57. (3) Let the C.P. of each article be Re.1.
Percentage of dishonesty = 10%
(Here x% = 10%)

∴ Actual C.P. = $\frac{100}{110}$ = Rs. $\frac{10}{11}$

∵ He buys 110 articles in Rs. 100.

∵ He sells 90 articles at the C.P. of 100 articles.

∴ Actual S.P. = $\frac{100}{90}$ = Rs. $\frac{10}{9}$

∴ Profit per cent

$= \frac{\frac{10}{9} - \frac{10}{11}}{\frac{10}{11}} \times 100$

$= \frac{20}{99} \times \frac{11}{10} \times 100 = \frac{200}{9}$

$= 22\frac{2}{9}\%$

TYPE-III

1. (4) Cost price of 1 orange = ₹ $\frac{3}{7}$

∴ Cost price of 100 oranges

$= \frac{3}{7} \times 100 = \frac{300}{7}$

$\because 100\% = \frac{300}{7}$

$\therefore 133\% = \frac{300}{7} \times \frac{133}{100}$ = ₹ 57

2. (2) Using Rule 1,
C.P. = 12
S.P. = 12 × 1.25 = 15
Total Profit = 15 – 12 = 3

% gain = $\frac{3}{12} \times 100$ = 25%

3. (1) Let the cost price of 1 book be x
∴ Cost price of 3 books = 3x
and, cost price of 12 books
= 12x
Selling price of 12 books
= 1800
= 12x + 3x = 15x
⇒ 15x = 1800

$\therefore x = \frac{1800}{15} = 120$

The cost price of each book
= ₹ 120

4. (3) C.P. of an article = ₹ $\frac{10}{11}$

S.P. of an article = ₹ $\frac{11}{10}$

∴ Profit = $\frac{11}{10} - \frac{10}{11}$

$= \frac{121-100}{110}$ = ₹ $\frac{21}{110}$

∴ Profit % = $\frac{\frac{21}{110} \times 100}{\frac{10}{11}}$

$= \frac{2100}{110} \times \frac{11}{10} = 21\%$

Aliter : Using Rule 13,
Here, a = 11, x = 10
b = 10, y = 11

Gain% = $\left(\frac{ay-bx}{bx}\right) \times 100\%$

$= \left(\frac{11 \times 11 - 10 \times 10}{10 \times 10}\right) \times 100\%$

$= \left(\frac{121-100}{100}\right) \times 100\%$

= 21%

5. (1) C.P. of 5 pencils = ₹ 1.

S.P. of 5 pencils = ₹ $\frac{5}{3}$

Gain = $\frac{5}{3} - 1 = \frac{2}{3}$

∴ Gain % = $\frac{\frac{2}{3}}{1} \times 100 = 66\frac{2}{3}\%$

Aliter : Using Rule 13,
Here, a = 5, x = 1
b = 3, y = 1

Gain% = $\left(\frac{ay-bx}{bx} \times 100\%\right)$

$= \frac{5-3}{3} \times 100\%$

$= \frac{200}{3} = 66\frac{2}{3}\%$

6. (4) C.P. of 100 oranges = ₹ 350
S.P. of 12 oranges = ₹ 48
∴ S.P. of 100 oranges

$= \frac{48}{12} \times 100$ = ₹ 400

Profit = ₹ (400 – 350) = ₹ 50

∴ Profit % = $\frac{50}{350} \times 100 = \frac{100}{7}$

$= 14\frac{2}{7}\%$

Aliter : Using Rule 13,
Here, a = 100, x = 350

b = 100, y = $\frac{48}{12} \times 100$ = 400

Gain% = $\left(\frac{ay-bx}{bx}\right) \times 100\%$

$= \frac{100 \times 400 - 100 \times 350}{100 \times 350} \times 100\%$

$= \frac{40-35}{35} \times 100\%$

$= \frac{100}{7}\% = 14\frac{2}{7}\%$

7. (3) Suppose the number of oranges bought
= LCM of 10 and 9 = 90

C.P. of 90 oranges = $\frac{25}{10} \times 90$

= ₹ 225

S.P. of 90 oranges = $\frac{25}{9} \times 90$

= ₹ 250

Profit % = $\frac{25}{225} \times 100$

$= \frac{100}{9} = 11\frac{1}{9}\%$

Aliter : Using Rule 13,
Here, a = 10, x = 25
b = 9, y = 25

Gain% = $\left(\frac{ay-bx}{bx}\right) \times 100\%$

$= \left(\frac{10 \times 25 - 9 \times 25}{9 \times 25}\right) \times 100\%$

$= \left(\frac{250-225}{9 \times 25}\right) \times 100\%$

$= \frac{100}{9} = 11\frac{1}{9}\%$

8. (4) Using Rule 2,
Total C.P. = ₹ 32
Total S.P. = ₹ (18+2) = ₹ 20
Loss = ₹ (32-20) = ₹ 12
∴ Loss per cent

$= \frac{12}{32} \times 100 = 37.5\%$

9. (4) Let number of articles bought
= 6 × 5 = 30
C.P. of 30 articles

$= ₹ \left(\frac{5}{6} \times 30\right) = ₹ 25$

S.P. of 30 articles

$= ₹ \left(\frac{6}{5} \times 30\right) = ₹ 36$

∴ Gain %

$= \frac{36-25}{25} \times 100 = 44\%$

Aliter : Using Rule 13,
Here, a = 6, x = 5
b = 5, y = 6

$\text{Gain\%} = \left(\frac{ay-bx}{bx}\right) \times 100\%$

$= \left(\frac{6 \times 6 - 5 \times 5}{5 \times 5}\right) \times 100\%$

$= \left(\frac{36-25}{25}\right) \times 100\%$

$= \frac{11}{25} \times 100\% = 44\%$

10. (4) Using Rule 2,
Total actual C.P.
= ₹ (500 × 10 + 2000) = ₹ 7000
And total S.P.
= ₹ (5 × 750 + 5× 550)
= ₹ (3750 + 2750) = ₹ 6500
Loss = 7000–6500 = ₹ 500

$\text{Loss percent} = \frac{500}{7000} \times 100$

$= \frac{50}{7} = 7\frac{1}{7}\%$

11. (3) Let the CP of each ball = x.
Then, clearly the cost price of (17 – 5) balls = ₹ 720
i.e., $12x = 720 \Rightarrow x = 60$ i.e. ₹ 60

12. (2) Using Rule 1,
CP of 120 excercise books
= ₹ (120 × 3) = ₹ 360
SP of 40 at ₹ 4 each
= ₹ (40 × 4) = ₹ 160
SP of 60 at ₹ 5 each
= ₹ (60 × 5) = ₹ 300
SP of remaining 20 books
= ₹ (20 × 3) = ₹ 60
Total SP = ₹ (160 + 300 + 60)
= ₹ 520
Profit % = ₹ (520 – 360)
= ₹ 160

$\therefore \text{Profit\%} = \frac{160}{360} \times 100$

$= \frac{400}{9} = 44\frac{4}{9}\%$

13. (2) Let the person buy 10 articles.

$\text{Total CP} = ₹ \left(1 + \frac{5}{4}\right) = ₹ \frac{9}{4}$

SP of 10 articles

$= ₹ \frac{2}{9} \times 10 = ₹ \frac{20}{9}$

$\therefore \text{Loss} = ₹ \left(\frac{9}{4} - \frac{20}{9}\right)$

$= ₹ \left(\frac{81-80}{36}\right) = ₹ \frac{1}{36}$

Now, if loss is ₹ $\frac{1}{36}$, number of articles = 10
∴ If loss is ₹ 3, number of articles = 36 × 10 × 3 = 1080

14. (3) Let the number of pencils bought = LCM of 4, 6 = 12
CP of 6 pencils = ₹ 4
∴ CP of 12 pencils = ₹ 8
S.P. of 4 pencils = ₹ 6
∴ S.P. of 12 pencils = ₹ 18
Profit = Rs. (18 – 8) = ₹ 10

$\therefore \text{Profit \%} = \frac{10}{8} \times 100 = 125\%$

Aliter :
Here, a = 6, x = 4
b = 4, y = 6

$\text{Gain\%} = \left(\frac{ay-bx}{bx}\right) \times 100\%$

$= \left(\frac{6 \times 6 - 4 \times 4}{4 \times 4}\right) \times 100\%$

$= \left(\frac{36-16}{16}\right) \times 100\%$

$= \frac{20}{16} \times 100\% = 125\%$

15. (4) Let Ravi buy 10 toffees.
∴ C.P. = ₹ 5
S.P. = ₹ 2

$\therefore \text{Loss \%} = \frac{5-2}{5} \times 100 = 60\%$

Aliter :
Here, a = 2, x = 1
b = 5, y = 1

$\text{Loss \%} = \left(\frac{ay-bx}{bx}\right) \times 100\%$

$= \left(\frac{2 \times 1 - 5 \times 1}{5 \times 1}\right) \times 100\%$

$= \frac{-3}{5} \times 100\%$

= 60% (-ve sign shows loss)

16. (3) Suppose, number of lemons bought
= LCM of 2, 5, 3 = 30

$\therefore \text{CP} = ₹ \left(\frac{1}{2} \times 30\right) = ₹ 15$

$\text{SP} = ₹ \left(\frac{3}{5} \times 30\right) = ₹ 18$

∴ Gain = ₹ 3
∴ Gain per cent

$= \frac{3}{15} \times 100 = 20\%$

Aliter :
Using Rule 13,
Here, a = 2, x = 1
b = 5, y = 3

$\text{Gain\%} = \left(\frac{ay-bx}{bx}\right) \times 100\%$

$= \left(\frac{2 \times 3 - 5 \times 1}{5 \times 1}\right) \times 100\%$

$= \frac{1}{5} \times 100\%$

= 20%

17. (2) Using Rule 1,
C.P. of the tape recorder

$= \frac{100}{95} \times 950 = ₹ 1000$

Gain = 1040 – 1000 = ₹ 40

$\text{\% Gain} = \frac{40}{1000} \times 100 = 4\%$

18. (2) Using Rule 2,
CP of 100 cups
= ₹ 100 × 10 = ₹ 1000
10 cups are broken.
∴ SP of 90 cups = ₹ (90 ×11)
= ₹ 990
Loss = ₹ (1000 – 990)
= ₹ 10
∴ Loss per cent

$= \frac{10}{1000} \times 100 = 1\%$

19. (1) Using Rule 1,
Let the SP of 1 book = x
$\therefore$ SP of 25 books = $25x$
According to the question,
$25x - 2000 = 5x$
$\Rightarrow 20x = 2000$
$\Rightarrow x = \frac{2000}{20} = 100$
$\therefore$ SP of 1 book = ₹ 100

20. (3) S.P. of 7 pens = $\frac{10 \times 140}{100}$
= ₹ 14
$\therefore$ S.P. of 1 pen = $\frac{14}{7}$ = ₹ 2
Clearly, 5 pens were sold for ₹ 10

Aliter : Using Rule 13,
Here, a = 7, x = 10
b = ?, y = 10, Gain% = 40%
$\text{Gain\%} = \left(\frac{ay - bx}{bx}\right) \times 100\%$
$40 = \left(\frac{7 \times 10 - b \times 10}{b \times 10}\right) \times 100\%$
4b = 70 – 10b
14b = 70
$b = \frac{70}{14}$ $\boxed{b = 5}$

21. (3) C.P. of 12 oranges
$= 60 \times \frac{100}{75} =$ ₹ 80
For a gain of 25%,
S.P. of 12 oranges
$= \frac{80 \times 125}{100} =$ ₹ 100
Hence, 12 Orange has to sell,
[You can also check through options]

22. (2) Let the man buy 60 oranges (LCM of 20 and 30) of each kind.
CP of the 60 oranges of the first kind = $\frac{60}{20} \times 60 =$ ₹180
CP of 60 oranges of second kind
$\frac{60}{30} \times 60 =$ ₹120
Total CP of 120 oranges
= (180 + 120) = ₹ 300
Their SP = $\frac{60}{25} \times 120 =$ ₹ 288
Loss = ₹ (300 – 288) = ₹ 12
$\therefore$ Loss Per cent
$= \frac{12}{300} \times 100 = 4\%$

23. (3) Let the vendor buy 20 (LCM of 5 and 4) bananas.
$\therefore$ CP of 20 bananas = ₹ 4
SP of 20 bananas = ₹ 5
$\therefore \text{Gain\%} = \frac{5-4}{4} \times 100 = 25\%$

Aliter :
Using Rule 13,
Here, a = 5, x = 1
b = 4, y = 1
$\text{His gain\%} = \left(\frac{ay - bx}{bx}\right) \times 100\%$
$= \left(\frac{5 \times 1 - 4 \times 1}{4 \times 1}\right) \times 100\%$
$= \frac{1}{4} \times 100\% = 25\%$

24. (3) If the CP of 20 apples be ₹ x, then
$\frac{x \times 120}{100} = 100$
$\Rightarrow x = \frac{100 \times 100}{120} =$ ₹ $\frac{250}{3}$
$\because$ ₹ $\frac{250}{3}$ = 20 apples
$\therefore$ ₹ $100 = \frac{20 \times 3 \times 100}{250}$
= 24 apples

Aliter : Using Rule 13,
Here, a = ?, x = 100
b = 20, y = 100
Gain% = 20%
$\text{Gain\%} = \left(\frac{ay - bx}{bx}\right) \times 100\%$
$20\% = \left(\frac{a \times 100 - 20 \times 100}{20 \times 100}\right) \times 100\%$
400 = 100a – 2000
2400 = 100a
a = 24

25. (3) Let he buy 15 eggs.
[LCM of 5 & 3]
$\therefore$ CP of 15 eggs = ₹ 25
$\therefore$ SP of 15 eggs =₹ 36
$\therefore$ Gain = 36 – 25 = ₹ 11
$\because$ ₹ 11 ≡ 15 eggs
$\therefore$ ₹ $143 \equiv \frac{15}{11} \times 143$
= 195 eggs

26. (1) Let the man buys 24 (LCM of 8 and 12) oranges.
$\therefore$ C.P. of 24 oranges
$= \frac{34}{8} \times 24 =$ ₹ 102
S.P. of 24 oranges
$= \frac{57}{12} \times 24 =$ ₹ 114
Gain = 114 – 102 = ₹ 12
$\because$ ₹ 12 ≡ 24 oranges
$\therefore$ ₹ $45 \equiv \frac{24}{12} \times 45 = 90$ oranges

27. (4) C.P. of 50 pens = 50 × 50
= ₹ 2500
For profit of 10%,
S.P. = $\frac{2500 \times 110}{100}$ = ₹ 2750
S.P. of 40 pens at a loss of 5%
$= \frac{40 \times 50 \times 95}{100}$ = ₹ 1900
$\therefore$ S.P. of remaining 10 pens
= 2750 – 1900 = ₹ 850
$\therefore$ Gain %
$= \frac{850 - 500}{500} \times 100 = 70\%$

28. (1) Loss = 5 – 4.50 = 0.50
$\therefore$ Loss percent = $\frac{0.50}{5} \times 100$
= 10%
Aliter : Using Rule 13,
Here, a = b, x = 5a
y = 4.50a
$\text{Loss \%} = \left(\frac{ay - bx}{bx}\right) \times 100\%$
$= \left(\frac{4.50a^2 - 5a^2}{5a^2}\right) \times 100\%$
$= \left(\frac{-0.5a^2}{5a^2}\right) \times 100\%$
= 10% (–ve sign shows loss)

29. (1) Using Rule 1,
Let the CP of each watch be x.
$\therefore$ CP of 14 watches = $14x$
and SP of 14 watches = ₹ 6300
According to the question,
$6300 - 14x = 4x$
$\Rightarrow 18x = 6300$
$\Rightarrow x = \frac{6300}{18}$ = ₹ 350

30. (3) Using Rule 1,
CP of each article
= ₹ $\frac{P}{12}$ and SP = ₹ $\frac{P}{8}$

Gain = $\frac{P}{8} - \frac{P}{12} = \frac{3P - 2P}{24} = \frac{P}{24}$

∴ Gain per cent =

$\frac{\frac{P}{24}}{\frac{P}{12}} \times 100 = 50\%$

31. (3) C.P. of 5 lemons

$= \frac{100}{140} \times 14 =$ ₹ 10

∴ C.P. of 12 lemons

$= \frac{10}{5} \times 21 =$ ₹ 24

Aliter : Using Rule 13,
Here, a = 12, x = ?
b = 5, y = 14, Gain% = 40%

Gain% = $\left(\frac{ay - bx}{bx}\right) \times 100\%$

40% = $\left(\frac{12 \times 14 - 5 \times x}{5x}\right) \times 100\%$

2x = 168 – 5x
7x = 168
x = 24

32. (4) If a articles are bought for ₹ x and b articles are sold for ₹ y, then

Gain per cent= $\left(\frac{ya - xb}{xb}\right) \times 100$

$= \frac{(11 \times 110 - 10 \times 100)}{10 \times 100} \times 100$

$= \frac{1210 - 1000}{1000} \times 100 = 21\%$

Aliter : Using Rule 13,
Here, a = 11, x = 100
b = 10, y = 110

Gain% = $\left(\frac{ay - bx}{bx}\right) \times 100\%$

$= \left(\frac{11 \times 110 - 10 \times 100}{10 \times 100}\right) \times 100\%$

$= \left(\frac{1210 - 1000}{1000}\right) \times 100\%$

= 21%

33. (4) Cost price of sewing machine

$= 1080 \times \frac{100}{90}$

= ₹ 1200

∴ S.P. for a profit of 10%

$= \frac{1200 \times 110}{100} =$ ₹ 1320

34. (2) Number of oranges bought = 100 (let)
C.P. = ₹100 (let)
S.P of 40 oranges = ₹ 100

∴ Gain percent = $\frac{100 - 40}{40} \times 100$

= 150 %
Remaining oranges = 60

Their 80 % = $\frac{60 \times 80}{100}$ = 48

These are sold at a profit of 75 %

∴ Their S.P. = $\frac{48 \times 175}{100}$ = ₹ 84

∴ Gain per cent = 84%

35. (2) First S.P. of article

$= \frac{200 \times 90}{100} =$ ₹ 180

After decrease of 5%,

S.P. = $\frac{180 \times 95}{100}$ = ₹ 171

36. (1) Using Rule 3,
C.P. of article

$= \frac{100}{100 - \text{loss per cent}} \times$ S.P.

$= \frac{100}{100 - 15} \times 102 =$ ₹ 120

On selling at Rs. 134.40,
Gain = ₹ (134.4 – 120)
= ₹ 14.4
∴ Gain per cent

$= \frac{14.4}{120} \times 100$ = 12%

37. (1) C.P. of first toy = ₹ x
C.P. of second toy = ₹ y

∴ $\frac{x \times 112}{100} = 504$

⇒ $x = \frac{504 \times 100}{112} =$ ₹ 450

Again, $y \times \frac{96}{100} = 504$

⇒ $y = \frac{504 \times 100}{96} =$ ₹ 525

Total C.P. = ₹ (450 + 525)
= ₹ 975
Total S.P. = 2 × 504
= ₹ 1008
Gain = 1008 – 975 = ₹ 33

∴ Profit per cent = $\frac{33 \times 100}{975}$

$= \frac{44}{13} = 3\frac{5}{13}\%$

38. (4) For A,

C.P. of horse = $4800 \times \frac{100}{80}$

= ₹ 6000
For B,

S.P. = $\frac{6000 \times 115}{100}$ = ₹ 6900

B's profit = Rs. (6900 – 4800)
= ₹ 2100

39. (4) C.P. of each apple = $\frac{100}{10}$

= ₹ 10
S.P. of each apple

= ₹ $\left(10 \times \frac{125}{100}\right)$ = ₹ 12.50

∴ Number of apples sold for Rs.

100 = $\frac{100}{12.5}$ = 8

40. (2) Cost price of table = ₹ x (let)
According to question,

$\frac{113x}{100} + 25 = \frac{118x}{100}$

[S. P. at R% profit

$= \frac{(100 + R)}{100} \times$ C.P.]

⇒ $\frac{118x}{100} - \frac{113x}{100} = 25$

⇒ $\frac{5x}{100} = 25$ ⇒ $\frac{x}{20} = 25$

⇒ x = 25 × 20 = ₹ 500

Aliter : Using Rule 11,
Here, x = 13%,
R= 25, y = 18%

C.P. of table = $\left(\frac{R}{y - x}\right) \times 100$

$= \left(\frac{25}{18 - 13}\right) \times 100$

$= \frac{25}{5} \times 100$

= ₹ 500

41. (3) C.P. of watch = ₹ x (let)

$\therefore$ S.P. of watch = $\frac{x \times 95}{100}$

= ₹ $\frac{19x}{20}$

Case II,

S.P. = ₹ $\left(\frac{19x}{20} + 56.25\right)$

Profit percent = 10 %

$\therefore \frac{x \times 110}{100} = \frac{19x}{20} + 56.25$

$\Rightarrow \frac{11x}{10} - \frac{19x}{20} = 56.25$

$\Rightarrow \frac{22x - 19x}{20} = 56.25$

$\Rightarrow \frac{3x}{20} = 56.25$

$\Rightarrow 3x = 56.25 \times 20$

$\Rightarrow x = \frac{56.25 \times 20}{3}$ = ₹ 375

Aliter : Using Rule 11,
Here, x = 5%, R = 56.25,
y = 10%

C.P. = $\left(\frac{R}{y+x}\right) \times 100$

$= \frac{56.25}{10+5} \times 100$

$= \frac{56.25}{15} \times 100$

$= \frac{5625}{15}$ = ₹ 375

42. (2) Using Rule 3,
C.P. of cycle = ₹ 1650
Loss = 8%
$\therefore$ S.P. of cycle

$= \left(\frac{100 - \text{loss}\%}{100}\right) \times$ C.P.

$= \frac{100-8}{100} \times 1650$

$= \frac{92 \times 1650}{100}$ = ₹ 1518

43. (4) C.P. of table = Rs. x (let)
According to question,

$\frac{x \times 90}{100} = 1800$

$\Rightarrow x = \frac{1800 \times 100}{90}$ = Rs. 2000

For a profit of 15%,

S.P. = $\frac{2000 \times 115}{100}$ = Rs. 2300

Aliter : Using Rule 3,
S.P. = ₹ 1800, Loss%= 10%

C.P. = S.P.$\left(\frac{100}{100 - \text{Loss}\%}\right)$

$= 1800\left(\frac{100}{100-10}\right)$

$= \frac{180000}{90}$ = Rs. 2000

Now New S.P.

= C.P. $\left(\frac{100 + \text{Profit}\%}{100}\right)$

$= 2000\left(\frac{100+15}{100}\right)$

$= 2000 \times \frac{115}{100}$

= Rs. 2300

44. (2) Cost price for the manufacturer = Rs. x (let)

$\therefore x \times \frac{118}{100} \times \frac{120}{100} \times \frac{125}{100}$

= 15045

$\Rightarrow x = \frac{15045 \times 1000000}{118 \times 120 \times 125}$

= Rs. 8500

45. (4) Let C.P. of article be Rs. x.
According to the question,
108% of x – 105% of x = 240

$\Rightarrow \frac{108x}{100} - \frac{105x}{100} = 240$

$\Rightarrow \frac{3x}{100} = 240$

$\Rightarrow x = \frac{24000}{3}$ = Rs. 8000

Note : In the original question it is Rs. 40, not Rs. 240.
Aliter : Using Rule 11,
Here, x = 5%, R = 240, y = 8%

C.P. = $\frac{R}{y-x} \times 100$

$= \frac{240}{8-5} \times 100$

= Rs 8000

46. (2) C.P. of radio = Rs. x (let)
According to the question,

$\frac{130x}{100} - \frac{120x}{100} = 60$

$\Rightarrow \frac{10x}{100} = 60$

$\Rightarrow x = 60 \times 10$ = Rs. 600

Aliter : Using Rule 11,
Here, x = 20%,
R = Rs 60, y = 30%

C.P. = $\frac{R}{(y-x)} \times 100$

$= \frac{60}{(30-20)} \times 100$

= Rs. 600

47. (1) C.P. of cycle = Rs. x (let)

$\therefore$ S.P. = $\frac{110x}{100}$ = Rs. $\frac{11x}{10}$

Case II,

New C.P. = Rs. $\frac{9x}{10}$

$\therefore \frac{11x}{10} + 60 = \frac{9x}{10} \times \frac{125}{100}$

= Rs. $\frac{9x}{8}$

$\Rightarrow \frac{9x}{8} - \frac{11x}{10} = 60$

$\Rightarrow \frac{90x - 88x}{80} = 60$

$\Rightarrow \frac{2x}{80} = 60$

$\Rightarrow \frac{x}{40} = 60$

$\Rightarrow x = 60 \times 40$

= Rs. 2400

48. (3) Profit percent

$= \frac{5-3}{3} \times 100$

$= \frac{200}{3} = 66\frac{2}{3}\%$

49. (1) C.P. of watch for A = Rs. x (let).
According to the question,

$x \times \frac{105}{100} \times \frac{104}{100} = 91$

$\Rightarrow x = \frac{91 \times 100 \times 100}{105 \times 104}$

$= \frac{250}{3}$ = Rs. 83.33

50. (2) C.P. for Swati

$= \text{Rs.}\left(\frac{120 \times 125}{100}\right) = \text{Rs. } 150$

C.P. for Divya

$= \text{Rs.}\left(\frac{100}{110} \times 198\right)$

= Rs. 180

∴ S.P. for Swati = Rs. 180

∴ Profit percent

$= \frac{180 - 150}{150} \times 100 = \frac{30 \times 2}{3}$

= 20%

51. (1) C.P. of article = Rs. x (let).

According to the question,

$\frac{94x}{100} + 64 = \frac{x \times 110}{100}$

$\Rightarrow \frac{110x}{100} - \frac{94x}{100} = 64$

$\Rightarrow \frac{16x}{100} = 64 \Rightarrow x = \frac{64 \times 100}{16}$

= Rs. 400

52. (4) Initial profit on article

= Rs. (78 – 69) = Rs. 9

∴ C.P. of article

= Rs. (69 – 9) = Rs. 60

53. (2) C.P. of each article

$= \frac{2400}{80} = \text{Rs. } 30$

Profit = 16%

∴ S.P. of each article

$= \text{Rs.}\left(\frac{30 \times 116}{100}\right) = \text{Rs. } 34.80$

54. (2) Let the C.P. of the book be Rs. x.

∴ S.P. of the book = Rs. $\frac{70x}{100}$

$= \text{Rs. } \frac{7x}{10}$

Case II,

$\frac{140x}{100} = \frac{7x}{10} + 140$

$\Rightarrow \frac{14x}{10} - \frac{7x}{10} = 140$

$\Rightarrow \frac{7x}{10} = 140 \Rightarrow 7x = 1400$

$\Rightarrow x = \frac{1400}{7} = \text{Rs. } 200$

55. (4) Let the C.P. of cloth be Rs. x per metre.

According to the question,

$x \times \frac{90}{100} = 9$

$\Rightarrow x = \frac{900}{90} = 10$

To gain 15%,

S.P. = Rs. $\left(\frac{10 \times 115}{100}\right)$ per metre

= Rs. 11.50 per metre

56. (3) Let total expenditure on repairing be Rs. x.

∴ Actual C.P. = Rs. (1000 + x)

∴ Total S.P. = Rs. (300 × 30)

= Rs. 9000

Total profit = Rs. (150 × 30)

= Rs. 4500

∴ 9000 – (1000 + x) = 4500

⇒ 1000 + x = 9000 – 4500 = 4500

⇒ x = 4500 – 1000 = Rs. 3500

57. (3) Let Kamal eat x apples.

According to the question,

$x \times \frac{140}{100} = 70 \Rightarrow \frac{14x}{10} = 70$

$\Rightarrow x = \frac{70 \times 10}{14} = 50$

58. (2) Five crates out of 25 crates of oranges were lost.

∴ C.P. of 20 crates of oranges

= Rs. 10000

S.P. of 20 crates of oranges

$= \text{Rs.}\left(\frac{10000 \times 125}{100}\right)$

= Rs. 12500

∴ S.P. per crate = $\frac{12500}{20}$

= Rs. 625

59. (3) Let the C.P. of article be Rs. x.

According to the question,

(118 – 115)% of x = 6

$\Rightarrow \frac{x \times 3}{100} = 6$

$\Rightarrow x = \frac{600}{3} = \text{Rs. } 200$

TYPE-IV

1. (1) According to the question

$\frac{\text{Cost price}}{\text{Selling price}} = \frac{5}{4}$

∴ Selling price $= \frac{4}{5} \times$ Cost price

Loss = Cost price – Selling price

= Cost price $- \frac{4}{5}$ Cost price

$= \frac{1}{5}$ Cost price

∴ Loss % $= \frac{\frac{1}{5}\text{Cost price} \times 100}{\text{Cost price}}$

$= \frac{100}{5} = 20\%$

Method 2 : Tricky Approach

₹ 1 is loss on ₹ 5.

∴ loss % $= \frac{1}{5} \times 100 = 20\%$

Aliter : Using Rule 2,

Here, C.P. = 5x, S.P. = 4x

Loss% $= \frac{\text{Loss}}{\text{C.P.}} \times 100$

$= \frac{5x - 4x}{5x} \times 100$

= 20%

2. (1) Using Rule 1,

Tricky Approach

Gain% $= \frac{(21 - 20)}{20} \times 100$

$= \frac{1}{20} \times 100 = 5\%$

3. (2) Let the C.P. be x

∴ (6 – 4)% of x = 3

⇒ 2% of x = 3

$\Rightarrow x = \frac{300}{2} = 150$

∴ S.P. at 4% gain

$= \frac{150 \times 104}{100} = ₹\ 156$

and S.P. at 6% gain

$= \frac{150 \times 106}{100} = ₹\ 159$

∴ The required ratio

= 156 : 159 = 52 : 53

4. (1) Let Milk : Water = K : 1
$\therefore$ S.P. = (K + 1) × 9
C.P. = 10K
Gain = 9 – K

$$\text{Gain \%} = \frac{9-K}{10K} \times 100$$

$$\Rightarrow \frac{9-K}{10K} \times 100 = 20$$

$\Rightarrow$ 90 – 10K = 20K
$\Rightarrow$ 30K = 90
$\Rightarrow$ K = 3
$\therefore$ Ratio = 3 : 1

5. (3) CP of refrigerator = ₹ $5x$
CP of television = ₹ $3x$
$\therefore 2x = 5500$

$$\Rightarrow x = \frac{5500}{2} = 2750$$

$\therefore$ CP of refrigerator = 5 × 2750
= ₹ 13750

6. (3) Gain per cent

$$\frac{210 \times (5+3) - [180 \times 5 + 200 \times 3]}{180 \times 5 + 200 \times 3} \times 100$$

$$= \frac{1680 - 1500}{1500} \times 100$$

$$= \frac{180}{1500} \times 100 = 12\%$$

7. (4) Let the first investment be $3x$
Then second investment be $5x$
Combined loss %

$$= \frac{3x \times \frac{15}{100} - 5x \times \frac{10}{100}}{3x + 5x} \times 100$$

$$= \frac{\frac{45x}{100} - \frac{50x}{100}}{8x} \times 100$$

$$= \frac{-5x}{8x \times 100} \times 100$$

$$= \frac{-5}{8} \text{ per cent or } \frac{5}{8}\% \text{loss}$$

[–ve sign shows loss].

8. (3) Using Rule 1,
Let the CP = $8x$ and SP = $9x$
$\therefore$ Profit = $(9x - 8x) = x$
$\therefore$ Profit %

$$= \frac{x}{8x} \times 100 = \frac{25}{2} = 12.5\%$$

9. (4) Let the printed price of the book be x.
$\therefore$ Selling price = 90% of x

$$= x \times \frac{90}{100} = \frac{9x}{10}$$

If the CP of the book be y, then

$$y \times \frac{112}{100} = \frac{9x}{10}$$

$$\frac{y}{x} = \frac{9}{10} \times \frac{100}{112} = \frac{45}{56} \text{ or } 45 : 56$$

10. (3) If C.P. = ₹ 100
S.P. = ₹ 300 [gain being 200%]
$\therefore$ Required ratio = 1 : 3
Aliter : Using Rule 3,

$$\frac{\text{C.P.}}{\text{S.P.}} = \frac{100}{100 + \text{Profit\%}}$$

$$= \frac{100}{100 + 200}$$

$$= \frac{100}{300} = 1 : 3$$

11. (3) Let C.P. be 100 then,
S.P. = 105 [gain being 5%]
Required ratio
= 105 : 100 = 21 : 20
Aliter : Using Rule 3,

$$\frac{\text{C.P.}}{\text{S.P.}} = \frac{100}{100 + \text{Profit\%}}$$

$$= \frac{100}{100 + 5}$$

$$= \frac{100}{105} = \frac{20}{21} = 20 : 21$$

12. (1) Using Rule 1,
Let the cost price = $5x$ and the selling price = $6x$.

$$\text{Gain \%} = \frac{6x - 5x}{5x} \times 100 = 20\%$$

13. (1) Using Rule 1,
Let Cost price = $10x$
Selling price = $11x$
$\therefore$ Gain per cent

$$= \frac{11x - 10x}{10x} \times 100$$

$$= \frac{x}{10x} \times 100 = 10\%$$

14. (3) $b = a \times \frac{200}{100} = 2a$

$$\frac{b}{a} = 2 \Rightarrow \frac{b}{a} - 1 = 2 - 1$$

$$\Rightarrow \frac{b-a}{a} = 1 \Rightarrow \frac{b-a}{a} \times 100 = 100$$

$\therefore$ Gain per cent = 100%

15. (2) B entered after x months.
Ratio of equivalent capitals for 1 month
= 64000 × 12 : 48000 (12 – x)
= 16 : (12 – x)

$$\therefore \frac{16}{12 - x} = \frac{2}{1} \Rightarrow 24 - 2x = 16$$

$\Rightarrow 2x = 8 \Rightarrow x = 4$ months

16. (1) By the rule of alligation, CP of

$$\text{mixed tea} = \frac{100}{120} \times 194.40$$

= ₹ 162 /kg

$$\therefore \text{Required ratio} = \frac{12}{30} = \frac{2}{5} \text{ or } 2 : 5$$

17. (4) CP of the mixture

$$= \frac{324 \times 100}{120} = ₹\ 270$$

$\therefore$ Required ratio = 2 : 5

18. (4) Let x kg of sugar costing ₹ 20/kg and y kg of sugar costing ₹ 15/kg are mixed.
According to the question,
$20x + 15y = 16(x + y)$
$\Rightarrow 20x + 15y = 16x + 16y$
$\Rightarrow 20x - 16x = 16y - 15y$
$\Rightarrow 4x = y$

$$\therefore \frac{x}{y} = \frac{1}{4} \text{ or } 1 : 4$$

Method 2 :
By the rule of alligation,

$\therefore$ Required ratio = 1 : 4

19. (4) If the C.P. of the mixture be ₹ x per kg, then

$$x \times \frac{120}{100} = 32.40$$

$$\Rightarrow x = \frac{32.40 \times 100}{120} = 27$$

∴ Required ratio = 2 : 5

20. (1) S.P. of 1 kg mixture = ₹ 68.20, Gain = 10%

∴ C.P. of 1 kg mixture

$$= ₹\left(68.20 \times \frac{100}{110}\right) = ₹\ 62$$

By the rule of alligation,

∴ Required ratio = 3 : 2

21. (2) Average price of blended tea

$$= \frac{280 \times 7 + 240 \times 9}{16}$$

$$= \frac{1960 + 2160}{16}$$

$$= \frac{4120}{16} = ₹\ 257.50 \text{ kg}$$

22. (4) C.P. of 40kg of mixture

= ₹ (15 × 29 + 25 × 20)

= ₹ (435 + 500) = ₹ 935

S.P. of 40kg of mixture

= 27 × 40 = ₹ 1080

∴ Gain = 1080 – 935 = ₹ 145

23. (2) Let the profit be x

According to question,

$$\left(1 - \frac{1}{3} - \frac{1}{4}\right) x = ₹\ 5000$$

$$\text{or } \left(\frac{12 - 4 - 3}{12}\right) x = ₹\ 5000$$

$$\frac{5}{12} x = ₹\ 5000$$

$$\therefore x = \frac{5000 \times 12}{5}$$

$$\therefore \frac{1}{3} = \frac{5000 \times 12}{5 \times 3} = ₹\ 4000$$

24. (1) Ratio of investment of A : B

= 2560 : 2000 = 32 : 25

Now, A gained = ₹ 320

B gained = ₹ 250

Total Profit = ₹ 110

∴ C gained = ₹ 535

According to question,

$$\frac{250}{535} = \frac{2000}{\text{C's Capital}}$$

Hence, C's capital

$$= \frac{2000 \times 535}{250} = ₹4280$$

25. (3) Let the total profit be ₹ x.

$$\therefore \text{A 's share in profit} = ₹\ \frac{3x}{5}$$

$$\text{B 's share in profit} = ₹\ \frac{x}{5}$$

$$\text{and C 's share in profit} = ₹\ \frac{x}{5}$$

According to the question,

$$\left(\frac{3x}{5} - \frac{x}{5}\right) = 400$$

$$\Rightarrow \frac{2x}{5} = 400$$

$$\Rightarrow x = \frac{400 \times 5}{2} = ₹\ 1000$$

26. (2) 8A = B × 12 = 6C

$$\Rightarrow \frac{8A}{24} = \frac{12B}{24} = \frac{6C}{24}$$

$$\Rightarrow \frac{A}{3} = \frac{B}{2} = \frac{C}{4}$$

∴ A : B : C = 3 : 2 : 4

∴ B's share

$$= \frac{2}{3 + 2 + 4} \times 864$$

$$= \frac{2}{9} \times 864 = ₹\ 192$$

27. (4) Initially, A's capital = ₹ x

$$\text{B's capital} = ₹\ \frac{3x}{2}$$

Ratio of the equivalent capitals of A and B for 1 month

$$= \left(x \times 10 + \frac{3x}{4} \times 2\right) : \left(\frac{3x}{2} \times 8 + \frac{3x}{4} \times 4\right)$$

$$= \left(10x + \frac{3x}{2}\right) : (12x + 3x)$$

= 23 : 30

$$\text{A' share} = \frac{23}{53} \times 53000$$

= ₹ 23000

28. (1) Share of rent = (number of oxen × time)

A : B : C

= (10 × 7) : (12 × 5) : (15 × 30)

A : B : C = 70 : 60 : 45

A : B : C = 14 : 12 : 9

C's share of rent

$$= \frac{9}{14 + 12 + 9} \times 175$$

$$= \frac{9}{35} \times 175 = 45$$

∴ C's share of rent is ₹ 45

29. (1) Ratio of profit sharing among A, B and C

= Ratio of equivalent capitals of A, B and C for 1 month

= 320000 × 4 : 510000 × 3 : 270000 × 5

= 32 × 4 : 51 × 3 : 27 × 5

= 128 : 153 : 135

Sum of ratios

= 128 + 153 + 135 = 416

Total profit = ₹ 124800

$$\therefore \text{A's share} = \frac{128}{416} \times 124800$$

= ₹ 38400

30. (2) Ratio of equivalent capitals of A and B for 1 month

= 100000 × 36 : 200000 × 24

= 36 : 48 = 3 : 4

$$\text{Part of profit gained by A} = \frac{3}{7}$$

$$\text{Part of profit gained by B} = \frac{4}{7}$$

∴ Required difference

$$\left(\frac{4}{7} - \frac{3}{7}\right) \times 84000 = ₹\ 12000$$

31. (4) Ratio of equivalent capitals of A, B and C for 1 month

= (40500 × 6 + 45000 × 6) : (45000 × 12) : (60000 × 6 + 45000 × 6)

= (405 + 450) : (450 × 2) : (600 + 450) = 855 : 900 : 1050

= 171 : 180 : 210

= 57 : 60 : 70

Sum of the ratios = 57 + 60 + 70

= 187

Required difference

$= \frac{70-57}{187} \times 56100$

$= \frac{13}{187} \times 56100 =$ ₹ 3900

32. (3) A : B = 1 : 3

B : C = 1 : 3 = 3 : 9

C : D = 1 : 3 = 9 : 27

∴ A : B : C : D = 1 : 3 : 9 : 27

Sum of ratios = 1 + 3 + 9 + 27

= 40

∴ C's share in profit

$= \frac{9}{40} \times 400000 =$ ₹ 90,000

33. (3) A's investment of ₹ 3500 is for 12 months

B's investment (let it be ₹ x) is for 7 months only.

At the end of the year the profit is divided in the ratio 2 : 3 and it must be equal to the ratio of the product, (Amount × time)

$\frac{12 \times 3500}{7x} = \frac{2}{3}$

or $x = \frac{12 \times 3500}{7} \times \frac{3}{2}$

or x = 9000

∴ B's investment is ₹ 9000.

34. (4) Let B remained in business for x months.

Ratio of equivalent capitals

= 45000 × 12 : 54000 × x

= 10 : x

$\therefore \frac{10}{x} = \frac{2}{1}$

$\Rightarrow 2x = 10 \Rightarrow x = 5$

Clearly, B joined after (12 – 5) = 7 months.

35. (1) Initial investment :

A = ₹ $5x$

B = ₹ $4x$

C = ₹ $3x$

∴ Ratio of their equivalent capitals for 1 month

$= 5x \times 12 : (4x \times 4 + (4x + 1000) \times 8) : (3x \times 8 + (3x + 2000) \times 4)$

$= 15x : (12x + 2000) : (9x + 2000)$

$\therefore \frac{15x}{12x + 2000} = \frac{15}{14}$

$\Rightarrow 14x = 12x + 2000$

$\Rightarrow 2x = 2000$

$\Rightarrow x =$ ₹ 1000

∴ C's investment = ₹ 3000

36. (2) Ratio of equivalent capitals of A, B and C for 1 month

$= \left(x \times 6 + \frac{3x}{2} \times 6\right) : (2x \times 6 + 4x \times 6)$

$: (4x \times 6 + 3x \times 6)$

$= 15x : 36x : 42x$

$= 5 : 12 : 14$

37. (1) A : B = 5 : 4 = 10 : 8

B : C = 8 : 9

∴ A : B : C = 10 : 8 : 9

Sum of ratios = 10 + 8 + 9 = 27

∴ C's share $= \frac{9}{27} \times 3600$

= ₹ 1200

38. (4) C.P. of mixture

$= \frac{320 \times 100}{120}$

$=$ Rs. $\frac{800}{3}$ per kg.

By rule of alligation,

∴ Required ratio $= \frac{40}{3} : \frac{260}{3}$

= 2 : 13

39. (3) C.P. of mobile = Rs. x (let)

$\therefore \frac{x \times 112}{100} = P$

and, $\frac{96x}{100} = Q$

$\therefore Q : P = \frac{96x}{100} : \frac{112x}{100}$

= 96 : 112 = 6 : 7

40. (3) Using Rule 1,

Cost price = Rs. $10x$

S.P. = Rs. $11x$

∴ Gain per cent

$= \frac{(11x - 10x)}{10x} \times 100$

$= \frac{100}{10} = 10\%$

41. (2) Distribution among A, B and C :

Actual ratio $= \frac{1}{2} : \frac{1}{3} : \frac{1}{4}$

$= \left(\frac{1}{2} \times 12\right) : \left(\frac{1}{3} \times 12\right) : \left(\frac{1}{4} \times 12\right)$

= 6 : 4 : 3

Wrong ratio = 2 : 3 : 4

Clearly, C gained.

Gain

$=$ Rs. $\left(\frac{4}{9} \times 1170 - \frac{3}{13} \times 1170\right)$

= Rs. (520 – 270) = Rs. 250

42. (2) C.P. of first watch = Rs.$16x$

C.P. of second watch = Rs. $23x$

According to the question,

Ratio after corresponding in creases,

$= \frac{11}{20}$

$\Rightarrow \frac{\frac{16x \times 110}{100}}{23x + 477} = \frac{11}{20}$

$\Rightarrow \frac{1760x}{100(23x + 477)} = \frac{11}{20}$

$\Rightarrow \frac{160x}{5(23x + 477)} = 1$

$\Rightarrow 160x = 115x + 2385$

$\Rightarrow 160x - 115x = 2385$

$\Rightarrow 45x = 2385$

$\Rightarrow x = \frac{2385}{45} = 53$

∴ Original C.P of second watch

= Rs. $23x$

= Rs. (23 × 53)

= Rs.1219

43. (1) Let 3 litres of liquid X and 2 litres of liquid Y be mixed together.

Cost of liquid Y = Rs. x /litre

Cost of liquid Y = Rs. $(x + 2)$/litre

According to the question,

Cost of the mixture

= Rs. $(3x + 6 + 2x)$ = Rs. $(5x + 6)$

$\therefore\ (5x + 6) \times \frac{110}{100} = 11 \times 5$

$\Rightarrow 5x + 6 = \frac{11 \times 5 \times 10}{11} = 50$

$\Rightarrow 5x = 50 - 6 = 44$

$\Rightarrow x = \frac{44}{5}$ = Rs. 8.8

$\therefore$ Cost of liquid X = 8.8 + 2
= Rs. 10.8/litre

44. (1) If the cost of milk be Rs. 100, then S.P. = Rs. 120
$\therefore$ Required ratio = 20 :100=1 : 5

45. (4) Let total profit be Rs. x.
Remaining profit after donations to charity

= Rs. $\frac{95x}{100}$

= Rs. $\frac{19x}{20}$

A : B = 3 : 2
Sum of the terms of the ratio
= 3 + 2 = 5

$\therefore$ A's share = $\frac{19x}{20} \times \frac{3}{5}$

$\therefore \frac{19 \times 3x}{100} = 8550$

$\Rightarrow x = \frac{8550 \times 100}{19 \times 3}$ = Rs. 15000

46. (2) C.P. of article = Rs. $10x$
Its S.P. = Rs. $11x$
Profit = Rs. $(11x - 10x)$ = Rs. x
$\therefore$ Profit per cent

$= \frac{x}{10x} \times 100 = 10\%$

47. (2) Let B's profit be Rs. x.
$\therefore$ A's profit = Rs. $(1650 - x)$
According to the question,

$\frac{1650 - x}{3} = \frac{2x}{5}$

$\Rightarrow 6x = 1650 \times 5 - 5x$
$\Rightarrow 6x + 5x = 8250$
$\Rightarrow 11x = 8250$

$\Rightarrow x = \frac{8250}{11}$ = Rs. 750

48. (3) C.P. of article = Rs. x (let)
Its S.P. = Rs. y

$\therefore\ x \times \frac{5}{100} = \frac{y \times 4}{100}$

$\Rightarrow \frac{x}{y} = \frac{4}{5} = 4 : 5$

49. (1) Ratio of the equivalent capitals of Anil and Vishal for 1 month
= 25000 × 12 : 30000 × 9
= 25 × 12 : 30 × 9
= 10 : 9
Sum of the terms of ratio
= 10 + 9 = 19

Anil's share = $\frac{10}{19} \times 19000$

= Rs. 10000

50. (3) Case I,

A : B : C = $\frac{1}{5} : \frac{1}{4} : \frac{1}{8}$

$= \left(\frac{1}{5} \times 40\right) : \left(\frac{1}{4} \times 40\right) : \left(\frac{1}{8} \times 40\right)$

[LCM of 5, 4 and 8 = 40]

= 8 : 10 : 5

Sum of the terms of ratio

= 8 + 10 + 5 = 23

Case II

A : B : C = 5 : 4 : 8

Sum of the terms of ratio

= 5 + 4 + 8 = 17

Clearly C gains

C's profit

$= \left(\frac{8}{17} - \frac{5}{23}\right) \times 391$

$= \frac{8}{17} \times 391 - \frac{5}{23} \times 391$

= 184 – 85 = 99 cookies

51. (3) Let the profit be Rs. = x.
S.P. = Rs. $5x$
$\therefore$ C.P. of article = Rs. $(5x - x)$
= Rs. $4x$
$\therefore$ Required ratio = $5x : 4x$
= 5 : 4

52. (2) C.P. of article = Rs. 100 (let)
On 15% loss,
S.P. of article = Rs. 85
$\therefore$ Required ratio
= 100 : 85 = 20 : 17

53. (2) Total investment by B and C
= Rs. 5000
B : C = 2 : 3
$\therefore$ B's investment

= Rs. $\left(\frac{2}{5} \times 5000\right)$

= Rs. 2000
C's investment

= Rs. $\left(\frac{3}{5} \times 5000\right)$

= Rs. 3000
Ratio of the equivalent capitals of A, B and C for 1 month
= 1000 : 2000 : 3000
= 1 : 2 : 3
Sum of the terms of ratio
= 1 + 2 + 3 = 6

$\therefore$ C's share = Rs. $\left(\frac{3}{6} \times 2400\right)$

= Rs. 1200

54. (2) Let the C.P. of article be Rs. $4x$.
Its S.P. = Rs. $5x$
Profit = Rs. $(5x - 4x)$ = Rs. x

$\therefore$ Profit per cent = $\frac{x}{4x} \times 100$

= 25%

55. (2) Ratio of sharing of loss = Ratio of investments
= 3000 : 2400
= 5 : 4
Sum of the terms of ratio
= 5 + 4 = 9
Total loss = Rs. 720
$\therefore$ Loss shared by B

= Rs. $\left(\frac{4}{9} \times 720\right)$ = Rs. 320

57. (2) C.P. of article = Rs. $20x$
S.P. = Rs. $21x$.
$\therefore$ Profit per cent

$= \frac{(21x - 20x)}{20x} \times 100$

$= \frac{100}{20} = 5\%$

58. (4) Profit per cent

$= \frac{26 - 25}{25} \times 100 = \frac{100}{25} = 4\%$

TYPE-V

1. (4) Using Rule 1,
The S.P. after the first discount of 5% on ₹ 80 = ₹$\left(80 - \frac{5 \times 80}{100}\right)$

= ₹ (80 – 4) = ₹ 76
Again, after 5% discount on ₹ 76,

S.P. = ₹$\left(76 - \frac{5 \times 76}{100}\right)$

= ₹ (76 – 3.80) = ₹ 72.20

2. (1) Using Rule 3,
C.P. of first buyer
= ₹ (840 + 10% of 840)
= ₹ (840 + 84) = ₹ 924
Now, this item is sold to the second buyer at 5% loss.
$\therefore$ Final selling price

= ₹ $\left(\frac{95}{100} \times 924\right)$ = ₹ 877.80

3. (3) Using Rule 3,
For two consecutive gains of x% and y%,

Effective gain = $\left(x+y+\frac{xy}{100}\right)\%$

His total gain per cent

$=\left(20+30+\frac{20\times30}{100}\right)=56\%$

4. (1) If the value of a number is first increased by x % and later decreased by x%, the net change is always a decrease which is equal to $\frac{x^2}{100}\%$.

∴ Required decrease

$=\frac{20\times20}{100}=4\%$

5. (2) Gain per cent

$=\left(10+10+\frac{10\times10}{100}\right)\%=21\ \%$

6. (2) Required percent

$=\left(35-20-\frac{35\times20}{100}\right)\%$

$=8\%$

TYPE-VI

1. (4) 90% of C.P. = ₹ 240

∴ C.P = ₹ $\frac{240\times100}{90}$

New S.P. = 120% of C.P.

= ₹ $240\times\frac{100}{90}\times\frac{120}{100}$ = ₹ 320

2. (3) According to question,
S.P. = ₹ 480
Loss% = 20%

∴ Cost price $=\frac{100}{80}\times480$

= ₹ 200

∴ Required price

$=\frac{120}{100}\times600$ = ₹ 720

3. (4) C.P. of that article

$=72\times\frac{100}{100-10}$

$=\frac{72\times100}{90}$ = ₹ 80

∴ S.P. of that article on 5% gain

$=80\times\frac{105}{100}$ = ₹ 84

4. (4) 89% of the cost price
= ₹ 178
∴ 111% of the cost price

= ₹ $\frac{178}{89}\times111$ = ₹ 222

Aliter : Using Rule 3,

C.P. = $178\times\frac{100}{100-11}$

$=\frac{17800}{89}$

C.P. = 200

S.P. = $200\times\left(\frac{100+11}{100}\right)$

= R. 222

5. (3) **Tricky Approach**
Let C.P. = $100x$
$(100-9)x=105$

$(100+30)\%\ x=\frac{105}{91}\times130$

= ₹ 150

Aliter : Using Rule 3,

C.P. = $105\times\left(\frac{100}{100-9}\right)$

$=\frac{105\times100}{91}$

C.P. = $\frac{1500}{13}$

New S.P.= $\frac{1500}{13}\times\left(\frac{100+30}{100}\right)$

= 15 × 10 = Rs150

6. (1) CP of 200kg of sugar
= ₹ (80 × 13.50 + 120 × 16)
= ₹ (1080 + 1920) = ₹ 3000
∴ CP of 1 Kg of sugar

= $\frac{3000}{200}$ = ₹ 15

∴ To gain 20% SP = $15\times\frac{120}{100}$

= ₹ 18 /kg.

7. (2) Let the quantity of water mixed be x kg.
Let the CP of 1 kg of pure milk
= ₹ 1

∴ Gain percent= $\frac{x}{50}\times100$

$\Rightarrow 2x=10\Rightarrow x=5$ kg.

8. (2) SP of article = ₹ 69
Loss % = 8%

∴ CP = ₹ $\frac{100\times69}{92}$

= ₹ 75
New SP = ₹ 78
∴ Gain %

$=\frac{78-75}{75}\times100=4\%$

Aliter : Using Rule 3,

C.P. = S.P. × $\frac{100}{100-\text{Loss}\%}$

$=\frac{69\times100}{100-8}$

$=\frac{6900}{92}$ = Rs. 75

New S.P.= C.P. $\left(\frac{100+\text{Profit}\%}{100}\right)$

$78=75\times\left(\frac{100+\text{Profit}\%}{100}\right)$

7800 = 7500 + 75 Profit%

$\frac{7800-7500}{75}$ = Profit %

$\frac{300}{75}$ = Profit%

Profit% = 4%

9. (4) 100% = 6

C.P. = 80% = $\frac{6}{100}\times80=\frac{24}{5}$

Now, 120% = $\frac{24}{5}$

100% = $\frac{24\times100}{5\times120}=4$

10. (3) Using Rule 3,

C.P. = $\frac{100}{100-\text{Loss}\%}\times$ S.P.

$=\frac{100}{90}\times45000$ = ₹ 50000

∴ S.P. = 115% of ₹ 50000

= ₹ $\frac{50000\times115}{100}$ = ₹ 57,500

11. (1) C.P. of radio = $\frac{100}{110}\times990$

= ₹ 900
∴ Loss = 900 – 890 = ₹ 10
Aliter : Using Rule 3,

C.P. = S.P. $\left(\frac{100}{100+\text{Profit}\%}\right)$

$= 990\left(\frac{100}{100+10}\right)$

$= \frac{99000}{110}$

C.P. = 900

Loss = C.P. – S.P.

= 900 – 890

= ₹ 10

12. (1) C.P. of table

$= 1140 \times \frac{100}{95}$ = ₹ 1200

S.P. at 5% gain

$= \frac{1200 \times 105}{100}$ = ₹ 1260

Aliter : Using Rule 3,

$\text{C.P.} = \text{S.P.}\left(\frac{100}{100-\text{Loss}\%}\right)$

$= 1140\left(\frac{100}{100-5}\right)$

$= \frac{114000}{95}$ = Rs 1200

$\text{S.P.} = \text{C.P.} \times \left(\frac{100+\text{Profit}\%}{100}\right)$

$= 1200\left(\frac{100+5}{100}\right)$

$= 1200 \times \frac{105}{100}$

= ₹ 1260

13. (2) If C.P. of radio be ₹ x, then 10% of x = 100

$\Rightarrow x = 1000$

For a gain of $12\frac{1}{2}\%$

$\text{S.P.} = 1000 \times \frac{\left(100+\frac{25}{2}\right)}{100}$

$= \frac{1000 \times 225}{200}$ = ₹ 1125

Aliter : Using Rule 11,

Here, x = 2.5%,

R = 100, y = $7\frac{1}{2}\%$

$\text{C.P.} = \frac{\text{R}}{\text{y}+\text{x}} \times 100$

$= \frac{100 \times 100}{2.5+7.5}$

= Rs 1000

Now New S.P.

$= \text{C.P.} \times \left(\frac{100+\text{Profit}\%}{100}\right)$

$= 1000\left(\frac{100+12.5}{100}\right)$

= 10 × 112.5

= ₹ 1125

14. (4) C.P. of fan

$= ₹ \left(\frac{600 \times 100}{90}\right)$

∴ Required S.P.

$= \frac{600 \times 100}{90} \times \frac{120}{100}$ = ₹ 800

Aliter : Using Rule 3,

$\text{C.P.} = \text{S.P.}\left(\frac{100}{100-\text{Loss}\%}\right)$

$= \frac{600 \times 100}{100-10}$

$\text{C.P.} = \frac{60000}{90}$

$\text{C.P.} = \frac{6000}{9}$

New S.P.

$= \text{C.P.} \times \left(\frac{100+\text{Pr ofit}\%}{100}\right)$

$= \frac{6000}{9}\left(\frac{100+20}{100}\right)$

$= \frac{60 \times 120}{9}$ = ₹ 800

15. (4) If the initial C.P. of car be Rs. x, then

∴ First S.P. = $\frac{9x}{10}$

$\therefore \frac{9x}{10} \times \frac{120}{100} = 54000$

$\Rightarrow x = \frac{54000 \times 1000}{9 \times 120}$

= ₹ 50000

16. (3) C.P. of article = $\frac{170 \times 100}{85}$

= ₹ 200

∴ Required S.P. = $\frac{200 \times 120}{100}$

= ₹ 240

Aliter : Using Rule 3,

$\text{C.P.} = \text{S.P.}\left(\frac{100}{100-\text{Loss}\%}\right)$

$\text{C.P.} = \frac{170 \times 100}{100-15}$

$= \frac{17000}{85}$

C.P. = Rs. 200

$\text{New S.P.} = \text{C.P.}\left(\frac{100+\text{Profit}\%}{100}\right)$

$= 200\left(\frac{100+20}{100}\right)$

$= \frac{200 \times 120}{100}$ = ₹ 240

17. (1) CP of chair

$= \frac{100}{75} \times 720$ = ₹ 960

To gain 25%, SP

$= \frac{125}{100} \times 960$ = ₹ 1200

Aliter : Using Rule 3,

$\text{C.P.} = \text{S.P.}\left(\frac{100}{100-\text{Loss}\%}\right)$

$= \frac{720 \times 100}{100-25}$

$= \frac{72000}{75}$ = Rs. 960

$\text{New S.P.} = \text{C.P.}\left(\frac{100+\text{Profit}\%}{100}\right)$

$= \frac{960 \times 125}{100}$

= ₹ 1200

18. (1) Let CP of basket be ₹ x.

∴ 130% of x = 19.50

$\Rightarrow \frac{130 \times x}{100} = 19.50$

$\Rightarrow x = \frac{19.50 \times 100}{130}$ = ₹ 15

For 40% gain,

SP = $\frac{140 \times 15}{100}$ = ₹ 21

Aliter : Using Rule 3

$\text{C.P.} = \text{C.P.}\left(\frac{100+\text{Profit}\%}{100}\right)$

$= \frac{19.50 \times 100}{100+30}$

$= \frac{1950}{130}$ = Rs. 15

New S.P.

$= \text{C.P.} \times \left(\frac{100+\text{Profit\%}}{100}\right)$

$= 15\left(\frac{100+40}{100}\right)$

$= \frac{15 \times 140}{100}$

$= \frac{210}{10}$ = ₹ 21

19. (4) Using Rule 1,

CP of 1 egg = $\frac{720}{20 \times 12}$ = ₹ 3

∴ Required SP of 1 egg

$= 3 \times \frac{120}{100}$ = ₹ 3.60

20. (4) Using Rule 3,
CP of the article

$\frac{100}{100 - \text{loss\%}} \times$ S.P.

= ₹ $\left(\frac{100}{95} \times 665\right)$ = ₹ 700

For the gain of 12%
SP of the article = 112% of 700

$= \frac{700 \times 112}{100}$ = ₹ 784

21. (4) Using Rule 3,
C.P. of article

$= \frac{100}{100 - \text{Loss\%}} \times$ S.P.

$= \frac{100}{100-30} \times 700$ = ₹ 1000

S.P. for a profit of 30%

$= 1000 \times \frac{130}{100}$ = ₹ 1300

22. (4) C.P. of wrist watch

$= \frac{720 \times 100}{75}$ = ₹ 960

∴ Required S.P.

$= \frac{960 \times 125}{100}$ = ₹ 1200

23. (3) C.P. of article = ₹ x

∴ S.P. = $\frac{112x}{100}$

New C.P. = $\frac{9x}{10}$

S.P. = $\frac{9x}{10} \times \frac{130}{100} = \frac{117x}{100}$

∴ $\frac{117x}{100} - \frac{112x}{100} = 5.75$

⇒ $\frac{5x}{100} = 5.75$

⇒ $x = \frac{5.75 \times 100}{5}$ = ₹ 115

∴ Required S.P. = $\frac{115 \times 120}{100}$

= ₹ 138

24. (1) Using Rule 3,
C.P. of 80 ball pens

$= 140 \times \frac{100}{70}$ = ₹ 200

For a gain of 30%

S.P. = $\frac{200 \times 130}{100}$ = ₹ 260

∵ ₹ 260 = 80 ball pens

∴ ₹ 104 = $\frac{80}{260} \times 104 = 32$

25. (1) Using Rule 3,
C.P. of 90 ball pens

$= \frac{100}{80} \times 160$ = ₹ 200

S.P. for a gain of 20%

$= \frac{200 \times 120}{100}$ = ₹ 240

∵ ₹ 240 = 90 ball pens

∴ ₹ 96 = $\frac{90}{240} \times 96 = 36$

26. (3) Total cost of rice
= ₹ (3 × 10 + 35 × 11)
= ₹ (300 + 385) = ₹ 685
Required S.P. = Rs. $\left(\frac{685 \times 130}{100}\right)$

Rate per kg = $\frac{685 \times 130}{65 \times 100}$

= ₹ 13.7

27. (4) Actual cost price of flat
= ₹ (925000 + 35000)
= ₹ 960000
S.P. = ₹ 1080000
Profit
= ₹ (1080000 – 960000)
= ₹ 120000
Profit percent

$= \frac{120000}{960000} \times 100 = 12.5\%$

28. (3) C.P. of article = Rs. x

∴ Its S.P. = Rs. $\frac{8x}{5}$

Profit = $\frac{8x}{5} - x = \frac{8x - 5x}{5}$

= Rs. $\frac{3x}{5}$

∴ Profit per cent = $\frac{\frac{3x}{5}}{x} \times 100$

$= \frac{3}{5} \times 100 = 60\%$

29. (1) Let the C.P. of each book be Rs. x.
According to the question,
S.P. of 12 copies = Rs. $(12x + 3x)$
= Rs. $15x$
∴ $15x = 1800$

⇒ $x = \frac{1800}{15}$ = Rs. 120

30. (2) Let the total quantity of sugar be x kg.
According to the question,
(100 – 5)% of x = 5

⇒ $x \times \frac{95}{100} = 5$

⇒ $x = \frac{500}{95} = \frac{100}{19} = 5\frac{5}{19}$ kg.

TYPE-VII

1. (3) Difference in percentage of sales tax

$= \frac{7}{2} - \frac{10}{3} = \frac{21-20}{6} = \frac{1}{6}\%$

∴ Required difference

$= \frac{1}{6}\%$ of 8400

$= \frac{1}{6} \times \frac{1}{100} \times 8400$ = ₹ 14

2. (3) Using Rule 3,
Suppose marked price = ₹ x

∴ S.P.= ₹ $\frac{2x}{3}$

CP = $\frac{2x}{3 \times 90} \times 100 = \frac{20x}{27}$

Profit at marked price

$= x - \frac{20x}{27} = \frac{7x}{27}$

$\therefore$ Per cent profit $= \dfrac{\frac{7x}{27}}{\frac{20x}{27}} \times 100$

$= \dfrac{7x}{27} \times \dfrac{27}{20x} \times 100 = 35\%$

3. (2) Let the CP of the article be ₹ 100.

$\therefore$ SP = Rs. 119

If the marked price be ₹ x, then,

$\dfrac{85}{100}$ of $x = 119$

$\Rightarrow \dfrac{85}{100} \times x = 119$

$\Rightarrow x = \dfrac{119 \times 100}{85} = 140$

Clearly, the marked price is 40% above the cost price.

4. (2) Let the marked price of the television be ₹ x.

CP for Rita = ₹ (16800 – 800)

= ₹ 16000

$\therefore$ 80% of x = 16000

$\Rightarrow x = \dfrac{16000 \times 100}{80}$

= ₹ 20000

5. (1) Let the marked price of the article be ₹ x.

$\therefore \dfrac{90x}{100} = \dfrac{800 \times 112.5}{100}$

$\Rightarrow \dfrac{9x}{10} = 900$

$\Rightarrow x = \dfrac{900 \times 10}{9}$ = ₹ 1000

6. (4) Let the advertised price be x.

$\Rightarrow$ S.P. = $\dfrac{77x}{100}$

$\Rightarrow$ C.P. = $\left(\dfrac{77x}{100} - 56\right)$

$\therefore \dfrac{77x - 5600}{100} \times \dfrac{110}{100} = \dfrac{77x}{100}$

$\Rightarrow \dfrac{77x - 5600}{100} = \dfrac{77x}{110} = \dfrac{7x}{10}$

$\Rightarrow 77x - 5600 = 70x$

$\Rightarrow 7x = 5600$

$\Rightarrow x$ = ₹ 800

7. (3) Let the CP be ₹ 100. Then, SP = ₹ 120.

Let the marked price be x.

Then, 90% of x = 120

$\Rightarrow x = \dfrac{120 \times 100}{90} = \dfrac{400}{3}$

$= 133\dfrac{1}{3}\%$

It means he should mark $33\dfrac{1}{3}\%$ higher than CP.

8. (4) Let the CP of article be 100.

$\therefore$ Marked price = ₹ 110

After 10% discount,

SP = 90% of ₹ 110 = ₹ 99

$\therefore$ Loss = ₹ 1 i.e. 1% of loss

9. (2) Let the original S.P. be x.

C.P. of the article

$= \dfrac{300 \times 100}{150}$ = ₹ 200

After corresponding increases

$\dfrac{x \times 120}{100} - 200 = 2(x - 200)$

$\Rightarrow \dfrac{6x}{5} - 200 = 2x - 400$

$\Rightarrow 6x - 1000 = 10x - 2000$

$\Rightarrow 4x = 1000 \Rightarrow x$ = ₹ 250

10. (4) Marked price of tape recorder

$= \dfrac{1500 \times 120}{100}$ = ₹ 1800

Gain = $\dfrac{1500 \times 8}{100}$ = ₹ 120

Discount = 1800 – (1500 + 120)

= ₹ 180

Let Discount per cent = x%, then

$\dfrac{1800 \times x}{100} = 180$

$\Rightarrow x = 10\%$

Method 2 :

If the discount be x%, then

$20 - x - \dfrac{20x}{100} = 8$

$\Rightarrow 20 - \dfrac{6x}{5} = 8$

$\Rightarrow \dfrac{6x}{5} = 20 - 8 = 12$

$\Rightarrow x = \dfrac{12 \times 5}{6} = 10\%$

11. (1) Let the C.P. be ₹ 100 and the marked price be ₹ x.

$\therefore x \times \dfrac{88}{100} = 132$

$\Rightarrow x = \dfrac{132 \times 100}{88}$

= 150 i.e., more by 50%

12. (1) If the marked price of the washing machine be ₹ x, then

$\dfrac{x \times 88}{100} = \dfrac{7660 \times 110}{100}$

$\Rightarrow x = \dfrac{7660 \times 110}{88}$ = ₹ 9575

13. (1) S.P. of each book = $\dfrac{75 \times 70}{100}$

= ₹ 52.50

Total S.P. = 1600 × 52.50

= ₹ 84000

Gain = 84000 – 70000 = ₹ 14000

$\therefore$ Gain% $= \dfrac{14000}{70000} \times 100 = 20\%$

14. (1) Let list price of article

= ₹ 100

$\therefore$ CP for Richa

$= 100 \times \dfrac{4}{5}$ = ₹ 80

$\therefore$ S.P. for Richa = ₹ 120

$\therefore$ Gain = 120 – 80 = ₹ 40

$\therefore$ Gain per cent $= \dfrac{40}{80} \times 100$

= 50%

15. (4) Let the cost price be 100 and marked price be ₹ x.

Then, $\dfrac{x \times 90}{100} = 108$

$\Rightarrow \dfrac{9x}{10} = 108$

$\Rightarrow x = \dfrac{108 \times 10}{9} = 120$

$\therefore$ Required percentage = 20%

16. (4) Let C.P. of each sari = ₹ x

Marked price = $\left(\dfrac{112x}{100}\right)$

$\therefore \dfrac{95}{100} \times \dfrac{112x}{100} = 266$

$\Rightarrow x = \dfrac{266 \times 100 \times 100}{95 \times 112}$ = ₹ 250

17. (1) Let Marked price = ₹ x

$\therefore$ C.P. = $\dfrac{7x}{10}$

S.P. $= \dfrac{7x}{10} \times \dfrac{140}{100} = \dfrac{98x}{100}$

$\therefore$ Loss $= x - \frac{98x}{100} = \frac{2x}{100}$

$\therefore$ Loss per cent

$= \frac{2x}{100 \times x} \times 100 = 2\%$

18. (4) If the marked price be Rs. 100, then

C.P. = ₹ 75

S.P. = ₹ 100

$\therefore$ Gain per cent $= \frac{25}{75} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$

19. (3) S.P. of article $= \frac{450 \times 90}{100}$

= ₹ 405

20. (3) C.P. of the article = ₹ 100 and marked price = x

$\therefore x \times \frac{90}{100} = 117$

$\Rightarrow x = \frac{117 \times 100}{90}$

= 130 i.e. 30% above C.P.

21. (3) C.P. of article = ₹ 100

$\therefore$ Marked price = ₹ 130

Selling price

$= \frac{130 \times \left(100 - \frac{25}{4}\right)}{100}$

$= \frac{130 \times 375}{400} = ₹\frac{975}{8}$

$= ₹\left(121\frac{7}{8}\right)$

$\therefore$ Gain $= 21\frac{7}{8}\%$

22. (3) C.P. of article = ₹100

Marked price = ₹ 125

S.P. $= \frac{125 \times 84}{100} =$ ₹ 105

Gain per cent = 5%

Method 2 :

Gain per cent

$= \left(25 - 16 - \frac{25 \times 16}{100}\right)\% = 5\%$

Gain % $= \frac{x - y - xy}{100}$

23. (4) Marked price = ₹ x

$\therefore$ C.P. $= \frac{70x}{100} =$ ₹ $\frac{7x}{10}$

$\therefore \frac{7x}{10} \times \frac{125}{100} = 8750$

$\Rightarrow x = \frac{8750 \times 1000}{7 \times 125} =$ ₹ 10000

24. (2) Marked price of article = ₹ x

$\therefore x \times (100 - 12)\% = 440$

$\Rightarrow x \times \frac{88}{100} = 440$

$\Rightarrow x = \frac{440 \times 100}{88} =$ ₹ 500

25. (*)Let the marked price of watch be Rs. x

$\therefore$ S.P = Rs. $\frac{4x}{5}$ = C.P. of Pratap

S.P. for Pratap

= Rs. $\frac{117 \times x}{100}$ = Rs. $\frac{117x}{100}$

$\therefore$ Gain $= \frac{117x}{100} - \frac{4x}{5}$

$= \frac{117x - 80x}{100}$

= Rs. $\frac{37x}{100}$

$\therefore$ Gain percent $= \frac{\frac{37x}{100}}{\frac{4x}{5}} \times 100$

$= \frac{37 \times 5}{4} = 46.25\%$

26. (2) Let the marked price be Rs. 100.

Mohan's C.P. = Rs. 80

Mohan's S.P. $= \frac{80 \times 140}{100}$

= Rs. 112

$\therefore$ Required profit percent = 12%

27. (1) Let the C.P. for Mr. X = Rs.x

According to the question,

$\left(100 + \frac{100}{9}\right)\%$ of $x = 5000$

$\Rightarrow x \times \frac{1000}{900} = 5000$

$\Rightarrow x = \frac{5000 \times 9}{10} =$ Rs. 4500

$\therefore$ Discount

= Rs. (5000 – 4500) = Rs. 500

$\therefore$ Discount per cent

$= \frac{500}{5000} \times 100 = 10\%$

TYPE-VIII

1. (3) Let the cost price of the commodity = ₹ x

According to the question,

$524 - x = x - 452$

or $2x = 524 + 452$

or $2x = 976$

or $x = \frac{976}{2} = 488$

The required price = ₹ 488

2. (2) Let the cost price be x.

$\therefore (100 + x)\%$ of $x = 144$

$\Rightarrow (100 + x)x = 14400$

$\Rightarrow x^2 + 100x - 14400 = 0$

$\Rightarrow x^2 + 180x - 80x - 14400 = 0$

$\Rightarrow x(x + 180) - 80(x + 180) = 0$

$\Rightarrow (x + 180)(x - 80) = 0$

$\Rightarrow x =$ ₹ 80 $[x \neq -180]$

3. (1) CP of 144 hens – SP of 144 hens = Loss = SP of 6 hens

$\therefore$ SP of 150 hens

= CP of 144 hens

Let CP of each hen = ₹ 1

CP of 150 hens = ₹ 150

SP of 150 hens = ₹ 144

$\therefore$ Loss% $= \frac{6}{150} \times 100 = 4\%$

Aliter : Using Rule 9,

Here, x = 144, y = 6

Loss% $= \frac{y \times 100}{x + y}$

$= \frac{600}{144 + 6}$

$= \frac{600}{150} = 4\%$

4. (4) Using Rule 3,

Let the CP of the article be x

Gain % = x%

$\therefore \frac{39 - x}{x} \times 100 = x$

$\Rightarrow 3900 - 100x = x^2$

$\Rightarrow x^2 + 100x - 3900 = 0$

$\Rightarrow x^2 + 130x - 30x - 3900 = 0$

$\Rightarrow x(x + 130) - 30(x + 130) = 0$

$\Rightarrow (x - 30)(x + 130) = 0$

$\Rightarrow x = 30$ as x cannot be negative

5. (1) SP of 12 ball pens = CP of 12 ball pens + SP of 4 ball pens.
$\Rightarrow$ SP of 8 ball pens = CP of 12 ball pens
$\therefore$ Gain per cent

$= \frac{4}{8} \times 100 = 50\%$

Aliter : Using Rule 9,
Here, x = 12, y = 4

$\text{Profit\%} = \frac{y \times 100}{x - y}$

$= \frac{4 \times 100}{12 - 4} = 50\%$

6. (2) Using Rule 3,
Let the cost price of article be ₹ x.

$\therefore \left(\frac{100 + x}{100}\right)$ of $x = 75$

$\Rightarrow x^2 + 100x - 7500 = 0$
$\Rightarrow x^2 + 150x - 50x - 7500 = 0$
$\Rightarrow x(x + 150) - 50(x + 150) = 0$
$\Rightarrow (x - 50)(x + 150) = 0$
$\Rightarrow x = 50$ as x can't be negative

7. (3) Let the C.P. of article be x, then, $425 - x = x - 355$
$\Rightarrow 2x = 425 + 355 = 780$

$\Rightarrow x = \frac{780}{2} =$ ₹ 390

8. (3) S.P. of 3 articles
= C.P. of 21 articles – S.P. of 21 articles
$\Rightarrow$ S.P. of 24 articles
= C.P. of 21 articles

$\therefore$ Loss percent $= \frac{24 - 21}{24} \times 100$

$= 12\frac{1}{2}\%$

Aliter : Using Rule 9,
Here, x = 21, y = 3

$\text{Loss\%} = \frac{y \times 100}{x + y}$

$= \frac{3 \times 100}{21 + 3}$

$= \frac{100}{8} = \frac{25}{2} = 12\frac{1}{2}\%$

9. (2) S.P. of 250 chairs – C.P. of 250 chairs
= S.P. of 50 chairs
$\Rightarrow$ S.P. of 200 chairs
= C.P. of 250 chairs
$\therefore$ profit%

$= \frac{250 - 200}{200} \times 100 = 25\%$

Aliter : Using Rule 9,
Here, x = 250, y = 50

$\text{Profit\%} = \frac{y \times 100}{x - y}$

$= \frac{50 \times 100}{250 - 50}$

$= \frac{50}{2} = 25\%$

10. (4) Let C.P. of a ball = x
S.P. of 17 balls = ₹ 720
$\therefore 17x - 720 = 5x$
$\Rightarrow 12x = 720$
$\Rightarrow x =$ ₹ 60

11. (3) S.P. of 36 oranges = C.P. of 36 oranges – S.P. of 4 oranges
$\Rightarrow$ S.P. of 40 oranges
= C.P. of 36 oranges
$\therefore$ Loss per cent

$= \frac{4}{40} \times 100 = 10\%$

Aliter : Using Rule 9,
Here, x = 36, y = 4

Here, loss % $= \frac{y \times 100}{x + y}$

$= \frac{4 \times 100}{36 + 4} = 10\%$

12. (1) C.P. of first painting

$= \frac{20000 \times 100}{125}$

= Rs. 16000
C.P. of second painting

$= \frac{20000 \times 100}{75} =$ Rs. 26666.7

Loss = Rs. (16000 + 26666.7 – 40000)
= Rs. 2666.7

13. (2) Let the C.P. of each article be Re. 1.
$\therefore$ C.P. of 21 articles = Rs. 21
S.P. of 21 articles = Rs. 28
$\therefore$ Profit per cent

$= \frac{28 - 21}{21} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$

14. (2) Let the C.P. of article be Rs. x.
According to the question,

$x \times \frac{120}{100} = 390$

$\Rightarrow x = \frac{390 \times 100}{120} =$ Rs. 325

15. (3) $\frac{20}{100} = \frac{1}{5} = \frac{\text{C.P.} - \text{S.P.}}{\text{S.P.}}$

$\Rightarrow 5x_1 - 5y = y$
Where C.P. = Rs. x_1,
S.P. = Rs. y
$\Rightarrow 5x_1 = 6y$

$\Rightarrow y =$ Rs. $\frac{5}{6}x_1$

$\therefore x = \frac{x_1 - \frac{5}{6}x_1}{x_1} \times 100$

$= \frac{x_1}{6x_1} \times 100 = \frac{50}{3} = 16\frac{2}{3}\%$

16. (2) Let the C.P. of article be Rs. 100 and its S.P. be Rs. x.
According to the question.

When S.P. = Rs. $\frac{x}{2}$

Loss per cent $= \frac{100 - \frac{x}{2}}{100} \times 100$

$\Rightarrow 100 - \frac{x}{2} = \frac{51}{2}$

$\Rightarrow \frac{x}{2} = 100 - \frac{51}{2} = \frac{200 - 51}{2}$

$\Rightarrow x =$ Rs. 149
$\therefore$ Required profit percent = 49%

TYPE-IX

1. (1) Let the cost price of the article = ₹ x
S.P. at 10% loss

$= x \times \frac{90}{100} = \frac{9x}{10}$

S.P. at $12\frac{1}{2}\%$ gain

$= x \times \frac{100 + 12\frac{1}{2}}{100} = \frac{225x}{200}$

According to the question

$\frac{9x}{10} + 9 = \frac{225x}{200}$

$\Rightarrow 180x + 1800 = 225x$

$\Rightarrow 225x - 180x = 1800$
$\Rightarrow 45x = 1800$
$\therefore x = ₹\ 40$

Aliter : Using Rule 11,
Here, x = 10%, R= 9, y = 12.5%

$$C.P. = \frac{R \times 100}{y + x}$$

$$= \frac{9 \times 100}{12.5 + 10}$$

$$= \frac{900}{22.5} = ₹\ 40$$

2. (2) **Tricky Approach**
80% x + 12 = 110%
Let x be the cost price
$\Rightarrow$ 30% x = 12

$$= \frac{12}{30} \times 100 = ₹\ 40$$

Aliter : Using Rule 11,
Here, x = 20%, R= 12, y = 10%

$$C.P. = \frac{R \times 100}{y + x}$$

$$= \frac{12 \times 100}{20 + 10} = ₹\ 40$$

3. (3) The article is sold at 11% loss.
$\therefore$ 89% of CP = ₹ 178

$$\Rightarrow CP = ₹\ \frac{178 \times 100}{89} = ₹\ 200$$

To gain 11%,
S.P. = 111% of ₹ 200

$$= ₹\ \frac{111}{100} \times 200 = ₹\ 222$$

4. (1) Let the C.P be ₹ x.
First selling price

$$= 90\% \text{ of } x = ₹\ \frac{9x}{10}$$

Second selling price

$$= \left(\frac{9x}{10} + 10\right)$$

$$\therefore 110\% \text{ of } x = \left(\frac{9x}{10} + 10\right)$$

$$\Rightarrow \frac{11x}{10} = \frac{9x}{10} + 10 \Rightarrow \frac{2x}{10} = 10$$

$$\Rightarrow x = \frac{10 \times 10}{2} = 50 = ₹\ 50$$

Aliter : Using Rule 11,
Here, x = 10%, R= 10, y = 10%

$$C.P. = \frac{R \times 100}{y + x}$$

$$= \frac{10 \times 100}{10 + 10} = ₹\ 50$$

5. (3) Let the CP of the book be ₹ x.

$$\text{Initial SP} = \frac{110}{100} \times x = 1.1\ x$$

New CP = 0.96 x
New SP

$$= \left(100 + \frac{75}{4}\right)\% \text{ of } 0.96x$$

$$= \frac{475}{400} \times 0.96x$$

= 1.14 x
Therefore,
1.14 x – 1.1x = 6
$\Rightarrow$ 0.04 x = 6

$$\Rightarrow x = \frac{6}{0.04} = \frac{600}{4} = 150$$

$\therefore$ CP = ₹ 150

6. (4) Let the CP of the typewriter be ₹ x.

$$\text{At 5\% loss, SP} = \frac{95x}{100}$$

$$\text{Now, } \frac{95x}{100} + 80 = \frac{105x}{100}$$

$$\Rightarrow \frac{105x}{100} - \frac{95x}{100} = 80$$

$$\Rightarrow \frac{105x - 95x}{100} = 80$$

$$\Rightarrow x = \frac{8000}{10} = ₹\ 800$$

Aliter : Using Rule 11,
Here, x = 5%, R = 80, y = 5%

$$C.P. = \frac{R \times 100}{y + x}$$

$$= \frac{80 \times 100}{5 + 5} = ₹\ 800$$

7. (3) Let the first CP of the commodity be ₹ 100.
$\therefore$ First SP = ₹ 110
Second CP = ₹ 90

$$\text{Gain\%} = \frac{50}{3}\%$$

$\therefore$ Second SP

$$= \left(100 + \frac{50}{3}\right)\% \text{ of } 90$$

$$= ₹\left(90 \times \frac{350}{300}\right) = ₹\ 105$$

Difference of first and second S.P.
= ₹ (110–105) = ₹ 5
$\because$ If the difference is ₹ 5, the CP = ₹ 100.
$\because$ If the difference be ₹ 2, the

$$CP = \frac{100}{5} \times 2 = ₹\ 40$$

8. (3) Let the CP of the cooker be ₹ x.

$$\therefore \text{ Initial SP} = \frac{116x}{100}$$

$$\text{Again, SP} = \left(\frac{116x}{100} + 20\right)$$

$$\therefore \frac{116x}{100} + 20 = \frac{120x}{100}$$

$\Rightarrow 116x + 2000 = 120x$
$\Rightarrow 4x = 2000$

$$\Rightarrow x = \frac{2000}{4} = ₹\ 500$$

Aliter : Using Rule 11,
Here, x = 16%, R = 20, Y = 20%

$$C.P. = \frac{R \times 100}{y - x}$$

$$= \frac{20 \times 100}{20 - 16}$$

= ₹ 500

9. (3) CP of the article

$$= \left(\frac{100}{112} \times 2576\right) = ₹\ 2300$$

New CP = ₹ 2200
$\therefore$ Gain per cent

$$= \frac{2576 - 2200}{2200} \times 100 = 17\frac{1}{11}$$

10. (4) Let the CP of the article be ₹x
SP of the article at 20% loss

$$= x \times \frac{80}{100} = \frac{4x}{5}$$

In second case,

$$\frac{4x}{5} + 50 = \frac{105x}{100}$$

$$\Rightarrow \frac{4x}{5} + 50 = \frac{21x}{20}$$

$$\Rightarrow \frac{21x}{20} - \frac{4x}{5} = 50$$

$$\Rightarrow \frac{21x - 16x}{20} = 50$$

$$\Rightarrow \frac{5x}{20} = 50$$

$\Rightarrow x$ = ₹ 200

Aliter : Using Rule 11,
Here, x = 20%, R= ₹ 50, y = 5%

$$\text{C.P.} = \frac{R \times 100}{y + x}$$

$$= \frac{50 \times 100}{20 + 5}$$

$$= \frac{50 \times 100}{25} = ₹\ 200$$

11. (2) Let the CP of the article be ₹x.

$$\therefore \frac{120x}{100} - \frac{80x}{100} = 60$$

$\Rightarrow 40x = 60 \times 100$

$$\Rightarrow x = \frac{60 \times 100}{40} = ₹\ 150$$

Aliter : Using Rule 11,
Here, x = 20%, R= ₹ 60, y= 20%

$$\text{C.P.} = \frac{R \times 100}{y + x}$$

$$= \frac{60 \times 100}{20 + 20}$$

$$= \frac{6000}{40} = ₹\ 150$$

12. (2) Let the CP of cycle be ₹x.

$$\text{S.P.} = \frac{108x}{100}$$

$$\frac{108x}{100} + 75 = \frac{114x}{100}$$

$\Rightarrow 108x + 7500 = 114x$

$\Rightarrow 114x - 108x = 7500$

$\Rightarrow 6x = 7500$

$$\Rightarrow x = \frac{7500}{6} = ₹\ 1250$$

Aliter : Using Rule 11,
Here, x = 8%, R= ₹ 75, y = 14%

$$\text{C.P.} = \frac{R \times 100}{y - x}$$

$$= \frac{75 \times 100}{14 - 8}$$

$$= \frac{7500}{6} = ₹\ 1250$$

13. (1) If the cost price of the book be ₹ x, then

$$\therefore \frac{x \times 80}{100} + 108 = \frac{x \times 130}{100}$$

$$\Rightarrow \frac{5x}{10} = 108 \Rightarrow x = ₹\ 216$$

Aliter : Using Rule 11,
Here, x = 20%, R= ₹108, y=30%

$$\text{C.P.} = \frac{R \times 100}{y + x}$$

$$= \frac{108 \times 100}{30 + 20}$$

$$= \frac{10800}{50} = ₹\ 216$$

14. (3) Let the C.P. be ₹ x
x (5% + 5%) = 5 [Being 5% gain]

$$100\% = \frac{5}{10} \times 100 = ₹\ 50$$

Aliter : Using Rule 11,
Here, x = 5%, R= ₹ 5, y = 5%

$$\text{C.P.} = \frac{R \times 100}{y + x}$$

$$= \frac{5 \times 100}{5 + 5} = ₹\ 50$$

15. (3) Let the C.P. of article be ₹x, then

$$\frac{120x}{100} - \frac{115x}{100} = 27$$

$$\Rightarrow \frac{5x}{100} = 27$$

$$\Rightarrow x = \frac{27 \times 100}{5} = ₹\ 540$$

Aliter : Using Rule 11,
Here, x = 15%, R= ₹ 27, y = 20%

$$\text{C.P.} = \frac{R \times 100}{y - x}$$

$$= \frac{27 \times 100}{20 - 15}$$

$$= \frac{27 \times 100}{5} = ₹\ 540$$

16. (3) C.P. of article be ₹x
S.P. at 15% gain

$$= \frac{115x}{100} = \frac{23x}{20}$$

$$\text{New C.P.} = ₹\ \frac{90x}{100}$$

New S.P.

$$= ₹\ \frac{90x}{100} \times \frac{125}{100} = ₹\ \frac{9x}{8}$$

$$\therefore \frac{23x}{20} - \frac{9x}{8} = 4$$

$$\Rightarrow \frac{46x - 45x}{40} = 4$$

$\Rightarrow x = 40 \times 4 = ₹\ 160$

17. (1) If the C.P. of article be ₹ x, then

$$\frac{105x}{100} - \frac{90x}{100} = 90$$

$$\Rightarrow \frac{15x}{100} = 90 \Rightarrow x = \frac{90 \times 100}{15}$$

$x = ₹\ 600$

$$\therefore \text{Original S.P.} = \frac{600 \times 90}{100}$$

$= ₹\ 540$

18. (2) C.P. of article = ₹ x

$$\therefore \text{First S.P.} = \frac{80x}{100} = ₹\ \frac{4x}{5}$$

According to question,

$$\frac{4x}{5} + 200 = \frac{105x}{100} = \frac{21x}{20}$$

$$\Rightarrow \frac{21x}{20} - \frac{4x}{5} = 200$$

$$\Rightarrow \frac{21x - 16x}{20} = 200$$

$$\Rightarrow \frac{5x}{20} = 200 \Rightarrow x = 4 \times 200$$

= ₹ 800

Aliter : Using Rule 11,
Here, x = 20%, R = ₹ 200, y=5%

$$\text{C.P.} = \frac{R \times 100}{y + x}$$

$$= \frac{200 \times 100}{5 + 20}$$

$$= \frac{20000}{25} = ₹\ 800$$

19. (3) C.P. of the article be ₹ x

$$\therefore \text{First S.P.} = \frac{19x}{20}$$

$$\text{C.P.} = \frac{9x}{10}$$

$$\therefore \frac{19x}{20} + 33$$

$$\Rightarrow \frac{9x \times 130}{1000} = \frac{117}{100}x$$

$$\Rightarrow \frac{117x}{100} - \frac{19x}{20} = 33$$

$$\Rightarrow \frac{117x - 95x}{100} = 33$$

$\Rightarrow 22x = 33 \times 100$

$$\Rightarrow x = \frac{33 \times 100}{22} = ₹\ 150$$

20. (1) If the C.P. of article be ₹ x, then

$$x \times \frac{116}{100} + 200 = \frac{x \times 120}{100}$$

$$\Rightarrow x \times \frac{4}{100} = 200$$

$$\Rightarrow x = \frac{200 \times 100}{4} = ₹\,5000$$

Aliter : Using Rule 11,
Here, x = 16%, R= 200, y = 20%

$$\text{C.P.} = \frac{R \times 100}{y - x}$$

$$= \frac{200 \times 100}{20 - 16} = ₹\,5000$$

21. (4) Required S.P. of 150 pens.

$$= 150 \times 12 \times \frac{115}{100} = ₹\,2070$$

S.P. of first 50 pens

$$= \frac{50 \times 12 \times 110}{100} = ₹\,660$$

∴ Required S.P. of 100 pens
= 2070 – 660 = ₹ 1410
C.P. of 100 pens = ₹ 1200

$$\therefore \text{Gain per cent} = \frac{210}{1200} \times 100$$

$$= \frac{35}{2} = 17\frac{1}{2}\%$$

22. (2) C.P. of 1 article = $\frac{1}{4} \times \frac{100}{96}$

$$= ₹\,\frac{25}{96}$$

$$\therefore \text{C.P. of 3 articles} = ₹\,\frac{75}{96}$$

$$\therefore \text{Gain} = 1 - \frac{75}{96} = \frac{96 - 75}{96}$$

$$= \frac{21}{96} = \frac{7}{32}$$

$$\therefore \text{Gain per cent} = \frac{\frac{7}{32}}{\frac{75}{96}} \times 100$$

$$= \frac{7}{32} \times \frac{96}{75} \times 100 = 28\%$$

23. (1) Let the C.P. of article be ₹ x.

$$\therefore \text{S.P.} = \frac{175x}{200}$$

New S.P.

$$= ₹\left(\frac{7x}{8} + 51.80\right)$$

$$\therefore \frac{175x}{200} + 51.8 = \frac{106}{100} \times x$$

$$\Rightarrow \frac{106x}{100} - \frac{175x}{200} = 51.8$$

$$\Rightarrow \frac{212x - 175x}{200} = 51.8$$

$$\Rightarrow 37\,x = 51.8 \times 200$$

$$\Rightarrow x = \frac{51.8 \times 200}{37} = ₹\,280$$

Aliter : Using Rule 11,
Here, x = 12.5%,
R = ₹ 51.80, y = 6%

$$\text{C.P.} = \frac{R \times 100}{y + x}$$

$$= \frac{51.80 \times 100}{12.5 + 6}$$

$$= \frac{5180}{18.5} = ₹\,280$$

24. (4) If the C.P. of watch be ₹ x, then

$$\text{First S.P.} = \frac{9x}{10}$$

$$\therefore \frac{105x}{100} - \frac{9x}{10} = 45$$

$$\Rightarrow \frac{105x - 90x}{100} = 45$$

$$\Rightarrow \frac{15x}{100} = 45$$

$$\Rightarrow x = \frac{45 \times 100}{15} = ₹\,300$$

$$\therefore \text{S. P.} = \frac{300 \times 9}{10} = ₹\,270$$

Aliter : Using Rule 11,
Here, x = 10%, R = ₹45, y = 5%

$$\text{C.P.} = \frac{R \times 100}{y + x}$$

$$= \frac{4500}{10 + 5}$$

$$= \frac{4500}{15} = 300$$

$$\Rightarrow \text{S.P.} = 300 - 300 \times \frac{10}{100}$$

S.P. = ₹ 270

25. (2) C.P. of T.V. for Yogita
= ₹ x (let)
According to question,

$$x \times \frac{120}{100} \times \frac{110}{100} = 33000$$

$$\Rightarrow x = \frac{33000 \times 100 \times 100}{120 \times 110}$$

= ₹ 25000

Aliter : Using Rule 15,
Here, r_1 = 20%, r_2 = 10%
C.P. for Deepa = C.P. for yogita

$$\left(1 + \frac{r_1}{100}\right)\left(1 + \frac{r_2}{100}\right)$$

33000 = C.P. for Yogita

$$\left(1 + \frac{20}{100}\right)\left(1 + \frac{10}{100}\right)$$

C.P. for Yogita =

$$\frac{33000 \times 100 \times 100}{120 \times 110}$$

= ₹ 25,000

26. (4) C.P. for A = Rs. x (let)
According to the question,

$$\frac{x \times 120}{100} \times \frac{75}{100} = P$$

$$\Rightarrow x = \frac{P \times 100 \times 100}{120 \times 75}$$

$$= \text{Rs. } \frac{10}{9}$$

Aliter : Using Rule 15,
Here, r_1 = 20%, r_2 = 25% (Loss)
C.P. for C = C.P. for A

$$\left(1 + \frac{r_1}{100}\right)\left(1 - \frac{r_2}{100}\right)$$

P = C.P. for A

$$\left(1 + \frac{20}{100}\right)\left(1 - \frac{25}{100}\right)$$

$$\text{C.P. for A} = \frac{P \times 100 \times 100}{120 \times 75}$$

$$= \frac{10P}{9}$$

27. (3) Let C.P. of article be Rs. x.

According of the question,

$625 - x = x - 545$

$\Rightarrow 2x = 625 + 545 = 1170$

$\Rightarrow x = \frac{1170}{2}$ = Rs. 585

$\therefore$ Required S.P.

= Rs. (585 + 65)

= Rs. 650

28. (4) C.P. of rice per kg

$= \frac{54 \times 100}{90}$ = Rs. 60

For 20% profit,

S.P. per kg.

$= \frac{60 \times 120}{100}$ = Rs. 72

Aliter : Using Rule 3,

$$\text{C.P.} = \text{S.P}\left(\frac{100}{100 - \text{Loss\%}}\right)$$

$$= 54\left(\frac{100}{100-10}\right)$$

C.P. = Rs. 60

New S.P.

$$= \text{C.P.}\left(\frac{100+\text{Profit\%}}{100}\right)$$

$$= 60 \times \left(\frac{100+20}{100}\right) = ₹\ 72$$

29. (4) Let the quantity of sugar at 8% profit be x kg.

$\therefore$ Quantity of sugar sold at 18% = $(100 - x)$ kg

According to the question,

$$x \times \frac{108}{100} + (1000 - x) \times \frac{118}{100}$$

$$= \frac{1000 \times 114}{100}$$

$\Rightarrow 108x + 118000 - 118x$

$= 114000$

$\Rightarrow 10x = 118000 - 114000$

$\Rightarrow 10x = 4000 \Rightarrow x = 400$ kg

30. (1) C.P. of 12 kg of potatoes

$= \text{Rs.} \left(\frac{63 \times 100}{105}\right)$

= Rs. 60

$\therefore$ C.P. of 50 kg of potatoes

$= \frac{60}{12} \times 50$ = Rs. 250

Loss = Rs. (250 – 247.50)

= Rs. 2.5

$\therefore$ Loss percent $= \frac{2.5}{250} \times 100$

= 1%

31. (1) Let the C.P. of article be Rs. x.

According to the question,

$$\frac{x \times 105}{100} - \frac{x \times 80}{100} = 200$$

$\Rightarrow 105x - 80x = 20000$

$\Rightarrow 25x = 20000$

$\Rightarrow x = \frac{20000}{25}$ = Rs. 800

Aliter : Using Rule 11,

Here, x = 20%, R= 200, y = 5%

$$\text{C.P.} = \frac{100 \times \text{R}}{\text{y} + \text{x}}$$

$$= \frac{100 \times 200}{20+5}$$

$$= \frac{100 \times 200}{25} = \text{Rs. } 800$$

32. (1) C.P. of article sold at loss = Rs. x.

$\therefore$ C.P. of article sold at profit = Rs. $(520 - x)$

According to the question,

$$x \times \frac{10}{100} = (520 - x) \times \frac{16}{100}$$

$\Rightarrow 5x = 520 \times 8 - 8x$

$\Rightarrow 13x = 520 \times 8$

$\Rightarrow x = \frac{520 \times 8}{13}$ = Rs. 320

$\therefore$ Its S.P. $= \frac{320 \times 90}{100}$

= Rs. 288

33. (3) C.P. of article = Rs. x

First S.P. = Rs. $\frac{9x}{10}$

Case II,

C.P. $= \frac{80x}{100}$ = Rs. $\frac{4x}{5}$

According to the question,

$$\frac{4x}{5} \times \frac{140}{100} - \frac{9x}{10} = 55$$

$$\Rightarrow \frac{56x}{50} - \frac{9x}{10} = 55$$

$$\Rightarrow \frac{56x - 45x}{50} = 55$$

$\Rightarrow 11x = 50 \times 55$

$\Rightarrow x = \frac{50 \times 55}{11}$ = Rs. 250

34. (1) Let the C.P. of television be Rs. x.

According to the question,

$(10 - 5)\%$ of $x = 1000$

$\Rightarrow x \times \frac{5}{100} = 1000$

$\Rightarrow x = \frac{1000 \times 100}{5}$ = Rs. 20000

35. (3) C.P. of watch = Rs. x (let)

Difference between selling prices = Rs. (350 – 340)

= Rs. 10

According to the question,

5% of $x = 10$

$\Rightarrow \frac{5x}{100} = 10$

$\Rightarrow 5x = 1000$

$\Rightarrow x = \frac{1000}{5}$ = Rs. 200

36. (3) Let the C.P. of bucket be Rs. x.

According to the question,

$$\frac{108x}{100} - \frac{92x}{100} = 28$$

$\Rightarrow \frac{16x}{100} = 28$

$\Rightarrow x = \frac{28 \times 100}{16}$ = Rs. 175

TYPE-X

1. (4) Let the cost price of the bicycle for A be ₹ x

Cost price for B = selling price for A = 1.20x

Cost price for C = selling price for B = (1.25) (1.20x) = 1.5x

But 1.5x = 225

$\therefore x = \frac{225}{1.5}$ = ₹ 150

$\therefore$ The cost price of the bicycle for A = ₹ 150

Aliter : Using Rule 15,

Here, r_1 = 20%, r_2 = 25%

C.P. for C = C.P. for A

$$\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)$$

225 = C.P. for A

$$\left(1+\frac{20}{100}\right)\left(1+\frac{25}{100}\right)$$

$$\text{C.P. for A} = \frac{225 \times 100 \times 100}{120 \times 125}$$

= ₹ 150

2. (1) Let the actual C.P. be ₹ x

$$x \times \frac{125}{100} \times \frac{125}{100} \times \frac{125}{100} = 250$$

$\Rightarrow x =$ ₹ 128

3. (3) SP for Mr. X

$$= 150000 \times \frac{105}{100} = ₹\ 157500$$

CP for Mr. Y = ₹ 157500

Y sells the article to X at a loss of 2%.

∴ SP for Mr. Y

$$= 157500 \times \frac{98}{100} = ₹\ 154350$$

∴ CP for Mr. X = ₹ 154350

∴ Gain of Mr. X

= ₹ (157500 – 154350)

= ₹ 3150

4. (3) Let the required cost price be ₹ x, then

$$x \times \frac{110}{100} \times \frac{120}{100} \times \frac{85}{100} = 56100$$

$$\Rightarrow x \times \frac{11}{10} \times \frac{6}{5} \times \frac{17}{20} = 56100$$

$$\Rightarrow x = \frac{56100 \times 10 \times 5 \times 20}{11 \times 6 \times 17}$$

= ₹ 50000

5. (2) If the C.P. for A be ₹ x, then

$$x \times \left(1 + \frac{1}{5}\right) \times \frac{120}{100} \times \left(1 - \frac{1}{6}\right)$$

= 600

$$\Rightarrow x \times \frac{6}{5} \times \frac{6}{5} \times \frac{5}{6} = 600$$

$$\Rightarrow x = \frac{600 \times 5}{6} = ₹\ 500$$

6. (1) Let the C.P. for A be ₹ x, then

$$x \times \frac{105}{100} \times \frac{110}{100} = 2310$$

$$\Rightarrow x = \frac{2310 \times 100 \times 100}{105 \times 110}$$

= ₹ 2000

Aliter : Using Rule 15,

Here, r_1 = 5%, r_2 = 10%

C.P. for C = C.P. for A

$$\left(1 + \frac{r_1}{100}\right)\left(1 + \frac{r_2}{100}\right)$$

2310 = C.P. for A

$$\left(1 + \frac{5}{100}\right)\left(1 + \frac{10}{100}\right)$$

$$\text{C.P. for A} = \frac{2310 \times 100 \times 100}{105 \times 110}$$

= 2000

7. (1) Let the C.P. of A be ₹ x, then

$$x \times \frac{110}{100} \times \frac{120}{100} = 264$$

$$\Rightarrow x = \frac{264 \times 100 \times 100}{110 \times 120}$$

= ₹ 200

Aliter : Using Rule 15,

Here, r_1 = 10%, r_2 = 20%

C.P. for C = C.P. for A

$$\left(1 + \frac{r_1}{100}\right)\left(1 + \frac{r_2}{100}\right)$$

264 = C.P. for A

$$\left(1 + \frac{10}{100}\right)\left(1 + \frac{20}{100}\right)$$

$$\text{C.P. for A} = \frac{264 \times 100 \times 100}{110 \times 120}$$

= ₹ 200

8. (3) Let the C.P. of A be ₹ x, then

$$\frac{x \times 125}{100} \times \frac{90}{100} = 675$$

$$\Rightarrow x = \frac{675 \times 100 \times 100}{125 \times 90} = ₹\ 600$$

Aliter : Using Rule 15,

Here, r_1 = 25%, r_2= 10%, (Loss)

C.P. for C = C.P. for A

$$\left(1 + \frac{r_1}{100}\right)\left(1 - \frac{r_2}{100}\right)$$

675 = C.P. for A

$$\left(1 + \frac{25}{100}\right)\left(1 - \frac{10}{100}\right)$$

$$\text{C.P. for A} = \frac{675 \times 100 \times 100}{125 \times 90}$$

= ₹ 600

9. (3) C.P. of tape recorder for A

$$= \frac{4860 \times 100}{(100 - 19)} = \frac{4860 \times 100}{81}$$

= ₹ 6000

$$\therefore \text{ S.P. for B} = \frac{6000 \times 117}{100}$$

= ₹ 7020

∴ B's gain = 7020 – 4860

= ₹ 2160

∴ Required profit percent

$$= \frac{2160}{4860} \times 100 = 44\frac{4}{9}\%$$

10. (4) Let the original cost of the land be ₹ x

According to the question,

$$345600 = P\left(1 + \frac{20}{100}\right)^3$$

$$\Rightarrow 345600 = P\left(\frac{6}{5}\right)^3 = \frac{216P}{125}$$

$$\Rightarrow P = \frac{345600 \times 125}{216} = ₹\ 200000$$

11. (4) Let the C.P. for A be ₹ x, then

$$x \times \frac{110}{100} \times \frac{105}{100} = 462$$

$$\Rightarrow x = \frac{462 \times 100 \times 100}{110 \times 105} = ₹\ 400$$

Aliter : Using Rule 15,

Here, r_1 = 10%, r_2 = 5%

C.P. for C = C.P. for A

$$\left(1 + \frac{r_1}{100}\right)\left(1 + \frac{r_2}{100}\right)$$

462 = C.P. for A

$$\left(1 + \frac{10}{100}\right)\left(1 + \frac{5}{100}\right)$$

$$\text{C.P. for A} = \frac{462 \times 100 \times 100}{110 \times 105}$$

= ₹ 400

12. (4) Using Rule 15,

Price obtained by C

$$= 3200 \times \frac{110}{100} \times \frac{215}{200} \times \frac{75}{100}$$

= ₹ 2838

13. (3) Using Rule 15,

Let C.P. for A be ₹ x

$$\therefore x \times \frac{120}{100} \times \frac{110}{100} \times \frac{225}{200} = 29.70$$

$$\Rightarrow x = \frac{29.70 \times 100 \times 100 \times 200}{120 \times 110 \times 225}$$

= ₹ 20

14. (3) Using Rule 15,

Let the C.P. of the suitcase for A be ₹ x, then

$$x \times \frac{110}{100} \times \frac{130}{100} = 2860$$

$$\Rightarrow x = \frac{2860 \times 100 \times 100}{110 \times 130}$$

= ₹ 2000

TYPE-XI

1. (3) Total S.P. = ₹ 2 lakhs
C.P of house

$= ₹ \left(\frac{100}{80} \times 1\right)$ lakh

$= ₹ \frac{5}{4}$ lakhs

C.P. of shop

$= ₹ \left(\frac{100}{120} \times 1\right)$ lakh

$= ₹ \frac{5}{6}$ lakh

Total C.P.

$= ₹ \left(\frac{5}{4} + \frac{5}{6}\right)$ lakhs

$= ₹ \frac{25}{12}$ lakhs

$\therefore$ Loss $= ₹ \left(\frac{25}{12} - 2\right)$ lakh

$= ₹ \frac{1}{12}$ lakh

2. (4) Using Rule 10,
If a man sells two articles at same price and makes a profit of x% on first and x% loss on second, there is always a loss of $\frac{x^2}{100}\%$

$\therefore$ Loss% $= \frac{(20)^2}{100} = \frac{400}{100} = 4\%$

3. (1) Using Rule 10,

Loss % = x% of x or $\frac{x^2}{100}$

Here, x = 10

$\therefore$ Loss% $= \frac{10 \times 10}{100} = 1\%$

4. (3) Using Rule 10,
Required loss%

$= \frac{(20)^2}{100} = \frac{400}{100} = 4\%$

$\because$ (100 – 4)% ≡ 24

$\therefore$ 4% ≡ $\frac{24}{96} \times 4$ = Loss of ₹1

5. (2) Using Rule 10,
Note : When S.P. of each of two items is same, on one of them there is x% loss and on the other there is x% gain, then there is always a loss given by (x% of x)%

$= \frac{x^2}{100}\%$

$\therefore$ The required loss %

$= \frac{10 \times 10}{100} = 1\%$

6. (2) Using Rule 10,
Here, the S.P. is same for both the machines. Hence, there will be always a loss in this situation.
Required loss %

$= \frac{10 \times 10}{100} = 1\%$

7. (4) Using Rule 10,
Here, S.P. is same. Hence there is always a loss.

Loss per cent $= \frac{20 \times 20}{100} = 4\%$

8. (2) CP of Television

$= \frac{12,000}{80} \times 100$ = ₹ 15000

CP of refrigerator

$= \frac{12,000}{120} \times 100$ = ₹ 10,000

Total C.P.
= 15000 + 10,000 = ₹ 25000
SP of both = ₹ 24,000
$\therefore$ Loss = 25,000 – 24,000
= ₹ 1000

9. (4) Let the amount of sugar sold at 7% profit be x kg. and let C.P. per kg be ₹1.
Total C.P. = ₹ 100
Total S.P. = 107% of x + 117% of $(100 - x)$
$= 1.07x + 1.17\ (100 - x)$
$= 1.07x + 117 - 1.17x$
$= 117 - 0.1x$
$\therefore 117 - 0.1x$
= 110% of 100
$\Rightarrow 0.1x = 117 - 110 = 7$
$\Rightarrow x = \frac{7}{0.1} = 7 \times 10$
= 70 kg.

10. (1) If x and y be the cost price of two goats, then,
80% of x = 144% of y

$\Rightarrow \frac{x}{y} = \frac{144}{80} = \frac{9}{5}$

i.e., $x : y = 9 : 5$
Sum of the ratios = 9 + 5 = 14
$\therefore$ Cost of first goat

$= ₹ \left(\frac{9}{14} \times 1008\right) = ₹ 648$

11. (4) Using Rule 10,
In such a situation, there is always a loss.
The selling price is immaterial.
Loss %

$= \left(\frac{\text{Common loss or gain\%}}{10}\right)^2$

$= \left(\frac{5}{10}\right)^2 \% = 0.25\%$

12. (4) Using Rule 10,
Required loss %

$= \frac{(20)^2}{100} = \frac{400}{100} = 4\%$

13. (4) Using Rule 7,
Required per cent effect

$= \left(20 - 25 - \frac{20 \times 25}{100}\right)\%$

=(–5 – 5)% = – 10% (10% decrease)
Negative sign shows decrease

14. (1) Total CP = ₹ 100
Total SP

$= ₹ \left(\frac{50 \times 120}{100} + \frac{25 \times 80}{100} + 25\right)$

= ₹ (60 + 20 + 25) = ₹105
$\therefore$ Gain% = 5%

$\left[\frac{105 - 100}{100} \times 100\right]$

15. (1) Let the cost price of first watch which sold on 16 per cent be x.
Then cost price of second watch $= (840 - x)$
According to the question,

$x \times \frac{116}{100} + (800 - x) \times \frac{88}{100} = 840$

$\Rightarrow \frac{116}{100} + \frac{73920 - 88x}{100} = 840$

$\Rightarrow 116x - 88x$
$= 84000 - 73920$
$\Rightarrow 28x = 10080$

$\therefore x = \frac{10080}{28}$ = ₹ 360

16. (3) Total SP = ₹ 240000
CP of car

$= ₹ \left(\frac{100}{80} \times 120000\right) = ₹ 150000$

CP of jeep $= ₹ \left(\frac{100}{120} \times 120000\right)$

= ₹ 100000
Total CP = ₹ 250000
$\therefore$ Loss = ₹ (250000 – 240000)
= ₹ 10000

17. (1) Let the price of the sent items be x.
According to the question,

$$\frac{2x}{3}\times\frac{5}{100}-\frac{x}{3}\times\frac{2}{100} = 400$$

$$\Rightarrow \frac{10x}{3}-\frac{2x}{3} = 400 \times 100$$

$$\Rightarrow \frac{8x}{3} = 40000$$

$$\Rightarrow x = \frac{40000\times 3}{8} = ₹\ 15000$$

18. (3) SP of total agricultural field

$$= ₹\left(360000\times\frac{110}{100}\right) = ₹\ 396000$$

SP of one–third of the field

$$= \frac{1}{3}\times 360000\times\frac{80}{100}$$

= ₹ 96000

SP of $\frac{2}{5}$ th of the field

$$= \frac{2}{5}\times 360000\times\frac{125}{100}$$

= ₹ 180000

∴ SP of the remaining field
= ₹ (396000 – 96000 – 180000)
= ₹ 120000

19. (2) The sum of cost prices of two articles is x. One of them is sold at a loss of a% and other is sold at a gain of b% and their S.P. is same.
∴ C.P. of article sold at a loss of a%

$$= \frac{100+b}{200-a+b}\times x$$

$$= \frac{100+15}{200-20+15}\times 19500$$

$$= \frac{115}{195}\times 19500 = ₹\ 11500$$

⇒ C.P. of second article
= ₹ 8000

20. (3) Let the CP of article A be ₹ x
∴ CP of article B = ₹ (5000 – x)
According to the question,
120% of x + 90% of (5000 – x)
= 102% of 5000
⇒ $120x + 450000 - 90x$
= 510000
⇒ $30x = 510000 - 450000$
= 60000

$$\Rightarrow x = \frac{60000}{30} = ₹\ 2000$$

21. (4) Using Rule 10,
Here, both the articles are sold at the same price.
Hence, there is always loss.
∴ Loss per cent

$$= \frac{25\times 25}{100} = \frac{25}{4} = 6\frac{1}{4}\%$$

22. (2) If the C.P. of horse be ₹ x, then C.P. of carriage = ₹ (40000 – x)
Then,

$$\frac{110\times x}{100}+\frac{(40000-x)\times 95}{100}$$

$$= \frac{40000\times 101}{100}$$

⇒ $110x + 3800000 - 95x$
= 4040000
⇒ $15x = 4040000 - 3800000$
⇒ $15x = 240000$

$$\Rightarrow x = \frac{240000}{15} = ₹\ 16000$$

23. (1) If the C.P. of first cycle be ₹ x, then C.P. of second cycle = ₹ (1600 – x). Then,

$$\frac{x\times 120}{100}+\frac{(1600-x)\times 110}{100}$$

$$-\frac{x\times 110}{100}-\frac{(1600-x)\times 120}{100} = 5$$

⇒ $12x + 17600 - 11x - 11x - 19200 + 12x = 50$
⇒ $2x = 50 + 19200 - 17600$
⇒ $2x = 1650 \Rightarrow x = 825$
C.P. of second cycle
= 1600 – 825 = ₹ 775
Difference = 825 – 775 = ₹ 50

24. (3) C.P. of article be ₹ x
∴ (118 – 115)% of x = 18

$$\Rightarrow \frac{x\times 3}{100} = 18$$

$$\Rightarrow x = \frac{18\times 100}{3} = ₹\ 600$$

Aliter : Using Rule 11,
Here, x = 15%, R= 18, y = 18%

$$\text{C.P.} = \frac{R\times 100}{y-x}$$

$$= \frac{18\times 100}{18-15} = ₹\ 600$$

25. (3) Check through option
10% of 3000

$$= \frac{3000\times 10}{100} = ₹\ 300$$

15% of 2000

$$= \frac{2000\times 15}{100} = ₹\ 300$$

26. (3) Let the merchant bought 100 metres of cloth for ₹ 100.
∴ Total S.P.

$$= ₹\left(\frac{50\times 140}{100}+\frac{25\times 60}{100}+25\right)$$

= ₹ (70 + 15 + 25) = ₹ 110
∴ Gain per cent = 10%

27. (2) C.P. of first chair

$$= \frac{100}{125}\times 120 = ₹\ 96$$

C.P. of second chair

$$= \frac{100}{75}\times 120 = ₹\ 160$$

∴ Loss = 160 + 96 – 240
= ₹ 16

28. (3) Let the C.P. of fans be ₹ x and ₹ y respectively.

$$\frac{x\times 15}{100}=\frac{y\times 9}{100}$$

$$\Rightarrow \frac{x}{y}=\frac{9}{15}=\frac{3}{5}$$

C.P. of first fan $= \frac{3}{8}\times 2160$
= ₹ 810

& C.P. of second fan $= \frac{5}{8}\times 2160$
= ₹ 1350

29. (2) S.P. of TV $= 2000\times\frac{120}{100}$
= ₹ 2400

S.P. of radio $= \frac{750\times 95}{100}$
= ₹ 712.5
Total S.P. = 2400 + 712.5
= ₹ 3112.50
∴ Gain = 3112.5 – 2000 – 750
= ₹ 362.50

30. (1) For the sake of convenience, Let the number of toffees of each type bought be 99 (LCM 11 and 9).
CP of first kind of 99 toffees
= ₹ 90
CP of second kind of 99 toffees
= ₹ 110
∴ CP of 198 toffees = ₹ 200
∴ SP of 198 toffees = ₹ 198
Loss = ₹. 2

$$\text{Loss \%} = \frac{2}{200}\times 100 = 1\%$$

31. (1) Let 20 apples of each type be bought.
C.P. of an apple of first type

$$= ₹\ \frac{10}{4}$$

C.P. of an apple of second type

$$= ₹\ \frac{10}{5}$$

C.P. of 40 apples

$$= ₹\left(20\times\frac{10}{4}+20\times\frac{10}{5}\right) = ₹\ 90$$

$$\text{Total S.P.} = \frac{40\times 20}{9} = ₹\ \frac{800}{9}$$

Loss = $90 - \frac{800}{9} = \frac{10}{9}$

$\therefore$ Loss per cent $= \frac{\frac{10}{9}}{90} \times 100$

$= \frac{100}{81} = 1\frac{19}{81}\%$

32. (1) C.P. of 700 gm of tea at ₹18 per 100 gm

= 7 × 18 = ₹ 126

C.P. of 300 gm of tea at ₹ 13 per 100 gm

= 3 × 13 = ₹ 39

Total cost of 1000 gm

= 126 + 39 = ₹ 165

Total S.P. of 1000 gm

= 18.15 × 10= ₹ 181.5

Gain = 181.5 – 165 = ₹ 16.5

Gain percent

$= \frac{16.5}{165} \times 100 = 10\%$

33. (1) Total CP of 70 kg of wheat

= ₹ (30 × 9.5 + 40 × 8.5)

= ₹ (285 + 340) = ₹ 625

Total S.P. of 70kg of wheat

= ₹ (8.90 × 70) = ₹ 623

$\therefore$ Loss = ₹ (625 – 623) = ₹ 2

34. (4) Let 10 articles of each kind be bought.

$\therefore$ Total cost

= ₹ (10 × 10 + 14 × 10) = ₹ 240

Total selling price

= 13 × 20 = ₹ 260

$\therefore$ Gain percent

$= \frac{260 - 240}{240} \times 100$

$= \frac{20 \times 100}{240} = 8\frac{1}{3}\%$

35. (4) C.P. of 40kg of mixture

= ₹ (15 × 29 + 25 × 20)

= ₹ (435 + 500) = ₹ 935

S.P. of 40kg of mixture

= 27 × 40 = ₹ 1080

$\therefore$ Gain = 1080 – 935 = ₹ 145

36. (2) Let total C.P. = ₹ 100 and number of articles = 100.

$\therefore$ Total S.P.

$= ₹ \left(\frac{75 \times 124}{100} + 25\right)$

= ₹ (93 + 25) = ₹ 118

$\therefore$ Gain per cent = 18%

37. (1) Using Rule 1,

Profit per cent

$= \frac{30 - 25}{25} \times 100$

$= \frac{500}{25} = 20\%$

38. (3) Let the C.P. of chair be Rs. x.

$\therefore$ C.P. of table = Rs. (500 – x)

According to the question,

$\frac{110x}{100} + (500 - x) \times \frac{90}{100} = 510$

$\Rightarrow \frac{11x}{10} + 500 \times \frac{9}{10} - \frac{9x}{10}$

$= 510$

$\Rightarrow \frac{2x}{10} + 450 = 510$

$\Rightarrow \frac{2x}{10} = 510 - 450 = 60$

$\Rightarrow x = \frac{60 \times 10}{2}$ = Rs. 300

OR

10% of $x - (500 - x) \times \frac{10}{100}$

$= 10$

$\Rightarrow \frac{x}{10} - 50 + \frac{x}{10} = 10$

$\Rightarrow \frac{2x}{10} = 50 + 10 = 60$

$\Rightarrow 2x = 60 \times 10$

$\Rightarrow x = \frac{60 \times 10}{2}$ = Rs. 300

39. (2) Total profit in sales

$= \text{Rs.} \left(\frac{750 \times 6}{100} - \frac{750 \times 4}{100}\right)$

= Rs. (45 – 30) = Rs. 15

$\left[\begin{array}{l}\text{or, Profit} = (6 - 4)\% \text{ of } 750 \\ = \frac{750 \times 2}{100} = \text{Rs.}15\end{array}\right]$

$\therefore$ Profit per cent $= \frac{15}{1500} \times 100$

$= 1\%$

40. (3) At the rate of 50 paise per metre,

C.P. of 250 metre of wire

$= \text{Rs.} \left(\frac{250 \times 50}{100}\right)$

= Rs. 125

C.P. of 500 metre of wire

= Rs. 250

$\therefore$ For 10% overall profit,

Total S.P. $= \text{Rs.} \left(\frac{250 \times 110}{100}\right)$

= Rs. 275

S.P. of 250 metre of wire

$= \text{Rs.} \left(\frac{125 \times 105}{100}\right)$

= Rs. 131.25

$\therefore$ S.P. of remaining 250 metre wire

= Rs. (275 – 131.25)

= Rs. 143.75

$\therefore$ Required profit per cent

$= \left(\frac{143.75 - 125}{125}\right) \times 100$

$= \frac{18.75 \times 100}{125} = 15\%$

41. (1) Let C.P. of all goods be Rs. 300.

$\therefore$ S.P. of one third goods = Rs. 85

Required S.P. of all the goods

$= \frac{300 \times 110}{100}$ = Rs. 330

$\therefore$ S.P. of goods of worth Rs. 200

= Rs. (330 – 85) = Rs. 245

$\therefore$ Required profit per cent

$= \frac{45}{200} \times 100$

$= \frac{45}{2} = 22\frac{1}{2}\%$

TYPE-XII

1. (4) Let the CP of the article be x.

$\therefore \frac{115x}{100} - \frac{110x}{100} = 10$

$\Rightarrow \frac{5x}{100} = 10$

$\Rightarrow x = \frac{10 \times 100}{5}$ = ₹ 200

2. (2) Using Rule 3,

$\frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100 = 25$ [given]

$\Rightarrow \frac{210}{\text{C.P.}} \times 100 = 25$

$\Rightarrow \text{CP} = \frac{100 \times 210}{25} = 840$

$\therefore$ S.P. $= \frac{125}{100}$ of 840

$= \frac{840 \times 125}{100}$ = ₹ 1050

3. (2) If the cost price of article be x, then

2% of x = 3

$\Rightarrow x = \frac{3 \times 100}{2}$ = ₹ 150

4. (3) Let the C.P. of article be Rs. x.

According to the question,

(104 – 103)% of x = 3

$\Rightarrow \frac{x}{100} = 3 \Rightarrow x$ = Rs. 300

5. (2) Profit per cent at C.P.

$= \frac{\text{Profit}}{\text{Cost Price}} \times 100$

$= \frac{100}{400} \times 100 = 25\%$

Profit per cent at S.P.

$= \frac{\text{Profit}}{\text{S.P.}} \times 100$

$= \frac{100}{500} \times 100 = 20\%$

$\therefore$ Required difference

$= 25 - 20 = 5\%$

TYPE-XIII

1. (2) Selling price = 405 × 110%

= ₹ 445.50

Remaining apples = 10 – 1= 9 kg

Therefore, the remaining apples (per kg) cost

$= \frac{445.50}{9} =$ ₹ 49.50

2. (2) Due to fall in price, there is a saving of 20% of ₹ 100 i.e., ₹ 20. With this amount the purchaser purchases 4 kg. of salt.

$\therefore$ Reduced price of salt per kg

$= \frac{20}{4} =$ ₹ 5

3. (2) Let the original price

= x per dozen

New price

= $(x - 4)$ per dozen

Original number of pins

$= \frac{48}{x}$ dozens

New number of pins

$= \frac{48}{x-4}$ dozens

According to the question,

$\frac{48}{x-4} - \frac{48}{x} = 1$

$\Rightarrow 48\left(\frac{x-x+4}{x(x-4)}\right) = 1$

$\Rightarrow x(x-4) = 48 \times 4$

$\Rightarrow x^2 - 4x - 192 = 0$

$\Rightarrow x^2 - 16x + 12x - 192 = 0$

$\Rightarrow x(x-16) + 12(x-16) = 0$

$\Rightarrow (x-16)(x+12) = 0$

$\Rightarrow x = 16$, because the price of pins can not be negative.

$\therefore x \neq -12$

$\therefore$ New price = 16 – 4

= ₹ 12 per dozen

4. (3) Let the C.P. of article be x.

$\therefore$ 105% of x – 80% of x = 100

$\Rightarrow$ 25% of x = 100

$\Rightarrow x = \frac{100 \times 100}{25} =$ ₹ 400

5. (1) Cost of 2 erasers

= 25% of 1

$= \frac{25}{100} \times 1 =$ ₹ $\frac{1}{4}$

$\Rightarrow$ Cost of one eraser = ₹ $\frac{1}{8}$

$\therefore$ 8 erasers will be available for ₹ 1

6. (2) Let the original rate

= x per kg.

New rate = 85% of x

$= \frac{85x}{100} = \frac{17x}{20}$

Original quantity for ₹ 240

$= \frac{240}{x}$

New quantity $= 240 \times \frac{20}{17x} = \frac{4800}{17x}$

$\therefore \frac{4800}{17x} - \frac{240}{x} = 2$

$\Rightarrow \frac{4800 - 4080}{17x} = 2$

$\Rightarrow \frac{720}{17x} = 2 \Rightarrow x = \frac{720}{2 \times 17}$

$\therefore$ Original rate per kg = ₹ $\frac{720}{34}$

$\therefore$ Reduced rate = ₹ $\frac{17x}{20}$

$=$ ₹$\left(\frac{17}{20} \times \frac{720}{34}\right) =$ ₹ 18

7. (4) Let the original price of 1 mango be x.

New rate = 120% of x

$= \frac{6x}{5}$

Number of mangoes bought in ₹ 40 $= \frac{40}{x}$

New quantity $= \frac{40 \times 5}{6x} = \frac{100}{3x}$

$\therefore \frac{40}{x} - \frac{100}{3x} = 4$

$\Rightarrow \frac{120 - 100}{3x} = 4 \Rightarrow \frac{20}{3x} = 4$

$\Rightarrow 3x = 5 \Rightarrow x =$ ₹ $\frac{5}{3}$

$\therefore$ Price of 15 mangoes before increase $= \frac{5}{3} \times 15 =$ ₹ 25

8. (2) If the C.P. of article be ₹ x, then

$x \times \left(105 - \frac{195}{2}\right)\% = 12$

$\Rightarrow x \times \frac{15}{200} = 12 \Rightarrow x = \frac{12 \times 200}{15}$

= ₹ 160

9. (1) Required profit percent

$= \left(x + y + \frac{xy}{100}\right)\%$

by Here, $x = 25\%$

$y = -\frac{25}{2}\%$

$= \left(25 - \frac{25}{2} - \frac{25 \times 25}{200}\right)\%$

$= \left(\frac{25}{2} - \frac{25}{8}\right)\%$

$= \left(\frac{100 - 25}{8}\right)\%$

$= \frac{75}{8}\% = 9\frac{3}{8}\%$

10. (3) Let the cost price of fan be Rs. x,

According to the question,

10% of x = 1250 – 1000

$\Rightarrow \frac{x \times 10}{100} = 250$

$\Rightarrow x = \frac{250 \times 100}{10} =$ Rs. 2500

Note : Here, increase in loss should be 10%.

11. (2) Cost of production of article

= Rs. 100 (let)

$\therefore$ S.P. = Rs. 133

New cost of production = Rs. 112

$\therefore$ S.P. $= \frac{133 \times 110}{100}$

= Rs. 146.30

$\therefore$ Profit per cent

$= \left(\frac{146.3 - 112}{112}\right) \times 100$

$= \frac{34.3 \times 100}{112} = \frac{3430}{112}$

$= \frac{245}{8} = 30\frac{5}{8}\%$

12. (3) Original price of rice

= Rs. x per kg.

New price

$= \frac{80x}{100} =$ Rs. $\frac{4x}{5}$ per kg

According to the question,

$\frac{1200}{\frac{4x}{5}} - \frac{1200}{x} = 5$

$\Rightarrow \frac{1200 \times 5}{4x} - \frac{1200}{x} = 5$

$\Rightarrow \frac{1500}{x} - \frac{1200}{x} = 5$

$\Rightarrow \frac{300}{x} = 5 \Rightarrow 5x = 300$

$\Rightarrow x = \frac{300}{5}$ = Rs. 60 per kg

∴ New price of rice

= Rs. $\left(\frac{4 \times 60}{5}\right)$ per kg

= Rs. 48 per kg

TYPE-XIV

1. (1) Let the cost price of article be x.

∴ 80% of x = 480

∴ x = $\left(\frac{480 \times 100}{80}\right)$ = ₹ 600

∴ S.P. for 20% profit

= ₹ $\left(\frac{600 \times 120}{100}\right)$ = ₹ 720

2. (4) Let the C.P. be ₹ 100

∴ C.P. – S.P. = $\frac{1}{5}$ S.P.

$\Rightarrow 100 = \left(1 + \frac{1}{5}\right)$ S.P.

$\Rightarrow 100 = \frac{6}{5} \times$ S.P.

$\Rightarrow$ S.P. = $\frac{100 \times 5}{6} = \frac{250}{3}$

∴ Loss % = $\frac{100 - \frac{250}{3}}{100} \times 100$

$= \frac{50}{3}\%$

3. (2) Let the cost price of each toy be x

∴ Cost price of 4 toys

= Selling price of 3 toys = 4x

∴ Selling price of 4 toys

$= \frac{4}{3} \times 4x = \frac{16}{3}x$

% profit = $\frac{\frac{16}{3}x - 4x}{4x} \times 100$

$= \left(\frac{16}{3} - 4\right) \times 25\%$

$= \frac{4}{3} \times 25\% = \frac{100}{3}\% = 33\frac{1}{3}\%$

4. (3) Cost price of house for Y

$= \frac{105}{100} \times 150000 =$ ₹157500

S.P. of house for Y

$= \frac{98}{100} \times$ Rs. 157500 = ₹ 154350

∴ Gain for X

= ₹ (157500 – 154350)

= ₹ 3150

5. (1) Cost price of a book

$= \frac{12000}{200}$ = ₹ 60

∴ Total profit = ₹ 60 × 20

= ₹ 1200

∴ Profit per cent

$= \frac{1200}{12000} \times 100 = 10\%$

6. (4) Let the C.P. of table be x

∴ According to the question

$\left(\frac{x - 350}{x} - \frac{x - 400}{x}\right) \times 100 = 5$

$\Rightarrow \frac{x - 350 - x + 400}{x} \times 100 = 5$

∴ $x = \frac{50 \times 100}{5}$ = ₹ 1000

∵ 5% of C.P. = ₹ 50

∴ C.P. = $\frac{50 \times 100}{50}$ = ₹ 1000

7. (4) Let the C.P. be x

∴ S.P. = $\frac{8}{5}x$

∴ Gain = $\frac{8x - 5x}{5} = \frac{3x}{5}$

Now, Gain % = $\frac{\frac{3x}{5}}{x} \times 100$

$= \frac{3}{5} \times 100 = 60\%$

8. (3) Let the C.P. of the jewel be ₹ 100

S.P. for the first person = ₹ 120

S.P. for the second person

= ₹$120 \times \frac{125}{100}$ = ₹ 150

Now, let the profit earned by the third person be x%

∴ $150 \times \frac{100 + x}{100} = 165$

$\Rightarrow 100 + x = \frac{165 \times 10}{15} = 110$

⇒ x = 110 – 100 = 10%

9. (2) Let the cost price be ₹ 100.

∴ Marked price = ₹ (100 + 15% of 100) = ₹ 115

The goods are sold at the discount of 12%.

∴ S.P. = (115 – 12% of 115)

= ₹ (115 – 13.80) = ₹ 101.20

Profit = ₹ (101.20 –100)

= ₹ 1.20

∴ Profit % = $\frac{1.20}{100} \times 100 = 1.2\%$

$= 1\frac{2}{10} = 1\frac{1}{5}\%$

10. (3) Suppose CP of table be x

SP = $\frac{x \times 110}{100} = \frac{11x}{10}$

CP at 5% less

$= \frac{x \times 95}{100} = \frac{19x}{20}$

According to question

$\frac{19x}{20} \times \frac{120}{100} = \frac{11x}{10} + 80$

$\Rightarrow \frac{57x}{50} - \frac{11x}{10} = 80$

$\Rightarrow \frac{2x}{50} = 80$

$\Rightarrow x = \frac{80 \times 50}{2}$ = ₹ 2000

11. (2) Required per cent increase

$= \frac{10}{90} \times 100 = 11\frac{1}{9}\%$

12. (4) Let 10 quintals of rice be bought.

∴ Actual C.P. of 8kg of rice

= 650 × 10 = ₹ 6500

∴ Required S.P.

$= \frac{6500 \times 120}{100}$ = ₹ 7800

∴ Rate of selling = $\frac{7800}{8}$ = ₹ 975

13. (3) Let the cost price be x

$\therefore$ Gain % = x%

$\therefore$ S.P. = C.P. + x% of C.P.

$\Rightarrow 75 = x + \frac{x^2}{100}$

$\Rightarrow x^2 + 100x - 7500 = 0$

$\Rightarrow x^2 + 150x - 50x - 7500 = 0$

$\Rightarrow x(x + 150) - 50(x + 150) = 0$

$\Rightarrow (x + 150)(x - 50) = 0$

$\Rightarrow x =$ ₹ 50

[as x cannot be negative]

14. (2) Let the cost price be x.

$\therefore$ 125% of x – 120% of x = 35

$\Rightarrow$ 5% of x = 35

$\therefore x =$ ₹ $\frac{35 \times 100}{5}$ = ₹ 700

15. (2) Let the CP be ₹ 100.

$\therefore$ SP = ₹ 120

New SP = ₹ 240

Profit = ₹ (240 –100) = ₹ 140

$\therefore$ Profit % $= \frac{140}{100} \times 100 = 140\%$

16. (3) Let the advertised price be ₹ 100.

$\therefore$ S.P. = ₹ 90, Profit = 20%

$\therefore$ C.P. = ₹ $\left(90 \times \frac{100}{120}\right)$ = ₹ 75

Profit = ₹ (90–75) = ₹ 15

Since for a profit of ₹ 15, the advertised price = ₹ 100

$\therefore$ For a profit of ₹ 7500, the advertised price

= ₹ $\frac{100 \times 7500}{15}$ = ₹ 50000

17. (3) Let the C.P. of article be x.

According to the question,

$\left(100 + \frac{25}{2}\right)\%$ of $x - \left(100 - \frac{25}{2}\right)\%$ of x = 13

$\Rightarrow \frac{x}{100}\left(100 + \frac{25}{2} - 100 + \frac{25}{2}\right) = 13$

$\Rightarrow \frac{x}{100} \times 25 = 13$

$\Rightarrow x = 13 \times 4 =$ ₹ 52

18. (4) Difference of SP

= ₹ (400 – 350) = ₹ 50

Now, 50 = 5% of CP

$\Rightarrow$ CP = $\frac{50 \times 100}{5}$ = ₹ 1000

19. (2) Let the C.P. be x

According to the question,

$\frac{x - 50}{x} \times 100 = \frac{70 - x}{x} \times 100$

$\Rightarrow x - 50 = 70 - x$

$\Rightarrow 2x = 120 \Rightarrow x = \frac{120}{2} = 60$

$\therefore$ Loss % = $\frac{60 - 50}{60} \times 100$

$= \frac{50}{3} = 16\frac{2}{3}\%$

20. (3) Let the C.P. of article = x

According to the question,

$\frac{105x}{100} - \frac{95x}{100} = 5$

$\Rightarrow 105x - 95x = 500$

$\Rightarrow 10x = 500$

$\Rightarrow x = \frac{500}{10}$ = ₹ 50

21. (4) Let marked price be x

$\therefore$ C.P. = $\frac{13}{15}x$

S.P. = $\frac{112x}{100}$

$\therefore$ Profit = $\left(\frac{112x}{100} - \frac{13x}{15}\right)$

$= \left(\frac{336x - 260x}{300}\right) = \frac{76x}{300}$

$\therefore$ Profit %

$= \frac{76x}{300} \times \frac{15}{13x} \times 100$

$= \frac{380}{13} = 29\frac{3}{13}\%$

22. (1) Let the profit per cent made by the second person be x.

$\therefore 38 = \left(x + 20 + \frac{20x}{100}\right)\%$

$\Rightarrow 38 = x + 20 + \frac{x}{5}$

$\Rightarrow \frac{6x}{5} = 38 - 20$

$\Rightarrow x = \frac{18 \times 5}{6} = 15\%$

23. (3) Production cost

$= 1265 \times \frac{100}{125} \times \frac{100}{115} \times \frac{100}{110}$

= ₹ 800

24. (3) Gain percent

$= \left(\frac{110}{100} \times 110 - 100\right)\%$

= (121 – 100)% = 21 per cent

25. (1) By selling 100 pencils, shopkeeper gains the SP of 20 pencils.

Clearly, CP of 100 pencils

= SP of 80 pencils

Let CP of each pencil = ₹ 1.

CP of 80 pencils = ₹ 80

SP of 80 pencils = ₹ 100

$\therefore$ Gain per cent

$= \frac{20}{80} \times 100 = 25\%$

Aliter : Using Rule 9,

Here, x = 100, y = 20

Profit % $= \frac{y \times 100}{x - y}$

$= \frac{20 \times 100}{100 - 20}$

$= \frac{20 \times 100}{80} = 25\%$

26. (3) Let 100 articles be sold and the CP of each article be ₹ 1.

$\therefore$ SP. of 75 articles

= ₹ $\left(\frac{120}{100} \times 75\right)$ = ₹ 90

Profit = ₹ (90 – 75) = ₹ 15

$\therefore$ Profit per cent = $\frac{15}{100} \times 100$

= 15%

27. (2) 15% of CP of article = ₹ 3

$\therefore$ CP of the article

$= \frac{3 \times 100}{15}$ = ₹ 20

28. (3) For the first trader,

Let the CP of the article be 100

$\therefore$ SP = ₹ 120

For the second trader,

SP of the article = ₹ 120

Gain = 20%

Let the CP be x.

$\therefore \frac{120 - x}{120} \times 100 = 20$

$\Rightarrow 120 - x = 20 \times \frac{6}{5} = 24$

$\Rightarrow x = 120 - 24 =$ ₹ 96

$\therefore$ Gain = ₹ 24

Difference of Gain = 24 – 20

= ₹ 4

$\because$ If the difference of gains be ₹ 4, then SP = ₹. 120

$\therefore$ When the difference be ₹ 85,

$$SP = \frac{120}{4} \times 85 = ₹\ 2550$$

29. (2) Let the CP of the article for A be ₹ 100

$\therefore$ CP for B = ₹ 110

Again CP for A

$$= 110 \times \frac{90}{100} = ₹\ 99$$

Gain of A = 110 – 99 = ₹ 11

or 11%

30. (3) Let the CP of the article be Rs. 100 and its SP be x

$$\frac{100 - x}{100} \times 100$$

$$= \frac{2x - 100}{100} \times 100$$

$\Rightarrow 100 - x = 2x - 100$

$\Rightarrow 3x = 200 \Rightarrow x = \frac{200}{3}$

$$\therefore \text{Loss\%} = 100 - \frac{200}{3}$$

$$= \frac{100}{3} = 33\frac{1}{3}\%$$

[because CP of the article = ₹ 100]

31. (1) $\text{Loss\%} = \frac{10 \times 10}{100} = 1\%$

32. (3) Let the CP of the article be x and SP be y.

According to the question,

$$y - x = \frac{20y}{100}$$

$$\Rightarrow y - \frac{y}{5} = x$$

$\Rightarrow 4y = 5x$ ... (i)

$$\text{Actual profit \%} = \frac{y - x}{x} \times 100$$

$$= \frac{4y - 4x}{4x} \times 100 = \frac{5x - 4x}{4x} \times 100$$

= 25%

33. (1) Let CP of each TV be x.

According to the question,

$2(x - 9400) = 10600 - x$

$\Rightarrow 2x - 18800 = 10600 - x$

$\Rightarrow 3x = 10600 + 18800$

= 29400

$$\Rightarrow x = \frac{29400}{3} = ₹\ 9800$$

34. (2) Tricky approach

C.P. of bicycle

$$= \frac{100}{114} \times 2850 = ₹\ 2500$$

S.P. for a profit of 8%

$$= \frac{108}{100} \times 2500 = ₹\ 2700$$

35. (3) $\frac{\text{S.P.} - \text{C.P.}}{\text{S.P.}} \times 100 = 20$

$\Rightarrow$ 5. S.P. – 5. C.P. = S.P.

$\Rightarrow$ 4. S.P. = 5. C.P.

$\therefore$ Required percentage

$$= \frac{5 - 4}{4} \times 100 = 25\%$$

36. (4) If cost price be x and selling price be y, then

$$\text{Profit \%} = \left(\frac{y - x}{x}\right) \times 100$$

$$= \left(\frac{y}{x} - 1\right) \times 100$$

$$\text{Selling price} = \frac{2y}{5}$$

$$\text{Loss} = \left(x - \frac{2y}{5}\right)$$

$$\therefore \frac{x - \frac{2y}{5}}{x} \times 100 = 10$$

$\Rightarrow 10x - 4y = x$

$\Rightarrow 9x = 4y$

$$\Rightarrow \frac{y}{x} = \frac{9}{4}$$

$\therefore$ Initial profit percent

$$= \left(\frac{9}{4} - 1\right) \times 100 = 125\%$$

Method 2 :

Shorter way is to go through options

From the given alternatives (4),

Gain = 125%

If C.P. = ₹100 then

original S.P. = ₹ 225

New S.P. = ₹ 90

Loss% = 10

37. (4) S.P. of first article = ₹ 4,000

gain % of first article = 25%

$\therefore$ C.P. of first article

$$= 4{,}000 \times \frac{100}{125} = ₹\ 3200$$

$\therefore$ Loss on second article

= 4000 – 3200 = ₹ 800

Now C.P. of second article

= 4000 + 800 = ₹ 4800

& S.P. of second article = ₹ 4000

$\therefore$ Loss of second article

= 4800 – 400 = ₹ 800

$$\therefore \text{Loss \%} = \frac{800 \times 100}{4800} = \frac{50}{3}$$

$$= 16\frac{2}{3}\%$$

38. (3) Actual gain percent

$$= \left(5 + 5 + \frac{5 \times 5}{100}\right)\% = 10.25\%$$

39. (2) CP of first article

$$= 5000 \times \frac{100}{125} = ₹\ 4000$$

$\therefore$ Loss on second article = ₹ 1000

$\therefore$ CP of second article = ₹ 6000

$\therefore$ If the loss percent be x%, then

$$\frac{6000 \times x}{100} = 1000$$

$$\Rightarrow x = \frac{50}{3} = 16\frac{2}{3}\%$$

40. (2) Let the S.P. of 60 articles be x.

$$\therefore \text{S.P. of 15 articles} = \frac{x}{4}$$

$\therefore$ C.P. of 60 articles

$$= x - \frac{x}{4} = \frac{3x}{4}$$

$$\therefore \text{Gain \%} = \frac{x}{4} \times \frac{4}{3x} \times 100$$

$$= \frac{100}{3} = 33\frac{1}{3}\%$$

Aliter : Using Rule 9,

Here, x = 60, y = 15

$$\text{Gain\%} = \frac{y \times 100}{x - y}$$

$$= \frac{15 \times 100}{60 - 15}$$

$$= \frac{15 \times 100}{45}$$

$$= \frac{100}{3} = 33\frac{1}{3}\%$$

41. (3) CP of 73 articles = ₹ 5110
∴ CP of 89 articles
$= \frac{5110}{73} \times 89 =$ ₹ 6230
Total SP of 89 articles
= ₹ 5607
Loss = ₹ (6230 – 5607) = ₹ 623
∴ Loss percent
$= \frac{623}{6230} \times 100 = 10\%$

42. (4) Let the C.P. of article be x.
Then, $\left(\frac{78-x}{x}\right) \times 100$
$= 2 \times \left(\frac{69-x}{x}\right) \times 100$
$\Rightarrow 78 - x = 2 \times 69 - 2x$
$\Rightarrow 2x - x = 138 - 78$
$\Rightarrow x =$ ₹ 60

43. (3) Let the merchant bought 100 metres of cloth for ₹ 100.
∴ Total S.P.
$=$ ₹ $\left(\frac{50 \times 140}{100} + \frac{25 \times 60}{100} + 25\right)$
= ₹ (70 + 15 + 25) = ₹ 110
∴ Gain per cent = 10%

44. (2) Gain per cent $= \frac{\text{Gain}}{\text{S.P.}} \times 100$
$\Rightarrow 20 = \frac{\text{S.P.} - \text{C.P.}}{\text{S.P.}} \times 100$
⇒ S.P. = 5 (S.P. – C.P.)
⇒ 5 C.P. = 5 S.P. – S.P. = 4 S.P.
$\Rightarrow$ S.P. $= \frac{5}{4}$ C.P. $= \left(1 + \frac{1}{4}\right)$ C.P.
∴ Required gain per cent = 25%

45. (1) ∵ (40 – 20)% ≡ ₹ 1
∴ 120% ≡ $\frac{1}{20} \times 120 =$ ₹ 6

46. (2) Let C.P. of radio sold on gain = x
C.P. of radio sold on loss
= ₹ (1920 – x)
$\therefore x \times \frac{120}{100}$
$= (1920 - x) \times \frac{\left(100 - \frac{20}{3}\right)}{100}$
$\Rightarrow x \times 120 = (1920 - x) \times \frac{280}{3}$
$\Rightarrow 3x = (1920 - x) \times \frac{7}{3}$
$\Rightarrow 9x + 7x = 1920 \times 7$
$\Rightarrow 16x = 1920 \times 7$
$\Rightarrow x =$ ₹ 840
∴ C.P. of second radio
= ₹ 1080

47. (2) Actual cost price
= 450 + 30 = ₹ 480
∴ Gain percent
$= \frac{600 - 480}{480} \times 100 = 25\%$

48. (1) If the C.P. of article be x, then
$\frac{117x}{100} - \frac{81x}{100} = 162$
$\Rightarrow \frac{36x}{100} = 162$
$\Rightarrow x = \frac{162 \times 100}{36} =$ ₹ 450

49. (3) If the C.P. of wrist watch be x, then
C.P. of wall clock = ₹ (390 – x)
$\therefore \frac{x \times 10}{100} + \frac{(390 - x) \times 15}{100}$
= 51.50
$\Rightarrow 10x + 5850 - 15x = 5150$
$\Rightarrow 5x = 5850 - 5150 = 700$
$\Rightarrow x = \frac{700}{5} =$ ₹ 140
∴ C.P. of wall clock
= 390 – 140 = ₹ 250
∴ Required difference
= 250 – 140 = ₹ 110

50. (2) C.P. of the article
$= \frac{700 \times 100}{140} =$ ₹ 500
∴ New selling price
$= \frac{500 \times 110}{100} =$ ₹ 550

51. (2) Let number of books sold in 2008 = 100
Number of books sold in 2009 = 20
Number of books sold in 2010
= 100
∴ Required percentage increase
$= \frac{100 - 20}{20} \times 100 = 400\%$

52. (2) Gain percent $= \frac{100}{900} \times 100$
$= \frac{100}{9} = 11\frac{1}{9}\%$
Aliter : Using Rule 14,
Gain% $= \frac{1000 - 900}{900} \times 100$
$= \frac{100}{900} \times 100\%$
$= \frac{100}{9}\% = 11\frac{1}{9}\%$

53. (4) C.P. of each article = ₹ 1
∴ Total C.P. = ₹ 200
Total S.P.
$= \frac{60 \times 120}{100} + \frac{140 \times 110}{100}$
= 72 + 154 = ₹ 226
Gain = 226 – 200 = ₹ 26
When gain = ₹ 26, C.P. = ₹ 1
When gain = ₹ 2600,
C.P. = ₹ 100

54. (3) Profit per cent
$= \left(20 - 5 - \frac{20 \times 5}{100}\right)\% = 14\%$

Second Method

Let original price of article
= ₹ 100
C.P. = ₹ 95
S.P. $= \frac{95 \times 120}{100} =$ ₹ 114
∴ Required gain per cent = 14%

55. (1) Gain by false weight
$= \frac{200}{800} \times 100 = 25\%$
∴ Required gain
$= \left(25 + 10 + \frac{25 \times 10}{100}\right)\%$
= 37.5%

56. (3) C.P. of first bullock
$= \frac{100 \times 8400}{120} =$ ₹ 7000
∴ Gain = ₹ 1400
∴ Loss = ₹ 1400
∴ C.P. of second bullock
= 8400 + 1400 = ₹ 9800
If loss be x%, then
$\therefore 9800 \times \frac{x}{100} = 1400$
$\Rightarrow x = \frac{100}{7} = 14\frac{2}{7}\%$

57. (2) Net gain per cent

$$= \left(20 - 15 - \frac{20 \times 15}{100}\right)\%$$

= (20 – 18)% = 2%

58. (2) The C.P. of a cow = be x and that of a goat y.

$3x + 8y = 47200$ ....(i)

$8x + 3y = 100200$ ....(ii)

By equation (i) × 3 – (ii) × 8,

$9x + 24y - 64x - 24y$

= 141600 – 801600

$\Rightarrow 55x = 660000$

$$\Rightarrow x = \frac{660000}{55} = ₹\ 12000$$

59. (4) Marked price of a radio set

$$= \frac{400 \times 130}{100} = ₹\ 520$$

$$\text{S.P.} = \frac{520 \times 92}{100} = ₹\ 478.4$$

$$\therefore \text{Gain per cent} = \frac{78.4}{400} \times 100$$

= 19.6%

60. (2) Profit percent

$$= \frac{150}{1000 - 150} \times 100$$

$$\frac{150 \times 100}{850} = \frac{300}{17} = 17\frac{11}{17}\%$$

Aliter : Using Rule 14,

Gain%=

$$\frac{\text{True weight} - \text{False weight}}{\text{False weight}} \times 100\%$$

$$= \frac{1000 - 850}{850} \times 100\%$$

$$= \frac{150}{850} \times 100\%$$

$$= \frac{300}{17} = 17\frac{11}{17}\%$$

61. (3) C.P. of article be x

$$\therefore \text{First S.P.} = \frac{80x}{100} = ₹\ \frac{4x}{5}$$

$$\frac{4x}{5} + 100 = \frac{x \times 105}{100} = \frac{21x}{20}$$

$$\Rightarrow \frac{21x}{20} - \frac{4x}{5} = 100$$

$$\Rightarrow \frac{21x - 16x}{20} = 100$$

$\Rightarrow 5x = 2000$

$$\Rightarrow x = \frac{2000}{5} = ₹\ 400$$

62. (1) S.P. of 25m of cloth – C.P. of 25m of cloth

= S.P. of 5m of cloth

∴ C.P. of 25m of cloth = S.P. of 20m of lcoth

∴ C.P.= ₹ 20, S.P. = ₹ 25 (let)

∴ Gain per cent

$$= \frac{5}{20} \times 100 = 25\%$$

Aliter : Using Rule 9,

Here, x = 25, y = 5

$$\text{Gain\%} = \frac{y \times 100}{x - y}\%$$

$$= \frac{5 \times 100}{25 - 5}\%$$

$$= \frac{5 \times 100}{20}\%$$

$$= \frac{100}{20} \times 5\%$$

= 25%

63. (2) Total expected S.P.

$$= \frac{96000 \times 110}{100} = ₹\ 105600$$

S.P. of first part

$$= \frac{2}{5} \times 96000 \times \frac{94}{100} = ₹\ 36096$$

S.P. of remaining part

= 105600 – 36096 = ₹ 69504

C.P. of remaining part

$$= \frac{3}{5} \times 96000 = ₹\ 57600$$

Gain = 69504 – 57600

= ₹ 11904

If the gain per cent be x, then

$$\frac{57600 \times x}{100} = 11904$$

$$\Rightarrow x = \frac{11904 \times 100}{57600} = 20\frac{2}{3}\%$$

64. (2) Gain $= X \times \frac{25}{100} = ₹\ \frac{X}{4}$

$$\text{Taxes} = \frac{X}{4} \times \frac{1}{2} = ₹\ \frac{X}{8}$$

65. (2) C.P. of 1 litre of milk = ₹ 1

S.P. of 1 litre of mixture = ₹ 1

∴ C.P. of 1 litre of mixture

$$= \frac{100}{125} \times 1 = ₹\ \frac{4}{5}$$

$$\text{Milk : Water} = \frac{4}{5} : \frac{1}{5} = 4 : 1$$

$$\text{Volume of water mixed} = \frac{1}{5}$$

66. (2) Let. C.P. of 200 eggs be Rs. x, 38 eggs are broken.

∴ S.P. of remaining 200 – 38

= 162 eggs

$$= \text{Rs. } \frac{1}{12}(162 \times 4.80)$$

$$= \text{Rs. } \left(\frac{777.6}{12}\right) = \text{Rs. } 64.8$$

∴ 108% of x = 64.8

$$\Rightarrow \frac{x \times 108}{100} = 64.8$$

$$\Rightarrow x = \frac{64.8 \times 100}{108} = \text{Rs. } 60$$

67. (3) C.P. of article = Rs. 100 (let)

∴ Marked price = Rs. 120

$$\therefore \text{S.P.} = \frac{120 \times 90}{100} = \text{Rs. } 108$$

∵ If S.P. = Rs. 108,

C.P. = Rs. 100

∴ If S.P. = Rs. 216,

$$\text{CP} = \frac{100}{108} \times 216 = \text{Rs. } 200$$

68. (3) C.P. of an apple

$$= \frac{600}{240} = \text{Rs. } 2.5$$

S.P. of an apple = Rs. 3.5

Total profit = Rs. 198

Total S.P. = Rs. (600 + 198)

= Rs. 798

∴ Number of apples sold

$$= \frac{798}{3.5} = 228$$

$\therefore$ Bad apples = 240 – 228 = 12

$\therefore$ Required per cent

$= \frac{12}{240} \times 100 = 5\%$

69. (3) Original price of car = Rs. x (let)

C.P. of car for Amit

$= \frac{90 \times x}{100} = \text{Rs. } \frac{9x}{10}$

Actual C.P.

$= \text{Rs. } \left(\frac{9x}{10} + 5000\right)$

According to the question,

$\left(\frac{9x}{10} + 5000\right) \times \frac{120}{100} = 100000$

$\Rightarrow \frac{9x}{10} + 5000$

$= \frac{100000 \times 100}{120} \approx 83300$

$\Rightarrow \frac{9x}{10} \approx 83300 - 5000 \approx 78300$

$\Rightarrow x \approx \frac{78300 \times 10}{9}$

$\approx$ Rs. 87000

70. (3) Marked price of article = Rs. x (let)

$\therefore$ C.P. of article = Rs. $\frac{5x}{9}$

If the rate of discount be y%, then

$\therefore x \times (100 - y)\% = 120\ \%$ of $\frac{5x}{9}$

$\Rightarrow 100 - y = \frac{5}{9} \times 120$

$\Rightarrow 300 - 3y = 200$

$\Rightarrow 3y = 300 - 200 = 100$

$\Rightarrow y = \frac{100}{3} = 33\frac{1}{3}\%$

71. (2) C.P. of 50 kg of rice

= Rs. (30 × 70 + 20 × 70.75)

= Rs. (2100 + 1415)

= Rs. 3515

S.P. of 50 kg. of rice

= Rs. (50 × 80.50) = Rs. 4025

Profit = Rs. (4025 – 3515)

= Rs. 510

72. (3) C.P of article = Rs. 100 (let)

$\therefore$ Marked price = Rs. 140

At 12% gain, S.P. = Rs. 112

$\therefore$ Discount = 140 – 112

= Rs. 28

If the rate of discount be x%, then

$140 \times x\% = 28$

$\Rightarrow \frac{140 \times x}{100} = 28$

$\Rightarrow x = \frac{28 \times 100}{140} = 20\%$

73. (4) Discount percent = x% (let).

According to the question

$\frac{975 \times x}{100} = 975 - 897$

$\Rightarrow \frac{975x}{100} = 78$

$\Rightarrow x = \frac{78 \times 100}{975} = 8\%$

74. (4) Let the C.P. of article be Rs. 100.

$\therefore$ Marked price = Rs. 120

According to the question,

After a discount of 10%,

S.P. = $\frac{120 \times 90}{100}$ = Rs. 108

$\therefore$ Profit = 108 – 100 = Rs. 8

$\therefore$ Profit per cent = 8

75. (1) C.P. for Y

$= \frac{150000 \times 105}{100} = \text{Rs. } 157500$

S.P. for Y

$= \frac{157500 \times 98}{100} = \text{Rs. } 154350$

$\therefore$ X's gain

= Rs. (157500 – 154350)

= Rs. 3150

76. (2) C.P. of article = Rs. x (let)

S.P. at 5% profit

$= \text{Rs. } \left(\frac{105x}{100}\right) = \text{Rs. } \frac{21x}{20}$

New C.P. of article = $\frac{95x}{100}$

$= \text{Rs. } \frac{19x}{20}$

S.P. = Rs. $\left(\frac{19x}{20} \times \frac{110}{100}\right)$

$= \text{Rs. } \left(\frac{209x}{200}\right)$

According to the question,

$\frac{21x}{20} - \frac{209x}{200} = 2$

$\Rightarrow \frac{210x - 209x}{200} = 2$

$\Rightarrow \frac{x}{200} = 2$

$\Rightarrow x$ = Rs. 400

77. (1) Marked price of bicycle = Rs. x (let).

According to the question,

$x \times 113.5\% = 6810$

$\Rightarrow \frac{x \times 113.5}{100} = 6810$

$\Rightarrow x = \frac{6810 \times 100}{113.5} = \text{Rs. } 6000$

78. (4) S.P. of first book = Rs.= 6

According to the question,

Gain on first 5 books

= 5 + 4 + 3 + 2 + 1 = 15

Loss on last 5 books

= 15

Hence, No loss or gain.

79. (2) Marked price of book

= Rs. x

Its C.P. = Rs. 100

According to the question,

$\frac{x \times 90}{100} = 120$

$\Rightarrow x = \frac{120 \times 100}{90} = \text{Rs. } \frac{400}{3}$

If commission be 15%, then

S. P. = $\frac{400}{3} \times \frac{85}{100} = \frac{340}{3}$

= Rs. 113.33

$\therefore$ Gain % = $13\frac{1}{3}\%$

80. (1) C.P. of umbrella

$= \frac{100}{120} \times 30$ = Rs. 25

S.P. of umbrella after 10% discount

= Rs. $\left(\frac{30 \times 90}{100}\right)$ = Rs. 27

∴ Required gain per cent

$= \left(\frac{27-25}{25}\right) \times 100\ \%$

$= \frac{200}{25}$ = 8%

81. (3) C.P. of vegetables = Rs. 100 per kg.

∵ S.P. of 900 gm. of vegetables = Rs. 120

∴ S.P. of 1000 gm. of vegetables = $\frac{120}{900} \times 1000$

= Rs. 133.33

∴ Gain% = 33.33%

82. (1) C.P. of petrol = Rs. 100 litre

∴ C.P. of kerosene = Rs. 40 litre

Price of 1 litre petrol and 200 ml kerosene

= Rs. 100 + 8 = 108

Gain = Rs. (120 – 108) = Rs.12

∴ Gain percent = $\frac{12}{108} \times 100$

= 11.11%

83. (3) Cost price of article at place A = Rs. x (let).

∴ Price at place B

= Rs. $\frac{85x}{100}$ = Rs. $\frac{17x}{20}$

According to the question,

$x - \left(\frac{17x}{20} + 150\right) = 150$

$\Rightarrow x - \frac{17x}{20} = 300$

$\Rightarrow \frac{20x - 17x}{20} = 300$

$\Rightarrow \frac{3x}{20} = 300$

$\Rightarrow x = \frac{300 \times 20}{3}$ = Rs. 2000

∴ Price at place B

$= \frac{17}{20} \times 2000$ = Rs. 1700

Actual price

= Rs. (1700 + 150) = Rs. 1850

Profit = Rs. (2000 – 1850)

= Rs. 150

∴ Profit percent

= Rs. $\left(\frac{150}{2000} \times 100\right)$

= 7.5%

84. (3) Profit per cent

$= \frac{\text{Error}}{(1000 - \text{Error})} \times 100$

$= \frac{125}{875} \times 100$

$= \frac{100}{7} = 14\frac{2}{7}\%$

85. (2) 30 eggs out of 510 eggs were broken.

∴ C.P. of 480 eggs i.e. 40 dozen of eggs = $\frac{510}{12} \times 20$

= Rs. 850

∴ C.P. of 1 dozen eggs = $\frac{850}{40}$ = Rs. 21.25

∴ For a profit of 20%,

Required S.P. per dozen

= Rs. $\left(\frac{21.25 \times 120}{100}\right)$

= Rs. 25.50

86. (1) C.P. for A = Rs. 100

C.P. for B = Rs. 88

C.P. for C = 88 × $\frac{225}{200}$ = Rs. 99

∴ Required loss per cent

$= \frac{100 - 99}{100} \times 100 = 1\%$

87. (2) Let the C.P. of each cake of type–I be Rs. x and that of type–II be Rs. y.

∴ $3x + 6y = 900$

$\Rightarrow x + 2y = 300$ ..... (i)

Again, $3 \times \frac{115x}{100} + \frac{6 \times y \times 90}{100}$ = 930

$\Rightarrow 115x + 180y = 31000$

By equation (i) × 2 – (ii),

$$\begin{array}{r} 115x + 230y = 34500 \\ \underline{115x + 180y = 31000} \\ 50y = 3500 \end{array}$$

$\Rightarrow y = \frac{3500}{50}$ = Rs. 70

From equation (i),

$x + 2 \times 70 = 300$

$\Rightarrow x$ = Rs. (300 – 140) = Rs. 160

88. (3) C.P. of 30 litre mixture of milk and water = Rs. (25 × 12) = Rs. 300

S.P. of 30 litre mixture

= Rs. (30 × 10.40)

= Rs. 312

Profit = Rs. (312 – 300)

= Rs. 12

∴ Profit per cent = $\frac{12}{300} \times 100$

= 4%

89. (3) Let the C.P. of 1 quintal of wheat be Re.1.

Let the quantity of wheat sold at 33% profit be x quintals.

∴ Quantity of wheat sold at 23% profit = (22 – x) quintals

According to the question,

$x \times \frac{33}{100} + (22 - x) \times \frac{23}{100}$

$= 22 \times \frac{27}{100}$

$\Rightarrow 33x + 22 \times 23 - 23x$

$= 22 \times 27$

$\Rightarrow 10x + 506 = 594$

$\Rightarrow 10x = 594 - 506 = 88$

$\Rightarrow x = \frac{88}{10}$ = 8.8 quintals

= (8.8 × 100) kg. = 880 kg.

90. (4) Let the shopkeeper buy 100 kg. of product.

∴ C.P. of 100 kg. of product

= Rs. (150 × 100)

= Rs. 15000

15% of products is damaged.

∴ S.P. of 85 kg. of product

$= \left(\frac{15000 \times 120}{100}\right)$

= Rs. 18000

∴ S.P. of 1 kg. of product

= Rs. $\left(\frac{18000}{85}\right)$

$= \frac{3600}{17}$ = Rs. $211\frac{13}{17}$

❑❑❑

TEST YOURSELF

1. A salesman mixes two varieties of tea, whose costs are Rs. 60 and Rs. 45 per kg respectively. In what proportion the two varieties are to be mixed so as to make a profit of 25% if the sale price be Rs. 62.50 per kg ?

(1) 2 : 3 (2) 1 : 2
(3) 1 : 3 (4) 2 : 5

2. A publisher printed 3000 copies of a book for sale, the cost of each book being Rs. 7.00. He distributed 500 copies to different institutions free of cost. He allowed a book free of cost for each 24 books purchased. If the price of each book is fixed at Rs. 14.50. determine the rate of profit or loss of the publisher.

(1) 66% loss (2) 66% profit
(3) 60% profit (4) 60% loss

3. Bimalbabu sells two cars each of Rs. 99,000. He makes a profit of 10% on the first car, but incurs a loss of 10% on the second. What will be his percentage of profit or loss on the whole transaction ?

(1) 1% profit (2) 1% loss
(3) 4% profit (4) 4% loss

4. A man purchased some eggs at the rate of Rs. 10 per dozen and again purchased $\frac{3}{4}$ of them at the rate of Rs. 12 per dozen. Then he sold all eggs at the rate of Rs. 13 per dozen and made a profit of Rs. 30. Find the total number of eggs he purchased altogether.

(1) 8 dozens (2) 9 dozens
(3) 10 dozens (4) None of these

5. A soap manufacturer supplies soap to wholesaler at 15% profit, wholesaler supplies these to retailer at 20% profit and retailer sells it to the consumer at 25% profit. If for the consumer the price of soap be Rs. 17.25, what is the manufacturing cost of the soap ?

(1) Rs. 10 (2) Rs. 9
(3) Rs. 12 (4) Rs. 8

6. A man sold an article at a loss of 12%. If he had sold for Rs. 56 more he would have gained 4%. What was the cost price of the article?

(1) Rs. 320 (2) Rs. 330
(3) Rs. 340 (4) Rs. 350

7. A dishonest tradesman marks his goods at an advance of 5 per cent on the cost price, and uses a fraudulent balance whose beam is horizontal when the weight in one scale is one-fifth more than the weight in the other. What is his actual gain per cent ?

(1) 30.25 % (2) 32.25 %
(3) 33.25 % (4) 31.25%

8. A man sells a television set at a profit of 10%. If he had bought it for 10% less and sold it for Rs. 360 less, he would have gained 20%. Find the cost price of the television set.

(1) Rs. 18000 (2) Rs. 18500
(3) Rs. 17000 (4) Rs. 19000

9. The C.P. of two shirts taken together is ₹ 840. If by selling one at a profit of 16% and the other at a loss of 12%, there is no loss or gain in the whole transaction, then the C.P. of the two shirts are respectively :

(1) ₹360, ₹480 (2) ₹480, ₹360
(3) ₹380, ₹460 (4) None of these

10. If sweets are bought at 15 for a rupee, how many must be sold for a rupee to gain 25%?

(1) 10 (2) 11
(3) 12 (4) 8

11. A compact disc player when sold for ₹13,600 incurred a loss of 15 per cent. At what price should it have been sold to make a profit of 35 per cent on the cost?

(1) ₹ 21,600 (2) ₹ 20,400
(3) ₹ 19,600 (4) None of these

12. If the selling price of 20 articles is the same as the cost price of 23 articles, find the profit per cent.

(1) 15% (2) 16%
(3) 8% (4) 12%

13. Ramesh bought two boxes for ₹ 1300. He sold one box at a profit of 20% and the other box at a loss of 12%. If the selling price of both boxes is the same, find the cost price of each box.

(1) ₹ 650, ₹ 650 (2) ₹ 550, ₹ 750
(3) ₹ 450, ₹ 850 (4) None of these

14. A trader sells an article at a profit of 15%. If he had bought it for 15% less and had sold it for ₹ 7.80 less, he would have gained 20%. Find the cost price of the article.

(1) ₹ 65 (2) ₹ 80
(3) ₹ 60 (4) ₹ 70

15. Ram Kumar sold his motor cycle to Mohan at a loss of 28%. Mohan spent ₹ 1680 on its repairs and sold the motor cycle to Sohan for ₹. 35910, thereby, making a profit of 12.5%. Find the cost of the motor cycle for Ram Kumar.

(1) ₹ 38000 (2) ₹ 35000
(3) ₹ 40000 (4) ₹ 42000

16. A shopkeeper reduces the price of his goods by 50% at the time of sale. Initially the price was fixed to get a profit of 25% on selling price after allowing 10% cash discount. Find out his approximate percentage of profit or loss.

(1) 26% loss (2) 28% profit
(3) 30% loss (4) 26% profit

17. A wholesaler sells 20 pens at the marked price (printed on the article) of 16 pens to a retailer. The retailer in turn sells them at the marked price . Determine the gain or loss per cent to the retailer.

(1) 25% loss (2) 25% profit
(3) 20% loss (4) 20% profit

18. A defective briefcase costing ₹ 800 is being sold at a loss of 8%. If the price is further reduced by 5%, find its approximate selling price.

(1) ₹ 600 (2) ₹ 650
(3) ₹ 700 (4) ₹ 725

19. A shopkeeper buys 40 bicycles and marks them at 25% above the cost price. He allows a discount of 10% on the marked price for cash sales, and 5% for credit sales. If three-fourth of the stock is sold for cash and the rest for credit, and if the total profit be ₹ 20250, what is the cost price of a bicycle ?

(1) ₹ 4000 (2) ₹ 3500
(3) ₹ 3200 (4) ₹ 3600

20. A dealer sold two coolers at ₹ 2,970 each. On selling one cooler, he gained 10%, on selling the other he lost 10%. Find the dealer's gain or loss per cent.

(1) 1% loss (2) 1% gain
(3) 2% loss (4) 2% gain

21. A man buys some quantity of wheat for ₹ 2400. He sells one-third of it at a profit of 5%. At what per cent gain should he sell the remaining two-third so as to make an overall profit of 10% on the whole transaction?
(1) 11.5% (2) 12.5%
(3) 13% (4) 13.5%

22. A man purchases some mangoes at the rate of 3 for ₹ 4 and the same quantity at 5 for ₹ 6. If he sells all the mangoes at the rate of 3 for ₹ 5, find his approximate gain or loss per cent.
(1) 35% loss (2) 32% loss
(3) 32% profit (4) 35% gain

23. What per cent above cost price should goods be marked for sale so that after allowing $12\frac{1}{2}\%$ trade discount and 5% cash discount, a net gain of 33% may be earned ?
(1) 45% (2) 40%
(3) 50% (4) 60%

24. *A*, *B* and *C* invest ₹ 15000, ₹ 20000 and ₹ 25000 respectively in a business. The profit earned is ₹ 1200. Find the share of A in the profit.
(1) ₹ 300 (2) ₹ 400
(3) ₹ 500 (4) ₹ 600

25. ₹ 52000 is to be divided among the partners *A*, *B* and *C*. The ratio of their investments is $\frac{1}{12}:\frac{1}{18}:\frac{1}{24}$. Find the share of A.
(1) ₹ 16000 (2) ₹ 24000
(3) ₹ 12000 (4) ₹ 18000

26. *A*, *B* and *C* invest ₹ 1000, ₹ 4000 and ₹ 5000 respectively in a business. At the end of the year the balance sheet shows a loss of 20% of the total initial investment. Find the share of loss of B.
(1) ₹ 1000 (2) ₹ 200
(3) ₹ 800 (4) ₹ 1200

27. *A*, *B* and *C* enter into a partnership. *A* invests ₹ 2400 for 4 years, *B* ₹ 2800 for 8 years and *C* ₹ 2000 for 10 years. They earn ₹ 1170. Find the share of each.
(1) ₹ 420 (2) ₹ 540
(3) ₹ 108 (4) ₹ 216

28. *A* and *B* are partners in a firm. *A* invests ₹ 15000 and *B* ₹ 25000. *A* is the working partner and gets 20% of the profit for his contribution in the management of the firm. *B* is the sleeping partner. If the profit is ₹ 475, find the share of B.
(1) ₹ 237.5 (2) ₹ 257.5
(3) ₹ 247.5 (4) ₹ 238.5

29. *A* starts an industry with ₹ 20 lakhs. After 4 months he enters into a partnership with *B* who contributes ₹ 40 lakhs. *C* joins them after another 3 months with a capital of ₹ 60 lakhs. At the year end, the balance sheet shows a profit of ₹ 74000. Find the share of A in the profit.
(1) ₹ 32000 (2) ₹ 24000
(3) ₹ 18000 (4) ₹ 16000

30. Ravi and Shyam enter into a partnership and together start a business with contributions of Rs. 15000 and ₹ 20000. After 4 months Mohan also joins them with contribution of ₹ 22500. After 9 months Shyam withdraws his contribution. At the end of the year there is a profit of ₹ 9000. Find the share of each in the profit.
(1) ₹ 4000 (2) ₹ 3000
(3) ₹ 3500 (4) ₹ 3600

31. *A*, *B* and *C* invest their capital into a partnership business in the following manner; A invests one-half of the capital for three- fourth of the time, *B* invests one-third of the capital for one-half of the time and *C* invests the remaining capital for the whole time. If the profit earned is ₹ 510, how should A get ?
(1) ₹ 260 (2) ₹ 250
(3) ₹ 270 (4) ₹ 280

32. Ravi starts a business with ₹ 45000. After a certain period of time he is joined by Mohan who invests ₹ 30000. At the end of the year they divide the profit in the ratio 9 : 4. When did Mohan join Ravi?
(1) After 3 months
(2) After 5 months
(3) After 6 months
(4) After 4 months

33. *A*, *B* and *C* enter into partnership with capital contribution of ₹ 25,000, ₹ 30,000 and ₹ 15,000 respectively. *A* is the working partner and he gets 30% of the profit for managing the business. The balance profit is distributed in proportion to the capital investment. At the year-end, *A* gets Rs. 200 more than *B* and *C* together. Find the total profit.
(1) ₹ 2500 (2) ₹ 2000
(3) ₹ 2200 (4) ₹ 2400

34. *A* and *B* enter into partnership with capital contribution of ₹ 5000 and ₹ 4000 respectively. After $\frac{1}{6}$th of the time *A* contributes additional ₹ 2000. Four months after the start *B* withdraws $\frac{1}{4}$th his capital, then *C* joins the business with a capital investment of ₹ 5000. At the end of the year the company's balance-sheet shows a profit of ₹ 2804. Find the share of *A* in the profit.
(1) ₹ 1402 (2) ₹ 701
(3) ₹ 1420 (4) ₹ 820

35. *A* and *B* enter into partnership and invest in stock market trading. Their investments initially were ₹ 50000 and ₹ 45000. After 4 months *A* withdraws half his capital. At the end of 8 months *B* withdraws half his capital and *C* joins them with a capital of ₹ 70000. What should be the ratio in which the profit will be divided at the year-end?
(1) 40 : 35 : 21 (2) 40 : 45 : 28
(3) 40 : 28 : 21 (4) None of these

36. *A*, *B* and *C* together hold a pasture for which they pay a rent at the rate of ₹ 160 per month. They put on it 70, 50 and 40 cows respectively. *A* sells $\frac{2}{7}$th of his stock to *B* after 4 months and further 3 months later *C* sells $\frac{2}{5}$th of his stock to *A*. How much of the rent should A pay in one year?
(1) ₹ 500 (2) ₹ 400
(3) ₹ 760 (4) ₹ 560

37. Ram and Shyam enter into a partnership by contributing capitals in the ratio 16 : 7. After 5 months Ram withdraws. If finally they share profit in the ratio of 5 : 7, find how long Shyam's capital was used ?
(1) 15 months (2) 14 months
(3) 12 months (4) 16 months

38. *A*, *B* and *C* enter into a partnership and invest their capital in the ratio 4 : 8 : 9. Their period of investment are in the ratio 6 : 3 : 5. In what ratio would they distribute their profits?

(1) 4 : 4 : 15 (2) 8 : 8 : 15
(3) 3 : 3 : 10 (4) 3 : 10 : 15

39. *A*, *B* and *C* enter into a partnership. Their capital contribution is in the ratio 21 : 18 : 14. At the end of the business term they share profits in the ratio 15 : 8 : 9. Find the ratio of time for which they invest their capitals.
(1) 37 : 38 : 72 (2) 39 : 38 : 72
(3) 90 : 56 : 81 (4) None of these

40. *A*, *B* and *C* enter into a partnership. Their contributions are Rs. 30 lakhs, Rs. 20 lakhs, and Rs. 10 lakhs respectively. *A* and *B* are working partners while *C* is a sleeping partner. *A* and *B* get 10% and 15% of gross profit respecitvely as salary for managing the business. If at the year end *C* receives ₹ 3.75 lakhs, as profit, find the share of *A*.
(1) ₹ 16 Lakhs (2) ₹ 12 Lakhs
(3) ₹ 18 Lakhs (4) ₹14.25 Lakhs

SHORT ANSWERS

1. (2)	**2.** (2)	**3.** (2)	**4.** (1)
5. (1)	**6.** (4)	**7.** (4)	**8.** (1)
9. (1)	**10.** (3)	**11.** (1)	**12.** (1)
13. (2)	**14.** (3)	**15.** (4)	**16.** (1)
17. (2)	**18.** (3)	**19.** (4)	**20.** (1)
21. (2)	**22.** (3)	**23.** (4)	**24.** (1)
25. (2)	**26.** (3)	**27.** (4)	**28.** (1)
29. (2)	**30.** (2)	**31.** (3)	**32.** (4)
33. (2)	**34.** (1)	**35.** (2)	**36.** (3)
37. (4)	**38.** (2)	**39.** (3)	**40.** (4)

EXPLANATIONS

1. (2) C.P. of 1 kg of mixture

$$= \frac{100}{100+25} \times 62.50 = \text{Rs. } 50$$

By alligation rule,

Kind I Rs. 60 — Kind II Rs. 45

Rs. 50

Rs. (50 – 45) = Rs. 5 — Rs. (60 – 50) = Rs. 10

Required ratio = 5 : 10 = 1 : 2

2. (2) Total cost of the books
= Rs. (3000 × 7) = Rs. 21000
500 books are given free of cost.
Selling price for 25 books
= 24 × 14.50 = Rs. 348
∴ Total selling price = Rs. 34800
∴ Gain = Rs. (34800 – 21000)
= Rs. 13800
∴ Gain%

$$= \frac{13800}{21000} \times 100 \approx 66\%$$

3. (2) C.P. of car sold at 10% profit

$$= \frac{100}{100+\text{gain\%}} \times \text{S.P.}$$

$$= \frac{100}{110} \times 99000 = \text{Rs. } 90000$$

C.P. of car sold at 10% loss

$$= \frac{100}{90} \times 99000 = \text{Rs. } 110000$$

Total C.P.
= Rs. (90000 + 110000)
= Rs. 200000
Total S.P. = Rs. 2 × 99000
= Rs. 198000
∴ Loss = Rs. 2000

$$\therefore \text{Loss\%} = \frac{2000}{200000} \times 100 = 1\%$$

Short - cut Method

If two things are sold at the same price and loss and gain per cent be same i.e. *x*% then there is always loss.

$$\text{and loss \%} = \frac{x^2}{100}\%$$

$$= \frac{10 \times 10}{100} = 1\%$$

4. (1) Let the total number of eggs be *x* dozens.
∴ Total C.P.

$$= \text{Rs. } \left(10x + \frac{3}{4}x \times 12\right)$$

$$= \text{Rs. } \left(\frac{40x + 36x}{4}\right)$$

$$= \text{Rs. } \frac{76x}{4} = \text{Rs. } 19x$$

$$\text{Total S.P.} = \left(x + \frac{3}{4}x\right) \times 13$$

$$= \frac{7 \times 13x}{4} = \text{Rs. } \frac{91x}{4}$$

$$\therefore \frac{91x}{4} - 19x = 30$$

$\Rightarrow 91x - 76x = 30 \times 4$
$\Rightarrow 15x = 30 \times 4$

$$\Rightarrow x = \frac{30 \times 4}{15} = 8 \text{ dozens.}$$

5. (1) Manufacturing cost

$$= \frac{100}{115} \times \frac{100}{120} \times \frac{100}{125} \times 17.25$$

= Rs. 10

6. (4) Let the C.P. be Rs. *x*.

$$\text{S.P.} = \frac{88x}{100} = \text{Rs. } \frac{22x}{25}$$

$$\text{New S.P.} = \text{Rs. } \left(\frac{22x}{25} + 56\right)$$

$$\therefore \frac{22x}{25} + 56 = \frac{104x}{100} = \frac{26x}{25}$$

$$\Rightarrow \frac{4x}{25} = 56 \Rightarrow x = \frac{56 \times 25}{4}$$

= Rs. 350

7. (4) A packet of goods marked 1 kg
Actual weight = 800 gm.
C.P. at Re. 1/gm = Rs. 800
S.P. of this packet

$$= \frac{105}{100} \times 1000 = \text{Rs. } 1050$$

$$\text{Gain \%} = \frac{250}{800} \times 100$$

= 31.25

8. (1) Let the C.P. of television set be Rs. *x*.

$$\text{First S.P.} = \text{Rs. } \frac{110}{100}x$$

$$= \text{Rs. } \frac{11}{10}x$$

$$\text{New C.P.} = \text{Rs. } \frac{9x}{10}$$

$$\text{New S.P.} = \text{Rs. } \frac{9x}{10} \times \frac{120}{100}$$

$$= \text{Rs. } \frac{27x}{25}$$

$$\therefore \frac{11x}{10} - \frac{27x}{25} = 360$$

$$\Rightarrow \frac{55x - 54x}{50} = 360$$

$\Rightarrow x = 360 \times 50 = \text{Rs. } 18000$

9. (1) Let the CP of shirt sold at 16% gain be Rs. x.

$\therefore\ x \times \frac{116}{100} + (840 - x) \times \frac{88}{100}$

$= 840$

$\Rightarrow 116x + 88 \times 840 - 88x$

$= 84000$

$\Rightarrow 28x = 84000 - 88 \times 840$

$= 840 \times 12$

$\Rightarrow x = \frac{840 \times 12}{28}$ = Rs. 360

CP of second shirt = 840 – 360

= Rs. 480

Alternate Method

Let the CP of shirt sold at gain be Rs. x and that of shirt sold at loss be Rs. y.

$\therefore\ x \times \frac{16}{100} = y \times \frac{12}{100}$

$\Rightarrow \frac{x}{y} = \frac{3}{4}$

$\Rightarrow x = \frac{3}{7} \times 840$ = Rs. 360

$y = \frac{4}{7} \times 840$ = Rs. 480

10. (3) Required answer

$= \frac{15 \times 100}{125} = 12$

11. (1) CP of a compact disc player

$= 13600 \times \frac{100}{85}$ = Rs. 16000

SP for a gain of 35%

$= \frac{16000 \times 135}{100}$

= Rs. 21600

12. (1) Let the, SP of 20 articles be x.

then, SP of 1 articles = $\frac{x}{20}$

Also the cost price of 23 articles = x

Then, CP of 1 article = $\frac{x}{23}$

Profit = SP – CP

$= \frac{x}{20} - \frac{x}{23} = \frac{23x - 20x}{460} = \frac{3x}{460}$

Profit % = $\frac{\text{Profit}}{\text{CP}} \times 100$

$= \frac{\frac{3x}{460}}{\frac{x}{23}} \times 100$

$= \frac{3x}{460} \times \frac{23}{x} \times 100 = 15\%$

13. (2) Total price of two boxes

= ₹ 1300

Let CP of one box = x

Then CP of other box = $(1300 - x)$

Profit on 1st box = 20%

$\therefore$ SP of 1st box

$= x + \frac{20}{100}x$

$= \frac{100x + 20x}{100}$ = Rs. $\frac{120x}{100}$

Loss on 2nd box = 12%

$\therefore$ SP of 2nd box = CP – Loss

$= (1300 - x) - \frac{12}{100}(1300 - x)$

$= (1300 - x)\left(1 - \frac{12}{100}\right)$

$= (1300 - x) \times \frac{88}{100}$

$= 1144 - \frac{88x}{100}$

But SP of both boxes is same

$\Rightarrow \frac{120x}{100} = 1144 - \frac{88x}{100}$

$\Rightarrow \frac{120x}{100} + \frac{88x}{100} = 1144$

$\Rightarrow \frac{208x}{100} = 1144$

$\Rightarrow x = \frac{1144 \times 100}{208} = 550$

$\therefore$ Cost price of 1st box

= ₹ 550

and cost price of another box

= ₹1300 – ₹ 550 = ₹ 750

14. (3) Let C.P. of the article = ₹ 100

$\therefore$ The first selling price

= ₹ 100 + ₹ 15 = ₹ 115

Now, C.P. = 100 – 15 = ₹ 85

S.P. = ₹ $\left(\frac{85 \times 120}{100}\right)$ = ₹ 102

Difference in S.P.

= ₹ 115 – ₹ 102 = ₹ 13

$\because$ If difference is ₹ 13, then C.P.

= ₹ 100

$\therefore$ If difference is ₹ $\frac{78}{10}$, the

C.P. $= \frac{100}{13} \times \frac{78}{10}$ = ₹ 60

15. (4) Let CP of motor cycle for Ram Kumar be x

SP for Ram Kumar

$= x - \frac{28}{100}x = \frac{72}{100}x$

$\therefore$ Cost for Mohan = $\frac{72}{100}x$

Cost of repairing = ₹ 1680

$\therefore$ Total CP for Mohan

= ₹ $\frac{72}{100}x + 1680$

Profit earned by Mohan = 12.5%

SP for Mohan = CP + Profit

$= \frac{72}{100}x + 1680$

$+ \frac{12.5}{100}\left(\frac{72}{100}x + 1680\right)$

SP = $\left(\frac{72x}{100} + 1680\right)\left(\frac{112.5}{100}\right)$

But, SP for Mohan is given

= Rs. 35910

$\therefore \left(\frac{72x}{100} + 1680\right)\left(\frac{112.5}{100}\right)$

= ₹ 35910

$\Rightarrow \left(\frac{72x}{100} + 1680\right) = \frac{35910 \times 100}{112.5}$

$\Rightarrow \frac{72x}{100} + 1680 = 31920$

$\Rightarrow x = \frac{30240 \times 100}{72}$

= ₹ 42000

So, the cost price of the motor cycle for Ram Kumar = ₹ 42,000

16. (1) Let initial S.P. = ₹ 100

profit = 25% of 100 = 25

$\therefore$ C.P. = 100 – 25 = ₹ 75

Now, when

Marked Price	Discount	S.P.
100	10	90
x	—	100

$\therefore x = \frac{100 \times 100}{90} = ₹\frac{1000}{9}$

$\therefore$ New S.P. = 50% of

₹ $\frac{1000}{9}$, i.e., $\frac{1000}{9} \times \frac{50}{100}$

= ₹ $\frac{500}{9}$ = ₹ $55\frac{5}{9}$

∴ Loss = ₹ 75 (Old Price) – ₹ $55\frac{5}{9}$ (New S.P.) = ₹ $19\frac{4}{9}$

∴ When

S.P.	Loss per cent
75 ↑	$19\frac{4}{9}$ ↓
100	y

where y = loss per cent

∴ $y = \frac{100}{75} \times \frac{175}{9}$

Loss per cent = $\frac{700}{27} = 25\frac{25}{27}\%$

= 26% (approx)

17. (2) Let the marked price of 1 pen = ₹ 100

∴ MP of 20 pens

= 20 × 100 = ₹ 2000

MP of 16 pens

= 16 × 100 = ₹ 1600

CP of 20 pens for retailer

= ₹ 1600

SP of 20 pens for retailer

= ₹ 2000

∴Profit = ₹ 400

Profit% = $\frac{400}{1600} \times 100$ = 25%

18. (3) C.P. = ₹ 800

Loss = 8%

⇒ SP = ₹ 800 – $\frac{8}{100} \times 800$

= ₹ 800 – 64 = ₹ 736

Reduction 5% = $\frac{5}{100} \times 736$

∴ Reduced SP

= ₹ 736 – 736 × $\frac{5}{100}$

= ₹ 736 – 36.80 = ₹ 699.20

∴ Selling price = ₹ 699.20 ≈ ₹ 700

19. (4) Number of bicycles = 40

Let C.P. of one bicycle be x

∴ Marked price of each bicycle

= $\frac{125}{100}x = 1.25\,x$

Discount for cash sale = 10%

Discount for credit sale = 5%

∴ S.P. for cash sale

= $1.25\,x \times \frac{90}{100}$

= $(1.25\,x \times 0.9) = 1.125\,x$

S.P. for credit sale

= $1.25\,x \times \frac{95}{100}$

= $(1.25\,x \times 0.95) = 1.1875\,x$

Number of bicycles sold for cash = 30

Number of bicycles sold on credit = 10

∴ Total S.P. = $[1.125\,x \times 30 + 1.1875x \times 10]$

= $45.625\,x$

∴ Profit = $(45.625 - 40)\,x$

= $5.625\,x$

But actual profit = ₹ 20250

∴ $5.625\,x = 20250$

⇒ $x = \frac{20250}{5.625}$ = ₹ 3600

Hence, C.P. of a bicycle

= ₹ 3600

20. (1) S P of one cooler = ₹ 2,970

Profit % = 10 %

Let C P of the cooler be x

Then, SP = CP + Profit

$\Rightarrow 2970 = x + \frac{10}{100}x$

$\Rightarrow 2970 = \frac{110}{100}x$

$\Rightarrow \frac{2970}{110} \times 100 = x$

⇒ x = ₹ 2700

For 2nd cooler,

S P = ₹ 2970

Loss = 10 %

Let CP = y, then

SP = CP – Loss = 2970

$= y - \frac{10}{100}y$

$\Rightarrow \frac{90y}{100} = 2970 \Rightarrow y$ = ₹ 3300

∴ Total cost price for coolers

= ₹ 2700 + 3300 = ₹ 6000

Total selling price for two coolers

= ₹ 2970 + 2970 = ₹ 5940

Hence, Loss

= ₹ 6000 – 5940 = ₹ 60

& Loss % = $\frac{60}{6000}$ × 100 = 1%.

21. (2) C.P. of $\frac{1}{3}$rd of wheat

= ₹ $\frac{2400}{3}$ = ₹ 800

S.P. of $\frac{1}{3}$rd of wheat

= $\frac{105}{100} \times 800$ = ₹ 840

C.P. of total wheat = ₹ 2400

Required S.P. of total wheat

= ₹ $\left(\frac{110}{100} \times 2400\right)$ = ₹ 2640

C.P. of remaining $\frac{2}{3}$rd of wheat

= $\frac{2}{3} \times 2400$ = ₹ 1600

Required S.P. of remaining $\frac{2}{3}$rd wheat

= ₹ 2640 – 840 = ₹ 1800

Profit % = $\frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100$

Therefore, required profit %

= $\frac{1800 - 1600}{1600} \times 100$

= $\frac{25}{2}\% = 12\frac{1}{2}\%$ = 12.5%

22. (3) Suppose the man purchases 1 mango in each case.

∵ C.P. of 3 mangoes = ₹ 4

∴ C.P. of 1 mango = ₹ $\frac{4}{3}$

Again,

∵ C.P. of 5 mangoes = ₹ 6

∴ C.P. of 1 mango = ₹ $\frac{6}{5}$

∴ C.P. of 2 (mixed) mangoes

= $\frac{4}{3} + \frac{6}{5} = \frac{20+18}{15}$ = ₹ $\frac{38}{15}$

∴ C.P. of 1 mango

= $\frac{1}{2} \times \frac{38}{15}$ = ₹ $\frac{19}{15}$

Now, ∵ S.P. of 3 mangoes = ₹ 5

∴ S.P. of 1 mango = ₹ $\frac{5}{3}$

∴ Profit = $\frac{5}{3} - \frac{19}{15}$ = ₹ $\frac{6}{15}$ = ₹ $\frac{2}{5}$

$\because$ Profit on ₹ $\frac{19}{15}$ = ₹ $\frac{2}{5}$

$\therefore$ Profit on ₹ 1 = $\frac{2}{5} \times \frac{15}{19}$

$\therefore$ Profit on ₹ 100

$= \frac{2}{5} \times \frac{15}{19} \times 100$ = ₹ $31\frac{11}{19}$

Hence, profit = $31\frac{11}{19}\%$ or $\approx 32\%$

23. (4) If the C.P. is ₹ 100, the cash selling price = ₹ 133.
Now, let invoice price (after allowing T.D.) be 100, cash discount = 5 %
$\therefore$ When,

Cash S.P.	Invoice price
100–5=95 ↑	100 ↓
133	y

$\therefore y = \frac{133 \times 100}{95}$ = ₹ 140

Now, Trade discount = $12\frac{1}{2}\%$

$\therefore$ Marked price 100 – $12\frac{1}{2}$ T.D.

= $87\frac{1}{2}$ (Invoice price)

When,

Invoice price	Marked price
$87\frac{1}{2}$ ↑	100 ↓
140	x

$\therefore x = \frac{140 \times 100 \times 2}{175}$ = Rs. 160

Thus, marked price should be 60% = (160–100) above cost.

24. (1) This is a case of simple partnership
Ratio of investments,
A : B : C
= 15000 : 20000 : 25000
= 3 : 4 : 5
Sum of the ratios = 3 + 4 + 5 = 12
Share in the profit :

For $A = \frac{3}{12} \times 1200$ = ₹ 300

25. (2) This is a case of simple partnership

$\frac{1}{12} : \frac{1}{18} : \frac{1}{24} = \frac{6}{72} : \frac{4}{72} : \frac{3}{72}$

(Here 72 is the LCM of 12, 18 and 24)
= 6 : 4 : 3
Sum of the ratios= 6+ 4 + 3 = 13

and, $\frac{52000}{13}$ = 4000

A's share = 6 × 4000 = Rs. 24000

26. (3) Total initial investment
= Rs.1000 + Rs. 4000 + Rs. 5000 = Rs. 10,000
Total loss = 20% of total initial investment

$= \frac{20}{100} \times 10{,}000$ = Rs. 2000

(This is an example of simple partnership.)
$\therefore$ ₹ 2000 has to be divided among the partners in proportion to their investments. Ratio of investments are
$A : B : C$ = ₹ 1000 : ₹ 4000 : ₹ 5000 = 1 : 4 : 5
Sum of the ratios = 1+ 4 + 5 = 10

$1 \Rightarrow \frac{\text{Rs. } 2000}{10}$ = ₹ 200

Share of loss for B
= 4 × ₹ 200 = ₹ 800

27. (4) This is a case of compound partnership.
₹ 2400 investment for 4 years earns as much as ₹ 2400 × 4 = ₹ 9600 in 1 year
Similarly, ₹ 2800 for 8 years is equivalent to ₹ 2800 × 8 = ₹ 22400 in 1 year
₹ 2000 for 10 years is equivalent to ₹ 2000 × 10
= ₹ 20,000 in 1 year
The profit is, therefore, divided in the ratio
₹ 9600 : ₹ 22400 : ₹ 20000
or, 12 : 28 : 25
Sum of the ratios =12 + 28 + 25 = 65

₹ $\frac{1170}{65}$ = Rs. 18

So, A's share =12 × ₹ 18 = ₹ 216

28. (1) First we have to deduct the payment to be made to A from the total profit for his contribution in the management of the firm.
20% of Rs. 475 = ₹ 95
Balance profit = ₹ (475 – 95)
= ₹ 380.
This has to be divided between A and B in the ratio of their investments i.e.,
₹ 15000: ₹ 25000 = 3 : 5
B's share

= ₹ $380 \times \frac{5}{8}$ = ₹ 273.5

29. (2) A's investment is ₹ 20 lakhs for the whole year i.e., 12 months which is equivalent to 20 × 12
= ₹ 240 lakhs for 1 month
B's investment is ₹ 40 lakhs for (12 – 4) = 8 months is equivalent to 40 × 8 = ₹ 320 lakhs for 1 month.
C's investment is ₹ 60 lakhs for 3 months is equivalent to 60 × 3
= ₹ 180 lakhs for 1 month
The share in the profit should be in the following ratio,
$A : B : C$ = 240 : 320 : 180
= 12 : 16 : 9

$\frac{74000}{12+16+9}$ = ₹ 2000

= profit for 1 month
A's share = ₹ (12 × 2000)
= ₹ 24000

30. (2) Ravi : Shyam : Mohan
= (15000 × 12) : (20000 × 9) : (22500 × 8)
= 180000 : 180000 : 180000
= 1 : 1 : 1
Therefore, the share of each in the profit is

$\frac{9000}{3}$ = ₹ 3000

31. (3) **C**'s share of the capital

$= 1 - \left(\frac{1}{2} + \frac{1}{3}\right) = \frac{1}{6}$

A : B : C = $\left(\frac{1}{2} \times \frac{3}{4}\right)$:

$\left(\frac{1}{3} \times \frac{1}{2}\right)$: $\left(\frac{1}{6} \times 1\right)$

$= \frac{3}{8} : \frac{1}{6} : \frac{1}{6}$

$= \frac{9}{24} : \frac{4}{24} : \frac{4}{24}$

= 9 : 4 : 4

$\frac{510}{9+4+4}$ = ₹ 30

Profit share of A = ₹ 30 × 9
= ₹ 270

32. (4) Suppose Mohan joins Ravi after x months.
Then, during the year Mohan's investment was for $(12 - x)$ months.

$$\therefore \frac{45000 \times 12}{30000 \times (12 - x)} = \frac{9}{4}$$

$$\Rightarrow \frac{12 - x}{12} = \frac{45000}{30000} \times \frac{4}{9}$$

$$\Rightarrow \frac{12 - x}{12} = \frac{2}{3} \Rightarrow 36 - 3x = 24$$

$\therefore x =$ 4 months

33. (2) Let the total profit be ₹ 100
A's share for managing the business which is 30% of profit=₹ 30
Balance profit = ₹ (100–30)=₹ 70
Ratio of capital investment;
$A : B : C$ = ₹ 25000 : Rs. 30000 : ₹ 15000
= 5 : 6 : 3

Now, $\frac{70}{5+6+3}$ = ₹ 5

Share of profit A's = ₹ 5×5 = ₹ 25
B's = ₹ 5 × 6 = ₹ 30
C's = ₹ 5 × 3 = Rs. 15
A's total share of profit
= ₹ 30 + ₹ 25 = ₹ 55
Profit share of B and C put together
= ₹ 30 + ₹ 15 = ₹ 45
A's – (B's + C's) share
= ₹ 55 – ₹ 45 = ₹ 10
When the difference is ₹ 10, the total profit is ₹ 100
When the difference is ₹ 200 (i.e., 10 × 20) total profit is ₹ 100 × 20 = ₹ 2000

34. (1) Computing in terms of 1 month
A's investment = (5000 × 12) + (2000 × 10) = ₹ 80000
B's investment = (4000 × 4) + (3000 × 8) = ₹ 40000
C's investment = 5000 × 8
= ₹ 40000
$A : B : C$ = 80000 : 40000 : 40000
$A : B : C$ = 2 : 1 : 1

Now, $\frac{2804}{2+1+1}$ = 701

A's share = 701 × 2 = ₹ 1402

35. (2) Investment ratio in terms of 1 month or of their equivalent capitals,
$A : B : C$

$$= \left\{(50000 \times 4) + \left(\frac{50000}{2} \times 8\right)\right\} :$$

$$\left\{(45000 \times 8) + \left(\frac{45000}{2} \times 4\right)\right\} :$$

(70000×4)
= 400,000 : 450,000 : 280,000
= 40 : 45 : 28
The profits will be distributed in the above ratio i.e., 40 : 45 : 28.

36. (3) Total rent to be paid for one year = 160 × 12 = ₹ 1920.
This is a case of compound partnership. So, the rent will be shared in proportion to the product of number of cows and time for each partner.
Computing in terms of 1 month,
For A :

$$(70 \times 4) + \left(70 - \frac{2}{7} \times 70\right)$$

$$\times 3 + \left(70 - \frac{2}{7} \times 70 + \frac{2}{5} \times 40\right) \times 5$$

= (70 × 4) + (50 × 3) + (66 × 5)
= 280 + 150 + 330
For A = 760
For B :

$$\{50 \times 4\} + \left\{50 + \frac{2}{7} \times 70\right\} \times 8$$

= 200 + 560
For B = 760
For C

$$\{40 \times 7\} + \left\{40 - \frac{2}{5} \times 40\right\} \times 5$$

= 280 + 120
For C = 400
So, $A : B : C$ = 760 : 760 : 400
= 19 : 19 : 10

$$\frac{1920}{19+19+10} = \frac{1920}{48} = 40$$

Rent to be paid,
by A = 19 × 40 = ₹ 760

37. (4) Let us assume that Shyam's capital was used for x months.
Then we can write the ratio of their equivalent capital investment as

$$\text{Ram : Shyam} = \frac{16 \times 5}{7 \times x} = \frac{5}{7}$$

or, x = 16
So, Shyam's capital was used for 16 months.

38. (2) Ratio of profit = Ratio of product of investment and time period.
Ratio of share of profits
$A : B : C$ = (4 × 6):(8 × 3):(9 × 5)
= 24 : 24 : 45
or $A : B : C$ = 8 : 8 : 15

39. (3) Ratio of profits = (Ratio of capital by time).
∴ Ratio of time = Ratio of profit divided by respective capitals.

$$= \frac{15}{21} : \frac{8}{18} : \frac{9}{14}$$

$$= \frac{5}{7} : \frac{4}{9} : \frac{9}{14}$$

$$= \frac{90}{126} : \frac{56}{126} : \frac{81}{126}$$

[126 is LCM of 7, 9 and 14]
$A : B : C$ = 90 : 56 : 81.

40. (4) Let the gross profit be x

A's salary $= \frac{10}{100}x = 0.10x$

B's salary = $0.15x$
Net profit = $x - (0.10x + 0.15x)$
= $0.75x$
The net profit will be shared among three partners in proportion to their capital contributions.
∴ Ratio of capital contributions,
$A : B : C$ = 30 : 20 : 10
$A : B : C$ = 3 : 2 : 1
Sum of the ratios = 3 + 2 + 1 = 6
C's share in the net profit

$$= \frac{1}{6} \times 0.75x$$

But, $\frac{0.75}{6}x = 3.75$

or $x = 6 \times \frac{3.75}{0.75}$

or x = 30
So, Gross profit = x = ₹ 30 lakhs
Total share for A or B will be sum of their salary and share in the net profit.

A's share $= 0.10x + \frac{3}{6} \times 0.75x$

= $0.10x + 0.375\,x = 0.475\,x$
[∵ Gross profit, x = 30 lakhs]
= 0.475 × 30 = 14.25 lakhs
& B's share

$= 0.15\,x + \frac{2}{6} \times 0.75x$

= $0.15x + 0.25\,x$
= 0.40 × 30 = 12 lakhs

❑❑❑

9 DISCOUNT

Importance : 'Discount' questions are special type of Profit and Loss questions. But as question on this type are regularly asked, hence it is suitable to give it as a separate chapter.

Scope of questions : Questions include/discount, successive discount, equivalent discount, C.P./S.P. after discount. Also questions based on special type, like comparison between two discount or comparisons of 'discount' and no discount' conditions are also asked.

Way to success: Note that all calculations of % discount are done on **'Marked'** price and not on C.P./S.P. use formulae for speedy answers. It is important to expertise in identification on all type of questions.

RULE 1 : If Marked Price = (MP)

Selling Price = (SP)

Then, Discount = MP – SP and

$$\text{Discount\%} = \frac{\text{Discount}}{\text{MP}} \times 100$$

$$\text{Discount\%} = \frac{\text{Marked Price} - \text{Selling Price}}{\text{Marked Price}} \times 100$$

Note: Any kind of Discount is calculated only on marked price and not on selling price or cost price.

RULE 2 : If article is sold on D% discount, then

$$\text{SP} = \frac{\text{MP}(100-\text{D})}{100},$$

$$\text{MP} = \frac{\text{SP} \times 100}{100-\text{D}}$$

RULE 3 : When successive Discounts D_1, D_2, D_3, so on, are given then

$$\text{SP} = \text{MP}\left(\frac{100-D_1}{100}\right)\left(\frac{100-D_2}{100}\right)\left(\frac{100-D_3}{100}\right)$$

RULE 4 : If D_1, D_2, D_3 are successive discounts, then equivalent discount/overall discount is (in percentage)

$$100-\left[\left(\frac{100-D_1}{100}\right)\left(\frac{100-D_2}{100}\right)\left(\frac{100-D_3}{100}\right)\times 100\right]$$

RULE 5 : (Special Case) : When two successive disounts are given, then overall discount is

$$=\left(D_1+D_2-\frac{D_1D_2}{100}\right)\%$$

RULE 6 : If r% of profit or loss occur after giving D% discount on marked price, then $\frac{\text{MP}}{\text{CP}} = \frac{100 \pm r}{100-D}$

(positive sign for profit and negative for loss)

RULE 7 : 'y' articles (quantity/number) are given free on purchasing 'x' articles. Then, Discount% = $\frac{y \times 100}{x+y}$

RULE 8 : A tradesman marks his goods r% above his cost price. If he allows his customers a discount of r_1% on the marked price. Then is profit or loss per cent is

$$\frac{r \times (100-r_1)}{100} - r_1$$

(Positive sign signifies profit and negative sign signifies loss).

RULE 9 : The marked price of an article is fixed in such a way that after allowing a discount of r% a profit of R% is obtained. Then the marked price of the article is

$\left(\frac{r+R}{100-r} \times 100\right)$% more than its cost price.

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE-I

1. Applied to a bill for ₹ 1,00,000 the difference between a discount of 40% and two successive discounts of 36% and 4% is :
(1) Nil (2) ₹1,440
(3) ₹ 2,500 (4) ₹ 4,000
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting & SSC Section officer (Audit) Exam ; 16.11.2003))

2. Successive discounts of 10% and 30% are equivalent to a single discount of :
(1) 40% (2) 35%
(3) 38% (4) 37%
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. The marked price of a watch was ₹ 720/-. A man bought the same for ₹ 550.80, after getting two successive discounts, the first at 10%. What was the second discount rate?
(1) 12% (2) 14%
(3) 15% (4) 18%
(SSC CGL Prelim Exam. 27.02.2000 (Ist Sitting) & (SSC GL Tier-I Exam. 21.04.2013)

4. The marked price of a watch is ₹ 1000. A retailer buys it at ₹ 810 after getting two successive discounts of 10% and another rate which is illegible. What is the second discount rate?
(1) 15% (2) 10%
(3) 8% (4) 6.5%
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

5. Successive discounts of 10% and 20% are equivalent to a single discount of :
(1) 30% (2) 15%
(3) 28% (4) 12%
(SSC CGL Prelim Exam. 24.02.2002 (Ist & IInd Sitting) & (SSC CGL Exam. 08.02.2004 (Ist Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting)

6. The equivalent single discount for two successive discounts of 15% and 10% is
(1) 25% (2) 20%
(3) 23.5% (4) 20.5%
(SSC CGLPrelim Exam. 24.02.2002 (Middle Zone)

7. The marked price of an article is ₹ 500. It is sold at successive discounts of 20% and 10%. The selling price of the article (in rupees) is :
(1) 350 (2) 375
(3) 360 (4) 400
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. An item is marked for ₹ 240 for sale. If two successive discounts of 10% and 5% are allowed on the sale price, the selling price of the article will be
(1) ₹ 205.20 (2) ₹ 204
(3) ₹ 34.80 (4) ₹ 36
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

9. The price of an article is raised by 30% and then two successive discounts of 10% each are allowed. Ultimately the price of the article is
(1) increased by 10%
(2) increased by 5.3%
(3) decreased by 3%
(4) decreased by 5.3%
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

10. A single discount equivalent to the successive discounts of 10%, 20% and 25% is
(1) 55% (2) 45%
(3) 46% (4) 60%
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003) & (SSC DEO Exam. 02.08.2009) & (SSC CISF ASI Exam. 29.08.2010)

11. List price of an article at a show room is ₹ 2,000 and it is being sold at successive discounts of 20% and 10%. Its net selling price will be :
(1) ₹ 1900 (2) ₹ 1700
(3) ₹ 1440 (4) ₹ 1400
(SSC CGLPrelim Exam. 08.02.2004 (Second Sitting)

12. The difference between a single discount of 30% on ₹ 550 and two successive discounts of 20% and 10% on the same amount is
(1) Nil (2) ₹ 11
(3) ₹ 22 (4) ₹ 44
(SSC CPO S.I. Exam. 05.09.2004)

13. The marked price of a watch is ₹ 800. A shopkeeper gives two successive discounts and sells the watch at ₹ 612. If the first discount is 10%, the second discount is :
(1) 10% (2) 12%
(3) 15% (4) 20%
(SSC CPO S.I. Exam. 26.05.2005) & (SSC CGL Prelim Exam. 21.04.2013)

14. A person paid ₹ 17,000 for a motor-car after a single discount of 15%. If he is given successive discounts of 5% and 10% then how much he would pay ?
(1) ₹ 17,000 (2) ₹ 17,010
(3) ₹17,100 (4) ₹ 18,900
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

15. The list price of a clock is ₹ 160. A customer buys it for ₹ 122.40 after two successive discounts. If first discount is 10%, the second is
(1) 10% (2) 12%
(3) 15% (4) 18%
(SSC CGL Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting) & (SSC GL Tier-I Exam. 19.05.2013))

16. A shopkeeper gives two successive discounts on an article marked ₹ 450. The first discount given is 10 per cent. If the customer pays ₹ 344.25 for the article, the second discount given is
(1) 14 per cent (2) 10 per cent
(3) 12 per cent (4) 15 per cent
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

17. A company offers three types of successive discounts : (i) 25% and 15%, (ii) 30% and 10%, (iii) 35% and 5%. Which offer is the best for a customer?
(1) First offer
(2) Second offer
(3) Third offer
(4) Any one; all are equally good
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

18. An article is listed at ₹ 900 and two successive discounts of 8% and 8% are given on it. How much would the seller gain or lose, if he gives a single discount of 16%, instead of two discounts ?
(1) Gain of ₹ 4.76
(2) Loss of ₹ 5.76
(3) Gain of ₹ 5.76
(4) Loss of ₹ 4.76
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

19. A dealer buys a car listed at ₹ 200000 at successive discounts of 5% and 10%. If he sells the car for 179550, then his profit is
(1) 10% (2) 9%
(3) 5% (4) 4%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

20. An article listed at ₹ 800 is sold at successive discounts of 25% and 15%. The buyer desires to sell it off at a profit of 20% after allowing a 10% discount. What would be his list price ?
(1) ₹ 620 (2) ₹ 600
(3) ₹ 640 (4) ₹ 680
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

21. The difference between a discount of 40% on ₹ 500 and two successive discounts of 36% and 4% on the same amount is
(1) zero (2) ₹ 1.93
(3) ₹ 2.00 (4) ₹ 7.20
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (IInd Sitting) & (SSC CGL Tier-I Exam. 19.06.2011 (IInd Sitting)

22. An article is listed at ₹ 920. A customer pays ₹ 742.90 for it after getting two successive discounts. If the rate of first discount is 15%, the rate of 2nd discount is
(1) 3% (2) 5%
(3) 8% (4) 12%
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

23. The marked price of watch was ₹ 820. A man bought the watch for ₹ 570.72 after getting two successive discounts, of which the first was 20%. The second discount was
(1) 18% (2) 15%
(3) 13% (4) 11%
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

24. A bicycle, marked at ₹ 2,000, is sold with two successive discount of 20% and 10%. An additional discount of 5% is offered for cash payment. The selling price of the bicycle at cash payment is
(1) ₹ 1,368 (2) ₹ 1,468
(3) ₹ 1,568 (4) ₹ 1,668
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

25. The difference between a discount of 40% on ₹ 500 and two successive discounts of 30% and 10% on the same amount is
(1) ₹ 15 (2) 0
(3) ₹ 20 (4) ₹ 10
(SSC CPO S.I. Exam. 09.11.2008)

26. The marked price of a T.V. is ₹ 16,000. After two successive discounts it is sold for ₹ 11,400. If the first discount is 5%, then the rate of second discount is
(1) 15% (2) 20%
(3) 30% (4) 25%
(SSC CPO S.I. Exam. 06.09.2009)

27. The difference between a discount of 30% on ₹ 2,000 and two successive discounts of 25% and 5% on the same amount is
(1) ₹ 30 (2) ₹ 35
(3) ₹ 25 (4) ₹ 40
(SSC CPO S.I. Exam. 06.09.2009)

28. If on a marked price, the difference of selling prices with a discount of 30% and two successive discounts of 20% and 10% is ₹ 72, then the marked price (in rupees) is
(1) 3,600 (2) 3,000
(3) 2,500 (4) 2,400
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

29. Successive discounts of 10%, 20% and 30% is equivalent to a single discount of
(1) 60% (2) 49.6%
(3) 40.5% (4) 36%
(SSC CPO SI Exam. 03.09.2006) & (SSC CGL Tier-I Exam.16.05.2010 (IInd Sitting) & (SSC CAPF's SI & CISF ASI Exam. 23.06.2013)

30. Two successive discounts of 20% and 20% is equivalent to a single discount of
(1) 42% (2) 40%
(3) 36% (4) 34%
(SSC (South Zone) Investigator Exam 12.09.2010)

31. Two successive discounts of 10% and 5% are equivalent to a single discount of
(1) 14% (2) 14.25%
(3) 14.50% (4) 15%
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

32. What single discount is equivalent to two successive discounts of 20% and 15%?
(1) 35% (2) 32%
(3) 34% (4) 30%
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting) **&** (SSC CHSL DEO Exam. 02.11.2014) (Ist Sitting)

33. The single discount equal to three consecutive discounts of 10%, 12% and 5% is
(1) 26.27% (2) 24.76%
(3) 9% (4) 11%
(SSC CGLTier-1 Exam 26.06.2011 (Second Sitting)

34. Two successive discounts of 5%, 10% are given for an article costing ₹850. Present cost of the article is (in ₹) :
(1) 725 (2) 726.75
(3) 700 (4) 650
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

35. A shopkeeper purchased a chair marked at ₹ 800, at two successive discounts of 10% and 15% respectively. He spent ₹ 28 on transportation and sold the chair for ₹ 800. His gain percent is :
(1) 40% (2) 30%
(3) 25% (4) 14%
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

36. The discount series 10%, 20%, 40% is equivalent to a single discount of
(1) 50% (2) 56.8%
(3) 60% (4) 62.28%
(SSC CPO S.I. Exam. 07.09.2003) & (SSC DEO Exam. 31.08.2008) & (SSC CHSL DEO & LDC Exam. 04.12.2011) & (SSC GL Tier-II Exam. 16.09.2012)

37. The single discount, which is equivalent to successive discounts of 25% and10 %, is :
(1) 35 % (2) 34.5%
(3) 33 % (4) 32.5 %
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

38. The single discount equivalent to two successive discounts of 20% and 5% is
(1) 24% (2) 25%
(3) 22% (4) 23%
(SSC SAS Exam. 26.06.2010) & (SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

39. The difference between a discount of 35% and two successive discounts of 20% on a certain bill was ₹ 22. The amount of the bill was

(1) ₹ 200 (2) ₹ 220
(3) ₹1,100 (4) ₹ 2,200

(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

40. The marked price of a watch is ₹ 1,600. The shopkeeper gives successive discounts of 10% and x% to the customer. If the customer pays ₹ 1,224 for the watch, the value of x is

(1) 5% (2) 10%
(3) 15% (4) 20%

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011) & (SSC GL Tier-I Exam. 21.04.2013 (Ist Sitting)

41. A single discount equivalent to discount series 20%, 20% and 10% is

(1) 50% (2) 48.4%
(3) 42.4% (4) 40.4%

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

42. The price of a certain television set is discounted by 10% and the reduced price is then discounted by 10%. This series of successive discounts is equivalent to a single discount of

(1) 20% (2) 19%
(3) 18% (4) 11%

(SSC CHSL DEO & LDC Exam. 04.12.2011 & 28.10.2012 (Ist Sitting (East Zone)

43. The single discount which is equivalent to successive discounts of 20%, 15% and 10% is

(1) 32·7% (2) 34·2%
(3) 36·9% (4) 38·8%

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

44. The single discount equivalent to the discount series of 20%,10% and 5% is :

(1) 11.66% (2) 31.6%
(3) 35.66% (4) 32%

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone) & (SSC CHSL DEO & LDC Exam. 10.11.2013)

45. Successive discounts of p% and q% on the catalogue price of an article is equivalent to a single discount of :

(1) $\left(x - y - \frac{xy}{100}\right)\%$

(2) $\left(p - q - \frac{pq}{100}\right)\%$

(3) $\left(p + q - \frac{pq}{100}\right)\%$

(4) $\left(p + q + \frac{pq}{100}\right)\%$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist & IInd Sitting (East Zone) & (SSC Graduate Level Tier-II Exam.29.09.2013)

46. A chair listed at ₹350 is available at successive discounts of 25% and 10%. The selling price of the chair is

(1) ₹ 236.25 (2) ₹ 230.25
(3) ₹ 240.25 (4) ₹ 242.25

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

47. A trader allows two successive discounts of 30% and 15% on selling an article. If he gets ₹ 476 for that article, find its marked price.

(1) ₹ 700 (2) ₹ 400
(3) ₹ 900 (4) ₹ 800

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting) & (SSC MTS Exam. 10.03.2013)

48. In selling an article, the single discount equivalent to two successive discounts of 25% and 5% is

(1) 28.75% (2) 30%
(3) 27.5% (4) 26%

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

49. The marked price of a table is ₹800. A retailer bought it after two successive discounts of 10% and 15%. He spent ₹13 on transportation and sold it for ₹875. His profit was

(1) 40% (2) 37%
(3) 28% (4) 25%

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

50. Alex sold his goods after announcing two successive discounts of 30% each. The effective discount altogether is

(1) 52% (2) 49%
(3) 50% (4) 51%

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

51. A sofa-set listed at ₹ 800 is sold to a retailer at successive discounts of 25% and 15% by the wholesaler. Then the cost price of the sofa-set for retailer is

(1) ₹ 500 (2) ₹ 510
(3) ₹ 550 (4) ₹ 560

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

52. The printed price of a book is ₹ 320. A retailer pays ₹ 244.80 for it. He gets successive discounts of 10% and an another rate. His second rate is :

(1) 15% (2) 16%
(3) 14% (4) 12%

(SSC CHSL DEO & LDC Exam. 04.11.2012 (Ist Sitting)

53. A single discount of 50% on an article costing ₹10000 is better than two successive discounts of 40% and 10% by

(1) ₹ 400 (2) ₹ 1000
(3) ₹ 500 (4) ₹ 600

(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

54. Two successive discounts of 70% and 30% are equivalent to a single discount of

(1) 75% (2) 79%
(3) 100% (4) 89%

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

55. A purchased a dining table, marked at ₹ 3,000 at a successive discounts of 10% and 15% respectively. He gave ₹ 105 as transportation charge and sold it at ₹ 3,200. What is his gain percentage?

(1) $22\frac{1}{3}\%$ (2) 25%
(3) $33\frac{1}{3}\%$ (4) $37\frac{17}{24}\%$

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

56. A dealer buys a table listed at ₹ 1,500 and gets successive discounts of 20% and 10%. He spends ₹ 20 on transportation and sells at a profit of 20%. Find the Selling Price of the table (in rupees).

(1) 1320 (2) 1080
(3) 1200 (4) 1230

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

57. A shopkeeper marks the price of an article at ₹ 80. What will be the selling price, if he allows two successive discounts of 5% each?
(1) ₹ 72.2 (2) ₹ 72
(3) ₹ 85 (4) ₹ 7.2
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

58. Which of the following successive discounts is better to a customer?
(a) 20%, 15%, 10% or
(b) 25%, 12%, 8% ?
(1) (a) is better
(2) (b) is better
(3) (a) or (b) (both are same)
(4) None of these
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

59. The cost price of an article is ₹ 100. A discount series of 5%, 10% successively reduces the price of a article by
(1) ₹ 4.5 (2) ₹ 14.5
(3) ₹ 24.5
(4) None of the above
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

60. An article is marked at ₹ 5,000. The shopkeeper allows successive discounts of x%, y%, z% on it. The net selling price is
(1) ₹ $\frac{(100-x)(100+y)(100+z)}{200}$
(2) ₹ $\frac{(100+x)(100+y)(100-z)}{200}$
(3) ₹ $\frac{(100-x)(100-y)(100-z)}{200}$
(4) ₹ $\frac{(100-x)(100+y)(100-z)}{200}$
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

61. A shopkeeper purchased a chair marked at ₹ 600 at two successive discounts of 15% and 20% respectively. He spent ₹ 28 on transportation and sold the chair for ₹ 545. His gain percent was
(1) 25% (2) 30%
(3) 35% (4) 20%
(SSC Graduate Level Tier-II Exam. 29.09.2013)

62. The marked price of a piano was ₹ 15,000. At the time of sale, there were successive discounts of 20%, 10% and 10% respectively on it. The sale price was
(1) ₹ 9,720 (2) ₹ 9,750
(3) ₹ 9,760 (4) ₹ 9,780
(SSC Graduate Level Tier-II Exam. 29.09.2013)

63. Successive discounts of 30% and 20% is equivalent to a single discount of
(1) 50% (2) 40%
(3) 44% (4) 10%
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

64. Two successive discounts of 10% and 5%, in this order, are given on a bill of ₹ 110. Find the net amount of money payable to clear the bill.
(answer to the nearest rupee)
(1) ₹ 94 (2) ₹ 95
(3) ₹ 96 (4) ₹ 97
(SSC CGL Tier-I Re-Exam. (2013)

65. A plate was sold for ₹ 6,300 after giving two successive discounts of $12\frac{1}{2}$% and 10%. Find the marked price.
(1) ₹ 7,300 (2) ₹ 7,700
(3) ₹ 8,000 (4) ₹ 7,250
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

66. A double bed is marked at ₹ 7,500. The shopkeeper allows successive discounts of 8%, 5% and 2% on it. What is the net selling price ?
(1) ₹ 6, 500 (2) ₹ 6,000
(3) ₹ 6,423.90 (4) ₹ 6,500.50
(SSC CHSL DEO & LDC Exam. 16.11.2014)

67. Two successive discounts of 10% and 20%, equals a single discount of
(1) 30% (2) 25%
(3) 28% (4) 29%
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

68. The difference between a discount of 30% and two successive discounts of 20% and 10% on the marked price of an article is Rs. 144. The marked price of the article is
(1) Rs. 7,200 (2) Rs. 7,400
(3) Rs. 7,500 (4) Rs. 7,000
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

69. 10% discount and then 20% discount in succession is equivalent to total discount of
(1) 28% (2) 15%
(3) 30% (4) 24%
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

70. Allowing 20% and 15% successive discounts, the selling price of an article becomes Rs. 3,060; then the marked price will be
(1) Rs. 4,000 (2) Rs. 4,400
(3) Rs. 5,000 (4) Rs. 4,500
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

71. Find a simple discount equivalent to a discount series of 10%, 20% and 25%.
(1) 55% (2) 45%
(3) 52% (4) 46%
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

72. The difference between successive discounts of 40% followed by 30% and 45% followed by 20% on the marked price of an article is Rs. 12. The marked price of the article is :
(1) ₹ 800 (2) ₹ 400
(3) ₹ 200 (4) ₹ 600
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

73. A dealer buys a table listed at Rs. 1,500 and gets successive discounts of 20% and 10%. He spends Rs. 20 on transportation and sells it at a profit of 20%. Find the selling price of the table.
(1) Rs. 1,420 (2) Rs. 1,300
(3) Rs. 1,320 (4) Rs. 1,380
(SSC CGL Tier-I Re-Exam, 30.08.2015)

74. If the cost of an article is Rs. P after two successive reductions of 20% and 25%, the original price of the article was
(1) Rs. $\frac{5P}{3}$ (2) Rs. $\frac{4P}{5}$
(3) Rs. $\frac{3P}{5}$ (4) Rs. $\frac{5P}{4}$
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

75. A scooter is sold at three successive discounts of 10%, 5% and 2%. If the marked price of the scooter is Rs. 18,000, find its net selling price.
(1) Rs. 15028.20
(2) Rs. 15082.00
(3) Rs. 15082.20
(4) Rs. 15080.00
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

76. A single discount equivalent to the series of discounts 20%, 10% and 5% is equal to :
(1) 32% (2) 30%
(3) 30.7% (4) 31.6%
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

77. Successive discounts of 20% and 10% are equivalent to a single discount of :
(1) 15% (2) 28%
(3) 25% (4) 30%
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

78. The list price of an electric fan is Rs. 300. If two successive discounts of 15% and 10% are allowed, its selling price would be
(1) Rs. 227.50 (2) Rs. 225
(3) Rs. 230 (4) Rs. 229.50
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

79. The successive discount of 15%, 20% and 25% on an article is equivalent to the single discount of
(1) 60% (2) 47%
(3) 49% (4) 40%
(SSC CGL Tier-I (CBE) Exam.10.09.2016)

80. If the successive discounts be 20%, 10% and 5%, then the single equivalent rate of discount is :
(1) 31.6% (2) 31.5%
(3) 31% (4) 31.4%
(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

81. An item is offered for sale at Rs. 250, less by successive discounts of 20% and 15%, The sale price of the item is :
(1) 82% of Rs. 250
(2) 77% of Rs. 250
(3) 68% of Rs. 250
(4) 65% of Rs. 250
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

82. A discount series of 15%, 20% and 25% is equal to the single discount of
(1) 48% (2) 49%
(3) 50% (4) 51%
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

83. The list price of an article is Rs. 900. It is available at two successive discounts of 20% and 10%. The selling price of the article is :
(1) Rs. 640 (2) Rs. 648
(3) Rs. 540 (4) Rs. 548
(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

84. A merchant changed his trade discount from 25% to 15%. This would increase selling price by
(1) $3\frac{1}{3}\%$ (2) $6\frac{1}{6}\%$
(3) $13\frac{1}{3}\%$ (4) $16\frac{1}{3}\%$
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

85. Successive discounts of 20% and 10% are given on an item marked at Rs. 700. Find the selling price.
(1) Rs. 504 (2) Rs. 196
(3) Rs. 582 (4) Rs. 601
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

86. Two successive discounts of 10% and 20% are equivalent to a single discount of
(1) 28% (2) 27%
(3) 25% (4) 30%
(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

87. The price of a chair is Rs. 500. It has been sold at two successive discounts of 10% each. What is its selling price?
(1) Rs. 400 (2) Rs. 405
(3) Rs. 415 (4) Rs. 425
(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

88. Two consecutive discounts x% and y% are equivalent to the single discount of
(1) $\left(x-y+\frac{xy}{100}\right)\%$
(2) $\left(x+y+\frac{xy}{100}\right)\%$
(3) $\left(x-y-\frac{xy}{100}\right)\%$
(4) $\left(x+y-\frac{xy}{100}\right)\%$
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

89. Two shopkeepers announce the same price of Rs. 700 for a sewing machine. The first offers successive discounts of 30% and 6% while the second offers successive discounts of 20% and 16%. The difference in their selling price is :
(1) Rs. 9.8 (2) Rs. 16.8
(3) Rs. 22.4 (4) Rs. 36.4
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

90. When a discount of 20% is given on a sweater, the profit is 28%. If the discount is 14%, then the profit is
(1) 42 per cent
(2) 46.4 per cent
(3) 33.2 per cent
(4) 37.6 per cent
(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

91. A shopkeeper offers 15% discount on all plastic toys. He offers a further discount of 4% on the reduced price to those customers who pay cash. What does a customer have to pay (in Rs.) in cash for a toy of Rs 200?
(1) 133.7 (2) 129.8
(3) 163.2 (4) 153.3
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

92. A dinner set is quoted for Rs. 1500. A customer pays Rs. 1173 for it. If the customer got a series of two discounts and the rate of first discount is 15% then the rate of second discount was
(1) 15% (2) 7%
(3) 9% (4) 8%
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

93. A trader marks the sale price 25% more on cost price and gives a 10% discount at the time of selling. The gain per cent is
(1) $12\frac{1}{2}\%$ (2) $12\frac{1}{3}\%$
(3) $11\frac{1}{2}\%$ (4) 12%
(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE-II

1. A tradesman marks his goods 10% above his cost price. If he allows his customers 10% discount on the marked price, how much profit or loss does he make, if any?
(1) 1% gain
(2) 1%loss
(3) 5% gain
(4) No gain, no loss
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A trademan marks his goods at 20% above the cost price. He allows his customers a discount of 8% on marked price. Find out his profit per cent.
(1) 12% (2) 10.4%
(3) 8.6% (4) 8.2%
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. A shopkeeper marks his goods 20% above cost price, but allows 30% discount for cash. His net loss is :
(1) 8% (2) 10%
(3) 16% (4) 20%
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. A shopkeeper marks his sarees at 20% above the cost price and allows the purchaser a discount of 10% for cash buying. What profit percent does he make?
(1) 18% (2) 12%
(3) 10% (4) 8%
(SSC CGL Prelim Exam. 27.02.2000) (IInd Sitting) & (SSC Section Officer Exam. 25.09.2005) & (SSC CPO SI. Exam. 03.09.2006) & (SSC CPO SI. Exam. 16.12.2007) & (SSC SAS Exam. 26.06.2010)

5. A trader marked the selling price of an article at 10% above the cost price. At the time of selling, he allows certain discount and suffers a loss of 1%. He allowed the discount of :
(1) 11% (2) 10%
(3) 9% (4) 10.5%
(SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting) & (SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting)

6. A shopkeeper marks his goods at 30% above the cost price but allows a discount of 10% at the time of sale. His gain is
(1) 21% (2) 20%
(3) 18% (4) 17%
(SSC CGL Exam. 11.05.2003 (IInd Sitting) & (SSC CGLPrelim Exam. 27.07.2008 (Ist Sitting)

7. A shopkeeper marks the price of an item keeping 20% profit. If he offers a discount of $12\frac{1}{2}\%$ on the marked price, his gain percent will be
(1) 4.5% (2) 5%
(3) 7.5% (4) 8%
(SSC (South Zone) Investigator Exam 12.09.2010)

8. A seller marks his goods 30% above their cost price but allows 15% discount for cash payment. His percentage of profit when sold in cash is
(1) 10.5% (2) 15%
(3) 9% (4) 8.5%
(SSC (South Zone) Investigator Exam. 12.09.2010)

9. A tradesman marks his goods at 25% above its cost price and allows purchasers a discount of $12\frac{1}{2}\%$ for cash payment. The profit, he thus makes, is
(1) $9\frac{3}{8}\%$ (2) $9\frac{1}{2}\%$
(3) $8\frac{1}{2}\%$ (4) $8\frac{3}{8}\%$
(SSC Data Entry Operator Exam. 31.08.2008) & (SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting)

10. What price should a shopkeeper mark on an article costing him ₹ 200 to gain 35% after allowing a discount of 25% ?
(1) ₹ 270 (2) ₹ 300
(3) ₹ 330 (4) ₹ 360
(SSC CHSL DEO & LDC Exam. 27.11.2010)

11. A trader marks his goods 40% above cost price and allows a discount of 25 %. The profit he makes, is :
(1) 15% (2) 10 %
(3) 5 % (4) 2 %
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

12. A dealer marks his goods 20% above their cost price. He then allows some discount on marked price so that he makes a profit of 10%. The rate of discount is
(1) $10\frac{1}{3}\%$ (2) $9\frac{1}{3}\%$
(3) $8\frac{2}{3}\%$ (4) $8\frac{1}{3}\%$
(SSCCHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

13. In a shop, shirts are usually sold at 40% above the cost price. During a sale, the shopkeeper offers a discount of 10% off the usual selling price. If he manages to sell 72 shirts for ₹ 13,608, then his cost price per shirt, (in ₹) is
(1) 210 (2) 150
(3) 149 (4) 125
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

14. If a shopkeeper marks the price of goods 50% more than their cost price and allows a discount of 40%, what is his gain or loss percent ?
(1) Gain of 10% (2) Loss of 10%
(3) Gain of 20% (4) Loss of 20%
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

15. A dealer marks his goods at 40% above the cost price and allows a discount of 20% on the marked price. The dealer has a
(1) loss of 20% (2) gain of 25%
(3) loss of 12% (4) gain of 12%
(SSC CPO S.I. Exam. 26.05.2005) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

16. A trader marks his goods45% above the cost price and gives a discount of 20% on the marked price. The gain % on goods he makes is :
(1) 15% (2) 14%
(3) 29% (4) 16%
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

17. Maha Bazaar offers 20% discount on bags which have been marked 50% above the cost price. Amarnath pays ₹ 840 for a bag. Then the cost price of the bag is
(1) ₹ 672 (2) ₹ 700
(3) ₹ 790 (4) ₹ 810
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

18. A merchant marks his goods 40% above the cost price and sells them at a discount of 15%. Find his gain %.
(1) 25% (2) 22%
(3) 19% (4) 20%
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

19. A trader marks his goods at 20% above the cost price. If he allows a discount of 5% for cash down payment, his profit percent for such a transaction is
(1) 15% (2) 12%
(3) 14% (4) 17%
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting) & (SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting)

20. The marked price is 20% higher than cost price. A discount of 20% is given on the marked price. By this type of sale, there is
(1) 4% loss
(2) 2% loss
(3) no loss no gain
(4) 4% gain
(SSC DEO Exam. 02.08.2009) & (SSC (10+2) Level Data Entry Operator & LDC Exam. 21.10.2012 (Ist Sitting)

21. A dealer marks his goods at 25% above the cost price and allows a discount of 10% for cash payment. His profit % is :
(1) 17.5% (2) 15%
(3) 12.5% (4) 20%
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

22. To gain 8% after allowing a discount of 10%, by what per cent cost price should be hiked in the list price ?
(1) 9% (2) 11%
(3) 18% (4) 20%
(SSC CPO SI. Exam. 26.05.2005) & (SSC (Commercial Audit) Exam. 26.11.2006 (IInd Sitting) & (SSCCHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

23. How much percent above the cost price should a shopkeeper mark his goods so as to earn a profit of 32% after allowing a discount of 12% on the marked price ?
(1) 50% (2) 40%
(3) 60% (4) 45%
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

24. A merchant allows a discount of 10% on marked price for the cash payment. To make a profit of 17%, he must mark his goods higher than their cost price by
(1) 33% (2) 40%
(3) 27% (4) 30%
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

25. A merchant purchases a wrist watch for ₹ 450 and fixes its list price in such a way that after allowing a discount of 10%, he earns a profit of 20%. Find the list price of the watch.
(1) ₹ 480 (2) ₹ 450
(3) ₹ 600 (4) ₹ 540
(SSC CGL Tier-I Exam. 26.06.2011) & (SSC Multi-Tasking Staff Exam. 17.03.2013 (Kolkata Region)

26. Anand marks up the price of an article by 50% and then allows a discount of 20% and sells it to Balaji. Balaji sells it for ₹ 20 more than what he purchased for, this S.P is 30% more than the original C.P of the article. Then Balaji's profit % is
(1) 7.5% (2) 6.66%
(3) 8.33% (4) 9%
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

27. Jasmine allows 4% discount on the marked price of her goods and still earns a profit of 20%. What is the cost price of a shirt if its marked price is ₹ 850?
(1) ₹ 650 (2) ₹ 720
(3) ₹ 700 (4) ₹ 680
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

28. The marked price of an article is ₹ 500. A shopkeeper gives a discount of 5% and still makes a profit of 25%. The cost price of the article is.
(1) ₹ 384 (2) ₹ 380
(3) ₹ 300 (4) ₹ 376
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

29. If the discount is equal to one fifth of the marked price and the loss is half the discount, then the percentage of loss is
(1) $10\frac{1}{9}\%$ (2) $11\frac{1}{9}\%$
(3) $12\frac{1}{9}\%$ (4) $13\frac{1}{9}\%$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

30. A shopkeeper allows a discount of 10% on the marked price of an item but charges a sales tax of 8% on the discounted price. If the customer pays ₹ 3,402 as the price including the sales tax, then the marked price is
(1) ₹ 3,400 (2) ₹ 3,500
(3) ₹ 3,600 (4) ₹ 3,800
(SSC CGL Tier-I Exam. 19.10.2014)

31. The cost price of a table is ₹ 3,200. A merchant wants to make 25 % profit by selling it. At the the time of sale he declares a discount of 20 % on the marked price. The marked price (in ₹) is
(1) 5,000 (2) 6,000
(3) 4,000 (4) 4,500
(SSC CGL Tier-I Exam. 26.10.2014)

32. A shopkeeper allows a discount of 12.5 % on the marked price of a certain article and makes a profit of 20 %. If the article costs the shopkeeper ₹ 210, then the marked price of the article will be
(1) ₹ 387 (2) ₹ 350
(3) ₹ 386 (4) ₹ 288
(SSC CGL Tier-I Exam. 26.10.2014)

33. A businessman allows a discount of 10 % on the marked price. What percent above the cost price must he mark his goods to make a profit of 17 per cent ?
(1) 27 % (2) 18 %
(3) 30 % (4) 20 %
(SSC CGL Tier-I Exam. 26.10.2014)

34. Charging 30% above its production cost a radio maker puts a label of ₹ 286 on a radio as its price. But at the time of selling it, he allows 10% discount on the labelled price. What will his gain be ?
(1) ₹ 257 .40 (2) ₹ 254. 40
(3) ₹ 198 (4) ₹ 37. 40
(SSC CGL Tier-I Exam. 26.10.2014)

35. A cycle dealer offers a discount of 10% and still makes a profit of 26%. What does he pay for a cycle whose marked price is ₹ 840 ?
(1) ₹ 600 (2) ₹ 650
(3) ₹ 700 (4) ₹ 750
(SSC CGL Tier-II Exam. 21.09.2014)

36. The marked price of an article is 10% highter than the cost price. A discount of 10% is given on the marked price. In this kind of sale, the seller bears.
(1) no loss, no gain
(2) a loss of 5%
(3) a gain of 1%
(4) a loss of 1%
(SSC CHSL DEO Exam. 02.11.2014) (Ist Sitting)

37. A shopkeeper allows 10% discount on goods when he sells without credit. Cost price of his goods is 80% of his selling price. If he sells his goods by cash, then his profit is
(1) 50% (2) 70%
(3) 25% (4) 40%
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

38. A dealer of scientific instruments allows 20% discount on the marked price of the instruments and still makes a profit of 25%. If his gain over the sale of an instrument is ₹ 150, find the marked price of the instrument.
(1) ₹ 938.50 (2) ₹ 940
(3) ₹ 938 (4) ₹ 937.50
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

39. Ram bought a T.V. with 20% discount on the labelled price. Had he bought it with 30% discount he would have saved ₹ 800. The value of the T.V. set that he bought is

(1) ₹ 5,000 (2) ₹ 8,000
(3) ₹ 9,000 (4) ₹ 10,000
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

40. If a person marks a product 25% above the cost price but allows 10% discount, then the percentage of profit is
(1) 35 % (2) 15 %
(3) 17.5 % (4) 12.5 %
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

41. A tradesman marks his goods at 20% above the cost price. He allows his coustomers a discount of 8% on the marked price. Then his profit per cent is
(1) 10.4% (2) 11%
(3) 12.2% (4) 9.7%
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

42. A shopkeeper gains 17% after allowing a discount of 10% on the marked price of an article. Find his profit percent if the articles are sold at marked price allowing no discount.
(1) 30% (2) 23%
(3) 27% (4) 37%
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

43. A shopkeeper allows a discount of 10% on the marked price of a camera. Marked price of the camera, which costs him ₹ 600, to make a profit of 20% should be
(1) ₹ 700 (2) ₹ 750
(3) ₹ 650 (4) ₹ 800
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

44. If the discount of 10% is given on the marked price of a radio, the gain is 20%. If the discount is increased to 20%, the gain per cent is :
(1) 5% (2) $6\frac{1}{4}$%
(3) $6\frac{2}{3}$% (4) $7\frac{5}{8}$%
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

45. 20% profit is made when a discount of 20% is given on the marked price. When the discount is 30% profit will be
(1) 4% (2) 5%
(3) 6% (4) 7.5%
(SSC CGL Tier-I Re-Exam, 30.08.2015)

46. A seller increases the cost price of an article by 30% and fixed the marked price as Rs. 286. But during sale he gave 10% discount to the purchaser. Percentage of profit will be
(1) 17 (2) 15
(3) 10 (4) 20
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

47. If a shopkeeper wants to give 20% discount on a toy, he has to sell it for Rs. 300. If he sells it at Rs. 405, then his gain percent is
(1) 5% (2) 4%
(3) 8% (4) 6%
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

48. A shopkeeper marks his goods 20% higher than the cost price and allows a discount of 5%. The percentage of his profit is:
(1) 15% (2) 20%
(3) 10% (4) 14%
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

49. After allowing 15% discount, the selling price of a radio becomes Rs. 255. The marked price is
(1) Rs. 500 (2) Rs. 600
(3) Rs. 400 (4) Rs. 300
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

50. The marked price of an article is 30% higher than the cost price. If a trader sells the articles allowing 10% discount to customer, then the gain percent will be
(1) 17 (2) 20
(3) 19 (4) 15
(SSC CGL Tier-II Online Exam.01.12.2016)

51. A merchant marked the price of an article by increasing its production cost by 40%. Now he allows 20% discount and gets a profit of Rs. 48 after selling it. The production cost is
(1) Rs. 320 (2) Rs. 360
(3) Rs. 400 (4) Rs. 440
(SSC CGL Tier-II Online Exam.01.12.2016)

52. A watch dealer pays 10% customs duty on a watch which costs Rs. 500 abroad. He desires to make a profit of 20% after giving a discount of 25% to the buyer. The marked price should be
(1) Rs. 950 (2) Rs. 800
(3) Rs. 880 (4) Rs. 660
(SSC CGL Tier-II Online Exam.01.12.2016)

53. The marked price of a laptop is Rs. 12000. In a clearance sale it is sold at a discount of 15%, incurring a loss of 4%. What is the cost price of the laptop?
(1) Rs. 10200 (2) Rs. 10625
(3) Rs. 11200 (4) Rs. 10275
(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

54. A merchant marks an article 20% above cost price. He then sells it at a discount of 20%. The sale gives him :
(1) No loss or gain
(2) 4% loss
(3) 2% gain
(4) 4% gain
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

55. A merchant marks an article 20% above cost price. He then sells it at a discount of 20%. The sale gives him:
(1) No loss or gain
(2) 4% loss
(3) 2% gain
(4) 4% gain
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

56. A trader purchased a gift box for Rs. 150. What should be the marked price on the gift box so that after allowing a discount of 10%, he makes a profit of 10%?
(1) Rs. 180 (2) Rs. 183.3
(3) Rs. 186.6 (4) Rs. 190
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

57. An article was sold at Rs. 950 allowing 5% discount on the marked price. The marked price of the article is
(1) Rs. 960 (2) Rs. 1000
(3) Rs. 955 (4) Rs. 945
(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

58. If a shop-keeper marks his goods for a certain amount so as to get 25% gain after allowing a discount of 20%, then his marked price is
(1) Rs. 156.25 (2) Rs. 146.25
(3) Rs. 166.25 (4) Rs. 150.25
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

59. A shopkeeper marks his goods 40% above the cost price and allows a discount of 25% on it. His gain per cent is
(1) 5% (2) 10%
(3) 15% (4) 20%
(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

60. A dealer marks his goods 20% above cost price. He then allows some discount on it and makes a profit of 8%. The rate of discount is
(1) 4% (2) 6%
(3) 10% (4) 12%
(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

61. A man bought a watch for 10% discount. If he had bought for 20% discount he would have got the watch for Rs. 125 less . The marked price of the watch is
(1) Rs. 2500 (2) Rs.1250
(3) Rs. 3750 (4) Rs.1000
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

62. A merchant marked cloth at Rs. 50 per metre . He offers two successive discounts of 15% and 20%. The net price per metre of cloth is :
(1) Rs. 32.50 (2) Rs. 42.50
(3) Rs. 34.00 (4) Rs. 40.00
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

63. A dealer marks his goods 20% above their cost prices. Then, he allows such a discount on the marked price so that he makes a profit of 8%. The rate of discount is :
(1) 12% (2) 10%
(3) 6% (4) 4%
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

64. A trader marks his goods in such a way that after allowing a discount of 10% he gains 15%. If an article costs him Rs. 720, his marked price is
(1) Rs.920 (2) Rs.900
(3) Rs.820 (4) Rs.950
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

65. While selling a shirt, a shopkeeper gives a discount of 7%. If he gives discount of 9% he earns Rs. 15 less on profit. The marked price of the shirt is
(1) Rs. 712 (2) Rs. 787
(3) Rs. 750 (4) Rs. 697
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

66. A book seller allowed 10% discount on printed price. He gets 30% commission from publisher. His profit in per cent will be
(1) 20 (2) $28\frac{4}{7}$
(3) 25 (4) $26\frac{3}{7}$
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

67. A dealer is selling an article at a discount of 5% on the marked price. If the marked price is 12% above the cost price and the article was sold for Rs. 532, then the cost price is (in Rs.)
(1) 500 (2) 525
(3) 505 (4) 520
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

68. A shopkeeper increases the price of an object by 40% and then sells it at 25% discount on the marked price. If the selling price of such an object be Rs. 2100, its cost price for the shopkeeper was
(1) Rs. 3000 (2) Rs. 1500
(3) Rs. 1750 (4) Rs. 2000
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

69. A retailer gets a discount of 40% on the printed price of an article. The retailer sells it at the printed price. His gain per cent is
(1) 40% (2) 55%
(3) $66\frac{2}{3}\%$ (4) 75%
(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

70. The list price (marked price) of an article is Rs. 900 and is available at two successive discounts of 20% and 10%. The selling price of the article, in rupees, is :
(1) 640 (2) 648
(3) 720 (4) 738
(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

71. A shopkeeper marks his goods 50% more than the cost price and allows a discount of 25%. His profit or loss percentage is :
(1) 37.5% (2) 25.5%
(3) 12.5% (4) 25%
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

TYPE-III

1. A dealer offers a discount of 10% on the marked price of an article and still makes a profit of 20%. If its marked price is ₹ 800, then the cost price of the article is :
(1) ₹ 900 (2) ₹ 800
(3) ₹ 700 (4) ₹ 600
(SSC CGLPrelim Exam. 24.02.2002 (First Sitting)

2. The marked price of an article is ₹ 200. A discount of $12\frac{1}{2}\%$ is allowed on the marked price and a profit of 25% is made. The cost price of the article is :
(1) ₹ 200 (2) ₹ 175
(3) ₹ 120 (4) ₹ 140
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

3. A shopkeeper earns a profit of 10% after allowing a discount of 20% on the marked price. The cost price of the article whose marked price is ₹ 880, is
(1) ₹ 704 (2) ₹ 640
(3) ₹ 774 (4) ₹ 680
(SSC CGL Prelim Exam.24.02.2002 (Middle Zone)

4. By giving a discount of 10% on the marked price of ₹ 1100 of a cycle, a dealer gains 10%. The cost price of the cycle is :
(1) ₹ 1100 (2) ₹ 900
(3) ₹ 1089 (4) ₹ 891
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

5. The marked price of an electric iron is ₹ 690. The shopkeeper allows a discount of 10% and gains 8%. If no discount is allowed, his gain per cent would be
(1) 20% (2) 24%
(3) 25% (4) 28%
(SSC CPO S.I. Exam. 07.09.2003)

6. A trader wishes to gain 20% after allowing 10% discount on the marked price to his customers. At what per cent higher than the cost price must he marks his goods ?

(1) 30% (2) $33\frac{1}{3}$%

(3) $34\frac{2}{3}$% (4) 35%

(SSC CGLPrelim Exam. 08.02.2004 (IInd Sitting) & (SSC CGL Prelim Exam. 04.02.2007) & (SSC MTS Exam. 17.03.2013 (Ist Sitting)

7. A shopkeeper buys an article for ₹ 180. He wishes to gain 20% after allowing a discount of 10% on the marked price to the customer. The marked price will be

(1) ₹ 210 (2) ₹ 240

(3) ₹ 270 (4) ₹ 300

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

8. The cost of manufacturing an article was ₹ 900. The trader wants to gain 25% after giving a discount of 10%. The marked price must be :

(1) ₹ 1500 (2) ₹ 1250

(3) ₹ 1200 (4) ₹ 1000

(SSC CGLPrelim Exam. 13.11.2005 (Ist Sitting) & (SSC GL Tier-I Exam. 21.04.2013)

9. A shopkeeper offers 10% discount on the marked price of his articles and still makes a profit of 20%. What is the actual cost of the article marked ₹ 500 for him ?

(1) ₹ 440 (2) ₹ 425

(3) ₹ 400 (4) ₹ 375

(SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting) & (FCI Assistant Grade-III Exam.25.02.2012 (Paper-I) (North Zone)

10. The marked price of an electric iron is ₹ 300. The shopkeeper allows a discount of 12% and still gains 10%. If no discount is allowed, his gain per cent would have been :

(1) 20% (2) 25%

(3) 27% (4) 30%

(SSC CPO S.I. Exam. 16.12.2007)

11. A manufacturer marked an article at ₹ 50 and sold it allowing 20% discount. If his profit was 25%, then the cost price of the article was

(1) ₹ 40 (2) ₹ 35

(3) ₹ 32 (4) ₹ 30

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

12. A shopkeeper earns a profit of 12% on selling a book at 10% discount on the printed price. The ratio of the cost price and the printed price of the book is

(1) 45 : 56 (2) 45 : 51

(3) 47 : 56 (4) 47 : 51

(SSC CGL Tier-I Exam.16.05.2010 (First Sitting)

13. The marked price of a radio is ₹ 480. The shopkeeper allows a discount of 10% and gains 8%. If no discount is allowed, his gain percent would be

(1) 18% (2) 18.5%

(3) 20.5% (4) 20%

(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

14. Marked price of an article is ₹ 275. Shopkeeper allows a discount of 5% and he gets a profit of 4.5%. The actual cost of the article is

(1) ₹ 250 (2) ₹ 225

(3) ₹ 215 (4) ₹ 210

(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

15. The price that Akbar should mark on a pair of shoes which costs him ₹ 1,200 to gain 12% after allowing a discount of 16% (in rupees) is

(1) 1,344 (2) 1,433

(3) 1,600 (4) 1,500

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

16. In order to maintain the price line a trader allows a discount of 10% on the marked price of an article. However, he still makes a profit of 17% on the cost price. Had he sold the article at the marked price, he would have earned a profit per cent of

(1) 30% (2) 32%

(3) 33% (4) 35%

(SSC CPO S.I. Exam. 05.09.2004)

17. A trader sells his goods at a discount of 20%. He still makes a profit of 25%. If he sells the goods at the marked price only, his profit will be

(1) 56.25% (2) 25.56%

(3) 50.25% (4) 54.25%

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

18. After allowing a discount of 16%, there was still a gain of 5%. Then the percentage of marked price over the cost price is

(1) 15% (2) 18%

(3) 21% (4) 25%

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 Paper-I)

19. The marked price of a radio is ₹ 4,800. The shopkeeper allows a discount of 10% and gains 8%. If no discount is allowed, his gain per cent will be

(1) 18% (2) 20%

(3) 22% (4) 25%

(SSC Data Entry Operator Exam. 02.08.2009)

20. An article of cost price ₹ 8,000 is marked at ₹ 11,200. After allowing a discount of x% a profit of 12% is made. The value of x is

(1) 21% (2) 20%

(3) 22% (4) 23%

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

21. A trader allows a trade discount of 20% and a cash discount of $6\frac{1}{4}$ % on the marked price of the goods and gets a net gain of 20% of the cost. By how much above the cost should the goods be marked for the sale ?

(1) 40% (2) 50%

(3) 60% (4) 70%

(SSC Graduate Level Tier-II Exam.16.09.2012)

22. A tradesman marks his goods at such a price that after allowing a discount of 15%, he makes a profit of 20%. What is the marked price of an article whose cost price is ₹170 ?

(1) ₹240 (2) ₹260

(3) ₹220 (4) ₹200

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

23. How much percent above the cost price should a shopkeeper mark his goods so as to earn a profit of 32% after allowing a discount of 12% on the marked price ?

(1) 50% (2) 40%

(3) 60% (4) 45%

(SSC CGL Tier-I Exam. 11.11.2012, Ist Sitting)

24. After allowing a discount of 12% on the marked price, a shopkeeper still gains 21%. The marked price is above the cost price by
(1) 25% (2) 30%
(3) 37.5% (4) 42.5%
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

25. A profit of 10% is made after giving a discount of 5% on a T. V. If the marked price of the TV is ₹ 2640.00, the cost price of the TV was :
(1) ₹ 2280 (2) ₹ 2296
(3) ₹ 2380 (4) ₹ 2396
(SSC Multi-Tasking Staff Exam. 10.03.2013)

26. A grinder was marked at ₹ 3,600. After given a discount of 10% the dealer made a profit of 8%. Calculate the cost price.
(1) ₹ 3,000 (2) ₹ 3,312
(3) ₹ 3,240 (4) ₹ 2,960
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

27. How much percent more than the cost price should a shopkeeper mark his goods so that after allowing a discount of 25% on the marked price, he gains 20% ?
(1) 70% (2) 50%
(3) 60% (4) 55%
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

28. A shopkeeper marks his goods 20% above his cost price and gives 15% discount on the marked price. His gain percent is
(1) 5% (2) 4%
(3) 2% (4) 1%
(SSC Graduate Level Tier-I Exam. 19.05.2013)

29. A shopkeeper marks his goods 40% above the cost price. He allows a discount of 5% for cash payment to his customers. He receives ₹1064 after paying the discount. His profit is
(1) ₹ 264 (2) ₹ 164
(3) ₹ 200 (4) ₹ 800
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

30. The true discount on ₹ 1, 860 due after a certain time at 5% is ₹ 60. Find the time after which it is due.
(1) 10 months (2) 8 months
(3) 9 months (4) 1 year
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

31. A shopkeeper sold an item for ₹1,510 after giving a discount of $24\frac{1}{2}\%$ and thereby incurred a loss of 10%. Had he sold the item without discount, his net profit would have been
(1) ₹ 641 (2) ₹ $322\frac{1}{9}$
(3) ₹ $422\frac{2}{9}$ (4) ₹ $322\frac{2}{9}$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

32. A trader buys goods at 20% discount on marked price. If he wants to make a profit of 25% after allowing a discount of 20%, by what percent should his marked price be greater than the original marked price ?
(1) 15% (2) 65%
(3) 25% (4) 20%
(SSC CGL Tier-I Exam. 19.10.2014)

33. A shopkeeper sold an item at 10% loss after giving a discount equal to half the marked price. Then the cost price is
(1) $\frac{1}{9}$th of marked price
(2) $\frac{4}{9}$th of marked price
(3) $\frac{5}{9}$th of marked price
(4) $\frac{7}{9}$th of marked price
(SSC CGL Tier-II Exam. 21.09.2014)

34. A person purchased a saree for ₹ 7710 after availing a net discount of ₹ 1285. The percentage of discount, the saree shop offers, is
(1) $14\frac{1}{7}\%$ (2) $14\frac{2}{7}\%$
(3) $14\frac{3}{7}\%$ (4) $14\frac{4}{7}\%$
(SSC CGL Tier-II Exam. 21.09.2014)

35. After allowing 10% discount, a dealer wishes to sell a machine for ₹ 2,700. At what price must the machine be marked ?
(1) ₹ 270 (2) ₹ 3,000
(3) ₹ 2,970 (4) ₹ 2,430
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

36. The marked price of a saree is Rs. 200. After allowing a discount of 20% on the marked price, the shopkeeper makes a profit of Rs. 16. Find the gain percent.
(1) $11\frac{1}{9}\%$ (2) $9\frac{1}{11}\%$
(3) 11% (4) 8%
(SSC CHSL DEO & LDC Exam. 9.11.2014)

37. A merchant offers 8% discount on all his goods and still makes a profit of 15%. If an item is marked ₹ 250, then its cost price is
(1) ₹ 180 (2) ₹ 200
(3) ₹ 230 (4) ₹ 187
(SSC CHSL DEO Exam. 16.11.2014) (Ist Sitting)

38. A store offers a variety of discounts that range between 20% and 25% inclusive. If a book is discounted to a price of ₹ 270, then its greatest possible original price was
(1) ₹ 345.5 (2) ₹ 324
(3) ₹ 360 (4) ₹ 337.5
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

39. A man allows a discount of 10% on a book whose marked price is Rs. 40. What is the cost price so that the profit is 20%?
(1) Rs. 35 (2) Rs. 40
(3) Rs. 30 (4) Rs. 45
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

40. A shopkeeper earns a profit of 12% on selling a book at 10% discount on the printed price. The ratio of the cost price to the printed price of the book is
(1) 45 : 56 (2) 50 : 61
(3) 99 : 125 (4) None of these
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

41. A man sold an article for Rs. 450, after allowing a discount of $16\frac{2}{3}$% on the printed price. What is that printed price ?
(1) Rs. 525 (2) Rs. 530
(3) Rs. 535 (4) Rs. 540
(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (IST Sitting)

42. A dealer purchased an article for Rs. 900 and fixes the list price in such a way that he gains 20% after allowing 10% discount, then the list price is :
(1) Rs. 1180 (2) Rs.1080
(3) Rs. 1200 (4) Rs.1100
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

TYPE-IV

1. A discount of 2½% is given to the customer on the marked price of an article. A man bought the article for ₹ 39. The marked price of the article is :
(1) ₹ 42 (2) ₹ 36.5
(3) ₹ 40 (4) ₹ 41.5
(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting)

2. The printed price of an article is ₹ 900 but the retailer gets a discount of 40%. He sells the article for ₹ 900. Retailer's gain per cent is :
(1) 40% (2) 60%
(3) $66\frac{2}{3}$% (3) $68\frac{1}{3}$%
(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting)

3. A retailer buys 40 pens at the marked price of 36 pens from a wholesaler. If he sells these pens giving a discount of 1%, what is the profit percent?
(1) 9% (2) 10%
(3) $10\frac{1}{9}$% (4) 11%
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. A fan is listed at ₹ 1,500 and a discount of 20% is offered on the list price. What additional discount must be offered to the customer now to bring the net price to ₹ 1,104 ?
(1) 8% (2) 10%
(3) 15% (4) 12%
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. A retailer gets a discount of 40% on the printing price of an article. The retailer sells it at the printing price. His gain per cent is
(1) 40% (2) 55%
(3) $66\frac{2}{3}$% (4) 75%
(SSC CPO S.I. Exam. 12.01.2003

6. A man buys an article for ₹ 80 and marks it at ₹ 120. He then allows a discount of 40%. What is the loss or gain per cent ?
(1) 12% gain (2) 12% loss
(3) 10% gain (4) 10% loss
(SSC CPO S.I. Exam. 12.01.2003

7. A discount of 14% on the marked price of an article is allowed and then the article is sold for ₹ 387. The marked price of the article is
(1) ₹ 450 (2) ₹ 427
(3) ₹ 500 (4) ₹ 440
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. A shopkeeper sells his goods at 10% discount on the marked price. What price should he mark on an article that costs him ₹ 900 to gain 10% ?
(1) ₹ 1275 (2) ₹ 1250
(3) ₹ 1175 (4) ₹ 1100
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

9. A tradesman gives 4% discount on the marked price and gives 1 article free for buying every 15 articles and thus gains 35%. The marked price is increased above the cost price by
(1) 40% (2) 39%
(3) 50% (4) 20%
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

10. A sells a scooter priced ₹ 36,000. He gives a discount of 8% on the first ₹ 20,000 and 5% on the next ₹ 10,000. How much discount can he offered on the remaining ₹ 6,000 if he is to get as much as when 7% discount is allowed on the total ?
(1) 5% (2) 6%
(3) 7% (4) 8%
(SSC CPO S.I. Exam. 07.09.2003)

11. A trader marked the price of his commodity so as to include a profit of 25%. He allowed discount of 16% on the marked price. His actual profit was :
(1) 5% (2) 9%
(3) 16% (4) 25%
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

12. If a discount of 20% on the marked price of a shirt saves a man Rs. 150, how much did he pay for the shirt ?
(1) ₹ 600 (2) ₹ 650
(3) ₹ 500 (4) ₹ 620
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

13. Ravi buys an article with a discount of 25% on its marked price. He makes a profit of 10% by selling it at ₹ 660. The marked price of the article was:
(1) ₹ 600 (2) ₹ 700
(3) ₹ 800 (4) ₹ 685
(SSC CPO S.I. Exam. 16.12.2007)

14. An article is sold at a discount of 20% and an additional discount of 30% is allowed on cash payment. If Vidya purchased the article by paying ₹ 2240 in cash, the marked price of the article was
(1) ₹ 4000 (2) ₹ 4368
(3) ₹ 4400 (4) ₹ 4480
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

15. While selling a cooler, a shopkeeper gives a discount of 10% on the marked price. If he gives a discount of 12% he earns ₹ 35 less as profit. The marked price of the cooler is
(1) ₹ 1,650 (2) ₹ 1,625
(3) ₹ 1,725 (4) ₹ 1,750
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

16. A trader gains 15% after selling an item at 10% discount on the printed price. The ratio of the cost price and printed price of the item is
(1) 18 : 23 (2) 17 : 18
(3) 17 : 23 (4) 18 : 25
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

17. While selling a shirt, a shopkeeper gives a discount of 7%. If he had given a discount of 9% he would have got ₹ 15 less as profit. The marked price of the shirt is
(1) ₹ 750 (2) ₹ 720
(3) ₹ 712.50 (4) ₹ 600
(SSC SAS Exam 26.06.2010 (Paper-1)

18. The selling price of an article is ₹ 1,920 and the discount given is 4%. The marked price of the article is

(1) ₹ 2,400 (2) ₹ 2,000
(3) ₹ 1,600 (4) ₹ 1,200

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

19. An article, which is marked ₹ 650, is sold for ₹572. The discount given is

(1) 12% (2) 13%
(3) 21% (4) 26%

(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

20. The cost price of an article is 64% of the marked price. The gain percentage after allowing a discount of 12% on the marked price is

(1) 37.5% (2) 48%
(3) 50.5% (4) 52%

(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

21. While selling a watch, a shopkeeper gives a discount of 5%. If he gives a discount of 6%, he earns ₹ 15 less as profit. What is the marked price of the watch?

(1) ₹ 1,250 (2) ₹ 1,400
(3) ₹ 1,500 (4) ₹ 750

(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

22. A shop-keeper sells a badminton racket whose marked price is ₹ 30, at a discount of 15% and gives a shuttle cock costing ₹ 1.50 free with each racket. Even then he makes a profit of 20%. His cost price, per racket, is

(1) ₹ 21.00 (2) ₹ 21.25
(3) ₹ 20.00 (4) ₹ 19.75

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

23. A shopkeeper allows 4% discount on his marked price. If the cost price of an article is ₹ 100 and he has to make a profit of 20%, then his marked price must be

(1) ₹ 96 (2) ₹ 120
(3) ₹ 125 (4) ₹ 130

(SSC Data Entry Operator Exam. 31.08.2008)

24. A shopkeeper sells his goods at 15% discount. The marked price of an article whose selling price is ₹ 629 is :

(1) ₹ 740 (2) ₹ 704
(3) ₹ 700 (4) ₹ 614

(SSC CHSL DEO & LDC Exam. 27.11.2010)

25. When a shopkeeper gives 10% discount on the list price of a toy, his gain is 20%. If he had given a discount of 20%, his percentage of gain would have been

(1) $6\frac{2}{3}$% (2) $8\frac{1}{3}$%
(3) 10% (4) 15%

(SSC CPO S.I. Exam. 09.11.2008) & (SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

26. A discount of 24% on the marked price of an article is allowed and then the article is sold for ₹ 342. The marked price of the article is

(1) ₹ 500 (2) ₹ 490
(3) ₹ 450 (4) ₹ 430

(SSC CISF Constable (GD) Exam. 05.06.2011)

27. Rahim bought a T.V. with 20% discount on list price. Had he bought it with 25% discount he would have saved ₹ 500. At what price did he buy the T.V?

(1) ₹ 16,000 (2) ₹ 12,000
(3) ₹ 10,000 (4) ₹ 8,000

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone) & (SSC GL Tier-II Exam. 16.09.2012)

28. A shopkeeper gains ₹ 56 on a toy after allowing 23% discount on its marked price. If his gain is 10%, then the marked price of the toy is :

(1) ₹ 810 (2) ₹ 800
(3) ₹ 560 (4) ₹ 740

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

29. A discount of 16% on the marked price of a book enables a man to buy a pen that costs ₹ 80. How much did he pay for the book ?

(1) ₹ 500 (2) ₹ 480
(3) ₹ 420 (4) ₹ 340

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

30. After allowing a discount of 12% on the marked price of an article, it is sold for ₹ 880. Find its marked price.

(1) ₹ 1,100 (2) ₹ 2,000
(3) ₹ 1,000 (4) ₹ 2,100

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

31. A fan in a shop is offered at a discount of 10%. It is sold during clearance sale at 6% discount over the already discounted price at ₹ 846. The original marked price of the fan is

(1) ₹ 900 (2) ₹ 946
(3) ₹ 850 (4) ₹ 896

(SSC Graduate Level Tier-II Exam.16.09.2012)

32. Mr. A bought a refrigerator with $16\frac{2}{3}$% discount on the labelled price. Had he bought it with 25% discount, he would have saved ₹600. At what price did he buy the refrigerator ?

(1) ₹ 6000 (2) ₹ 7200
(3) ₹ 7500 (4) ₹ 5000

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

33. The selling price of a video game is ₹ 740 and the discount allowed is 7.5%. The marked price of the video game is :

(1) ₹ 600 (2) ₹ 700
(3) ₹ 800 (4) ₹ 900

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

34. A fan is listed at ₹150 and a discount of 20% is given. Then the selling price is

(1) ₹180 (2) ₹150
(3) ₹120 (4) ₹110

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

35. If a dining table with marked price ₹ 6,000 was sold to a customer for ₹5,500, then the rate of discount allowed on the table is

(1) 10% (2) 8%
(3) $8\frac{1}{3}$% (4) 9%

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

36. A washing machine is sold at a discount of 30%. If a man buys it for ₹ 6,580, its list price is

(1) ₹ 7,500 (2) ₹ 8,600
(3) ₹ 9,400 (4) ₹ 6,990

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

37. An article marked ₹ 800 is offered at ₹ 736 in the off season. The rate of discount offered is :

(1) 10% (2) 7%
(3) 7.5% (4) 8%

(SSC CHSL DEO & LDC Exam. 21.10.2012, IInd Sitting)

38. Discount on a pair of shoes marked at ₹ 475 and discounted at 15%, is

(1) ₹ 70 (2) ₹ 71.25
(3) ₹ 72 (4) ₹ 72.25

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

39. A machine is marked at ₹ 6,800 and available at a discount of 10%. The shopkeeper gives another off season discount to the buyer and sells the machine for ₹ 5,202. Find the off season discount.

(1) 10% (2) 12%
(3) 15% (4) 18%

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

40. A shopkeeper buys an article for ₹ 360. He wants to make a gain of 25% on it after a discount of 10%. The marked price is

(1) ₹ 486 (2) ₹ 450
(3) ₹ 500 (4) ₹ 460

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

41. A table with marked price ₹ 1200 was sold to a customer for ₹ 1100. Find the rate of discount allowed on the table.

(1) 9% (2) $8\frac{1}{3}\%$
(3) $9\frac{1}{3}\%$ (4) 10%

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

42. The marked price of an item is twice the cost price. For a gain of 15%, the discount should be

(1) 7.5% (2) 20.5%
(3) 32.5% (4) 42.5%

(SSC CHSL DEO & LDC Exam. 9.11.2014)

43. The listed price of a shirt is ₹ 270 and it is available at ₹ 237.60. The rate of discount is

(1) 10% (2) 12%
(3) 15% (4) 20%

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

44. A dealer allows his customers a discount of 25% and still gains 25%. If an article costs Rs. 1,440 to the dealer; then its marked price is

(1) Rs. 1,850 (2) Rs. 2,400
(3) Rs. 2,560 (4) Rs. 1,500

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

45. The marked price of a watch was Rs. 720. A man bought the same for Rs. 550.80 after getting two successive discounts, the first being 10%. The second discount rate is

(1) 18% (2) 12%
(3) 14% (4) 15%

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

46. An item was sold for Rs. 3600 at 25% discount. Its marked price was

(1) Rs. 2880 (2) Rs. 2700
(3) Rs. 4800 (4) Rs. 4500

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

47. A shopkeeper, in order to clear his old stock of T.V. sets, offers 12% discount on the T.V. sets. If the marked price of a T.V. set is Rs. 6500, the selling price of the T.V. set is:

(1) Rs. 5700 (2) Rs. 5720
(3) Rs. 5400 (4) Rs. 6000

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

48. A seller gains 20% profit even after allowing 10% discount. If the amount of profit on a TV set is Rs. 750, then the marked price of the TV set is

(1) Rs. 5200 (2) Rs. 5000
(3) Rs. 4800 (4) Rs. 5500

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

49. Articles are marked at a price which gives a profit of 25%. After allowing a certain discount the profit reduces to $12\frac{1}{2}\%$. The discount percent is

(1) 11.1% (2) 10%
(3) $12\frac{1}{2}\%$ (4) 12%

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

50. After allowing a discount of 20%, a radio is available for Rs. 1200. Its marked price was :

(1) Rs. 1550 (2) Rs. 1500
(3) Rs. 1800 (4) Rs. 1400

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

51. The marked price of a CD is Rs. 250. It is sold for Rs. 225. The rate of discount is :

(1) 2.5% (2) 10%
(3) 25% (4) $11\frac{1}{9}\%$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

52. A shopkeeper fixes the price of an article at 30% higher than its actual cost. If the sells it at 10% discount on marked price then, the profit is :

(1) 18% (2) 19%
(3) 17% (4) 20%

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

53. A shop keeper allows 20% discount on the marked price on his articles. Find the marked price of an article for which he charges Rs. 740.

(1) Rs. 725 (2) Rs. 875
(3) Rs. 925 (4) Rs. 1040

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

54. The price of a shirt after 15% discount, is Rs.119. What was the marked price of the shirt before discount?

(1) Rs.129 (2) Rs.140
(3) Rs.150 (4) Rs.160

(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (IST Sitting)

55. A shopkeeper offers 2.5% discount on cash purchases. What cash amount would Rohit pay for a cycle, the marked price of which is Rs. 3600 ?

(1) Rs. 3490 (2) Rs. 3500
(3) Rs. 3510 (4) Rs. 3520

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

56. The marked price of an article is 10% higher than the cost price. A discount of 10% is given at the marked price. In this kind of sale, the seller

(1) bears no gain , no loss
(2) gains
(3) loses 1%
(4) None of these

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

57. The rate of discount being given on a shirt, where selling price is Rs. 576 after deducting a discount of Rs. 109 on its marked price, is :

(1) 14% (2) 18%
(3) 15% (4) 16%

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

58. At what percentage above the cost price must an article be marked so as to gain 33% after allowing a customer a discount of 5% ?

(1) 40% (2) 45%
(3) 35% (4) 47%

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

59. The marked price of a ceiling fan is Rs. 1200 and the shopkeeper allows a discount of 5 % on it. Then selling price of the fan is
(1) Rs. 1410 (2) Rs. 1400
(3) Rs. 1140 (4) Rs. 1104
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

60. When a discount of Rs. 42 is allowed on the marked price of an article, the new reduced price becomes 86% of the original price. Find the marked price.
(1) Rs. 250 (2) Rs. 300
(3) Rs. 350 (4) Rs. 400
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

61. While selling a watch, a shopkeeper gives a discount of 5%. If he gives a discount of 7%, he earns Rs. 15 less as profit. The marked price of the watch is :
(1) Rs. 697.5
(2) Rs. 712.5
(3) Rs. 750
(4) None of the these
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

62. The cost price of an article is Rs. 200. If 20% profit is made after giving 20% discount on the marked price, the marked price is :
(1) Rs. 300 (2) Rs. 320
(3) Rs. 420 (4) Rs. 450
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

63. If a retailer offers a discount of 32% on the marked price of his goods and thus ends up selling at cost price, what was the percentage markup price?
(1) 24 per cent
(2) 47.05 per cent
(3) 22.34 per cent
(4) 32 per cent
(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

64. If the shopkeeper sells an item at Rs 960 which is marked as Rs 1200, what is the discount he is offering ?
(1) 25 percent (2) 12 percent
(3) 20 percent (4) 28 percent
(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

65. A photographer allows a discount of 10% on the advertised price of a camera. The price (in Rs.) that must be marked on the camera, which cost him Rs. 600, to make a profit of 20% would be
(1) 650 (2) 800
(3) 700 (4) 850
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

66. What was the rate of discount if a computer with marked price ₹ 30,000 was sold for ₹ 28,000 ?
(1) 20% (2) $7\frac{1}{2}\%$
(3) $6\frac{2}{3}\%$ (4) 15%
(SSC Multi-Tasking Staff Exam. 30.04.2017)

67. Peter bought an item at 20% discount on its original price. He sold it with 40% increase on the price he bought it. The new sale price is greater than the original price (in per cent) by
(1) 10 (2) 8
(3) 7.5 (4) 12
(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE-V

1. A discount of 15% on one article is the same as discount of 20% on a second article. The costs of the two articles can be :
(1) ₹ 85, ₹ 60 (2) ₹ 60, ₹ 40
(3) ₹ 40, ₹ 20 (4) ₹ 80, ₹ 60
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A salesman is allowed $5\frac{1}{2}\%$ discount on the total sales made by him plus a bonus of $\frac{1}{2}\%$ on sales over ₹ 10,000. If his total earnings were ₹ 1,990, his total sales (in ₹) was
(1) 30,000 (2) 32,000
(3) 34,000 (4) 35,000
(SSC CPO S.I. Exam. 12.01.2003)

3. A housewife saved ₹ 2.50 in buying a dress on sale. If she spent ₹ 25 for the dress, **approximately** how much per cent she saved in the transaction?
(1) 8% (2) 9%
(3) 10% (4) 11%
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

4. A trader marked his goods at 20% above the cost price. He sold half the stock at the marked price, one quarter at a discount of 20% on the marked price and the rest at a discount of 40% on the marked price. His total gain is
(1) 2% (2) 4.5%
(3) 13.5% (4) 15%
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

5. A fan is listed at ₹ 1500 and a discount of 20% is offered on the list price. What additional discount must be offered to the customer to bring the net price to ₹ 1104 ?
(1) 8% (2) 10%
(3) 12% (4) 15%
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

6. A shopkeeper gives 12 per cent additional discount after giving an initial discount of 20 per cent on the marked price of a radio. If the sale price of the radio is ₹ 704, the marked price is
(1) ₹ 844.80 (2) ₹ 929.28
(3) ₹ 1,044.80 (4) ₹ 1,000
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

7. A dealer buys an article marked at ₹ 25,000 with 20% and 5% off. He spends ₹ 1,000 for its repair and sells it for ₹ 25,000. What is his gain or loss per cent?
(1) Loss of 25% (2) Gain of 25%
(3) Gain of 10% (4) Loss of 10%
(SSC CGLPrelim Exam. 04.02.2007 (First Sitting)

8. The marked price of a shirt and trousers are in the ratio 1 : 2. The shopkeeper gives 40% discount on the shirt. If the total discount on the set of the shirt and trousers is 30%, the discount offered on the trousers is
(1) 15% (2) 20%
(3) 25% (4) 30%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

9. A retailer purchases a grinder at a discount of 15% and sells it for ₹ 1955 at a profit of 15%. The amount of discount received by the retailer from the wholesaler was
(1) ₹ 270 (2) ₹ 290
(3) ₹ 300 (4) ₹ 330
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

10. A dozen pair of socks quoted at ₹ 80 are available at a discount of 10%. How many pairs of socks can be bought for ₹ 24 ?

(1) 4 (2) 5
(3) 3 (4) 6

(SSC CPO S.I. Exam. 06.09.2009)

11. If an electricity bill is paid before due date, one gets a reduction of 4% on the amount of the bill. By paying the bill before due date a person got a reduction of ₹ 13. The amount of his electricity bill was

(1) ₹ 125 (2) ₹ 225
(3) ₹ 325 (4) ₹ 425

(SSC CGLTier-I Exam. 16.05.2010 (Second Sitting)

12. The true discount on a sum of money due 2 years hence at 5% is ₹15. Find the sum.

(1) ₹150 (2) ₹165
(3) ₹170 (4) ₹160

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

13. A shopkeeper lists the price of an article as ₹500. But he gives a certain discount which allows the buyer to pay ₹500 for the article including 10% sales tax. The rate of discount is

(1) 10% (2) $10\frac{1}{11}\%$
(3) $9\frac{1}{11}\%$ (4) 11%

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

14. With a 5 % discount on the cost of sugar, a buyer could purchase 2 kg more sugar for ₹ 608. Selling price of sugar is :

(1) ₹15.50 (2) ₹ 15
(3) ₹16.50 (4) ₹ 16

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

15. During a month-long annual sale, a shopkeeper sells his goods at a discount of 50%. But in the last week, he offers an additional discount of 40%. If the original price of a shirt is ₹ x, then the price, (in rupees) during the last week of the sale will be

(1) 90% of x (2) 70% of x
(3) 30% of x (4) 10% of x

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

16. Ramesh bought 10 cycles for ₹500 each. He spent ₹2,000 on the repair of all cycles. He sold five of them for ₹750 each and the remaining for ₹550 each. Then the total gain or loss % is

(1) Gain of $8\frac{1}{3}\%$

(2) Loss of $8\frac{1}{3}\%$

(3) Gain of $7\frac{2}{3}\%$

(4) Loss of $7\frac{1}{7}\%$

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

17. A fan is listed at ₹ 1,400 and the discount offered is 10%. What additional discount must be given to bring the net selling price to ₹ 1,200 ?

(1) $16\frac{2}{3}\%$ (2) 5%

(3) $4\frac{16}{21}\%$ (4) 6%

(SSC CPO S.I. Exam. 16.12.2007)

18. The Banker's discount on a bill due 6 months hence at 16% per annum is ₹ 216. The true discount is :

(1) ₹ 212 (2) ₹ 180
(3) ₹ 210 (4) ₹ 200

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

19. The cost of manufacture of a tape recorder is ₹ 1,500. The manufacturer fixes the marked price 20% above the cost of manufacture and allows a discount in such a way as to get a profit of 8%. The rate of discount is

(1) 12% (2) 8%
(3) 20% (4) 10%

(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

20. A shop offers 10% discount on every purchase of an article. It also offers an additional discount of 12%, if the payment is made in cash. If the original price of an item is ₹ 250, how much a customer will pay, if he wants to pay the price in cash?

(1) ₹ 180 (2) ₹ 192
(3) ₹ 198 (4) ₹ 195

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

21. The interest on a certain sum of money is ₹ 22 and the true discount on the same sum for the same time and at the same rate is ₹ 20, Find the sum.

(1) ₹ 220 (2) ₹ 200
(3) ₹ 210 (4) ₹ 212

(SSC Graduate Level Tier-I Exam. 21.04.2013)

22. A mobile phone is listed at ₹ 1,500 and a discount of 10% is offered on the list price. What additional discount must be offered to the customer now to bring the net price to ₹ 1,242?

(1) 10% (2) 8%
(3) 12% (4) 18%

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

23. A reduction of 20% in the price of rice enables a customer to purchase 12.5 kg more for ₹ 800. The original price of rice (per kg) is

(1) ₹ 14 (2) ₹16
(3) ₹ 12 (4) ₹ 15

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

24. A reduction of 10% in the price of a commodity enables a person to buy 25 kg more for ₹ 225. The original price of the commodity per kg was

(1) ₹ 2 (2) ₹ 1
(3) ₹ 2.50 (4) ₹ 1.50

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

25. For a certain article, if discount is 25% the profit is 25%. If the discount is 10%, then the profit is

(1) 50% (2) 40%

(3) 30% (4) $33\frac{1}{3}\%$

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

26. A toy train is marked at ₹ 400 and sold at a discount of 8% during Ganesh puja. A shopkeeper announces a discount of 8%. The amount he will loose if he announces a single discount of 16% is

(1) ₹ 2.56 (2) ₹ 3.84
(3) ₹ 4.16 (4) ₹ 5.78

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

27. The marked price of a toy is ₹ 60 and at a discount that was sold for ₹ 45. Then rate of discount allowed is

(1) 30% (2) 35%
(3) 20% (4) 25%

(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

28. A pen is listed for ₹ 12. A discount of 15% is given on it. A second discount is given bringing the price down to ₹ 8.16. The rate of second discount is

(1) 20% (2) 15%
(3) 18% (4) 25%

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

29. A man saves ₹ 25 on the purchase of an article on which a discount of 20% is allowed. How much did the man pay ?

(1) ₹ 75 (2) ₹ 150
(3) ₹ 100 (4) ₹ 125

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

30. A is to pay B, ₹ 600 in 4 years time. A offers to pay up B at present. What discount should B allow A ?

(1) ₹ 96 (2) ₹ 100
(3) ₹ 120 (4) ₹ 110

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

31. To attract more visitors, Zoo authority announces 20% discount on every ticket which costs 25 paise. For this reason, sale of ticket increases by 28%. Find the percentage of increase in the number of visitors.

(1) 40% (2) 50%
(3) 60% (4) No change

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

32. The list price of a shirt is ₹ 440 and a customer pays ₹ 396 for it. The discount rate is

(1) 10% (2) $10\frac{1}{2}$%
(3) 20% (4) 12%

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

33. A shopkeeper listed the price of goods at 30% above the cost price. He sells half the stock at this price, one fourth of the stock at a discount of 15% and the remaining at 30% discount. His overall profit is

(1) $15\frac{3}{8}$% (2) 15%
(3) $15\frac{3}{5}$% (4) $15\frac{2}{3}$%

(SSC CGL Tier-I Exam. 19.10.2014)

34. The discount on a certain sum of money, due at the end of $2\frac{1}{4}$ years at $2\frac{2}{3}$ % p.a. is ₹ 78. Find the sum.

(1) ₹ 1,278 (2) ₹ 1,300
(3) ₹ 1,378 (4) ₹ 1,400

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

35. X purchased an item at a discount of 10% and sold it to Y at 10% profit. The marked price and the price for which Y purchased the item are in ratio

(1) 1 : 1 (2) 10 : 99
(3) 20 : 99 (4) 100 : 99

(SSC CHSL DEO & LDC Exam. 16.11.2014)

36. If in a sale, the discount given on a saree is equal to one-fourth the marked price and the loss due to this discount is 15%, then the ratio of the cost price to the selling price is

(1) 3 : 4 (2) 4 : 3
(3) 10 : 17 (4) 20 : 17

(SSC CHSL DEO Exam. 16.11.2014) (Ist Sitting)

37. A trader who marks his goods up to 50% offered a discount of 20%. What % profit the trader makes after offering the payment ?

(1) 30% (2) 70%
(3) 20% (4) 50%

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

38. A retailer buys a sewing machine at a discount of 15% and sells it for ₹ 1955. Thus he makes a profit of 15%. The discount is

(1) ₹ 270 (2) ₹ 290
(3) ₹ 300 (4) ₹ 310

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

39. After allowing a discount of 10% on marked price a trader makes a profit of 15%. The ratio of the marked price to the cost price is

(1) 23 : 9 (2) 23 : 10
(3) 23 : 18 (4) 23 : 19

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

40. Mr. x and Mr. y each bought the same motorcycle using a 10% off coupon. Mr. x's cashier took 10% off the price and then added 8.5% sales tax whereas Mr. y's cashier first added the sales tax and then took 10% off the total price. The amount Mr. x paid is

(1) less by ₹ 550 as the amount Mr. y paid
(2) same as the amount Mr. y paid
(3) greater by ₹ 85 as the amount Mr. y paid
(4) greater by ₹ 850 as the amount Mr. y paid

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

41. The price of an antique is reduced by 20% and then this price is again reduced by 10%. The total reduction of the price is

(1) 25 % (2) 30 %
(3) 23 % (4) 28 %

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

42. A builder purchases 25 windows at 25% off the total price of ₹ 1,20,000. If the builder receives an additional discount of ₹ 7500 for the purchase, then the cost of each window is

(1) ₹ 3300 (2) ₹ 3100
(3) ₹ 3400 (4) ₹ 3200

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

43. The list price of a book is Rs. 100. A dealer sells three such books for Rs. 274.50 after allowing discount at a certain rate. Find the rate of discount.
(1) 8.16% (2) 8.5%
(3) 8.34% (4) 8.33%
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

44. A dealer buys an article listed at Rs. 100 and gets successive discounts of 10% and 20%. He spends 10% of the cost price on transportation. At what price should he sell the article to earn a profit of 15%?
(1) ₹ 90.80 (2) ₹ 92.00
(3) ₹ 91.08 (4) ₹ 91.20
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

45. A company showroom gives a discount of 20% on the second grade shoes and a further discount of 15% on shareholder's coupon. The total discount, a coupon holder will get is
(1) 32% (2) 36%
(3) 35% (4) 38%
(SSC CGL Tier-I Re-Exam, 30.08.2015)

46. Two blends of a commodity costing Rs. 35 and Rs. 40 per kg. respectively are mixed in the ratio 2 : 3 by weight. If one–fifth of the mixture is sold at Rs. 46 per kg and the remaining at the rate of Rs. 55 per kg. the profit percent is
(1) 50 (2) 30
(3) 40 (4) 20
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

47. The total discount on Rs. 1860 due after a certain time at 5% is Rs. 60. Find the time after which it is due
(1) 9 months (2) 8 months
(3) 7 months (4) 10 months
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

48. State electricity board gives 15% discount on electric bills if it is paid before due date. One person gets Rs. 54 as discount. The amount of actual bill was :
(1) Rs. 362 (2) Rs. 359
(3) Rs. 360 (4) Rs. 361
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

49. A house was sold for Rs. y by giving a discount of x%, then the list price was :
(1) $\frac{100y}{100-x}$ (2) $\frac{100y}{1-\frac{x}{100}}$
(3) $\frac{100x}{100-y}$ (4) $\frac{100\,y}{1-x}$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

50. A shopkeeper allows 20% discount on his advertised price and to make a profit of 25% on his outlay. What is the advertised price (in Rs.) on which he gains Rs. 6000 ?
(1) 36000 (2) 37500
(3) 39000 (4) 42500
(SSC CGL Tier-II Online Exam.01.12.2016)

51. Ramesh marks his goods 30% above cost price. If he ssells the item for . 910 after allowing a discount of 15 %, find his cost price.
(1) Rs. 823.5 (2) Rs. 758
(3) Rs. 814.2 (4) Rs. 856.5
(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

52. A shopkeeper used to allow a discount of Rs. 20 on a product. He doubles the discount on the product and sold it for Rs. 80. What was the percentage of discount offered ?
(1) 20% (2) 25%
(3) 30% (4) 33.33%
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

53. The original price of a TV set is Rs. 6,000. If the price is discounted by 20% and then raised by 10% for service contract, the price charged by the shopkeeper is
(1) Rs. 5400 (2) Rs. 5280
(3) Rs. 5100 (4) Rs.4200
(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

54. A sells a car priced at Rs. 36,000. He gives a discount of 8% on the first Rs. 20,000 and 5% on the remaining Rs. 16,000. B also sells a car of the same make, priced at Rs. 36,000. He gives a discount of 7% on the total price. Calculate the actual prices charged by A and B for the cars.
(1) A = Rs. 33,500; B = Rs. 33,400
(2) A = Rs. 33,480; B = Rs. 33,600
(3) A = Rs. 33,450; B = Rs. 33,650
(4) A = Rs. 33,600; B = Rs. 33,480
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

55. A cloth merchant has announced 25% rebate in prices. If one needs to have a rebate of Rs. 40, then how many metres of cloth costing Rs. 32 per metre he should purchase ?
(1) 6 m (2) 5 m
(3) 10 m (4) 7 m
(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

56. An article marked at Rs. 540 is sold at Rs. 496.80 in an offseason offer. Then the rate of discount offered (in per cent) is
(1) 7 (2) 7.5
(3) 8 (4) 10
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

57. A bookseller allowed 15% discount on the books sold. Sunil purchased books worth Rs. 1500. How much will he have to pay to the bookseller.
(1) Rs. 1200 (2) Rs. 1250
(3) Rs. 1275 (4) Rs. 1300
(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

58. The list price of TV is Rs. 2300 and discount series is found to be 25% and 10%. Then the selling price of TV is
(1) Rs.1255.5 (2) Rs.1525.5
(3) Rs.1552.5 (4) Rs.1555.2
(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

59. A watch is listed for Rs. 230 and is sold at a discount of 12%. The sale price of the watch is
(1) Rs. 27.6 (2) Rs. 276
(3) Rs. 202.4 (4) Rs. 257.6
(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

60. A dealer allows a discount of 15%. A customer pays an amount of Rs. 318.75 for an article. At what price is the article listed ?
(1) Rs. 366.50 (2) Rs. 375.00
(3) Rs. 350.00 (4) Rs. 431.25
(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

61. A fan is listed at Rs. 150 with a discount of 20%. What additional discount must be offered to the customer to bring the net price to Rs. 108 ?
(1) $11\frac{1}{9}\%$ (2) 15%
(3) 8%
(4) None of these
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

62. A dealer marks a washing machine for Rs. 7500, and allows a discount of 6% on it. Find its selling price.
(1) Rs. 6850 (2) Rs. 7050
(3) Rs. 7250 (4) Rs. 6950
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

63. A shopkeeper gives two successive discounts of 7% each on the marked price of Rs. 20,000 of an article. The selling price of the article is
(1) Rs. 12,978 (2) Rs. 19,278
(3) Rs. 18,927 (4) Rs. 17,298
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

SHORT ANSWERS

TYPE-I

1. (2)	**2.** (4)	**3.** (3)	**4.** (2)
5. (3)	**6.** (3)	**7.** (3)	**8.** (1)
9. (2)	**10.** (3)	**11.** (3)	**12.** (2)
13. (3)	**14.** (3)	**15.** (3)	**16.** (4)
17. (3)	**18.** (2)	**19.** (3)	**20.** (4)
21. (4)	**22.** (2)	**23.** (3)	**24.** (1)
25. (1)	**26.** (4)	**27.** (3)	**28.** (1)
29. (2)	**30.** (3)	**31.** (3)	**32.** (2)
33. (2)	**34.** (2)	**35.** (3)	**36.** (2)
37. (4)	**38.** (1)	**39.** (4)	**40.** (3)
41. (3)	**42.** (2)	**43.** (4)	**44.** (2)
45. (3)	**46.** (1)	**47.** (4)	**48.** (1)
49. (1)	**50.** (4)	**51.** (2)	**52.** (1)
53. (1)	**54.** (2)	**55.** (3)	**56.** (1)
57. (1)	**58.** (2)	**59.** (2)	**60.** (3)
61. (1)	**62.** (1)	**63.** (3)	**64.** (1)
65. (3)	**66.** (3)	**67.** (3)	**68.** (1)
69. (1)	**70.** (4)	**71.** (4)	**72.** (4)
73. (3)	**74.** (1)	**75.** (3)	**76.** (4)
77. (2)	**78.** (4)	**79.** (3)	**80.** (1)
81. (3)	**82.** (2)	**83.** (2)	**84.** (3)
85. (1)	**86.** (1)	**87.** (2)	**88.** (4)
89. (1)	**90.** (4)	**91.** (3)	**92.** (4)
93. (1)			

TYPE-II

1. (2)	**2.** (2)	**3.** (3)	**4.** (4)
5. (2)	**6.** (4)	**7.** (2)	**8.** (1)
9. (1)	**10.** (4)	**11.** (3)	**12.** (4)
13. (2)	**14.** (2)	**15.** (4)	**16.** (4)
17. (2)	**18.** (3)	**19.** (3)	**20.** (1)
21. (3)	**22.** (4)	**23.** (1)	**24.** (4)
25. (3)	**26.** (3)	**27.** (4)	**28.** (2)
29. (2)	**30.** (2)	**31.** (1)	**32.** (4)
33. (3)	**34.** (4)	**35.** (1)	**36.** (4)
37. (3)	**38.** (4)	**39.** (2)	**40.** (4)
41. (1)	**42.** (1)	**43.** (4)	**44.** (3)
45. (2)	**46.** (1)	**47.** (3)	**48.** (4)
49. (4)	**50.** (1)	**51.** (3)	**52.** (3)
53. (2)	**54.** (2)	**55.** (2)	**56.** (2)
57. (2)	**58.** (1)	**59.** (1)	**60.** (3)
61. (2)	**62.** (3)	**63.** (2)	**64.** (1)
65. (3)	**66.** (2)	**67.** (1)	**68.** (4)
69. (3)	**70.** (2)	**71.** (3)	

TYPE-III

1. (4)	**2.** (4)	**3.** (2)	**4.** (2)
5. (1)	**6.** (2)	**7.** (2)	**8.** (2)
9. (4)	**10.** (2)	**11.** (3)	**12.** (1)
13. (4)	**14.** (1)	**15.** (3)	**16.** (1)
17. (1)	**18.** (4)	**19.** (2)	**20.** (2)
21. (3)	**22.** (1)	**23.** (1)	**24.** (3)
25. (1)	**26.** (1)	**27.** (3)	**28.** (3)
29. (4)	**30.** (2)	**31.** (4)	**32.** (3)
33. (3)	**34.** (2)	**35.** (2)	**36.** (1)
37. (2)	**38.** (3)	**39.** (3)	**40.** (1)
41. (4)	**42.** (3)		

TYPE-IV

1. (3)	**2.** (3)	**3.** (2)	**4.** (1)
5. (3)	**6.** (4)	**7.** (1)	**8.** (4)
9. (3)	**10.** (3)	**11.** (1)	**12.** (1)
13. (3)	**14.** (1)	**15.** (4)	**16.** (1)
17. (1)	**18.** (2)	**19.** (1)	**20.** (1)
21. (3)	**22.** (3)	**23.** (3)	**24.** (1)
25. (1)	**26.** (3)	**27.** (4)	**28.** (2)
29. (1)	**30.** (3)	**31.** (1)	**32.** (1)
33. (3)	**34.** (3)	**35.** (3)	**36.** (3)
37. (4)	**38.** (2)	**39.** (3)	**40.** (3)
41. (2)	**42.** (4)	**43.** (2)	**44.** (2)
45. (4)	**46.** (3)	**47.** (2)	**48.** (2)
49. (3)	**50.** (2)	**51.** (2)	**52.** (3)
53. (3)	**54.** (2)	**55.** (3)	**56.** (3)
57. (4)	**58.** (1)	**59.** (3)	**60.** (2)
61. (3)	**62.** (1)	**63.** (2)	**64.** (3)
65. (2)	**66.** (3)	**67.** (4)	

TYPE-V

1. (4)	**2.** (3)	**3.** (2)	**4.** (1)
5. (1)	**6.** (4)	**7.** (2)	**8.** (3)
9. (3)	**10.** (1)	**11.** (3)	**12.** (2)
13. (3)	**14.** (4)	**15.** (3)	**16.** (4)
17. (3)	**18.** (4)	**19.** (4)	**20.** (3)
21. (1)	**22.** (2)	**23.** (2)	**24.** (2)
25. (1)	**26.** (1)	**27.** (4)	**28.** (1)
29. (3)	**30.** (*)	**31.** (3)	**32.** (1)
33. (1)	**34.** (2)	**35.** (4)	**36.** (4)
37. (3)	**38.** (3)	**39.** (3)	**40.** (2)
41. (4)	**42.** (1)	**43.** (2)	**44.** (3)
45. (1)	**46.** (3)	**47.** (2)	**48.** (3)
49. (1)	**50.** (2)	**51.** (1)	**52.** (4)
53. (2)	**54.** (4)	**55.** (2)	**56.** (3)
57. (3)	**58.** (3)	**59.** (3)	**60.** (2)
61. (4)	**62.** (2)	**63.** (4)	

EXPLANATIONS

TYPE-I

1. (2) Using Rule 5,
Successive discounts of 36% and 4% is overall equals to

$$=\left(36+4-\frac{36\times 4}{100}\right)\%$$

= 38.56%

∴ Percentage difference = 40 – 38.56

= 1.44%

Difference between discount

= 1.44% of 100000

$$=\frac{1.44\times 100000}{100}=₹\ 1440$$

2. (4) Using Rule 5,
Equivalent discount

$$=30+10-\frac{30\times 10}{100}=37\%$$

3. (3) Marked price = ₹ 720
Actual price = ₹ 550.80
First discount = 10%
Let the second discount be x%
Then, we can write
720 (1 – 0.10) (1–0.01x)
= 550.80
⇒ 720 × 0.9 (1– 0.01x) = 550.8
⇒ 648 (1 – 0.01x) = 550.8

$$\Rightarrow 1-0.01\,x=\frac{550.8}{648}$$

$$0.01\,x=1-\frac{550.8}{648}$$

$$x=\frac{1-0.85}{0.01}$$

x = 0.15 × 100
x= 15
∴ Second discount = 15%

4. (2) Price after 10% first discount

$$=1000\times\frac{100-10}{100}$$

$$=1000\times\frac{90}{100}=₹\ 900$$

Given :
Price after second discount
= ₹ 810
∴ Second discount
= 900 – 810 = ₹ 90
∴ Percentage of second discount

$$=\frac{90\times 100}{900}=10\%$$

5. (3) Using Rule 5,
Successive discounts of x% and y%

$$=\left(x+y-\frac{x\times y}{100}\right)\%$$

∴ Required discount

$$=\left(20+10-\frac{20\times 10}{100}\right)\%$$

= 30 – 2 = 28%

6. (3) **Trick :**
Equivalent discount

$$=\left(15+10-\frac{15\times 10}{100}\right)\%=23.5\%$$

7. (3) Equivalent discount of successive discounts of 20% and 10%

$$=\left(20+10-\frac{20\times 10}{100}\right)\%=28\%$$

∴ Selling Price = (100 – 28) % of ₹ 500 = 72 % of 500

$$=₹\ \frac{500\times 72}{100}=₹\ 360$$

Aliter : Using Rule 3,
M.P. = Rs. 500
D_1 = 20%
D_2 = 10%

$$\text{S.P.}=\text{M.P.}\left(\frac{100-D_1}{100}\right)\left(\frac{100-D_2}{100}\right)$$

$$=500\left(\frac{100-20}{100}\right)\left(\frac{100-10}{100}\right)$$

$$=500\times\frac{80}{100}\times\frac{90}{100}=\text{Rs. }360$$

8. (1) A single discount equal to the two successive discounts

$$=\left(10+5-\frac{10\times 5}{100}\right)\%=14.5\%$$

∴ Selling price of the article
= 85.5% of ₹ 240

$$=₹\ \frac{85.5\times 240}{100}=₹\ 205.20$$

Aliter : Using Rule 3,
Here, M.P. = Rs. 240,
D_1 = 10%, D_2 = 5%

$$\text{S.P.}=\text{M.P.}\left(\frac{100-D_1}{100}\right)\left(\frac{100-D_2}{100}\right)$$

$$=240\left(\frac{100-10}{100}\right)\left(\frac{100-5}{100}\right)$$

$$=240\times\frac{90}{100}\times\frac{95}{100}$$

= Rs. 205.20

9. (2) Using Rule 5,
Let the original price be ₹ 100
∴ Increased price = ₹ 130
Equivalent discount

$$=\left(10+10-\frac{10\times 10}{100}\right)=19\%$$

∴ Ultimate price of the article = 81% of 130 = 105.3 i.e. increase by 5.3%.

10. (3) Single of discount for successive discounts 10% and 20%

$$=\left(20+10-\frac{20\times 10}{100}\right)\%=28\%$$

∴ Equivalent discount for discounts 28% and 25%

$$=\left(28+25-\frac{28\times 25}{100}\right)\%$$

= 53 – 7 = 46%

Aliter : Using Rule 4,
Single equivalent discount

$$=100-\left[\left(\frac{100-D_1}{100}\right)\left(\frac{100-D_2}{100}\right)\left(\frac{100-D_3}{100}\right)\times 100\right]$$

$$=100-\left[\left(\frac{100-10}{100}\right)\left(\frac{100-20}{100}\right)\left(\frac{100-25}{100}\right)\times 100\right]$$

$$=100-\frac{90}{100}\times\frac{80}{100}\times\frac{75}{100}\times 100$$

= 100 – 54 = 46%

11. (3) Equivalent discount for successive discounts of 20% and 10%

$$=\left[20+10-\frac{20\times 10}{100}\right]\%$$

= 28%

∴ Net selling price = 72% of 2000

$$=₹\ \frac{72\times 2000}{100}=₹\ 1440$$

Aliter : Using Rule 3,
Here, M.P. = ₹ 2000,
D_1 = 20%, D_2 = 10%

$$\text{S.P.}=\text{M.P.}\left[\left(\frac{100-D_1}{100}\right)\left(\frac{100-D_2}{100}\right)\right]$$

$$=\left[2000\times\left(\frac{100-20}{100}\right)\times\left(\frac{100-10}{100}\right)\right]$$

$$=2000\times\frac{80\times 90}{10000}=₹\ 1440$$

12. (2) Using Rule 5,
Case I : A single discount of 30%
Case II : Two successive discounts of 20% and 10%
Single equivalent discount

$= (20 + 10 - \frac{20 \times 10}{100})\ \% = 28\%$

Difference = (30 – 28)% = 2%
∴ Required difference
= 2% of 550

$= ₹\ \frac{2 \times 550}{100} = ₹\ 11.$

13. (3) Let the second discount be x%.
Then, 90 % of (100 – x) % of 800 = 612

$\Rightarrow \frac{90}{100} \times \frac{100 - x}{100} \times 800 = 612$

$\Rightarrow 100 - x = \frac{612 \times 100}{90 \times 8} = 85$

$\Rightarrow x = 100 - 85 = 15\%$

Aliter : Using Rule 3,
Here, M.P. = Rs. 800, S.P. = Rs. 612, D_1 = 10%, D_2 = ?

$S.P. = M.P.\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)$

$612 = 800 \times \left(\frac{100 - 10}{100}\right) \times \left(\frac{100 - D_2}{100}\right)$

$612 = 800 \times \frac{90}{100} \times \frac{100 - D_2}{100}$

$\frac{6120}{72} = 100 - D_2$

$D_2 = \frac{100 - 6120}{72}$

$= \frac{7200 - 6120}{72} = 15\%$

14. (3) Let 'x' be the marked price
Single Discount = 15%
⇒100 – 15 = 85
85% of x = 17,000

$\therefore\ x = \frac{17,000}{85} \times 100$

= ₹ 20,000
Required SP

$= 20,000 \times \frac{95}{100} \times \frac{90}{100}$

= 180 × 95 = ₹ 17100

Aliter : Using Rule 2 and Rule 3,

$M.P. = \frac{S.P. \times 100}{100 - D}$

$= \frac{17000 \times 100}{100 - 15}$

$= \frac{17000 \times 100}{85}$

M.P. = 20000
Also, S.P.

$= M.P.\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)$

$= 20000\left(\frac{100 - 5}{100}\right)\left(\frac{100 - 10}{100}\right)$

$= 20000 \times \frac{95}{100} \times \frac{90}{100}$

= 180 × 95 = ₹ 17100

15. (3) Marked price = ₹ 160
After 10% discount

$S.P = \frac{90}{100} \times 160 = ₹\ 144$

Let other discount = x%

$\therefore\ \frac{(100 - x)}{100} \times 144 = ₹\ 122.40$

$\Rightarrow 100 - x = \frac{12240}{144}$

$\Rightarrow 100 - x = 85$

$\Rightarrow x = 100 - 85 = 15\%$

Aliter : Using Rule 3,

$S.P. = M.P.\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)$

$122.40 = 160\left(\frac{100 - 10}{100}\right)\left(\frac{100 - D_2}{100}\right)$

$\frac{1224000}{160} = 90 \times \left(\frac{100 - D_2}{1}\right)$

$\frac{1224000}{160 \times 90} = 100 - D_2$

$85 = 100 - D_2$

$\Rightarrow\ D_2 = 15\%$

16. (4) Let the second discount be x per cent.
According to the question,

$450 \times \frac{100 - 10}{100} \times \frac{100 - x}{100}$

= 344.25

$\therefore\ 100 - x$

$= \frac{344.25 \times 100 \times 100}{450 \times 90}$

$\therefore\ 100 - x = 85$

$\therefore\ x = 100 - 85 = 15\%.$

Aliter : Using Rule 3,
Here, M.P. = Rs. 450, S.P. = Rs. 344.25, D_1 = 10%, D_2 = ?

$S.P. = M.P.\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)$

$344.25 = 450 \times \left(\frac{100 - 10}{100}\right)\left(\frac{100 - D_2}{100}\right)$

$\frac{3442500}{450 \times 90} = (100 - D_2)$

$85 = 100 - D_2$

$\Rightarrow D_2 = 15\%$

17. (3) Using Rule 5,
(i) : Equivalent discount

$= \left(25 + 15 - \frac{25 \times 15}{100}\right)\%$

= (40 – 3.75) % = 36.25%

(ii) : Equivalent discount

$= \left(30 + 10 - \frac{30 \times 10}{100}\right)\%$

= (40 – 3) % = 37%

(iii) : Equivalent discount

$= \left(35 + 5 - \frac{35 \times 5}{100}\right)\%$

= (40 – 1.75) % = 38.25%

Clearly, third offer is best for a customer.

18. (2) Using Rule 5,
Equivalent discount for two successive discounts of 8% and 8%

$= \left(8 + 8 - \frac{8 \times 8}{100}\right)\%$

= (16–0.64) % = 15.36 %
∴ SP = (100 –15.36) % of 900

$= ₹\left(\frac{84.64 \times 900}{100}\right) = ₹\ 761.76$

For a single discount of 16%,
SP = 84% of 900

$= ₹\ \left(\frac{84 \times 900}{100}\right) = ₹\ 756$

Certainly seller will lose in this case.
∴ Loss = ₹ (761.76 – 756)
= ₹ 5.76

19. (3) Equivalent discount

$= 10 + 5 - \frac{10 \times 5}{100} = 14.5\ \%$

∴CP (for buyer)
= 85.5% of ₹ 200000

$= ₹\left(\frac{85.5 \times 200000}{100}\right) = ₹\ 171000$

SP = ₹ 179550

Gain = ₹ (179550 –171000)

= ₹ 8550

∴ Gain %

$= \frac{8550}{171000} \times 100 = 5\%$

Aliter : Using Rule 3,

Here, M.P. = 200000, S.P. is C.P. byer for

$D_1 = 5\%$,

$D_2 = 10\%$

$S.P. = M.P.\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)$

$= 200000\left(\frac{100 - 5}{100}\right)\left(\frac{100 - 10}{100}\right)$

$= 20 \times 95 \times 90$

C.P. for buyer =171000

S.P. = 179550

Profit $= S.P. - \frac{C.P.}{C.P.} \times 100\%$

$= \frac{8550}{171000} \times 100 = 5\%$

20. (4) Using Rule 5,

Effective discount

$= 25 + 15 - \frac{25 \times 15}{100}$

= 40 – 3.75 = 36.25 %

∴ CP for buyer

= (100 – 36.25) % of 800

$= \frac{63.75 \times 800}{100} = ₹\ 510$

∴ To gain 20%,

$SP = ₹\left(\frac{120 \times 510}{100}\right) = ₹\ 612$

Let the list price be ₹ x.

∴ 90% of x = ₹ 612

$\Rightarrow \frac{90x}{100} = 612 \Rightarrow x = \frac{61200}{90}$

= ₹ 680

21. (4) Using Rule 5,

Single equivalent discount of two successive discounts of 36% and

$4\% = 36 + 4 - \frac{36 \times 4}{100}$

= 40 – 1.44 = 38.56

Percentage difference

= 40 – 38.56 = 1.44

∴ Required difference

$= 500 \times \frac{1.44}{100} = ₹\ 7.20$

22. (2) Total discount

= ₹ (920 – 742.90)

= ₹ 177.10

First discount = 15%

∴ Discount = 15% of 920

$= \frac{920 \times 15}{100} = ₹\ 138$

Price after this discount

= 920 – 138 = ₹ 782

Remaining discount

= 177.10 – 138 = ₹ 39.10

Let the second discount be x %.

$\therefore \frac{782 \times x}{100} = 39.10$

$\Rightarrow x = \frac{39.10 \times 100}{782} = 5\%$

Aliter : Using Rule 3,

Here, M.P. = Rs. 920, S.P. = Rs. 742.90

$D_1 = 15\%$, $D_2 = ?$

$S.P. = M.P.\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)$

742.90

$= 920\left(\frac{100 - 15}{100}\right)\left(\frac{100 - D_2}{100}\right)$

$\frac{7429000}{920 \times 85} = 100 - D_2$

$95 = 100 - D_2$

$\Rightarrow D_2 = 5\%$

23. (3) Total discount

= ₹ (820 – 570.72) = ₹ 249.28

First discount $= 820 \times \frac{20}{100} = ₹164$

∴ Second discount

= ₹ (249.28 – 164) = ₹ 85.28

Price of the article after first discount = ₹ (820 – 164) = ₹ 656

If the second discount be x% , then

x% of 656 = 85.28

$\Rightarrow x = \frac{85.28 \times 100}{656} = 13\%$

Aliter : Using Rule 3,

Here, M.P. = Rs. 820, S.P. = 570.72, $D_1 = 20\%$, $D_2 = ?$

$S.P. = M.P.\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)$

$570.72 = 820\left(\frac{100 - 20}{100}\right)\left(\frac{100 - D_2}{100}\right)$

$\frac{5707200}{820 \times 80} = 100 - D_2$

$100 - D_2 = 87$

$D_2 = 13\%$

24. (1) Using Rule 5,

Single equivalent discount for two successive discounts of 20% and 10%

$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\% = 28\%$

Now , single discount for 28% and

$5\% = \left(28 + 5 - \frac{28 \times 5}{100}\right)\%$

= (33 – 1.4) % = 31.6%

∴ Required selling price of bicycle at cash payment

= (100 – 31.6) % of ₹ 2000

$= \frac{2000 \times 68.4}{100} = ₹1368$

25. (1) Using Rule 5,

Single equivalent discount of two consecutive discount of 30% and 10%

$= 30 + 10 - \frac{30 \times 10}{100} = 37\%$

∴ Required difference = 40% of 500 – 37% of 500

= 3% of 500

$= 500 \times \frac{3}{100} = ₹15$

26. (4) After a discount of 5%

$SP = \frac{95 \times 16000}{100} = ₹\ 15200$

Let the second discount be x%.

∴ x% of 15200

= (15200 – 11400)

$\Rightarrow \frac{x \times 15200}{100} = 3800$

$\Rightarrow x = \frac{3800 \times 100}{15200} = 25$

∴ Second discount = 25%

Aliter : Using Rule 3,

Here, M.P. = 16000,

S.P. = 11400, D_1 = 5%, D_2 = ?

$$S.P. = M.P.\left(\frac{100-D_1}{100}\right)\left(\frac{100-D_2}{100}\right)$$

$$11400 = 16000\left(\frac{100-5}{100}\right)\left(\frac{100-D_2}{100}\right)$$

$$\frac{114000}{16\times 95} = 100 - D_2$$

$$75 = 100 - D_2$$

$$D_2 = 25\%$$

27. (3) Using Rule 5,
Case I,

$$\text{Discount} = \frac{30\times 2000}{100} = ₹\ 600$$

Single equivalent discount for discounts of 25% and 5%.

$$= \left(25+5-\frac{25\times 5}{100}\right)\%$$

= (30 – 1.25)% = 28.75%

$$\therefore \text{Discount} = \frac{28.75\times 2000}{100}$$

= ₹ 575

∴ Difference = ₹ (600 – 575)
= ₹ 25

28. (1) Using Rule 5,
Let the marked price be ₹ x.

$$\therefore \text{ In case I, SP} = ₹\ \frac{70x}{100}$$

Single discount equivalent to successive discounts of 20% and 10%.

$$= \left(20+10-\frac{20\times 10}{100}\right)\% = 28\%$$

$$\therefore \text{ S.P. in this case} = \frac{72x}{100}$$

$$\therefore \frac{72x}{100} - \frac{70x}{100} = 72$$

$$\Rightarrow \frac{2x}{100} = 72$$

$$\therefore x = \frac{72\times 100}{2} = ₹\ 3600$$

29. (2) Using Rule 5,
Single equivalent discount for successive discounts of 10% and 20%.

$$= \left(10+20-\frac{20\times 100}{100}\right)\% = 28\%$$

Single equivalent discount for 28% and 30%.

$$= \left(28+30-\frac{28\times 30}{100}\right)\% = 49.6\%$$

30. (3) Using Rule 5,
Equivalent single discount

$$= \left(20+20-\frac{20\times 20}{100}\right)\% = 36\%$$

31. (3) Using Rule 5,
Single equivalent discount

$$= \left(10+5-\frac{10\times 5}{100}\right)\%$$

= (15 – 0.5)% = 14.5%

32. (2) Using Rule 5,
Single equivalent discount

$$= \left(x+y-\frac{xy}{100}\right)\%$$

$$= \left(20+15-\frac{20\times 15}{100}\right)\% = 32\%$$

33. (2) Single equivalent discount for 10% and 12%.

$$= \left(12+10-\frac{12\times 10}{100}\right)\% = 20.8\%$$

Single equivalent discount for 20.8% and 5%.

$$= \left(20.8+5-\frac{20.8\times 5}{100}\right)\%$$

= 24.76%

Aliter : Using Rule 4,
Here, D_1 = 10%, D_2 = 12%, D_3 = 5%
Single equivalent discount

$$= 100-\left[\left(\frac{100-D_1}{100}\right)\left(\frac{100-D_2}{100}\right)\left(\frac{100-D_3}{100}\right)\times 100\right]$$

$$= 100-\left[\left(\frac{100-10}{100}\right)\left(\frac{100-12}{100}\right)\left(\frac{100-5}{100}\right)\times 100\right]$$

$$= 100-\frac{90}{100}\times\frac{88}{100}\times\frac{95}{100}\times 100$$

= 100 – 75.24 = 24.76%

34. (2) Using Rule 5 and Rule 2,
Single equivalent discount

$$= \left(5+10-\frac{10\times 5}{100}\right)\% = 14.5\%$$

∴ Cost of article after discount

$$= \frac{850\times(100-14.5)}{100} = ₹\ 726.75$$

35. (3) Using Rule 5,
Single equivalent discount

$$= \left(15+10-\frac{15\times 10}{100}\right) = 23.5\%$$

$$\therefore \text{ Cost price} = \frac{800\times 76.5}{100}$$

= ₹ 612

Actual C.P. = ₹ (612 + 28)
= ₹ 640

$$\therefore \text{ Gain \%} = \frac{800-640}{640}\times 100$$

$$= \frac{160\times 100}{640} = 25\%$$

36. (2) Single equivalent discount for 10% and 20%

$$= 10 + 20 - \frac{20\times 10}{100} = 28\%$$

Single equivalent discount for 28% and 40%

$$= \left(40+28-\frac{28\times 40}{100}\right)\%$$

= (68 – 11.2) % = 56.8%

Aliter : Using Rule 4,
Here, D_1 = 10%, D_2 = 20%, D_3 = 40%
Single discount

$$= 100-\left[\left(\frac{100-D_1}{100}\right)\left(\frac{100-D_2}{100}\right)\left(\frac{100-D_3}{100}\right)\times 100\right]$$

$$= 100-\left(\frac{100-10}{100}\right)\times\left(\frac{100-20}{100}\right)\times\left(\frac{100-40}{100}\right)\times 100$$

$$= 100-\frac{90}{100}\times\frac{80}{100}\times\frac{60}{100}\times 100$$

= 100 – 43.20 = 56.8%

37. (4) Using Rule 5,
Single equivalent discount

$$= \left(25+10-\frac{25\times 10}{100}\right)\%$$

= 32.5%

38. (1) Using Rule 5,
Equivalent single discount

$$= \left(x+y-\frac{xy}{100}\right)\%$$

$$= \left(20+5-\frac{20\times 5}{100}\right)\%$$

= (25 – 1)% = 24%

39. (4) Using Rule 5,
Single equivalent discount of two successive discounts of 20% each

$$= \left(20 + 20 - \frac{20 \times 20}{100}\right)\%$$

= 36%

If the amount of the bill be x, then

$\therefore$ (36 – 35)% of x = 22

$$\Rightarrow \frac{x}{100} = 22 \Rightarrow x = ₹\ 2200$$

40. (3) S.P. after first discount

$$= \frac{1600 \times 90}{100} = ₹\ 1440$$

$\therefore$ Second discount

= 1440 – 1224 = ₹ 216

$$\therefore \frac{1440 \times x}{100} = 216$$

$$\therefore x = \frac{216 \times 100}{1440} = 15\%$$

41. (3) Single equivalent discount for 20% and 20%

$$= \left(20 + 20 - \frac{20 \times 20}{100}\right)\% = 36\%$$

Single equivalent discount for 36% and 10%

$$= \left(36 + 10 - \frac{36 \times 10}{100}\right)\% = 42.4\%$$

Aliter : Using Rule 4,

$$= 100 - \left[\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)\left(\frac{100 - D_3}{100}\right) \times 100\right]$$

$$= 100 - \left[\left(\frac{100 - 20}{100}\right) \times \left(\frac{100 - 20}{100}\right) \times \left(\frac{100 - 10}{100}\right) \times 100\right]$$

$$= 100 - \frac{80}{100} \times \frac{80}{100} \times \frac{90}{100} \times 100$$

= 100 – 57.60 = 42.40

42. (2) Using Rule 5,
Single equivalent discount

$$= \left(10 + 10 - \frac{10 \times 10}{100}\right)\% = 19\%$$

43. (4) Single equivalent discount for 20% and 15%

$$= \left(20 + 15 - \frac{20 \times 15}{100}\right)\% = 32\%$$

Single equivalent discount for 32% and 10%

$$= \left(32 + 10 - \frac{32 \times 10}{100}\right)\% = 38.8\%$$

Aliter : Using Rule 4,
Here, D_1 = 20%, D_2 = 15%, D_3 = 10%
Single equivalent discount

$$= 100 - \left[\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)\left(\frac{100 - D_3}{100}\right) \times 100\right]$$

$$= 100 - \left[\left(\frac{100 - 20}{100}\right)\left(\frac{100 - 15}{100}\right)\left(\frac{100 - 10}{100}\right) \times 100\right]$$

$$= 100 - \frac{80}{100} \times \frac{85}{100} \times \frac{90}{100} \times 100$$

= 100 – 61.20 = 38.80%

44. (2) Single equivalent discount for 20% and 10%

$$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\% = 28\%$$

Single equivalent discount for 28% and 5%

$$= \left(28 + 5 - \frac{28 \times 5}{100}\right)\% = 31.6\%$$

Aliter : Using Rule 4,
Here, D_1 = 20%, D_2 = 10%, D_3 = 5%
Single equivalent discount

$$= 100 - \left[\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)\left(\frac{100 - D_3}{100}\right) \times 100\right]$$

$$= 100 - \left[\left(\frac{100 - 20}{100}\right)\left(\frac{100 - 10}{100}\right)\left(\frac{100 - 5}{100}\right) \times 100\right]$$

$$= 100 - \frac{80}{100} \times \frac{90}{100} \times \frac{95}{100} \times 100$$

= 100 – 68.40 = 31.60%

45. (3) Single equivalent discount

$$= \left(p + q - \frac{pq}{100}\right)\%$$

46. (1) Single equivalent discount

$$= \left(25 + 10 - \frac{25 \times 10}{100}\right) = 32.5\%$$

$\therefore$ S.P. of chair

$$= \frac{350(100 - 32.5)}{100}$$

$$= \frac{350 \times 67.5}{100} = ₹\ 236.25$$

Aliter : Using Rule 3,
Here, M.P. = ₹ 350,
D_1 = 25%, D_2 = 10%

$$\text{S.P.} = \text{M.P.}\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)$$

$$= 350 \times \left(\frac{100 - 25}{100}\right)\left(\frac{100 - 10}{100}\right)$$

$$= 350 \times \frac{75}{100} \times \frac{90}{100} = ₹\ 236.25$$

47. (4) Single equivalent discount

$$= \left(30 + 15 - \frac{30 \times 15}{100}\right)\% = 40.5\%$$

If the marked price be x, then

$$x \times \frac{100 - 40.5}{100} = 476$$

$$\Rightarrow x = \frac{476 \times 100}{59.5} = ₹\ 800$$

Aliter :
Here, S.P. = Rs. 476, D_1 = 30%, D_2 = 15%

$$\text{S.P.} = \text{M.P.}\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)$$

$$476 = \text{M.P.}\left(\frac{100 - 30}{100}\right)\left(\frac{100 - 15}{100}\right)$$

$$\text{M.P.} = \frac{4760000}{70 \times 85}$$

M.P. = ₹ 800

48. (1) Using Rule 5,
Single equivalent discount

$$= \left(25 + 5 - \frac{25 \times 5}{100}\right)\%$$

= (30 – 1.25)% = 28.75%

49. (1) Using Rule 5,
C.P. of the table

$$= 800 \times \frac{90}{100} \times \frac{85}{100} = ₹\ 612$$

Actual C.P. = 612 + 13= ₹ 625

Profit = 875 – 625 = ₹ 250

$\therefore$ Profit per cent

$$= \frac{250}{625} \times 100 = 40\%$$

50. (4) Using Rule 5,
Single equivalent discount

$$= \left(30 + 30 - \frac{30 \times 30}{100}\right)\% = 51\%$$

51. (2) Using Rule 5,
Single equivalent discount

$$= \left(25 + 15 - \frac{25 \times 15}{100}\right)$$

= 40 – 3.75 = 36.25

$\therefore$ C.P. for the retailer

$$= \frac{800 \times (100 - 36.25)}{100} = ₹\ 510$$

52. (1) First discount

$$= 320 \times \frac{10}{100} = ₹\ 32$$

$\therefore$ Price after first discount

= 320 – 32 = ₹ 288

If the second discount be x%, then

$$\therefore \frac{288 \times x}{100} = 288 - 244.80$$

= 43.2

$$\Rightarrow x = \frac{43.2 \times 100}{288} = 15\%$$

Aliter : Using Rule 3,

Here, M.P. = Rs. 320, S.P. = Rs. 244.80, D_1 = 10%, D_2 = ?

$$\text{S.P.} = \text{M.P.}\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)$$

$$244.80 = 320\left(\frac{100 - 10}{100}\right)\left(\frac{100 - D_2}{100}\right)$$

$$\frac{2448000}{320 \times 90} = 100 - D_2$$

$$100 - D_2 = 85$$

$$D_2 = 100 - 85$$

$$D_2 = 15\%$$

53. (1) Using Rule 5,

Single equivalent discount for 40% and 10%

$$= \left(40 + 10 - \frac{40 \times 10}{100}\right)\% = 46\%$$

Difference of percentage = 4%

$\therefore$ Savings = 4% of 10000

$$= \frac{10000 \times 4}{100} = ₹\ 400$$

54. (2) Using Rule 5,

Single equivalent discount

$$= \left(70 + 30 - \frac{70 \times 30}{100}\right)\%$$

= (100 – 21)% = 79%

After a discount of 70%, remaining price is just 30. On this 30%, another discount of 30% is given which will be equal to 9 so, total discount = 70% + 9% =79%.

55. (3) Using Rule 5,

C.P. for A

$$= 3000 \times \frac{90}{100} \times \frac{85}{100} = ₹\ 2295$$

Actual C.P. = 2295 + 105

= ₹ 2400

$$\therefore \text{Gain per cent} = \frac{800}{2400} \times 100$$

$$= \frac{100}{3} = 33\frac{1}{3}\%$$

56. (1) Using Rule 5,

Single equivalent discount

$$= \left(20 + 10 - \frac{20 \times 10}{100}\right) = 28\%$$

$$\therefore \text{C.P. of table} = \frac{1500 \times 72}{100}$$

= ₹ 1080

Actual C.P. = 1080 + 20 = ₹ 1100

$\therefore$ Required S.P.

$$= 1100 \times \frac{120}{100} = ₹\ 1320$$

57. (1) Single equivalent discount

$$= \left(5 + 5 - \frac{25}{100}\right)\%$$

$$= 9\frac{3}{4} = \frac{39}{4}\%$$

$$\therefore \text{S.P.} = 80 \times \frac{361}{400} = ₹\ 72.2$$

Aliter : Using Rule 3,

Here, M.P. = ₹ 80, D_1 = 5%, D_2 = 5%, S.P. = ?

$$\text{S.P.} = \text{M.P.}\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)$$

$$\text{S.P.} = 80\left(\frac{100 - 5}{100}\right)\left(\frac{100 - 5}{100}\right)$$

$$= 80 \times \frac{95}{100} \times \frac{95}{100} = ₹\ 72.2$$

58. (2) (a) Single equivalent discount for 20% and 15%

$$= \left(20 + 15 - \frac{20 \times 15}{100}\right)\% = 32\%$$

Single equivalent discount for 32% and 10%

$$= \left(32 + 10 - \frac{32 \times 10}{100}\right) = 38.8\%$$

(b) Single equivalent discount for 25% and 12%

$$= \left(25 + 12 - \frac{25 \times 12}{100}\right) = 34\%$$

Single equivalent discount for 34% and 8%

$$= \left(34 + 8 - \frac{34 \times 8}{100}\right)\%$$

= 42 – 2.72 = 39.28%

Aliter : Using Rule 4,

Case I. D_1 = 20%,

D_2 = 15%, D_3 = 10%

Equivalent discount

$$= 100 - \left[\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)\left(\frac{100 - D_3}{3}\right) \times 100\right]$$

$$= 100 - \left[\left(\frac{100 - 20}{100}\right)\left(\frac{100 - 15}{100}\right)\left(\frac{100 - 10}{3}\right) \times 100\right]$$

$$= 100 - \left[\frac{80}{100} \times \frac{85}{100} \times \frac{90}{100} \times 100\right]$$

= 100 – 61.2 = 38.8%

Case II.

D_1 = 25%, D_2 = 12%, D_3 = 8%

Equivalent discount

$$= 100 - \left[\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)\left(\frac{100 - D_3}{3}\right) \times 100\right]$$

$$= 100 - \left[\left(\frac{100 - 25}{100}\right) \times \left(\frac{100 - 12}{100}\right) \times \left(\frac{100 - 8}{100}\right) \times 100\right]$$

$$= 100 - \left[\frac{75}{100} \times \frac{88}{100} \times \frac{92}{100} \times 100\right]$$

= 100 – 60.72 = 39.28%

$\Rightarrow$ Case II is better than Case I.

59. (2) Using Rule 5,

Single equivalent discount

$$= \left(10 + 5 - \frac{10 \times 5}{100}\right) = 14.5\%$$

i.e. ₹ 14.50

60. (3) Using Rule 3,

Required S.P.

$$= 5000 \times \frac{(100 - x)}{100} \times \frac{(100 - y)}{100} \times \frac{(100 - z)}{100}$$

$$= ₹\left(\frac{(100 - x)(100 - y)(100 - z)}{200}\right)$$

61. (1) C.P. of chair

$$= \left(600 - \frac{600 \times 15}{100}\right) \times \frac{80}{100}$$

$= \frac{510 \times 80}{100}$ = ₹ 408

Actual C.P. = 408+28 = ₹ 436

Gain percent

$= \frac{545 - 436}{436} \times 100 = 25\%$

62. (1) Single equivalent discount for 20% and 10%

$= \left(20 + 10 - \frac{20 \times 10}{100}\right) = 28\%$

Single equivalent discount for 28% and 10%

$= \left(28 + 10 - \frac{28 \times 10}{100}\right) = 35.2\%$

∴ S.P. of Piano

$= \frac{15000 \times (100 - 35.2)}{100}$

= ₹ 9,720

Aliter : Using Rule 3,

Here, M.P. = ₹15000

S.P. = ?

D_1 =20%, D_2 = 10%, D_3 = 10%

S.P. =

$$\text{M.P.}\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)\left(\frac{100 - D_3}{100}\right)$$

$$= 15000\left(\frac{100 - 20}{100}\right)\left(\frac{100 - 10}{100}\right)\left(\frac{100 - 10}{100}\right)$$

$$= 15000 \times \frac{80}{100} \times \frac{90}{100} \times \frac{90}{100}$$

= 15 × 72 × 9 = ₹ 9720

63. (3) Using Rule 5,

Single equivalent discount

$= \left(30 + 20 - \frac{30 \times 20}{100}\right)\%$

= 50 – 6 = 44%

64. (1) Using Rule 5,

Single equivalent discount

$= \left(10 + 5 - \frac{10 \times 5}{100}\right)\%$

= 14.5 %

∴ Amount to be paid

= (100 – 14.5)% of 110

$= \frac{110 \times 85.5}{100}$ = ₹ 94.05

≈ ₹ 94

65. (3) Single equivalent discount for two successive discounts

$= (x + y - \frac{xy}{100})$ %

$= \left(\frac{25}{2} + 10 - \frac{25 \times 10}{200}\right)\%$

= (12.5 + 10 – 1.25)%

= 21.25 %

If the marked price of the plate be ₹ x, then

= (100 – 21.25) % of x = 6300

$\Rightarrow x \times \frac{78.75}{100} = 6300$

$\Rightarrow x = \frac{6300 \times 100}{78.75}$ = ₹ 8000

Aliter : Using Rule 3,

Here, S.P. = ₹ 6300, M.P. = ?

$D_1 = \frac{25}{2}\%$ D_2 = 10%

$$\text{S.P.} = \text{M.P.}\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)$$

$$6300 = \text{M.P.}\left(\frac{100 - \frac{25}{2}}{100}\right)\left(\frac{100 - 10}{100}\right)$$

$$6300 = \text{M.P.}\left(\frac{175}{200}\right)\left(\frac{90}{100}\right)$$

$$\text{M.P.} = \frac{6300 \times 200 \times 100}{175 \times 90}$$

M.P. = ₹ 8000

66. (3) Single equivalent discount for 8% and 5%

$= \left(8 + 5 - \frac{8 \times 5}{100}\right)\%$

= (13 – 0.4) = 12.6 %

Single equivalent disconut for 12.6% and 2%

$= \left(12.6 + 2 - \frac{12.6 \times 2}{100}\right)\%$

= 14.6 – 0.252 = 14.348 %

∴ Net S.P.

= (100 – 14.348)% of 7500

$= \frac{7500 \times 85.652}{100}$ = ₹ 6423.90

Aliter : Using Rule 3,

M.P. = ₹ 7500

S.P. = ?, D_1 = 8%, D_2 = 5%, D_3 = 2%

S.P. =

$$\text{M.P.}\left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)\left(\frac{100 - D_3}{100}\right)$$

$$= 7500\left(\frac{100 - 8}{100}\right)\left(\frac{100 - 5}{100}\right)\left(\frac{100 - 2}{100}\right)$$

$$= 7500 \times \frac{92}{100} \times \frac{95}{100} \times \frac{98}{100}$$

= ₹ 6423.90

67. (3) Using Rule 5,

Single equivalent discount

$= \left(x + y - \frac{xy}{100}\right)\%$

$= \left(10 + 20 - \frac{10 \times 20}{100}\right)\%$

= 28%

68. (1) Using Rule 5,

Let the marked price of article be Rs. x,

Single equivalent discount for 20% and 10%

$= \left(x + y - \frac{xy}{100}\right)\%$

$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\%$ = 28%

According to the question,

30% of x – 28% of x = 144

$\Rightarrow \frac{x \times 2}{100} = 144$

$\Rightarrow x = \frac{144 \times 100}{2}$

= Rs. 7200

69. (1) Using Rule 5,

Single equivalent discount

$= \left(x + y - \frac{xy}{100}\right)\%$

$= \left(10 + 20 - \frac{10 \times 20}{100}\right)\%$

= (30 – 2)% = 28%

70. (4) Marked price of article
= Rs. x (let)
According to the question,

$$x \times \frac{80}{100} \times \frac{85}{100} = 3060$$

$$\Rightarrow x = \frac{3060 \times 100 \times 100}{80 \times 85}$$

= Rs. 4500

Aliter : Using Rule 3,
Here, S.P. = Rs. 3060
M.P. =?, D_1 = 20%, D_2 = 15%

$$\text{S.P.} = \text{M.P.}\left(\frac{100-D_1}{100}\right)\left(\frac{100-D_2}{100}\right)$$

$$3060 = \text{M.P.}\left(\frac{100-20}{100}\right)\left(\frac{100-15}{100}\right)$$

$$3060 = \text{M.P.}\left(\frac{80}{100} \times \frac{85}{100}\right)$$

$$\text{M.P.} = \frac{3060 \times 10000}{80 \times 85}$$

M.P. = Rs. 4500

71. (4) Single equivalent discount for discounts of 10% and 20%

$$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\%$$

= (30 – 2)% = 28%

Single equivalent discounts for discounts of 28% and 25%

$$= \left(28 + 25 - \frac{28 \times 25}{100}\right)\%$$

= (53 –7)% = 46%

Aliter : Using Rule 4,
Here, D_1 = 10%,
D_2 = 20%, D_3 = 25%

Single equivalent discount

$$= 100 - \left[\left(\frac{100-D_1}{100}\right)\left(\frac{100-D_2}{100}\right)\left(\frac{100-D_3}{100}\right) \times 100\right]$$

$$= 100 - \left[\left(\frac{100-10}{100}\right)\left(\frac{100-20}{100}\right)\left(\frac{100-25}{100}\right) \times 100\right]$$

$$= 100 - \frac{90}{100} \times \frac{80}{100} \times \frac{75}{100} \times 100$$

= 100 – 54 = 46%

72. (4) Using Rule 5,
Single equivalent discount for 40% and 30%

$$= \left(40 + 30 - \frac{40 \times 30}{100}\right)\%$$

= (70 – 12)% = 58%

Single equivalent discount for 45% and 20%

$$= \left(45 + 20 - \frac{45 \times 20}{100}\right)\%$$

= (65 – 9)% = 56%

Let the marked price be Rs. x.

According to the question,

$x \times (58 - 56)\% = 12$

$$\Rightarrow \frac{x \times 2}{100} = 12$$

$$\Rightarrow x = \frac{1200}{2} = \text{Rs. } 600$$

73. (3) Using Rule 6,
Single equivalent discount for 20% and 10%

$$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\%$$

= 28%

∴ C.P. = (100 – 28)% of 1500

$$= \frac{1500 \times 72}{100} = \text{Rs. } 1080$$

Actual C.P. = Rs. (1080 + 20)
= Rs. 1100

∴ S.P. on 20% profit

$$= \frac{1100 \times 120}{100} = \text{Rs. } 1320$$

74. (1) Using Rule 3,
Price of article = Rs. x (let)
According to the question,

$$\text{P} = \frac{x(100-20)}{100} \times \frac{100-25}{100}$$

$$\Rightarrow \text{P} = x \times \frac{80}{100} \times \frac{75}{100}$$

$$\Rightarrow \text{P} = x \times \frac{4}{5} \times \frac{3}{4} = \frac{3x}{5}$$

$$\Rightarrow x = \text{Rs. } \frac{5}{3}\text{P}$$

75. (3) Using Rule 3,
Net selling price of scooter.

$$= \text{Rs.}\left(18000 \times \frac{90}{100} \times \frac{95}{100} \times \frac{98}{100}\right)$$

= Rs. 15082.2

76. (4) Single equivalent discount for x% and y%.

$$= \left(x + y - \frac{xy}{100}\right)\%$$

∴ Single equivalent discount for 20% and 10%

$$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\% = 28\%$$

Single equivalent discount for 28% and 5%

$$= \left(28 + 5 - \frac{28 \times 5}{100}\right)\%$$

$$= \left(33 - \frac{140}{100}\right)\%$$

= (33 – 1.4)% = 31.6%

Aliter : Using Rule 4,
Here, D_1=20%, D_2=10%, D_3=5%
Single equivalent discount

$$= 100 - \left[\left(\frac{100-D_1}{100}\right)\left(\frac{100-D_2}{100}\right)\left(\frac{100-D_3}{100}\right) \times 100\right]$$

$$= 100 - \left[\left(\frac{100-20}{100}\right)\left(\frac{100-10}{100}\right)\left(\frac{100-5}{100}\right) \times 100\right]$$

$$= 100 - \frac{80}{100} \times \frac{90}{100} \times \frac{95}{100} \times 100$$

= 31.6%

77. (2) Using Rule 5,
Single equivalent discount

$$= \left(20 + 10 - \frac{20 \times 10}{100}\right) = 28\%$$

78. (4) Single equivalent discount for 15% and 10%.

$$= \left(15 + 10 - \frac{15 \times 10}{100}\right)\%$$

= (25 – 1.5)% = 23.5%

∴ Required S.P.
= (100 – 23.5)% of 300

$$= \frac{300 \times 76.5}{100} = \text{Rs. } 229.5$$

Aliter : Using Rule 3,
Here, M.P. = Rs. 300, S.P. = ?
D_1 = 15%, D_2 = 10%

$$\text{S.P.} = \text{M.P.}\left(\frac{100-D_1}{100}\right)\left(\frac{100-D_2}{100}\right)$$

$$= 300\left(\frac{100-15}{100}\right)\left(\frac{100-10}{100}\right)$$

$$= 300 \times \frac{85}{100} \times \frac{90}{100} = 229.50$$

79. (3) Single equivalent discount for 15% and 20%

$= \left(15 + 20 - \frac{15 \times 20}{100}\right)\%$

= (35 – 3)% = 32%

Single equivalent discount for 32% and 25%

$= \left(32 + 25 - \frac{32 \times 25}{100}\right)\%$

= (57 – 8)% = 49%

80. (1) Single equivalent discount for 20% and 10%

$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\%$

= (30 – 2)% = 28%

Single equivalent discount for 28% and 5%

$= \left(28 + 5 - \frac{28 \times 5}{100}\right)\%$

$= \left(33 - \frac{140}{100}\right) = 31.6\%$

81. (3) Single equivalent discount

$= \left(x + y - \frac{xy}{100}\right)\%$

$= \left(20 + 15 - \frac{20 \times 15}{100}\right) = 32\%$

∴ Required S.P.

= (100 – 32)% of 250

= 68% of 250

82. (2) Single equivalent discount for 15% and 20%

$= \left(20 + 15 - \frac{20 \times 15}{100}\right)\%$

= (35 – 3)% = 32%

Single equivalent discount for 32% and 25%

$= \left(32 + 25 - \frac{32 \times 25}{100}\right)\%$

= (57 – 8) = 49%

83. (2) Single equivalent discount for 20% and 10%

$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\% = 28\%$

Marked price of article

= Rs. 900

S.P. of article

= (100 – 28)% of 900

$= \frac{900 \times 72}{100} = \text{Rs. } 648$

84. (3) Let marked price of article be Rs. x.

∴ S.P. at 25% discount

$= \text{Rs. } \frac{75x}{100} = \text{Rs. } \frac{3x}{4}$

S.P. at 15% discount

$= \text{Rs. } \frac{85x}{100} = \text{Rs. } \frac{17x}{20}$

Increase $= \text{Rs. } \left(\frac{17x}{20} - \frac{3x}{4}\right)$

$= \text{Rs. } \left(\frac{17x - 15x}{20}\right) = \text{Rs. } \frac{x}{10}$

∴ Percentage increase

$= \frac{\frac{x}{10}}{\frac{3x}{4}} \times 100$

$= \frac{x}{10} \times \frac{4}{3x} \times 100$

$= \frac{40}{3} = 13\frac{1}{3}\%$

85. (1) Required selling price

$= \text{Rs. } \left(700 \times \frac{80}{100} \times \frac{90}{100}\right)$

= Rs. 504

86. (1) Single equivalent discount

$= \left(x + y - \frac{xy}{100}\right)\%$

$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\%$

= (30 – 2)% = 28%

87. (2) Single equivalent discount for 10% and 10%

$= \left(10 + 10 - \frac{10 \times 10}{100}\right)\% = 19\%$

∴ S.P. of chair

= (100 – 19)% of Rs. 500

$= \text{Rs. } \left(\frac{500 \times 81}{100}\right) = \text{Rs. } 405$

88. (4) Single equivalent discount for consecutive discounts of x% and y%

$= \left(x + y - \frac{xy}{100}\right)\%$

Illustration : Let the marked price of an article be Rs. 100.

Two consecutive discounts

= 20% and 10%

Price after a discount of 20%

= Rs. 80

Price after a discount of 10%

$= \frac{80 \times 90}{100} = \text{Rs. } 72$

Discount = Rs. (100 – 72)

= Rs. 28 i.e., 28%

By formula,

Single equivalent discount

$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\%$

= 28%

89. (1) For the first shopkeeper,

Single equivalent discount for two successive discounts of 30% and 6%

$= \left(30 + 6 - \frac{30 \times 6}{100}\right)\%$

= (36 –1.8)% = 34.2%

∴ S.P. of sewing machine

= (100 – 34.2)% of Rs. 700

$= \text{Rs. } \left(\frac{700 \times 65.8}{100}\right) = \text{Rs. } 460.6$

For the second shopkeeper,

Single equivalent discount

$= \left(20 + 16 - \frac{20 \times 16}{100}\right)\%$

= (36 – 3.2)% = 32.8%

∴ S.P. of sewing machine

= 700 × (100 – 32.8)%

$= \text{Rs. } \left(\frac{700 \times 67.2}{100}\right)$

= Rs. 470.4

Required difference

= Rs. (470.4 – 460.6) = Rs. 9.8

OR

Difference between single equivalent discounts

= (34.2 – 32.8)% = 1.4%

∴ Difference of S.P.

$= \text{Rs. } \left(\frac{700 \times 1.4}{100}\right)$

= Rs. 9.8

90. (4) Let the C.P. of sweater be Rs. 100 and its marked price be Rs. x.

According to the question,

$x \times \frac{80}{100} = 128$

$\Rightarrow x \times \frac{4}{5} = 128$

$\Rightarrow x = \frac{128 \times 5}{4} = \text{Rs. } 160$

When discount = 14%, then

S.P. of sweater

= 160 × (100 – 1(4)%

$= \frac{160 \times 86}{100} = \text{Rs. } 137.6$

∵ C.P. = Rs. 100

∴ Profit per cent = 37.6%

91. (3) The customer pays in cash.
Single equivalent discount for 15% and 4%

$= \left(15 + 4 - \frac{15 \times 4}{100}\right)\%$

= (19 – 0.6)% = 18.4%

∴ Required S.P.

= (100 – 18.4)% of 200

= Rs. $\left(\frac{200 \times 81.6}{100}\right)$

= Rs. 163.2

92. (4) According to the question,
First discount = 15%
S.P. of dinner set after first discount = (100 – 15)% of Rs. 1500

= Rs. $\left(\frac{1500 \times 85}{100}\right)$

= Rs. 1275

Second discount

= Rs. (1275 – 1173)

= Rs. 102

If second discount be x%, then

$\therefore \frac{1275 \times x}{100} = 102$

$\Rightarrow x = \frac{102 \times 100}{1275} = 8\%$

93. (1) Let the C.P. of article be Rs. 100.

∴ Its marked price = Rs. 125

SP = Rs. $\left(\frac{125 \times 90}{100}\right)$

= Rs. 112.5

∴ Profit per cent = 12.5%

OR

Profit per cent

$= \left(x + y + \frac{xy}{100}\right)\%$

where x = 25%; y = –10%

$= \left(25 - 10 - \frac{25 \times 10}{100}\right)\%$

= 12.5%

TYPE-II

1. (2) Required loss [As per Rule]

$= \left(\frac{10 \times 10}{100}\right)\% = 1\%$

Aliter : Using Rule 8,
Here, r = 10% and r_1 = 10%

⇒ Required profit or loss

$= \frac{r \times (100 - r_1)}{100} - r_1$

$= \frac{10 \times (100 - 10)}{100} - 10$

= 9 – 10

= –1% (–ve sign shows loss)

= 1% loss

2. (2) Suppose C.P. = 100
On 20% above S.P. = 120
On discount of 8%

$= 120 - 120 \times \frac{8}{100}$

$= 120 - \frac{48}{5} = 120 - 9.6 = 110.4$

Gain = 110.4 – 100 = 10.4%

Aliter : Using Rule 8,
Here, r = 20%, r_1 = 8%
Profit or loss

$= \frac{r \times (100 - r_1)}{100} - r_1$

$= \frac{20 \times (100 - 8)}{100} - 8$

$= \frac{20 \times 92}{100} - 8$

= 18.4 – 8

= 10.4% profit

3. (3) Let the cost price be x
Mark Price

$= \left(1 + \frac{20}{100}\right)x = 1.2x$

Cash price $= \left(1 - \frac{30}{100}\right)1.2x$

= 0.7 × 1.2x = 0.84x

Net Loss = x – 0.84x = 0.16x

∴ Net loss%

$= \frac{0.16x}{x} \times 100 = 16\%$

Aliter : Using Rule 8,
Here, r = 20%, r_1 = 30%
Profit or loss

$= \frac{r \times (100 - r_1)}{100} - r_1$

$= \frac{20 \times (100 - 30)}{100} - 30$

= 14 – 30 = –16%

= 16% loss

4. (4) Gain % $= 20 - 10 - \frac{20 \times 10}{100}$

= 20 – 12 = 8%

Aliter : Using Rule 8,
Here, r = 20%, r_1 = 10%
Profit or loss

$= \frac{r \times (100 - r_1)}{100} - r_1$

$= \frac{20 \times (100 - 10)}{100} - 10$

= 18 – 10 = 8% profit.

5. (2) Let C.P. be 100
Marked price = 110

∴ x% of 110 = 11

$\Rightarrow x = \frac{11 \times 100}{110} = 10\%$

Aliter : Using Rule 8,
Here, loss % = 1%, r = 10%, r_1 = x%

loss % $= \frac{r \times (100 - r_1)}{100} - r_1$

$-1 = \frac{100 \times (100 - x)}{100} - x$

(–ve sign for loss)

–100 = 1000 – 10x – 100x

+110x = 1100

x = 10%

⇒ r_1 = 10%

6. (4) Let the CP of the article be 100.
According to the question,
The marked price = ₹ 130
Discount = 10%

∴ SP = 90% of 130

$= \frac{130 \times 90}{100}$ = ₹ 117

∴ Gain = 117 – 100 = ₹ 17

∴ Gain per cent = 17% since the CP = ₹100

Aliter : Using Rule 8,
Here, r = 30%, r_1 = 10%

gain % $= \frac{r \times (100 - r_1)}{100} - r_1$

$= \frac{30 \times (100 - 10)}{100} - 10$

$= \frac{30 \times 90}{100} - 10 = 17\%$

7. (2) Let the cost price be ₹ 100.

∴ Marked price = ₹ 120

SP = $87\frac{1}{2}$% of 120

$= \frac{175}{200} \times 120$ = ₹ 105

∴ Gain per cent = 5%

Aliter : Using Rule 8,

Here, r = 20%, $r_1 = 12\frac{1}{2}\%$

Profit % $= \frac{r \times (100 - r_1)}{100} - r_1$

$= \dfrac{20 \times \left(100 - \dfrac{25}{2}\right)}{100} - \dfrac{25}{2}$

$= \dfrac{20 \times 175}{200} - 12.5$

$= 17.5 - 12.5 = 5\%$

8. (1) Let the C.P. be ₹ 100
∴ Marked price = ₹ 130
S.P. = 85% of ₹ 130

$= ₹ \left(\dfrac{85 \times 130}{100}\right) = ₹\ 110.5$

∴ Gain percent = 10.5%
Aliter : Using Rule 8,
Here, r = 30%, r_1 = 15%

Profit % = $\dfrac{r \times (100 - r_1)}{100} - r_1$

$= \dfrac{30 \times (100 - 15)}{100} - 15$

$= \dfrac{30 \times 85}{100} - 15$

$= 25.5 - 15 = 10.5\%$

9. (1) Let the cost price of article = ₹ 100
∴ Marked price = ₹ 125
SP of the article

$= \left(100 - \dfrac{25}{2}\right)\%$ of 125

$= \dfrac{175}{2}\%$ of 125

$= \dfrac{125 \times 175}{2 \times 100} = \dfrac{875}{8}$

$= ₹\ 109\dfrac{3}{8}$

∴ Gain percent

$= \left(109\dfrac{3}{8} - 100\right) = 9\dfrac{3}{8}\%$

Aliter : Using Rule 8,
Here, r = 25%,

$r_1 = 12\dfrac{1}{2}\% = 12.5\%$

Profit % = $\dfrac{r \times (100 - r_1)}{100} - r_1$

$= \dfrac{25 \times (100 - 12.5)}{100} - 12.5$

$= \dfrac{25 \times 87.5}{100} - 12.5$

$= 21.875 - 12.5 = 9.375$

$= 9\dfrac{3}{8}\%$

10. (4) Let the marked price be *x*.

$\therefore \dfrac{x \times 75}{100} = 200 \times \dfrac{135}{100}$

$\Rightarrow x = \dfrac{200 \times 135}{75} = ₹\ 360$

Aliter : Using Rule 9,
Here, r = 25%, R = 35%,
C.P. = ₹ 200
Marked price

$= \text{Rs.}200 + 200 \times \left(\dfrac{r + R}{100 - r} \times 100\right)\%$

$= 200 + 200 \times \left(\dfrac{25 + 35}{100 - 25}\right) \times 100\%$

$= 200 + \dfrac{200 \times 60}{75} \times 100\%$

$= 200 + \dfrac{200 \times 20 \times 4}{100}$

= 200 + 160 = ₹ 360

11. (3) Let the cost price be ₹ 100.
Marked price = ₹ 140

S.P. = $\dfrac{75 \times 140}{100}$ = ₹ 105

∴ Profit per cent = 5%
Aliter : Using Rule 8,
Here, r = 40%, r_1 = 25%

Profit % = $\dfrac{r \times (100 - r_1)}{100} - r_1$

$= \dfrac{40 \times (100 - 25)}{100} - 25$

$= \dfrac{40 \times 75}{100} - 25$

$= \dfrac{3000}{100} - 25$

= 30 – 25 = 5%

12. (4) Let cost price of article = ₹ 100
∴ Marked price of article

$= \dfrac{100 \times 120}{100} = ₹\ 120$

S.P. of article = ₹ 110
∴ Discount = 120 – 110 = ₹ 10
∴ If discount = *x*%, then

$\dfrac{120 \times x}{100} = 10$

$\Rightarrow x = \dfrac{10 \times 100}{120} = \dfrac{25}{3} = 8\dfrac{1}{3}\%$

Aliter : Using Rule 8,
Here, r = 20%, Profit = 10%
Let, discount r_1 = x%

Profit % = $\dfrac{r \times (100 - r_1)}{100} - r_1$

$10 = \dfrac{20 \times (100 - x)}{100} - r_1$

1000 = 2000 – 20x – 100x
–1000 = –120x

$x = \dfrac{100}{12}$

$= \dfrac{25}{3} = 8\dfrac{1}{3}\%$

13. (2) Let the CP of each shirt be ₹ 100, then SP = ₹ 140.

∴ New SP = $\dfrac{140 \times 90}{100}$ = ₹ 126

∴ When S.P. is ₹ 126,
CP. = ₹ 100

∴ When S.P. is ₹ $\dfrac{13608}{72}$,

then C.P.

$= \dfrac{100}{126} \times \dfrac{13608}{72}$ = ₹ 150

14. (2) C.P. of article = ₹ 100
Marked price = ₹ 150

S.P. = $\dfrac{150 \times 60}{100}$ = ₹ 90

Loss = 100 – 90 = ₹ 10 i.e. 10%
Aliter : Using Rule 8,
Here, r = 50%, r_1 = 40%

His loss % = $\dfrac{r \times (100 - r_1)}{100} - r_1$

$= \dfrac{50 \times (100 - 40)}{100} - 40$

$= \dfrac{50 \times 60}{100} - 40$

= –10%

(–ve sign shows loss)

= 10% loss

15. (4) Let the CP of article be ₹ 100.
∴ Marked price = ₹ 140

S.P. = $\dfrac{140 \times 80}{100}$ = ₹ 112

∴ Gain per cent = 12%
Aliter : Using Rule 8,
Here, r = 40%, r_1 = 20%
Required profit or loss %

$= \dfrac{r \times (100 - r_1)}{100} - r_1$

$= \dfrac{40 \times (100 - 20)}{100} - 20$

$= \dfrac{40 \times 80}{100} - 20$

= 32 – 20 = 12% profit

16. (4) Let the C.P. of article be ₹ 100
$\Rightarrow$ Marked price = ₹ 145

$\Rightarrow$ S.P. = $\frac{145 \times 80}{100}$ = ₹ 116

$\Rightarrow$ Profit percent = 16%

Aliter : Using Rule 8,
Here, r = 45%, r_1 = 20%

Gain % = $\frac{r \times (100 - r_1)}{100} - r_1$

$= \frac{45 \times (100 - 20)}{100} - 20$

$= \frac{3600}{100} - 20$

= 36 – 20 = 16%

17. (2) Let the cost price be ₹ 100.
$\therefore$ Marked price = ₹ 150

S.P. = $\frac{150 \times 80}{100}$ = ₹ 120

when S.P. = 120, C.P. = 100
when S.P. = 840

C.P.= $\frac{100}{120} \times 840$ = ₹ 700

Aliter : Using Rule 8,
Here, r = 50%, r_1 = 20%,
S.P. = ₹ 840

Gain % = $\frac{r \times (100 - r_1)}{100} - r_1$

$= \frac{50 \times (100 - 20)}{100} - 20$

$= \frac{50 \times 80}{100} - 20$

= 20%

We know that

Gain % = $\frac{\text{S.P.–C.P.}}{\text{C.P.}} \times 100$

$20 = \left(\frac{840 - x}{x}\right) \times 100$

20x = 84000 – 100x
120x = 84000

$\boxed{x = 700}$

$\therefore$ C.P. = ₹ 700

18. (3) Let the C.P. of each article be ₹ 100.
$\therefore$ Marked price = ₹ 140

$\therefore$ S.P. = $\frac{140 \times 85}{100}$ = ₹ 119

$\therefore$ Gain per cent = 19%

Aliter : Using Rule 8,
Here, r = 40%, r_1 = 15%

Gain % = $\frac{r \times (100 - r_1)}{100} - r_1$

$= \frac{40 \times (100 - 15)}{100} - 15$

$= \frac{40 \times 85}{100} - 15$

$= \frac{3400}{100} - 15$

= 19%

19. (3) Let C.P. be ₹ 100.
Marked price = ₹ 120

S.P. = $\frac{120 \times 95}{100}$ = ₹ 114

Gain per cent = 14%

Aliter : Using Rule 8,
Here, r = 20%, r_1 = 5%

Gain % = $\frac{r \times (100 - r_1)}{100} - r_1$

$= \frac{20 \times (100 - 5)}{100} - 5$

= 19 – 5 = 14%

20. (1) Let Cost price = ₹ 100
Marked price = ₹ 120

Selling price = $\frac{120 \times 80}{100}$ = ₹ 96

$\therefore$ Loss = ₹ 4 and loss per cent = 4%

Aliter : Using Rule 8,
Here, r = 20%, r_1 = 20%

Loss % = $\frac{r \times (100 - r_1)}{100} - r_1$

$= \frac{20 \times (100 - 20)}{100} - 20$

$= \frac{20 \times 80}{100} - 20$

= –4% (–ve sign shows loss)
= 4% loss

21. (3) Let Cost price of article = ₹ 100
Marked price = ₹ 125

$\therefore$ S.P. = $\frac{125 \times 90}{100}$ = ₹ 112.5

$\therefore$ Gain = 112.5 – 100 = 12.5

$\Rightarrow$ Gain percent = 12.5%

Aliter : Using Rule 8,
Here, r = 25%, r_1 = 10%

Profit % = $\frac{r \times (100 - r_1)}{100} - r_1$

$= \frac{25 \times (100 - 10)}{100} - 10$

$= \frac{25 \times 90}{100} - 10$

= 22.5 – 10 = 12.5%

22. (4) Let the cost price be ₹ 100 and marked price be *x*.

$\therefore \frac{x \times 90}{100} = 108$

$\Rightarrow \frac{9x}{10} = 108$

$\Rightarrow x = \frac{108 \times 10}{9} = 120$

Required Percent = 20%

Aliter : Using Rule 8,
Here, Gain % = 8%, r_1 = 10%, r = ?

Gain % = $\frac{r \times (100 - r_1)}{100} - r_1$

$8 = \frac{r \times (100 - 10)}{100} - 10$

$8 = \frac{r \times 90}{100} - 10$

$18 = \frac{r \times 9}{10}$ = 20%

23. (1) Let the C.P. be ₹ 100 and the marked price be ₹ *x*.

$\therefore x \times \frac{88}{100} = 132$

$\Rightarrow x = \frac{132 \times 100}{88}$

= 150 i.e., more by 50%

$\therefore$ Required percentage = 50%

Aliter : Using Rule 8,
Here, Gain % = 32%,
r_1 = 12%, r = ?

Gain % = $\frac{r \times (100 - r_1)}{100} - r_1$

$32 = \frac{r \times (100 - 12)}{100} - 12$

$44 = \frac{r \times 88}{100}$

r = 50%

24. (4) C.P. of article = ₹ 100
Let marked price of article x.

$$\therefore\ x \times \frac{90}{100} = 117$$

$$\Rightarrow x = \frac{117 \times 100}{90}$$

= ₹ 130 or 30% above the cost price.

Aliter : Using Rule 8,
Here, r_1 = 10%, gain % = 17%, r = ?

$$\text{Gain \%} = \frac{r \times (100 - r_1)}{100} - r_1$$

$$17 = \frac{r \times (100 - 10)}{100} - 10$$

$$27 = \frac{r \times 90}{100}$$

r = 30%

25. (3) Let marked price of the wrist watch be x

$$\therefore\ \frac{90x}{100} = \frac{450 \times 120}{100}$$

$\Rightarrow 90x = 450 \times 120$

$$\therefore\ x = \frac{450 \times 120}{90} = ₹\ 600$$

Aliter : Using Rule 8,
Here, r_1 = 10%, profit = 20%, r = ?

$$\text{Gain \%} = \frac{r \times (100 - r_1)}{100} - r_1$$

$$20 = \frac{r \times (100 - 10)}{100} - 10$$

$$20 = \frac{9r}{10} - 10$$

$$30 = \frac{9r}{10}$$

$$r = \frac{300}{9}\%$$

$$\therefore\ \text{List price} = 450 + 450 \times \frac{300}{9}\%$$

$$= 450 + 450 \times \frac{300}{900}$$

= 450 + 150 = ₹ 600

26. (3) For Anand,
Cost price = ₹ x

Marked price = ₹ $\frac{3}{2}x$

$$\text{Selling price} = \frac{3x}{2} \times \frac{80}{100}$$

= ₹ $\frac{6x}{5}$

For Balaji,

Cost price = ₹ $\frac{6x}{5}$

Selling price = ₹ $\left(\frac{6x}{5} + 20\right)$

$$\therefore\ \frac{6x}{5} + 20 = \frac{x \times 130}{100}$$

$$\Rightarrow \frac{13x}{10} - \frac{6x}{5} = 20$$

$$\Rightarrow \frac{13x - 12x}{10} = 20$$

$$\Rightarrow \frac{x}{10} = 20$$

$\Rightarrow x$ = ₹ 200

∴ Required gain percent

$$= \frac{20}{\frac{6x}{5}} \times 100$$

$$= \frac{20 \times 5 \times 100}{6 \times 200} = \frac{25}{3} = 8.33\%$$

27. (4) Cost price of the shirt = ₹ x

$$\therefore\ x \times \frac{120}{100} = \frac{850 \times 96}{100}$$

$\Rightarrow x \times 120 = 850 \times 96$

$$\Rightarrow x = \frac{850 \times 96}{120} = ₹\ 680$$

Aliter : Using Rule 6,
Here r = 20%, D = 4%,
M.P. = ₹ 850, C.P. = ?

$$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + r}{100 - D}$$

$$\frac{850}{\text{C.P.}} = \frac{100 + 20}{100 - 4}$$

$$\text{C.P.} = \frac{850 \times 96}{120}$$

C.P. = ₹ 680

28. (2) Cost price of the article = ₹ x

$$\therefore\ x \times \frac{125}{100} = \frac{500 \times 95}{100}$$

$$\Rightarrow x = \frac{500 \times 95}{125} = ₹\ 380$$

Aliter : Using Rule 6,
Here, R = 25%, D = 5%,
M.P. = ₹ 500, C.P. = ?

$$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + r}{100 - D}$$

$$\frac{500}{\text{C.P.}} = \frac{100 + 25}{100 - 5}$$

$$\text{C.P.} = \frac{500 \times 95}{125} = ₹\ 38$$

29. (2) Marked price = ₹ x

Discount = ₹ $\frac{x}{5}$

S.P. = $x - \frac{x}{5}$ = ₹ $\frac{4x}{5}$

Loss = ₹ $\frac{x}{10}$

$$\therefore\ \text{C.P.} = \frac{4x}{5} + \frac{x}{10}$$

$$= \frac{8x + x}{10} = ₹\ \frac{9x}{10}$$

$$\therefore\ \text{Loss per cent} = \frac{\frac{x}{10}}{\frac{9x}{10}} \times 100$$

$$= \frac{100}{9} = 11\frac{1}{9}\%$$

30. (2) Marked price of article
= ₹ x (let)
∴ S.P. of article

$$= ₹\ \left(x \times \frac{90}{100} \times \frac{108}{100}\right)$$

$$\therefore\ x \times \frac{90}{100} \times \frac{108}{100} = 3402$$

$$\Rightarrow x = \frac{3402 \times 100 \times 100}{90 \times 108}$$

= ₹ 3500

31. (1) Let the marked price of table be ₹ x.

$\therefore \frac{x \times 80}{100} = \frac{3200 \times 125}{100}$

$\Rightarrow x \times 80 = 3200 \times 125$

$\Rightarrow x = \frac{3200 \times 125}{80} =$ ₹ 5000

Aliter : Using Rule 6,
Here, r = 25%, D = 20%,
C.P. = ₹ 3200, M.P. = ?

$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + \text{r}}{100 - \text{D}}$

$\frac{\text{M.P.}}{3200} = \frac{100 + 25}{100 - 20}$

M.P. = $\frac{125 \times 3200}{80}$ = ₹ 5000

32. (4) Marked price of article = ₹ x

$\therefore \frac{x \times (100 - 12.5)}{100} = \frac{210 \times 120}{100}$

$\Rightarrow x \times 87.5 = 210 \times 120$

$\Rightarrow x = \frac{210 \times 120}{87.5} =$ ₹ 288

Aliter : Using Rule 6,
Here,R= 20%, D = 12.5%,
C.P. = ₹ 210, M.P. = ?

$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + \text{r}}{100 - \text{D}}$

$\frac{\text{M.P.}}{210} = \frac{100 + 20}{100 - 12.5}$

M.P. = $\frac{120}{87.5} \times 210$

= ₹ 288

33. (3) C.P. of article = ₹ 100
and marked price of article
= ₹ x (let)

$\therefore x \times \frac{90}{100} = 117$

$\Rightarrow x = \frac{117 \times 100}{90} =$ ₹ 130

i.e. 30% above the cost price.

Aliter : Using Rule 6,
Let, C.P. = ₹ 100, r = 17%,
D = 10%, M.P. = ?

$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + \text{r}}{100 - \text{D}}$

$\frac{\text{M.P.}}{100} = \frac{100 + 17}{100 - 10}$

M.P. = $\frac{117}{90} \times 100$

M.P. = ₹ 130

$\Rightarrow$ 30% above cost price.

34. (4) Production cost of radio= ₹ x

$\therefore \frac{x \times 130}{100} = 286$

$\Rightarrow x = \frac{286 \times 100}{130} =$ ₹ 220

$\therefore$ Selling price = 90% of 286

$= \frac{286 \times 90}{100} =$ ₹ 257.40

Profit = ₹ (257.40 – 220)

= ₹ 37.40

35. (1) C.P. of cycle = Rs. x

$\therefore 840 \times \frac{90}{100} = \frac{x \times 126}{100}$

$\Rightarrow x \times 126 = 840 \times 90$

$\Rightarrow x = \frac{840 \times 90}{126} =$ ₹ 600

Aliter : Using Rule 6,
Here, r = 26%, D = 10%,
M.P. = ₹ 840

$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + \text{r}}{100 - \text{D}}$

$\frac{840}{\text{M.P}} = \frac{100 + 26}{100 - 10}$

C.P. = $\frac{840 \times 90}{126}$ = Rs. 600

36. (4) C.P. of article = ₹100

Marked price = ₹ 110

S.P. = $\frac{110 \times 90}{100}$ = ₹ 99

Loss = 100 – 99 = ₹ 1 = 1%

Aliter : Using Rule 8,
Here, r = 10%, r_1 = 10%

$\Rightarrow$ Gain or Loss %

$= \frac{\text{r} \times (100 - \text{r}_1)}{100} - \text{r}_1$

$= \frac{10 \times (100 - 10)}{100} - 10$

= 9 – 10

= –1 (–ve sign shows loss)

$\Rightarrow$ Loss = 1%

37. (3) Marked price of article
= Rs. x

$\therefore$ S.P. of article = $\frac{90x}{100}$

= Rs. $\frac{9x}{10}$

$\therefore$ C.P = $\frac{80 \times 9x}{100 \times 10} = \frac{36x}{50}$

$\therefore$ Gain = $\frac{9x}{10} - \frac{36x}{50}$

$= \frac{45x - 36x}{50}$ = Rs. $\frac{9x}{50}$

$\therefore$ Gain% = $\frac{\frac{9x}{50}}{\frac{36x}{50}} \times 100 = 25\%$

38. (4) Marked price of instrument
= Rs. x (let)

$\therefore$ Its S.P. = Rs. $\frac{80x}{100}$

= Rs. $\frac{4x}{5}$

$\therefore$ C.P. = Rs. $\left(\frac{4x}{5} - 150\right)$

$\therefore \frac{4x}{5} = \left(\frac{4x}{5} - 150\right) \times \frac{125}{100}$

$\Rightarrow \frac{4x}{5} = \left(\frac{4x}{5} - 150\right) \times \frac{5}{4}$

$\Rightarrow \frac{4x}{5} \times \frac{4}{5} = \frac{4x}{5} - 150$

$\Rightarrow \frac{4x}{5} - \frac{16x}{25} = 150$

$\Rightarrow \frac{20x - 16x}{25} = 150$

$\Rightarrow \frac{4x}{25} = 150 \Rightarrow 4x = 150 \times 25$

$\Rightarrow x = \frac{150 \times 25}{4}$ = Rs. 937.5

39. (2) Marked price of TV

= Rs. x (let)

According to question,

$$\frac{x \times 80}{100} - \frac{x \times 70}{100} = 800$$

$$\Rightarrow \frac{10x}{100} = 800$$

$$\Rightarrow x = \frac{800 \times 100}{10} = \text{Rs. } 8000$$

40. (4) Profit per cent

$$= \left(x + y + \frac{xy}{100}\right)\%$$

$$= \left(25 - 10 - \frac{25 \times 10}{100}\right)\%$$

= (15 – 2.5)% = 12.5 %

Aliter : Using Rule 8,

Here = r = 25%, r_1 = 10%

$$\text{Gain \%} = \frac{r \times (100 - r_1)}{100} - r_1$$

$$= \frac{25 \times (100 - 10)}{100} - 10$$

$$= \frac{25 \times 90}{100} - 10$$

= 22.5 – 10 = 12.5%

41. (1) Let the C.P. of article be Rs. 100,

According to the questions

Marked price of article = Rs. 120

After a discount of 8%,

$$\text{S. P.} = \left(\frac{120 \times 92}{100}\right)$$

= Rs. 110.4 Gain

= Rs. (110.4 – 100) = Rs. 10.4

∴ Gain % = 10.4%

Aliter : Using Rule 8,

Here, r = 20%

r_1 = 8%

$$\text{Gain \%} = \frac{r \times (100 - r_1)}{100} - r_1$$

$$= \frac{20 \times (100 - 8)}{100} - 8$$

$$= \frac{20 \times 92}{100} - 8$$

= 18.4 – 8 = 10.4%

42. (1) C.P of article = Rs. 100 (let).

M.P. of article = Rs. x (let)

According to the question,

$$\frac{x \times 90}{100} = 117$$

$$\Rightarrow x = \frac{117 \times 100}{90} = \text{Rs. } 130$$

= marked price

∴ On allowing no discount profit = 30%

43. (4) Let the marked price of the camera be Rs. x.

According to the question,

$$\frac{x \times 90}{100} = \frac{600 \times 120}{100}$$

$\Rightarrow x \times 90 = 600 \times 120$

$$\Rightarrow x = \frac{600 \times 120}{90} = \text{Rs. } 800$$

Aliter : Using Rule 6

Here, r = 20%

D = 10%

C.P. = Rs. 600

M.P. = ?

$$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + r}{100 - D}$$

$$\frac{\text{M.P.}}{600} = \frac{100 + 20}{100 - 10}$$

$$\text{M.P.} = \frac{120 \times 600}{90} = 800$$

44. (3) Let the C.P. of article be Rs. 100 and the marked price be Rs. x.

Case I

$$\frac{x \times 90}{100} = 120$$

$$\Rightarrow x = \frac{120 \times 100}{90}$$

$$= \text{Rs. } \frac{400}{3}$$

Case II

$$\text{S.P.} = \frac{x \times 80}{100} = \text{Rs. } \frac{4x}{5}$$

$$= \text{Rs. } \left(\frac{4}{5} \times \frac{400}{3}\right) = \text{Rs. } \frac{320}{3}$$

$$\therefore \text{ Profit} = \text{Rs. } \left(\frac{320}{3} - 100\right)$$

$$= \text{Rs. } \left(\frac{320 - 300}{3}\right)$$

$$= \text{Rs. } \frac{20}{3}$$

$$\therefore \text{ Profit percent} = \frac{20}{3}\%$$

$$= 6\frac{2}{3}\%$$

45. (2) Let the marked price of article be Rs. x and its C.P. be Rs. 100.

According to the question,

$$x \times \frac{80}{100} = \frac{100 \times 120}{100}$$

$$\Rightarrow x = \frac{120 \times 100}{80} = \text{Rs. } 150$$

S.P. after a discount of 30%

$$= \frac{150 \times 70}{100}$$

= Rs. 105 i.e. gain = 5%

46. (1) C.P. of article

$$= \text{Rs. } \left(\frac{100}{130} \times 286\right) = \text{Rs. } 220$$

S.P. of article

$$= \frac{286 \times 90}{100} = \text{Rs. } 257.40$$

∴ Profit

= Rs. (257.40 – 220)

= Rs. 37.40

∴ Profit percent

$$= \frac{37.40 \times 100}{220} = 17\%$$

47. (3) Marked price of toy = Rs. x

A discount of 20% is given.

$$\therefore \frac{80x}{100} = 300$$

$$\Rightarrow x = \frac{300 \times 100}{80}$$

= Rs. 375

∴ Profit percent

$$= \left(\frac{405 - 375}{375}\right) \times 100 = 8\%$$

48. (4) C.P. of article = Rs. 100

Its marked price = Rs. 120

$\therefore$ S.P. = $\frac{120 \times 95}{100}$

= Rs. 114

$\therefore$ Profit percent = 14%

49. (4) Let the marked price of radio be Rs. x.

According to the question,

85% of x = 255

$\Rightarrow \frac{x \times 85}{100} = 255$

$\Rightarrow x = \frac{255 \times 100}{85}$ = Rs. 300

50. (1) Let the C.P. of article be Rs. 100.

$\therefore$ Its marked price = Rs. 130

Its S.P. = 90% of 130

$= \frac{130 \times 90}{100}$ = Rs. 117

$\therefore$ Profit per cent = 17%

51. (3) Let the production cost of article be Rs. x.

Effective percentage

$= \left(x + y + \frac{xy}{100}\right)\%$

$= \left(40 - 20 - \frac{40 \times 20}{100}\right)\%$

= (20 – 8)% = 12%

According to the question,

12% of x = 48

$\Rightarrow \frac{12x}{100} = 48$

$\Rightarrow x = \frac{48 \times 100}{12}$ = Rs. 400

52. (3) Let the marked price of watch be Rs. x.

Actual C.P. of watch

= 110% of 500

= Rs. $\left(\frac{500 \times 110}{100}\right)$ = Rs. 550

According to the question,

$x \times \frac{75}{100} = \frac{550 \times 120}{100}$

$\Rightarrow x = \frac{550 \times 120}{75}$ = Rs. 880

53. (2) C.P. of laptop = Rs. x

According to the question,

$x \times \frac{96}{100} = \frac{12000 \times 85}{100}$

= 120 × 85

$\Rightarrow x = \frac{120 \times 85 \times 100}{96}$

= Rs. 10625

54. (2) Let the C.P. of article be Rs. 100.

According to the question,

Marked price of article

= Rs. 120

S.P. of article = Rs. $\left(\frac{120 \times 80}{100}\right)$

= Rs. 96

$\therefore$ Loss = Rs. 4 i.e. 4%

55. (2) C.P. of article = Rs. 100

$\therefore$ Marked price = Rs. 120

S.P. = $\frac{120 \times 80}{100}$ = Rs. 96

$\therefore$ Loss = Rs. 4 i.e., 4%

56. (2) Marked price of gift box

= Rs. x

According to the question,

$\frac{90x}{100} = \frac{150 \times 110}{100}$

$\Rightarrow$ 90x = 150 × 110

$\Rightarrow x = \frac{150 \times 110}{90}$ = Rs. 183.3

57. (2) Let the marked price of article be Rs. x.

According to the question,

95% of x = 950

$\Rightarrow x \times \frac{95}{100} = 950$

$\Rightarrow x = \frac{950 \times 100}{95}$ = Rs. 1000

58. (1) Let the marked price of article be Rs. x and its cost price be Rs. 100.

According to the question.

(100 – 20)% of x = 125

$\Rightarrow x \times \frac{80}{100} = 125$

$\Rightarrow x$ = Rs. $\left(\frac{125 \times 100}{80}\right)$

= Rs. 156.25

59. (1) C.P. of article = Rs. 100 (let)

$\therefore$ Its marked price = Rs. 140

Discount = 25%

$\therefore$ S.P. of article

= Rs. $\left(\frac{140 \times 75}{100}\right)$

= Rs. 105

$\therefore$ Profit per cent = 5%

60. (3) C.P. of article = Rs. 100 (let)

$\therefore$ Marked price = Rs. 120

Its S.P. = Rs. 108

$\therefore$ Discount = Rs. (120 – 108)

= Rs. 12

$\therefore$ If discount be x%, then,

$120 \times \frac{x}{100} = 12$

$\Rightarrow x = \frac{12 \times 100}{120} = 10\%$

61. (2) Let the marked price of watch be Rs. x.

According to the question,

(20 – 10)% of x = 125

$\Rightarrow x \times \frac{10}{100} = 125$

$\Rightarrow x$ = Rs. 1250

62. (3) Single equivalent discount for 15% and 20%

$= \left(20 + 15 - \frac{20 \times 15}{100}\right)\%$

= (35 – 3)% = 32%

$\therefore$ Net rate of cloth

= (100 – 32)% of Rs. 50

= Rs. $\left(\frac{50 \times 68}{100}\right)$ per metre

= Rs. 34 per metre

63. (2) Let the C.P. of article be Rs. 100.

$\therefore$ Its marked price = Rs. 120

Let the rate of discount be x%

According to the question,

x% of 120 = 120 – 108

$\Rightarrow \frac{120 \times x}{100} = 12$

$\Rightarrow x = \frac{12 \times 100}{120} = 10\%$

64. (1) Let the marked price of article be Rs. x.

According to the question,

90% of x = 720 × 115%

$\Rightarrow x \times \frac{90}{100} = 720 \times \frac{115}{100}$

$\Rightarrow x = \frac{115 \times 720}{90}$ = Rs. 920

65. (3) Let the marked price of article be Rs. x.
According to the question,
$(9 - 7)\%$ of $x = 15$

$\Rightarrow x \times \frac{2}{10} = 15$

$\Rightarrow x = \frac{15 \times 100}{2}$ = Rs. 750

66. (2) Let the marked price of book be Rs. 100.
C.P. for the retailer
= Rs. (100 – 30) = Rs. 70
S.P. for the retailer = Rs. 90
∴ Profit per cent

$= \left(\frac{90 - 70}{70}\right) \times 100$

$= \frac{200}{7} = 28\frac{4}{7}\%$

67. (1) Let the C.P. of article be Rs. x.

∴ Marked price = Rs. $\frac{112x}{100}$

According to the question,

$\frac{112x}{100} \times \frac{95}{100} = 532$

$\Rightarrow x = \frac{532 \times 10000}{112 \times 95}$ = Rs. 500

68. (4) Percentage effect

$= \left(40 - 25 - \frac{40 \times 25}{100}\right)\%$

= (15 – 10)% = 5%
If the C.P. of article be Rs. x,

then, $x \times \frac{105}{100} = 2100$

$\Rightarrow x = \frac{2100 \times 100}{105}$ = Rs. 2000

69. (3) Let the marked price of the article be Rs. 100.
∴ C.P. for the retailer

= Rs. $\left(\frac{100 \times 60}{100}\right)$ = Rs. 60

Its S.P. = Rs. 100
∴ Profit = Rs. (100 – 60)
= Rs. 40

∴ Profit per cent = $\frac{40}{60} \times 100$

$= \frac{200}{3} = 66\frac{2}{3}\%$

70. (2) Single equivalent discount for 20% and 10%

$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\%$

= (30 – 2)% = 28%
∴ S.P. of article
= (100 – 28)% of Rs. 900

= Rs. $\left(\frac{900 \times 72}{100}\right)$ = Rs. 648

71. (3) Let C.P. of article be Rs. 100.
∴ Marked price = Rs. 150
S.P. of article

= Rs. $\left(\frac{150 \times 75}{100}\right)$

= Rs. 112.5
∴ Profit = Rs. (112.5 – 100)
= Rs. 12.5
∵ C.P. = Rs. 100
∴ Profit per cent = 12.5%

TYPE-III

1. (4) S.P. of that article

$= 800 \times \frac{90}{100} =$ ₹ 720

He still makes 20% profit
∴ C.P. of the article

$= 720 \times \frac{100}{120} =$ ₹ 600

Aliter : Using Rule 6,
Here, r = 20%, D = 10%,
M.P. = ₹ 800, C.P. = ?

$\frac{M.P.}{C.P.} = \frac{100 + r}{100 - D}$

$\frac{800}{C.P.} = \frac{100 + 20}{100 - 10}$

C.P. = $\frac{800 \times 90}{120}$

C.P. = ₹ 600

2. (4) Discount

$= 12\frac{1}{2}\% = \frac{25}{2}\%$

After discount S.P.
= ₹ 200 × 87.5) = ₹ 175
Gain % = 25%

Required C.P. = ₹ $\frac{100}{125} \times 175$

= ₹ 140
Aliter : Using Rule 6,
Here, r = 25%, D = 12.5%,
M.P. = ₹ 200, C.P. = ?

$\frac{M.P.}{C.P.} = \frac{100 + r}{100 - D}$

$\frac{200}{C.P.} = \frac{100 + 25}{100 - 12.5}$

C.P. = $\frac{200 \times 87.5}{125}$

C.P. = ₹ 140

3. (2) SP of article
= (100 – 20)% of 880
= 80%of 880

$= 880 \times \frac{80}{100} =$ ₹ 704

Let CP be x
Again, 110% of $x = 704$

$x = \frac{704}{110} \times 100$ = ₹ 640

∴ Original cost = ₹ 640
Aliter : Using Rule 6,
Here, r = 10%, D = 20%,
M.P. = ₹ 880, C.P. = ?

$\frac{M.P.}{C.P.} = \frac{100 + r}{100 - D}$

$\frac{880}{C.P.} = \frac{100 + 10}{100 - 20}$

C.P. = $\frac{880 \times 80}{110}$

C.P. = ₹ 640

4. (2) Selling Price
= ₹ (1100 – 10% of 1100)
= ₹ (1100 – 110) = ₹ 990
Let the cost price = x
∴ x + 10% of x = 990

$\Rightarrow \frac{11x}{10} = 990$

$\Rightarrow x = \frac{990 \times 10}{11}$ = ₹ 900

Aliter : Using Rule 6,
Here, r = 10%, D = 10%,
M.P. = ₹ 1100, C.P. = ?

$\frac{M.P.}{C.P.} = \frac{100 + r}{100 - D}$

$\frac{1100}{C.P.} = \frac{100 + 10}{100 - 10}$

C.P. = $\frac{1100 \times 90}{110}$ = ₹ 900

5. (1) Marked price = ₹ 690
∴ Discount = 10%

$SP = \frac{690 \times 90}{100}$ = ₹ 621

Profit = 8%

∴ $CP = \frac{621}{108} \times 100$ = ₹ 575

Profit without discount
= 690 – 575 = ₹ 115
Profit per cent

$= \frac{115}{575} \times 100 = 20\%$

Aliter (1) : Using Rule 9,
Here, r = 10%
R = 20%
Required percentage

$= \frac{(r+R)}{100-r} \times 100\%$

$= \frac{10+20}{100-10} \times 100\%$

$= \frac{30}{90} \times 100\%$

$= 33\frac{1}{3}\%$

Gain % $= \frac{S.P. - C.P.}{C.P.} \times 100$ (without discount)

$= \frac{480-400}{400} \times 100$

$= \frac{80}{400} \times 100 = 20\%$

Aliter (2) : Using Rule 6,
Here, M.P. = ₹ 690, D = 10%, r = 8%

$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$

$\frac{690}{C.P.} = \frac{100+8}{100-10}$

$C.P. = \frac{690 \times 90}{108}$

C.P. = ₹ 575
Gain % (without discount)

$= \frac{690-575}{575} \times 100\%$

$= \frac{115}{575} \times 100\%$

= 20%

6. (2) Let the CP be ₹ 100. Then SP = ₹ 120
Let the marked price be x.
Then, 90% of x = ₹ 120

$\Rightarrow x = \frac{120 \times 100}{90} = \frac{400}{3}$

$= 133\frac{1}{3}$

It is $33\frac{1}{3}$% higher than the CP.

7. (2) SP $= 180 \times \frac{120}{100}$ = ₹ 216

∴ 90% = 216

100% $= \frac{216}{90} \times 100$ = ₹ 240

8. (2) CP = ₹ 900
∴ S.P. = 125% of 900

$= \left(\frac{900 \times 125}{100}\right)$ = ₹ 1125

Let the marked price be x
∴ 90% of x = ₹ 1125

$\Rightarrow x = \frac{1125 \times 100}{90}$ = ₹ 1250

9. (4) Let the cost price of article be x

$\therefore 500 \times \frac{90}{100} = \frac{120}{100} \times x$

$\Rightarrow 450 = \frac{6x}{5}$

$\Rightarrow x = \frac{450 \times 5}{6}$ = ₹ 375

Aliter : Using Rule 6,
C.P. = ? , M.P. = ₹ 500, r = 20%, D = 10%

$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$

$\frac{500}{C.P.} = \frac{100+20}{100-10}$

$C.P. = \frac{500 \times 90}{120}$ = ₹ 375

10. (2) SP of electric iron
= 88% of 300

= ₹ $\frac{300 \times 88}{100}$ = ₹ 264

Profit = 10%
∴ CP of electric iron

$= \frac{100}{110} \times 264$ = ₹ 240

After no discount,
Gain = 300 – 240 = ₹ 60

Gain per cent $= \frac{60}{240} \times 100 = 25\%$

Aliter : Using Rule 6,
Here, M.P. = ₹ 300,
r = 10%, D = 12%.

$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$

$\frac{300}{C.P.} = \frac{100+10}{100-12}$

$C.P. = \frac{300 \times 88}{110}$

Gain % (without discount)

$= \frac{300-240}{240} \times 100$

= 25%

11. (3) Marked price = ₹ 50
S.P. after discount = 80% of 50
= ₹ 40
If the CP of article be x, then

$\frac{125 \times x}{100} = 40$

$\Rightarrow x = \frac{40 \times 100}{125}$ = ₹ 32

Aliter : Using Rule 6,
Here, M.P. = ₹ 50, C.P. = ?,
r = 25%, D = 20%

$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$

$\frac{50}{C.P.} = \frac{100+25}{100-20}$

$C.P. = \frac{50 \times 80}{125}$ = ₹ 32

12. (1) Let the CP be ₹ 100.
∴ SP = ₹ 112
If the marked price be x, then
90 % of x = 112

$\Rightarrow x = \frac{112 \times 100}{90}$ = ₹ $\frac{1120}{9}$

∴ Required ratio = $100 : \frac{1120}{9}$

= 900 : 1120 = 45 : 56

Aliter : Using Rule 6,
Here, r = 12%
D = 10%

$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$

$$\frac{M.P.}{C.P.} = \frac{100+12}{100-10}$$

$$\frac{M.P.}{C.P.} = \frac{112}{90}$$

$$\frac{C.P.}{M.P.} = \frac{90}{112}$$

$$\frac{C.P.}{M.P.} = \frac{45}{56}$$

C.P. : M.P. = 45 : 56

13. (4) If the CP of radio be x, then

$$\frac{108}{100} \text{ of } x = \frac{480 \times 90}{100}$$

$$\Rightarrow \frac{x \times 108}{100} = 432$$

$$\Rightarrow x = \frac{432 \times 100}{108} = ₹\ 400$$

Gain per cent (if no discount is allowed) = $\frac{80}{400} \times 100 = 20\%$

Aliter : Using Rule 6,
Here, r = 8%, D = 10%,
M.P. = ₹ 480

$$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$$

$$\frac{480}{C.P.} = \frac{100+8}{100-10}$$

$$C.P. = \frac{480 \times 90}{108} = ₹\ 400$$

$$\text{Gain \%} = \frac{S.P. - C.P.}{C.P.} \times 100$$

(without discount)

$$= \frac{480-400}{400} \times 100$$

$$= \frac{80}{400} \times 100 = 20\%$$

14. (1) Let C.P. of article be x

$$\therefore \frac{x \times 104.5}{100} = \frac{275 \times 95}{100}$$

$$\Rightarrow x \times 104.5 = 275 \times 95$$

$$\Rightarrow x = \frac{275 \times 95}{104.5} = ₹\ 250$$

Aliter : Using Rule 6,
M.P. = ₹ 275, D = 5%,
r = 4.5%, C.P. = ?

$$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$$

$$\frac{275}{C.P.} = \frac{100+4.5}{100-5}$$

$$C.P. = \frac{275 \times 95}{104.5}$$

C.P. = ₹ 250

15. (3) Let the marked price be x.

$$\therefore x \times \frac{84}{100} = \frac{1200 \times 112}{100}$$

$$\Rightarrow x \times \frac{84}{100} = 112 \times 12$$

$$\Rightarrow x = \frac{112 \times 1200}{84} = ₹\ 1600$$

Aliter : Using Rule 6,
C.P. = ₹ 1200, r = 12%,
D = 16%

$$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$$

$$\frac{M.P.}{1200} = \frac{100+12}{100-16}$$

$$M.P. = \frac{112 \times 1200}{84} = ₹\ 1600$$

16. (1) Let the marked price be ₹100.
∴ S.P. = 90% of 100 = ₹ 90
Profit = 17%

$$C.P. = ₹\ 90 \times \frac{100}{117}$$

$$= ₹\ \frac{1000}{13}$$

If no discount is allowed,
S.P. = ₹ 100

$$\text{Profit} = ₹\left(100 - \frac{1000}{13}\right)$$

$$= ₹\ \frac{300}{13}$$

∴ Profit %

$$= \frac{\frac{300}{13}}{1000/13} \times 100 = 30\%$$

Aliter : Using Rule 6,
Here, D = 10%, r = 17%,
Let the M.P. = ₹ 100

$$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$$

$$\frac{100}{C.P.} = \frac{100+17}{100-10}$$

$$\frac{100}{C.P.} = \frac{117}{90}$$

$$C.P. = \frac{100 \times 90}{117}$$

$$= \frac{1000}{13}$$

Profit = S.P. – C.P.

$$= 100 - \frac{1000}{13}$$

$$= \text{Rs.}\frac{300}{13}$$

$$\text{Profit \%} = \frac{\frac{300}{13}}{\frac{1000}{13}} \times 100\%$$

$$= 30\%$$

17. (1) Let the marked price = ₹ 100
∴ S.P = ₹ 80
Profit = 25%

$$\therefore CP = ₹\left(\frac{100}{125} \times 80\right) = ₹\ 64$$

Profit after selling on marked price= 100 – 64 = ₹ 36

$$\therefore \text{Gain \%} = \frac{36}{64} \times 100 = 56.25\%$$

Aliter : Using Rule 6,
Here, D = 20%
r = 25%
Let, M.P. be ₹ 100

$$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$$

$$\frac{100}{C.P.} = \frac{100+25}{100-20}$$

$$C.P. = \frac{100 \times 80}{125}$$

C.P. = ₹ 64
Profit = 100 – 64 = 36

$$\text{Gain \%} = \frac{36}{64} \times 100\%$$

$$= 56.25\%$$

18. (4) Let the C.P. of article be ₹100 and its marked price be x.

$$\therefore x \times \frac{84}{100} = 105$$

$$\Rightarrow x = \frac{105 \times 100}{84} = 125$$

∴ Required percentage = 25%

Aliter : Using Rule 6,
Here, r = 5%
D = 16%

$$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$$

$$= \frac{100+5}{100-16} = \frac{105}{84}$$

Required Percentage

$$= \frac{105-84}{84} \times 100 = 25\%$$

19. (2) Let CP of radio be Rs. x.
According to the question,

$$\frac{108x}{100} = 4800 \times \frac{90}{100} = 4320$$

$$\Rightarrow x \ \frac{4320 \times 100}{108} = ₹\ 4000$$

If no discount is allowed,
Gain per cent

$$= \frac{800}{4000} \times 100 = 20\%$$

Aliter : Using Rule 6,
M.P. = ₹ 4800, D = 10%, r = 8%

$$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$$

$$\frac{4800}{C.P.} = \frac{100+8}{100-10}$$

$$C.P. = \frac{4800 \times 90}{108}$$

C.P. = 4000

Gain % (without discount)

$$= \frac{4800-4000}{4000} \times 100$$

$$= \frac{800}{4000} \times 100$$

= 20%

20. (2) S.P. for a profit of 12%

$$= \frac{8000 \times 112}{100} = ₹\ 8960$$

∴ Discount = 11200 – 8960
= ₹ 2240

If the discount per cent be x, then

$$\frac{11200 \times x}{100} = 2240$$

$$x = \frac{2240 \times 100}{11200} = 20\%$$

Aliter : Using Rule 6,
Here, M.P. = ₹ 11200
C.P. = ₹ 8000
r = 12%
D = x%

$$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$$

$$\frac{11200}{8000} = \frac{100+12}{100-x}$$

$$= \frac{11200}{8000} = \frac{112}{100-x}$$

100 – x = 80

⇒ x = 20%

21. (3) Let C.P. of article = ₹ 100
Marked price = x
Single equivalent discount

$$= \left(20 + \frac{25}{4} - \frac{20 \times 25}{400}\right)\%$$

= 25%

$$\therefore\ x \times \frac{75}{100} = 120$$

$$\Rightarrow x = \frac{120 \times 100}{75} = ₹\ 160$$

⇒ 160 – 100 = 60%

22. (1) If the marked price be x, then

$$x \times \frac{85}{100} = \frac{170 \times 120}{100}$$

⇒ x × 85 = 170 × 120

$$\Rightarrow x = \frac{170 \times 120}{85} = ₹\ 240$$

Aliter : Using Rule 6,
Here, D = 15%
r = 20%
C.P. = ₹ 170

$$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$$

$$\frac{M.P.}{170} = \frac{100+20}{100-15}$$

$$\frac{M.P.}{170} = \frac{120}{85}$$

$$M.P. = \frac{120 \times 170}{85}$$

M.P. = ₹ 240

23. (1) Let the C.P. be 100 and the marked price be x.

$$\therefore\ x \times \frac{88}{100} = 132$$

$$\Rightarrow x = \frac{132 \times 100}{88}$$

= 150 i.e., more by 50%

Aliter : Using Rule 9,
Here, r = 12%
R = 32%
Required percentage

$$= \left(\frac{r+R}{100-r} \times 100\right)\%$$

$$= \left(\frac{12+32}{100-12}\right) \times 100\%$$

$$= \frac{44}{88} \times 100 = 50\%$$

24. (3) C.P. of article = ₹ 100
Marked price be x

$$\therefore\ \frac{x \times 88}{100} = 121$$

$$\Rightarrow x = \frac{121 \times 100}{88} = ₹\ 137.5$$

i.e. 37.5% above C.P.

Aliter : Using Rule 9,
Here, r = 12%
R = 21%
Required percentage

$$= \left(\frac{r+R}{100-r} \times 100\right)\%$$

$$= \left(\frac{12+21}{100-12}\right) \times 100\%$$

$$= \frac{33}{88} \times 100\%$$

$$= \frac{3}{8} \times 100$$

$$= \frac{300}{8}\% = 37.5\%$$

25. (1) Let the C.P. of TV be x, then

$$\frac{x \times 110}{100} = 2640 \times \frac{95}{100}$$

$$\Rightarrow x = \frac{2640 \times 95}{110} = ₹\ 2280$$

Aliter : Using Rule 6,
Here, r = 10%, D = 5%,

M.P. = ₹ 264000, C.P. = ?

$$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$$

$$\frac{2640}{C.P.} = \frac{100+10}{100-5}$$

$$C.P. = \frac{2640 \times 95}{110}$$

$= 24 \times 95 = 2280$

26. (1) If the C.P. of grinder be x, then

$$\frac{x \times 108}{100} = \frac{3600 \times 90}{100} = 3240$$

$$\Rightarrow x = \frac{3240 \times 100}{108} = ₹\ 3000$$

Aliter : Using Rule 6,
M.P. = ₹ 3600, D = 10%,
r = 8%, C.P. = ?

$$\frac{M.P.}{C.P.} = \frac{100+r}{100-D}$$

$$\frac{3600}{C.P.} = \frac{100+8}{100-10}$$

$$C.P. = \frac{3600 \times 90}{108}$$

$$= \frac{3600 \times 10}{12}$$

= ₹ 3000

27. (3) Let C.P. of article = ₹ 100
If the marked price of article be x, then

$$x \times \frac{75}{100} = 120$$

$$\Rightarrow x = \frac{120 \times 100}{75} = 160$$

i.e. 60% above the cost price

Aliter : Using Rule 9,
r = 25%, R = 20%
Required percentage

$$= \left(\frac{r+R}{100-r} \times 100\right)\%$$

$$= \left(\frac{25+20}{100-25} \times 100\right)\%$$

$$= \frac{45}{75} \times 100$$

= 60%

28. (3) If the C.P. of goods be ₹ 100, then
Marked price = ₹ 120

$$\therefore \text{ S.P. } = \frac{120 \times 85}{100} = ₹\ 102$$

Hence, Profit per cent = 2%

Aliter : Using Rule 8,
Here, r = 20%, r_1 = 15%

$$\text{Gain } \% = \frac{r \times (100 - r_1)}{100} - r_1$$

$$= \frac{20 \times (100-15)}{100} - 15$$

$$= \frac{20 \times 85}{100} - 15$$

= 17 – 15 = 2%

29. (4) Cost price of article = ₹ x

$$\therefore x \times \frac{140}{100} \times \frac{95}{100} = 1064$$

$$\Rightarrow x = \frac{1064 \times 100 \times 100}{140 \times 95}$$

= ₹ 800

30. (2) Present worth = 1860 – 60
= ₹ 1800

$$\text{Time} = \frac{100 \times \text{True Discount}}{\text{Present worth} \times \text{Rate}}$$

$$= \frac{100 \times 60}{1800 \times 5} = \frac{2}{3} \text{ year}$$

$$= \left(\frac{2}{3} \times 12\right) \text{ months} = 8 \text{ months}$$

31. (4) Marked price of the article = ₹ x

$$\text{Discount} = 24\frac{1}{2}\% = \frac{49}{2}\%$$

$$\therefore \left(100 - \frac{49}{2}\right)\% \text{ of } x = 1510$$

$$\Rightarrow x \times \left(\frac{200-49}{200}\right) = 1510$$

$$\Rightarrow x \times \frac{151}{200} = 1510$$

$$\Rightarrow x = \frac{1510 \times 200}{151} = ₹\ 2000$$

$$\therefore \text{ C.P. of article} = \frac{1510 \times 100}{90}$$

$$= ₹\ \frac{15100}{9}$$

$$\therefore \text{ Gain} = 2000 - \frac{15100}{9}$$

$$= \frac{18000 - 15100}{9} = \frac{2900}{9}$$

$$= ₹\ 322\frac{2}{9}$$

32. (3) Original marked price of goods = ₹100

$$\text{C.P} = \frac{100 \times 80}{100} = ₹\ 80$$

Case II,
If the marked price be ₹ x, then

$$x \times \frac{80}{100}$$

$$= \frac{80 \times 125}{100}$$

$$\Rightarrow x = \frac{80 \times 125}{100} = ₹\ 125$$

Percent = 125 –100 = 25 %

33. (3) Marked price = ₹ x and cost price = ₹ y.

$\therefore$ 50% of x = 90% of y

$$\Rightarrow \frac{x \times 50}{100} = \frac{y \times 90}{100}$$

$$\Rightarrow y = \frac{x \times 50}{90} = ₹\ \frac{5}{9}x$$

$= \frac{5}{9}$ th of marked price.

34. (2) Marked price
= ₹ (7710 + 1285)
= ₹ 8995
If discount = x%, then
x% of 8995 = 1285

$$\Rightarrow \frac{8995 \times x}{100} = 1285$$

$$\Rightarrow x = \frac{1285 \times 100}{8995} = \frac{100}{7} = 14\frac{2}{7}\%$$

35. (2) Let the marked price be ₹ x.

$$\therefore x \times \frac{90}{100} = 2700$$

$$\Rightarrow x = \frac{2700 \times 100}{90} = ₹\ 3000$$

36. (1) S.P. of saree
= (100 – 20)% of 200

$$= \frac{200 \times 80}{100} = ₹\ 160$$

$\therefore$ C.P. of saree = 160 – 16

= ₹ 144

$\therefore$ Profit percent $= \frac{16}{144} \times 100$

$= \frac{100}{9} = 11\frac{1}{9}\%$

37. (2) C.P. of article = ₹ x
According to question,
92% of marked price

$= \frac{115}{100} \times$ C.P.

$\therefore \frac{250 \times 92}{100} = \frac{115x}{100}$

$\Rightarrow 115x = 250 \times 92$

$\Rightarrow x = \frac{250 \times 92}{115}$ = ₹ 200

Aliter : Using Rule 6,
Here, r = 15%, D = 8%,
M.P. = ₹ 250, C.P. = ?

$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + r}{100 - D}$

$\frac{250}{\text{C.P.}} = \frac{100 + 15}{100 - 8}$

C.P. $= \frac{250 \times 92}{115}$

C.P. = ₹ 200

38. (3) Greatest possible original price will be when discount be maximum
If the price be Rs. x, then

$\frac{75}{100}$ of $x = 270$

$\Rightarrow x = \frac{270 \times 100}{75}$ = Rs. 360

39. (3) C.P. of article = Rs. x (let)
According to the question,

$x \times \frac{120}{100} = \frac{40 \times 90}{100}$

$\Rightarrow x = \frac{40 \times 90}{120}$ = Rs. 30

Aliter : Using Rule 6,
Here, D = 10%, r = 20%,
M.P. = Rs. 40, C.P. = ?

$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + r}{100 - D}$

$\frac{40}{\text{C.P.}} = \frac{100 + 20}{100 - 10}$

C.P. $= \frac{40 \times 90}{120}$

C.P. = Rs. 30

40. (1) Let the C.P. of article be Rs. x and its marked price be Rs. y.
According to the question,
90% of y = 112% of x
$\Rightarrow 90 \times y = 112 \times x$

$\Rightarrow \frac{x}{y} = \frac{90}{112} = 45 : 56$

41. (4) Let the marked price of article be Rs. x.
According to the question,

$\left(100 - \frac{50}{3}\right)\%$ of $x = 450$

$\Rightarrow x \times \left(\frac{300 - 50}{3}\right)\% = 450$

$\Rightarrow x \times \frac{250}{300} = 450$

$\Rightarrow x \times \frac{5}{6} = 450$

$\Rightarrow x = \frac{450 \times 6}{5}$ = Rs. 540

42. (3) Let the marked price of article be Rs. x.
According to the question,
90% of x = 120% of 1900

$\Rightarrow x \times \frac{90}{100} = \frac{900 \times 120}{100}$

$\Rightarrow x = \frac{900 \times 120}{90}$ = Rs. 1200

TYPE-IV

1. (3) Suppose printed price = ₹ 100
$\therefore$ S.P. = ₹ (100–2.5) = ₹ 97.5

$\therefore$ Marked Price $= \frac{100 \times 39}{97.5}$

= ₹ 40

2. (3) Printed price = ₹ 900
On 40% discount

$= 900 - \frac{900 \times 40}{100} = 900 - 360$

C.P. for retailer = 540
S.P. = 900
Profit = 900 – 540 = 360

Gain % $= \frac{360 \times 100}{540}$

$= \frac{200}{3} = 66\frac{2}{3}\%$

3. (2) Let the marked price of each pen be x
Total cost price of 40 pens = Total marked price of 36 pens = 36x
Selling price of 1 pen after 1% discount = (1–0.01)x = 0.99x
Selling price of 40 pens
= 40 × 0.99x = 39.6x

Profit $= \frac{39.6 - 36}{36} \times 100$

$= \frac{3.6}{36} \times 100 = 10\%$

4. (1) First discount = 20%
Price after first discount

= ₹ $\left(1500 - \frac{20}{100} \times 1500\right)$

= ₹ (1500 – 300) = ₹ 1200
Let the additional discount be x%

$\therefore \left(1200 - \frac{x \times 1200}{100}\right) = 1104$

$\Rightarrow 1200 - 12x = 1104$
$\Rightarrow 12x = 1200 - 1104 = 96$

$\Rightarrow x = \frac{96}{12} = 8\%$

5. (3) Let the printed price of the article be ₹ 100
Discount = 40%
C.P. = ₹ (100 – 40) = ₹ 60
S.P. = ₹ 100

$\therefore$ Gain % $= \frac{40}{60} \times 100$

$= \frac{200}{3} = 66\frac{2}{3}\%$

6. (4) Discount

$= 120 \times \frac{40}{100}$ = ₹ 48

$\therefore$ S.P. = ₹ (120 – 48) = ₹ 72
Loss = 80 – 72 = ₹ 8

$\therefore$ Loss % $= \frac{8}{80} \times 100 = 10\%$

Aliter : Using Rule 6,
Here, C.P. = Rs. 80, M.P. = Rs. 120, D = 40%

$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + r}{100 - D}$

$\frac{120}{80} = \frac{100 + r}{100 - 40}$

$\frac{3}{2} = \frac{100 + r}{60}$

90 = 100 + r

r = –10% (–ve sign shows loss)

$\Rightarrow$ Loss = 10%

7. (1) Let the marked price be x

$\therefore$ 86% of x = 387

$\therefore x = \frac{387 \times 100}{86} =$ ₹ 450

Aliter : Using Rule 2,

Here, D = 14%, S.P. = ₹ 387, M.P. = ?

$$\text{M.P.} = \frac{\text{S.P.} \times 100}{100 - \text{D}}$$

$$= \frac{387 \times 100}{100 - 14}$$

$$= \frac{38700}{86} = ₹\ 450$$

8. (4) C.P. = ₹ 900

Gain = 10%

$\therefore$ S.P. = ₹ $\left(\frac{110}{100} \times 900\right)$ = ₹ 990

Let the marked price be x.

$\therefore \frac{90}{100}x = 990$

$\therefore x = \frac{990 \times 100}{90} =$ ₹ 1100

Aliter : Using Rule 6,

Here, D = 10%, C.P. = ₹ 900, R = 10%, M.P. = ?

$$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + \text{r}}{100 - \text{D}}$$

$$\frac{\text{M.P.}}{900} = \frac{100 + 10}{100 - 10}$$

$$\text{M.P.} = \frac{110}{90} \times 900$$

M.P. = ₹ 1100

9. (3) Let the C.P. of each article be ₹ 1

For 15 books, the tradesman gives 1 book free.

$\therefore$ C.P. of 15 books = ₹ 16

$\therefore$ S.P. of 15 books

$= 16 \times \frac{135}{100} =$ ₹ $\frac{108}{5}$

$\therefore$ S.P. of 1 book $= \frac{108}{5 \times 15}$

$=$ ₹ $\frac{36}{25}$

Now, 96% of marked price $= \frac{36}{25}$

$\therefore$ Marked price $= \frac{36 \times 100}{25 \times 96} = \frac{3}{2}$

= ₹ 1.5

$\therefore$ The required % increase

$= \frac{0.5}{1} \times 100 = 50\%$

10. (3) Discount on ₹ 36000

$= \frac{36000 \times 7}{100} =$ ₹ 2520

Discount on first ₹ 20,000

$= \frac{20000 \times 8}{100} =$ ₹ 1600

Discount on next ₹ 10,000

$= \frac{10{,}000 \times 5}{100} =$ ₹ 500

$\therefore$ Discount on remaining ₹ 6,000

= 2520 – (1600 + 500) = ₹ 420

$\therefore$ Required percent

$= \frac{420 \times 100}{6000} = 7\%$

11. (1) Let the C.P. be ₹ 100

$\therefore$ Marked price = ₹ 125

S.P. = 8% of 125

$= \frac{84 \times 125}{100} =$ ₹ 105

$\therefore$ Profit = ₹ (105 – 100) = ₹ 5

$\therefore$ Profit % = 5%

12. (1) Let the marked price of the shirt be Rs. x.

According to the question,

$x \times \frac{20}{100} = 150$

$\Rightarrow x = \frac{150 \times 100}{20} = 750$

$\therefore$ Price paid = ₹ (750 – 150)

= ₹ 600

13. (3) CP of the article for Ravi

$= 660 \times \frac{100}{110} =$ ₹ 600

Ravi bought the article at the discount of 25%

$\therefore$ 75% of marked price = ₹ 600

Marked price $= \frac{600 \times 100}{75} =$ ₹ 800

14. (1) Let the marked price of the article be x.

Equivalent discount for successive discounts of 30% and 20%

$= \left(30 + 20 - \frac{30 \times 20}{100}\right)\%$

= (50 – 6)% = 44%

$\Rightarrow$ (100 – 44)% of x = 2240

$\Rightarrow \frac{x \times 56}{100} = 2240$

$\Rightarrow x = \frac{2240 \times 100}{56} =$ ₹ 4000

15. (4) Let the market price of the cooler be x,

According to the question,

(12 – 10)% of x = 35

$\Rightarrow \frac{x \times 2}{100} = 35$

$\Rightarrow x = \frac{3500}{2} =$ ₹ 1750

16. (1) Let the CP of article be x and its marked price be y.

According to the question,

90% of y = 115% of x

$\Rightarrow \frac{y \times 90}{100} = \frac{x \times 115}{100}$

$\Rightarrow \frac{x}{y} = \frac{90}{115} = \frac{18}{23} \Rightarrow 18:23$

Aliter : Using Rule 6,

Here, r = 15%, D = 10%

$$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + \text{r}}{100 - \text{D}}$$

$$= \frac{100 + 15}{100 - 10}$$

$$\frac{\text{M.P.}}{\text{C.P.}} = \frac{115}{90}$$

$$\frac{\text{C.P.}}{\text{M.P.}} = \frac{90}{115}$$

$$\frac{\text{C.P.}}{\text{M.P.}} = \frac{18}{23}$$

$\Rightarrow$ C.P. : M.P. = 18 : 23

17. (1) Let the marked price of the shirt be x.

Difference of discounts = 2%

$\therefore$ 2% of x = 15

$\Rightarrow \frac{x \times 2}{100} = 15$

$\Rightarrow x = \frac{15 \times 100}{2} =$ ₹ 750

18. (2) If the marked price of the article be x, then

96% of x = 1920

$\Rightarrow \frac{x \times 96}{100} = 1920$

$\Rightarrow x = \frac{1920 \times 100}{96} =$ ₹ 2000

Aliter : Using Rule 2,

S.P. = ₹ 1920

D = 4%

M.P. = ?

$$\text{M.P.} = \frac{\text{S.P.} \times 100}{100 - \text{D}}$$

$$= \frac{1920 \times 100}{100 - 4}$$

$$= \frac{1920 \times 100}{96} = ₹\ 2000$$

19. (1) Discount = 650 – 572 = ₹ 78

If the discount be x% then

$$\frac{650 \times x}{100} = 78$$

$$\Rightarrow x = \frac{78 \times 100}{650} = 12\%$$

Aliter : Using Rule 1,

Here, M.P. = ₹ 650

S.P. = ₹ 572

$$\text{Discount \%} = \frac{\text{M.P.} - \text{S.P.}}{\text{M.P.}} \times 100$$

$$= \frac{650 - 572}{650} \times 100$$

$$= \frac{7800}{650} = 12\%$$

20. (1) Let marked price of article = ₹ 100

∴ C.P. of article = ₹ 64

∴ S.P. of article = ₹ 88

∴ Profit per cent

$$= \frac{88 - 64}{64} \times 100 = 37.5\%$$

21. (3) Let the marked price of watch be x.

$$\therefore \frac{x \times 95}{100} - \frac{x \times 94}{100} = 15$$

$\Rightarrow x = 15 \times 100 =$ ₹ 1500

22. (3) Discount = 15%

SP of racket = 85% of ₹ 30

= ₹ 25.50

One shuttle cock of ₹ 1.50 is free.

∴ Actual SP

= ₹ (25.50 – 1.50) = ₹ 24

He still gains 20%

$$\therefore \text{CP} = \frac{100}{120} \times 24 = ₹\ 20$$

23. (3) Let the marked price of the article be x

According to the question,

96% of x = 120% of 100

$$\Rightarrow x \times \frac{96}{100} = \frac{100 \times 120}{100}$$

$$\Rightarrow x = \frac{100 \times 120}{100} = ₹\ 125$$

Aliter : Using Rule 6,

Here, r = 20%, D = 4%,

C.P. = ₹ 100, M.P. = ?

$$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + \text{r}}{100 - \text{D}}$$

$$\frac{\text{M.P.}}{100} = \frac{100 + 20}{100 - 4}$$

$$\text{M.P.} = \frac{120 \times 100}{96}$$

$$= \frac{1000}{8}$$

M.P. = ₹ 125

24. (1) Let the marked price be x.

$$\therefore \frac{x \times 85}{100} = 629$$

$$\Rightarrow x = \frac{629 \times 100}{85} = ₹\ 740$$

Aliter : Using Rule 2,

M.P. = ? , S.P. = ₹ 629,

D = 15%

$$\text{M.P.} = \frac{\text{S.P} \times 100}{100 - \text{D}}$$

$$= \frac{629 \times 100}{100 - 15}$$

$$= \frac{62900}{85} = ₹\ 740$$

25. (1) Let the cost price of toy be ₹ 100 and the marked price be x.

$$\therefore \frac{x \times 90}{100} = 120$$

$$\Rightarrow x = \frac{120 \times 100}{90} = ₹\ \frac{400}{3}$$

S.P. after a discount of 20%

$$= 80\% \text{ of } \frac{400}{3}$$

$$= \frac{400 \times 80}{300} = \frac{320}{3} = 106\frac{2}{3}$$

∴ Profit percent

$$= 106\frac{2}{3} - 100 = 6\frac{2}{3}\%$$

26. (3) If the marked price of article be x, then

$$\frac{x \times 76}{100} = 342$$

$$\Rightarrow x = \frac{342 \times 100}{76} = ₹\ 450$$

Aliter : Using Rule 2,

Here, D = 24%, S.P. = ₹ 342, M.P. = ?

$$\text{M.P.} = \frac{\text{S.P.} \times 100}{100 - \text{D}}$$

$$= \frac{342 \times 100}{100 - 24}$$

$$= \frac{34200}{76} = ₹\ 450$$

27. (4) If the marked price of T.V. be x, then,

$$\frac{x \times 5}{100} = 500$$

$$\Rightarrow x = \frac{500 \times 100}{5}$$

= ₹ 10000

∴ Initial S.P. of T.V.

$$= \frac{10000 \times 80}{100} = ₹\ 8000$$

28. (2) Let marked price of toy be x

$$\therefore \text{S.P.} = x \times \frac{77}{100} = \frac{77x}{100}$$

$$\text{C.P.} = x \times \frac{77}{100} \times \frac{100}{110} = \frac{7x}{10}$$

$$\therefore \frac{77x}{100} - \frac{7x}{10} = 56$$

$$\Rightarrow \frac{7x}{100} = 56$$

$$\Rightarrow x = \frac{100 \times 56}{7} = ₹\ 800$$

29. (1) Let the amount paid (s.p.) be x

∴ 16% of x = 80

$$\Rightarrow x = \frac{80}{16} \times 100$$

∴ x = ₹ 500

30. (3) Marked price

$$= \frac{100}{100 - 12} \times 880 = ₹\ 1000$$

Aliter : Using Rule 2,

Here, S.P. = ₹ 880, D = 12%, M.P. = ?

$$\text{M.P.} = \frac{\text{S.P.} \times 100}{100 - \text{D}}$$

$$= \frac{880 \times 100}{100 - 12} = ₹\ 1000$$

31. (1) Marked price

$= \frac{846 \times 100}{94} =$ ₹ 900

32. (1) Difference of discounts

$= \left(25 - \frac{50}{3}\right)\% = \frac{25}{3}\%$

Let the marked price be x, then

$x \times \frac{25}{300} = 600$

$\Rightarrow x =$ ₹ 7200

∴ Required S.P.

$= 7200 \times \left(100 - \frac{50}{3}\right)\%$

$= \frac{7200 \times 250}{300} =$ ₹ 6000

33. (3) Marked price

$= \frac{100}{(100 - 7.5)} \times 740$

$= \frac{740 \times 100}{92.5} =$ ₹ 800

Aliter : Using Rule 2,
Here, S.P. = ₹ 740, D = 7.5%,
M.P. = ?

M.P. $= \frac{\text{S.P.} \times 100}{100 - \text{D}}$

$= \frac{740 \times 100}{100 - 7.5}$

$= \frac{74000}{92.5}$

M.P. = ₹ 800

34. (3) S.P. of the fan $= \frac{150 \times 80}{100}$

= ₹ 120

Aliter : Using Rule 2,
M.P. = ₹ 150, D = 20%, S.P. = ?

M.P. $= \frac{\text{S.P.} \times 100}{100 - \text{D}}$

$150 = \frac{\text{S.P.} \times 100}{100 - 20}$

S.P. $= \frac{150 \times 80}{100}$

S.P. = ₹ 120

35. (3) Discount = 6000 – 5500
= ₹ 500

If discount = x%, then

$\frac{6000 \times x}{100} = 500$

$\Rightarrow x = \frac{500}{60} = \frac{25}{3} = 8\frac{1}{3}\%$

Aliter : Using Rule 1,
M.P. = ₹ 6000
S.P. = ₹ 5500

Discount % $= \frac{\text{M.P.} - \text{S.P.}}{\text{M.P.}} \times 100$

$= \frac{6000 - 5500}{6000} \times 100$

$= \frac{500 \times 100}{6000}$

$= 8\frac{1}{3}\%$

36. (3) Marked price

$= \frac{6580 \times 100}{70} =$ ₹ 9400

Aliter : Using Rule 2,
D = 30%, S.P. = 6580,
M.P. = ?

M.P. $= \frac{\text{S.P.} \times 100}{100 - \text{D}}$

$= \frac{6580 \times 100}{100 - 30}$

$= \frac{658000}{70} =$ ₹ 9400

37. (4) Using Rule 1,
Discount = 800 – 736 = ₹ 64
∴ Discount percent

$= \frac{64}{800} \times 100 = 8\%$

38. (2) Using Rule 1,
Required discount

$= \frac{475 \times 15}{100} =$ ₹ 71.25

39. (3) Price after discount of 10%

$= \frac{6800 \times 90}{100} =$ ₹ 6120

If the seasonal discount be x%, then

$\frac{6120 \times x}{100} = 6120 - 5202 = 918$

$\Rightarrow x = \frac{918 \times 100}{6120} = 15\%$

40. (3) Marked price of the article = ₹ x.

$\therefore \frac{x \times 90}{100} = \frac{360 \times 125}{100}$

$\Rightarrow \frac{9x}{10} = 90 \times 5$

$\Rightarrow x = \frac{90 \times 5 \times 10}{9} =$ ₹ 500

Aliter : Using Rule 6,
C.P. = ₹ 360
r = 25%, D = 10%, M.P. = ?

$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + \text{r}}{100 - \text{D}}$

$\frac{\text{M.P.}}{360} = \frac{100 + 25}{100 - 10}$

M.P. $= \frac{125 \times 360}{90}$

M.P. = ₹ 500

41. (2) Rate of discount = x%

$\therefore 1200 \times \frac{x}{100} = 1200 - 1100$

$\Rightarrow 12x = 100$

$\Rightarrow x = \frac{100}{12} = \frac{25}{3} = 8\frac{1}{3}\%$

Aliter : Using Rule 1,
Here, M.P. = ₹ 1200,
S.P. = ₹ 1100

Discount % $= \frac{\text{M.P.} - \text{S.P.}}{\text{M.P.}} \times 100$

$= \frac{1200 - 1100}{1200} \times 100$

$= \frac{100 \times 100}{1200} = 8\frac{1}{3}\%$

42. (4) C.P. of item = ₹ 100 (let)

∴ Marked price of item = ₹ 200
S.P. for a gain of 15% = ₹ 115
∴ Discount = 200 – 115 = ₹ 85
If discount percent be x%, then

$\frac{200 \times x}{100} = 85$

$\Rightarrow 2x = 85 \Rightarrow x = \frac{85}{2} = 42.5\%$

Aliter : Using Rule 6,
Let, C.P. = ₹ x,
M.P. = ₹ 2x, r = 15%

$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + \text{r}}{100 - \text{D}}$

$\frac{2\text{x}}{\text{x}} = \frac{100 + 15}{100 - \text{D}}$

200 – 2D = 115
2D = 85
D = 42.5%

43. (2) Discount = 270 – 237.60
= Rs. 32.4
If the rate of discount be x%, then

$$270 \times \frac{x}{100} = 32.4$$

$$\Rightarrow x = \frac{32.4 \times 100}{270} = 12\%$$

Aliter : Using Rule 1,
Here, S.P. = Rs. 237.60,
M.P. = Rs. 270
Discount %

$$= \frac{\text{M.P.} - \text{S.P.}}{\text{M.P.}} \times 100\%$$

$$= \frac{270 - 237.60}{270} \times 100\%$$

$$= \frac{32.40 \times 100}{270}\%$$

= 12%

44. (2) Let the marked price of article be Rs. x
According to the question,

$$\frac{x \times 75}{100} = \frac{1440 \times 125}{100}$$

$$\Rightarrow x = \frac{1440 \times 125}{75} = \text{Rs. } 2400$$

Aliter : Using Rule 6,
Here, D = 25%, r = 25%, C.P. = Rs. 1440, M.P. = ?

$$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + \text{r}}{100 - \text{D}}$$

$$\frac{\text{M.P.}}{1440} = \frac{100 + 25}{100 - 25}$$

$$\text{M.P.} = \frac{125 \times 1440}{75}$$

= Rs. 2400

45. (4) Marked price = Rs. 720
Discount= 10%
∴ After a discount of 10%,

$$\text{S.P.} = \text{Rs. } \left(\frac{720 \times 90}{100}\right)$$

= Rs. 648
Final S.P. = Rs. 550.80
∴ Discount = Rs. (648 – 550.80)
= Rs. 97.2
If the second discount be x%, then

$$\frac{648 \times x}{100} = 97.2$$

$$\Rightarrow x = \frac{97.2 \times 100}{648} = 15\%$$

Aliter : Using Rule 3,
S.P. = Rs. 550.80, M.P. = Rs. 720
D_1 = 10%, D_2 = ?

$$\text{S.P.} = \text{M.P.} \left(\frac{100 - D_1}{100}\right)\left(\frac{100 - D_2}{100}\right)$$

$$550.80 = 720\left(\frac{100 - 10}{100}\right)\left(\frac{100 - D_2}{100}\right)$$

$$\frac{550.80 \times 100 \times 100}{720 \times 90}$$

$$= 100 - D_2$$

$85 = 100 - D_2$
$D_2 = 100 - 85$
$D_2 = 15\%$

46. (3) C.P. of article = Rs. x (let).
According to the question,

$$\frac{x \times 75}{100} = 3600$$

$$\Rightarrow x = \frac{3600 \times 100}{75} = \text{Rs. } 4800$$

Aliter : Using Rule 2,
Here,S.P. = Rs. 3600
D = 25%
M.P. = ?

$$\text{M.P.} = \frac{\text{SP} \times 100}{100 - \text{D}}$$

$$\text{M.P.} = \frac{3600 \times 100}{100 - 25}$$

$$\text{M.P.} = \frac{360000}{75}$$

= M.P. = Rs. 4800

47. (2) Rate of discount = 12%
∴ S.P. of TV set
= 6500 × (100 – 12)%

$$= \frac{6500 \times 88}{100} = \text{Rs.}5720$$

Aliter : Using Rule 2,
Here, D = 12%,
M.P. = Rs. 6500, S.P. = ?

$$\text{M.P.} = \frac{\text{S.P.} \times 100}{100 - \text{D}}$$

$$6500 = \frac{\text{S.P.} \times 100}{100 - 12}$$

$$\text{S.P.} = \frac{6500 \times 88}{100}$$

S.P. = Rs. 5720

48. (2) S.P. of TV set

$$= \text{Rs. } \left(\frac{120}{20} \times 750\right)$$

= Rs. 4500
If the marked price be Rs. x, then

$$\frac{x \times 90}{100} = 4500$$

$$\Rightarrow x = \frac{4500 \times 100}{90}$$

= Rs. 5000

49. (3) Let the C.P. of each article be Rs. 100.
∴ Marked price = Rs. 125
On giving discount,
S.P. = Rs. 112.5
∴ Discount
= 125 – 112.5 = Rs. 12.5

i.e., $12\frac{1}{2}\%$

50. (2) Let the marked price of radio be Rs. x.
According to the question,
80% of x = 1200

$$\Rightarrow \frac{x \times 80}{100} = 1200$$

$$\Rightarrow x = \frac{1200 \times 100}{80} = \text{Rs.}1500$$

Aliter : Using Rule 2,
Here, D = 20%,
S.P. = Rs. 1200, M.P. = ?

$$\text{M.P.} = \frac{\text{S.P.} \times 100}{100 - \text{D}}$$

$$= \frac{1200 \times 100}{100 - 20}$$

$$\text{M.P.} = \frac{120000}{80}$$

M.P. = Rs. 1500

51. (2) Marked price = Rs. 250
S.P. = Rs. 225
Discount = 250 – 225 = Rs. 25
If the rate of discount be x%, then

$$\frac{250 \times x}{100} = 25$$

$$\Rightarrow x = \frac{25 \times 100}{250} = 10\%$$

Aliter : Using Rule 1,
Here, M.P. = Rs. 250,
S.P. = Rs. 225

$$\text{Discount \%} = \frac{\text{M.P.} - \text{S.P.}}{\text{M.P.}} \times 100\%$$

$$= \frac{250 - 225}{250} \times 100\%$$

$= 10\%$

52. (3) Let the C.P. of article be Rs. 100.

$\therefore$ Marked price = Rs. 130

$$\text{S.P.} = \frac{130 \times 90}{100} = \text{Rs. } 117$$

$\therefore$ Profit% = 17%

OR

Required profit percent

$$= \left(x + y + \frac{xy}{100}\right)\%$$

$$= \left(30 - 10 - \frac{30 \times 10}{100}\right)\% = 17\%$$

Aliter : Using Rule 8,

Here, r = 30%

r_1 = 10%

Profit % =

$$\frac{r \times (100 - r_1)}{100} - r_1$$

$$= \frac{30 \times (100 - 10)}{100} - 10$$

$$= \frac{30 \times 90}{100} - 10 = 17\%$$

53. (3) Let the marked price of article be Rs. x.

According to the question,

$$x \times \frac{80}{100} = 740$$

$$\Rightarrow x = \text{Rs. } \left(\frac{740 \times 100}{80}\right)$$

= Rs. 925

54. (2) Let the marked price of the shirt be Rs. x.

According to the question,

(100 – 15) % of x = 119

$$\Rightarrow x \times \frac{85}{100} = 119$$

$$\Rightarrow x = \frac{119 \times 100}{85} = \text{Rs. } 140$$

55. (3) Discount on marked price

$$= \text{Rs. } \left(\frac{3600 \times 2.5}{100}\right) = \text{Rs. } 90$$

$\therefore$ S.P. of cycle

= Rs. (3600 – 90)

= Rs. 3510

56. (3) Let the C.P. of article be Rs. 100.

$\therefore$ Its marked price = Rs. 110

S.P. after a discount of 10%

$$= \text{Rs. } \left(\frac{110 \times 90}{100}\right)$$

= Rs. 99

$\therefore$ Loss = Rs. (100 – 99)

= Re. 1 i.e., 1%

57. (4) Marked price of shirt

= Rs. (576 + 109)

= Rs. 685

Let the rate of discount be x%.

$\therefore$ x % of 685 = 109

$$\Rightarrow \frac{685 \times x}{100} = 109$$

$$\Rightarrow x = \frac{109 \times 100}{685} = 16\%$$

58. (1) Let the C.P. of article be Rs. 100 and the marked price be Rs. x.

According to the question,

$$95\% \text{ of } x = \frac{100 \times 133}{100}$$

$$\Rightarrow \frac{x \times 95}{100} = 133$$

$$\Rightarrow x = \frac{133 \times 100}{95} = \text{Rs. } 140 \text{ i.e.,}$$

40% above than C.P.

59. (3) S.P. of ceiling fan

= (100 – 5)% of Rs. 1200

$$= \text{Rs. } \left(\frac{1200 \times 95}{100}\right)$$

= Rs. 1140

60. (2) Let the marked price of article be Rs. x.

According to the question,

x × (100 – 86)% = 42

$$\Rightarrow \frac{x \times 14}{100} = 42$$

$$\Rightarrow x = \frac{42 \times 100}{14} = \text{Rs. } 300$$

61. (3) Let the marked price of watch be Rs. x.

According to the question,

(7 – 5)% of x = 15

$$\Rightarrow \frac{x \times 2}{100} = 15$$

$$\Rightarrow x = \frac{15 \times 100}{2} = \text{Rs. } 750$$

62. (1) Let the marked price of article be Rs. x.

According to the question,

$$x \times \frac{80}{100} = \frac{200 \times 120}{100}$$

$$\Rightarrow x = \text{Rs. } \left(\frac{200 \times 120}{80}\right) = \text{Rs. } 300$$

63. (2) Let the marked price of article be Rs. x and the C.P. be Rs. 100.

According to the question,

(100 – 32)% of x = 100

$$\Rightarrow \frac{x \times 68}{100} = 100$$

$\Rightarrow x \times 68 = 100 \times 100$

$$\Rightarrow x = \frac{100 \times 100}{68} = \frac{2500}{17}$$

= Rs. 147.05

i.e., 47.05% above the cost price.

64. (3) Discount = Rs. (1200 – 960)

= Rs. 240

If the rate of discount be x%, then

x% of 1200 = 240

$$\Rightarrow \frac{1200 \times x}{100} = 240$$

$\Rightarrow 12x = 240$

$$\Rightarrow x = \frac{240}{12} = 20\%$$

65. (2) Let the marked price of camera be Rs. x.

According to the question,

(100 – 10)% of x = 120% of 600

$\Rightarrow x \times 90 = 600 \times 120$

$$\Rightarrow x = \frac{600 \times 120}{90} = \text{Rs. } 800$$

66. (3) Discount

= Rs. (30000 – 28000)

= Rs. 2000

If the rate of discount be x%, then

$$30000 \times \frac{x}{100} = 2000$$

$\Rightarrow 300x = 2000$

$$\Rightarrow x = \frac{2000}{300} = \frac{20}{3} = 6\frac{2}{3}\%$$

67. (4) Let the original price of item be Rs. 100.

C.P. for Peter = Rs. 80

$$\text{S.P. for Peter} = \text{Rs. } \left(\frac{80 \times 140}{100}\right)$$

= Rs. 112

$\therefore$ Required per cent

$$= \frac{(112 - 100) \times 100}{100} = 12\%$$

TYPE-V

1. (4) Check through options

15% of 80 $= \frac{80 \times 15}{100} = 12$

and 20% of 60 $= \frac{60 \times 20}{100} =$ ₹ 12

Therefore, 15% of 80 and 20% of 60 are same. Hence the cost prices should be ₹ 80 and ₹ 60.

2. (3) Let the salesman's total sales be ₹ (10000 + x)

According to the question,

$10000 \times \frac{11}{2}\% + x \times 6\% = 1990$

$\Rightarrow$ 5000 × 11% + 6x% = 1990

$\Rightarrow$ 5000 × 11 + 6x = 199000

$\Rightarrow$ 6x = 199000 – 55000

$\Rightarrow$ 6x = 144000

$\Rightarrow x = \frac{144000}{6} = 24000$

$\therefore$ The required sales

= 24000 + 10000 = ₹ 34,000

3. (2) The housewife spends ₹ 25 and saves ₹ 2.50.

i.e., She pays ₹ 25 for a dress of ₹ 27.50.

$\therefore$ % Saving

$= \frac{2.50}{27.50} \times 100 \approx 9\%$ (app.)

4. (1) Let the C.P. of total goods be ₹ 100.

$\therefore$ Marked price = ₹ 120

S.P. of $\frac{1}{2}$ stock = ₹ 60

Gain = ₹ 10

S.P. of $\frac{1}{4}$ stock

= (80% of 120) $\times \frac{1}{4}$ = ₹ 24

$\therefore$ Loss = ₹ (25 – 24) = ₹ 1

S.P. of remaining $\frac{1}{4}$ stock

= (60% of 120) $\times \frac{1}{4}$ = ₹ 18

$\therefore$ Loss = ₹ (25 – 18) = ₹ 7

$\therefore$ Gain = 10 – 1 – 7

= ₹ 2 i.e., 2%

5. (1) After a discount of 20%,

Listed price = 80% of ₹1500

$= ₹ \left(1500 \times \frac{80}{100}\right) =$ ₹ 1200

Difference

= ₹ (1200 – 1104) = ₹ 96

Let x % of 1200 = 96

$\Rightarrow x = \frac{96 \times 100}{1200} = 8$

$\therefore$ Second discount = 8%

6. (4) Let the marked price of the radio be x.

According to the question,

$x \times \frac{80}{100} \times \frac{88}{100} = 704$

$\therefore x = \frac{704 \times 100 \times 100}{80 \times 88} =$ ₹ 1000

7. (2) Using Rule 5,

Equivalent discount

$= \left(20 + 5 - \frac{20 \times 5}{100}\right)\% = 24\%$

$\therefore$ CP of article

$= ₹ \left(25000 \times \frac{76}{100}\right) =$ ₹ 19000

Repairs cost = ₹ 1000

$\therefore$Actual CP = 19000 +1000

= ₹ 20000

SP = ₹ 25000

Profit = 25000 –20000 = ₹ 5000

$\therefore$ Gain%

$= \frac{5000}{20000} \times 100 = 25\%$

8. (3) Let the marked price of shirt be x and that of trousers be $2x$.

Let the discount on the trousers be y%. Then,

$x \times \frac{40}{100} + 2x \times \frac{y}{100} = 3x \times \frac{30}{100}$

$\Rightarrow 40x + 2xy = 90x$

$\Rightarrow 2y = 90 - 40$

$\Rightarrow y = \frac{50}{2} = 25\%$

9. (3) Let the marked price of the grinder be ₹100

SP after a discount of 15%

= ₹ 85

SP to gain 15% = $\frac{85 \times 115}{100}$

= ₹ 97.75

If ₹ 97.75 is the SP, the marked price = ₹ 100

$\therefore$ If ₹ 1955 is the SP, the marked price = $\frac{100}{97.75} \times 1955$ = ₹ 2000

Amount of discount received by the retailer = 15% of 2000

$= \frac{2000 \times 15}{100} =$ ₹ 300

10. (1) SP of 12 pairs of socks

= 90% of 80

$= \frac{80 \times 90}{100} =$ Rs.72 = ₹ 72

$\therefore$ Number of pairs bought for ₹

24 = $\frac{12 \times 24}{72} = 4$

11. (3) Let the amount of the bill be x.

$\therefore \frac{4x}{100} = 13$

$\Rightarrow x = \frac{1300}{4} =$ ₹ 325

12. (2) True discount

$= \frac{\text{Amount} \times \text{R} \times \text{T}}{100 + (\text{R} \times \text{T})}$

$\Rightarrow 15 = \frac{\text{A} \times 5 \times 2}{100 + 10}$

$\Rightarrow$ A = 11 × 15 = ₹ 165

13. (3) Let the S.P. be x (without tax).

$\therefore x + x \times \frac{10}{100} = 500$

$\Rightarrow \frac{11x}{10} = 500 \Rightarrow x =$ ₹ $\frac{5000}{11}$

$\therefore$ Discount = $500 - \frac{5000}{11}$

$= \frac{500}{11}$

Discount per cent

$= \frac{500}{11 \times 500} \times 100$

$= \frac{100}{11}\%$ or $9\frac{1}{11}\%$

14. (4) Using Rule 5,

Let the original S.P. of sugar be x per kg.

S.P. after discount

= ₹ $\frac{95x}{100}$ per kg

$= ₹ \frac{19x}{20}$ per kg

$\therefore \frac{608}{\frac{19x}{20}} - \frac{608}{x} = 2$

$\Rightarrow 608\left(\frac{20}{19x} - \frac{1}{x}\right) = 2$

$\Rightarrow \frac{608}{19x} = 2 \Rightarrow x = \frac{608}{19 \times 2} = ₹\ 16$

15. (3) Single equivalent discount

$= \left(50 + 40 - \frac{50 \times 40}{100}\right)\%$

= 70%

∴ Required price of shirt

= 30% of x

16. (4) Total actual C.P.

= ₹ (500 × 10 + 2000) = ₹ 7000

Total S.P.

= ₹ (5 × 750 + 5× 550)

= ₹ (3750 + 2750) = ₹ 6500

Loss = 7000 – 6500 = ₹ 500

Loss percent

$= \frac{500}{7000} \times 100 = \frac{50}{7} = 7\frac{1}{7}\%$

17. (3) Marked price of the fan

= ₹ 1400

SP after allowing a discount of 10% = 90% of 1400

$= \frac{1400 \times 90}{100} = ₹\ 1260$

Second discount

= ₹ (1260 – 1200) = ₹ 60

Let the second discount be x%.

∴ x% of 1260 = 60

$\Rightarrow x = \frac{60 \times 100}{1260} = \frac{100}{21} = 4\frac{16}{21}\%$

18. (4) True discount

$= \frac{\text{Banker's discount} \times 100}{100 + \text{Rate} \times \text{Time}}$

$= \frac{216 \times 100}{100 + 16 \times \frac{6}{12}}$

$= \frac{216 \times 100}{108} = ₹\ 200$

19. (4) Marked price of tape recorder

$= \frac{1500 \times 120}{100} = ₹\ 1800$

Gain $= \frac{1500 \times 8}{100} = ₹120$

Discount = 1800 – (1500 + 120)

= ₹ 180

Let Discount per cent = x%, then

$\frac{1800 \times x}{100} = 180 \Rightarrow x = 10\%$

Method 2 :

Quicker Method

If the discount be x%, then

$20 - x - \frac{20x}{100} = 8$

$\Rightarrow 20 - \frac{6x}{5} = 8$

$\Rightarrow \frac{6x}{5} = 20 - 8 = 12$

$\Rightarrow x = \frac{12 \times 5}{6} = 10\%$

20. (3) Required S.P.

$= 250 \times \frac{90}{100} \times \frac{88}{100} = ₹\ 198$

21. (1) Sum

$= \frac{\text{S.I.} \times \text{True discount}}{\text{S.I.} - \text{True discount}}$

$= \frac{22 \times 20}{22 - 20} = ₹\ 220$

22. (2) Price after discount of 10%

$= \frac{1500 \times 90}{100} = ₹\ 1350$

Second discount

= 1350 – 1242 = ₹ 108

If the rate of second discount be x% then,

$\frac{1350 \times x}{100} = 108$

$\Rightarrow x = \frac{108 \times 100}{1350} = 8\%$

23. (2) Let original price of rice

= x /kg

New price $= \frac{4x}{5}$ per kg

$\therefore \frac{800}{\frac{4x}{5}} - \frac{800}{x} = 12.5$

$\Rightarrow 800\left(\frac{5}{4x} - \frac{1}{x}\right) = 12.5$

$\Rightarrow 800\left(\frac{5-4}{4x}\right) = 12.5$

$\Rightarrow \frac{800}{4x} = 12.5$

$\Rightarrow x = \frac{200}{12.5} = ₹\ 16/\text{kg}.$

24. (2) Original price of article be x/kg.

New price $= \frac{9x}{10}$ /kg.

$\therefore \frac{225}{\frac{9x}{10}} - \frac{225}{x} = 25$

$\Rightarrow \frac{225 \times 10}{9x} - \frac{225}{x} = 25$

$\Rightarrow \frac{250}{x} - \frac{225}{x} = 25$

$\Rightarrow \frac{25}{x} = 25 \Rightarrow x = ₹\ 1/\text{kg}.$

25. (1) Let the marked price be x and cost price be ₹ 100, then

$\frac{x \times 75}{100} = 125$

$\Rightarrow x = \frac{125 \times 100}{75} = ₹\ \frac{500}{3}$

S.P. after a discount of 10%

$= \frac{500}{3} \times \frac{90}{100} = ₹\ 150$

∴ Gain per cent = 50%

Aliter : Using Rule 6,

Here, r = 25%, D = 25%.

$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + 25}{100 - 25}$

$\frac{\text{M.P.}}{\text{C.P.}} = \frac{125}{75} = \frac{5}{3}$

Now, D = 10%

Profit = ?

$\frac{\text{M.P.}}{\text{C.P.}} = \frac{100 + \text{r}}{100 - \text{D}}$

$\frac{5}{3} = \frac{100 + \text{r}}{100 - 10}$

$100 + \text{r} = \frac{5}{3} \times 90$

r = 150 – 100

r = 50%

26. (1) Single equivalent discount for successive discounts of 8% and 8%

$= \left(8+8-\frac{8\times 8}{100}\right)\%$

$= (16-0.64)\%$

$\therefore$ Difference = 0.64%

$\therefore$ Loss = 400 × 0.64%

Amount he will losse

$= \frac{400\times 64}{100\times 100}$ = ₹ 2.56

27. (4) If the rate of discount be x%, then

$\frac{60\times x}{100} = 60 - 45 = 15$

$\Rightarrow x = \frac{15\times 100}{60} = 25\%$

Aliter : Using Rule 1.

M.P. = ₹ 60

S.P. = ₹ 45

Discount % = $\frac{\text{M.P.} - \text{S.P.}}{\text{M.P.}}\times 100$

Discount % = $\frac{60-45}{60}\times 100$

$= \frac{15}{60}\times 100 = 25\%$

28. (1) Let the rate of second discount be x %

After 15% discount,

Price of pen $= \frac{85}{100}\times 12$ = ₹ 10.20

Now, 10.20 – 8.16 = ₹ 2.04

It is second discount.

$\therefore \frac{x}{100}\times 10.20 = 2.04$

$\Rightarrow 10.2x = 204$

$\Rightarrow x = \frac{204}{10.2} = 20\%$

29. (3) $\because$ 20% ≡ ₹ 25

$\therefore$ 80% ≡ $\frac{80}{20}\times 25$ = ₹ 100

30. (*) If the rate = 5% p.a.; then Present worth

$= \frac{\text{Amount} \times 100}{100 + (\text{R} \times \text{T})}$

$= \frac{600\times 100}{100+(5\times 4)} = \frac{600\times 100}{120}$

= ₹ 500

Discount = 600 – 500 = ₹ 100

Note : No rate is mentioned in the question.

31. (3) Original number of visitors = 100

Total revenue = 100 × 25

= 2500 paise

= ₹ 25

Case II,

Cost of each ticket = $\frac{25\times 80}{100}$

= 20 paise = ₹ 0.2

Total revenue = $\frac{25\times 128}{100}$ = ₹ 32

If the number of visitors be x, then

$x \times 0.2 = 32$

$\Rightarrow x = \frac{32}{0.2} = \frac{320}{2} = 160$

$\therefore$ Required percentage = 60

32. (1) Discount = 440 – 396 = ₹ 44

If the rate of discount be x %, then

$\frac{440\times x}{100} = 44$

$\Rightarrow x = \frac{44\times 100}{440} = 10\ \%$

Aliter : Using Rule 1,

Here, M.P. = ₹ 440

S.P. = ₹ 396

Discount % = $\frac{\text{M.P.} - \text{S.P.}}{\text{M.P.}}\times 100\%$

$= \frac{440-396}{440}\times 100\%$

$= \frac{44}{440}\times 100\%$

= 10%

33. (1) C.P. of articles = ₹ 100 (let)

Marked price of articles

$= \frac{100\times 130}{100}$ = ₹ 130

S.P. of half of articles

$= \frac{130}{2}$ = ₹ 65

S.P. of one-fourth of articles at 15% discount = $\frac{65}{2}\times\frac{85}{100}$

= ₹ 27 .625

S.P. of remaining articles

$= \frac{65}{2}\times\frac{70}{100}$ = ₹ 22.75

Total S.P.

= ₹ (65 + 27.625 + 22.75)

= ₹ 115.375

$\therefore$ Profit % = 15.375% = $15\frac{3}{8}$ %

34. (2) Sum = $\frac{\text{discount} \times 100}{\text{time} \times \text{rate}}$

$= \frac{78\times 100}{\frac{9}{4}\times\frac{8}{3}} = \frac{78\times 100}{6}$

= ₹ 1300

35. (4) Marked price of article = ₹ x

C.P. for X = $\frac{90x}{100}$ = ₹ $\frac{9x}{10}$

C.P. for Y = $\frac{9x\times 110}{100}$ = ₹ $\frac{99x}{100}$

$\therefore$ Required ratio = $x : \frac{99x}{100}$

= 100 : 99

36. (4) Let C.P. of article be = ₹ x

$\therefore$ S.P. = ₹ $\frac{85x}{100}$

$\therefore$ Required ratio = $x : \frac{85x}{100}$

= 100 : 85 = 20 : 17

37. (3) Required discount

$= \left(50-20-\frac{50\times 20}{100}\right)\%$

= 20%

Detailed Method

C.P. of article = Rs. 100

Marked price = Rs. 150

S.P. = $\frac{150\times 80}{100}$ = Rs. 120

Gain per cent = 20%

38. (3) Marked price of sewing machine = Rs. x

C.P. for the retailer

$= \frac{1955 \times 100}{115}$

= Rs. 1700

$\therefore\ x \times \frac{85}{100} = 1700$

$\Rightarrow x = \frac{1700 \times 100}{85}$ = Rs. 2000

$\therefore$ Discount = 2000 – 1700

= Rs. 300

39. (3) Marked price = Rs. x and cost price = Rs. y (let)

According to question,

$\frac{x \times 90}{100} = \frac{y \times 115}{100}$

$\Rightarrow \frac{x}{y} = \frac{115}{90} = \frac{23}{18} = 23 : 18$

40. (2) Price of motor cycle = Rs. a (let)

For Mr. x

C.P. of motor cycle

$= \text{Rs. } \left(\frac{90a}{100} \times \frac{108.5}{100}\right)$

For Mr y

C.P. of motor cycle

$= \text{Rs. } \left(\frac{108.5a}{100} \times \frac{90}{100}\right)$

41. (4) Percentage decrease

$= \left(x + y + \frac{xy}{100}\right)\%$

$= \left(-20 - 10 + \frac{20 \times 10}{100}\right)\%$

= –28%

Aliter : Using Rule 5,

Here, $D_1 = 20\%$

$D_2 = 10\%$

Net reduction

$= \left(D_1 + D_2 - \frac{D_1 D_2}{100}\right)\%$

$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\%$

= (30 – 2)% = 28%

42. (1) C.P. of 25 windows

$= \frac{120000 \times 75}{100}$ = Rs. 90,000

After additional discount,

C.P. for builder

= Rs. (90000 – 7500)

= Rs. 82500

$\therefore$ Cost of each window

$= \frac{82500}{25}$ = Rs. 3300

43. (2) Total marked price of three books = Rs. 300

Their S.P. = Rs. 244.50

Discount = Rs. (300 – 274.50)

= Rs. 25.50

If the rate of discount be x%, then

$\frac{300 \times x}{100} = 25.50$

$\Rightarrow 300x = 25.50 \times 100$

$\Rightarrow x = \frac{25.50 \times 100}{300} = 8.5\%$

Aliter : Using Rule 1,

M.P. = Rs. 300 (for three books)

S.P. = Rs. 274.50

Discount%

$= \left(\frac{\text{M.P.} - \text{S.P.}}{\text{M.P.}}\right) \times 100\%$

$= \left(\frac{300 - 274.50}{300}\right) \times 100\%$

$= \frac{25.50}{300} \times 100$

= 8.5%

44. (3) Using Rule 5,

Single equivalent discount =

$\left(10 + 20 - \frac{10 \times 20}{100}\right)\%$

= (30 – 2)% = 28%

$\therefore$ C.P. of article = 100 – 28

= Rs. 72

Actual cost price of article

$= \frac{72 \times 110}{100}$ = Rs. 79.2

$\therefore$ For a profit of 15%,

Required S.P. = $\frac{79.2 \times 115}{100}$

= Rs. 91.08

45. (1) Using Rule 5,

Required single discount

$= \left(x + y - \frac{xy}{100}\right)\%$

$= \left(20 + 15 - \frac{20 \times 15}{100}\right)\%$

= (35 – 3)% = 32%

46. (3) Let 5 kg of mixture be prepared.

$\therefore$ C.P. of 5 kg of mixture

= Rs. (2 × 35 + 3 × 40)

= Rs. (70 + 120)

= Rs. 190

Total S.P. of this mixture

= Rs. (46 + 4 × 55)

= Rs. (46 + 220) = Rs. 266

$\therefore$ Profit per cent

$= \left(\frac{266 - 190}{190}\right) \times 100$

$= \frac{7600}{190} = 40\% = 1$

47. (2) Required time

$= \frac{60 \times 100}{1800 \times 5} = \frac{2}{3}$ year

$= \left(\frac{2}{3} \times 12\right)$ months

= 8 months

48. (3) Let the amount of actual bill be Rs. x.

According to the question,

$\frac{x \times 15}{100} = 54$

$\Rightarrow x = \frac{54 \times 100}{15}$ = Rs. 360

49. (1) Let the marked price of building be Rs. z.

$\therefore$ According to the question,

$z \times (100 - x)\% = y$

$\Rightarrow z \times \frac{100 - x}{100} = y$

$\Rightarrow z = \text{Rs. } \frac{100y}{100 - x}$

Aliter : Using Rule 2,

S.P. = Rs. y, D = x %

$$\text{M.P.} = \frac{SP \times 100}{100 - D}$$

$$\text{M.P.} = \frac{y \times 100}{100 - x}$$

50. (2) Profit on outlay = Rs. 6000
According to the question,
25% of outlay = Rs. 6000

$\therefore$ Outlay = $= \frac{6000 \times 100}{25}$

= Rs. 24000
Again, if the advertised price be Rs. x, then

$x \times \frac{80}{100}$ = Rs. (24000 + 6000)

$\Rightarrow x = \frac{30000 \times 100}{80}$

= Rs. 37500

51. (1) C.P. of article = Rs. x.

$\therefore$ Marked price $= \frac{130x}{100}$

= Rs. $\frac{13x}{10}$

According to the question,

$\frac{13x}{10} \times \frac{85}{100} = 910$

$\Rightarrow 13x \times 85 = 910 \times 1000$

$\Rightarrow x = \frac{910000}{13 \times 85}$ = Rs. 823.5

52. (4) Marked price of article
= 80 + 40 = Rs. 120
If the discount be x%, then
x% of 120 = Rs. 40

$\Rightarrow \frac{120 \times x}{100} = 40$

$\Rightarrow x = \frac{40 \times 100}{120} = \frac{100}{3} = \frac{100}{3}$

= 33.33%

53. (2) Price of T.V. set after discount
= 80% of Rs. 6000

= Rs. $\left(\frac{6000 \times 80}{100}\right)$

= Rs. 4800
S.P. of T.V. set with service contract = Rs. $\left(\frac{4800 \times 110}{100}\right)$

= Rs. 5280

54. (4) Actual price charged by A

= Rs. $\left(\frac{20000 \times 92}{100} + \frac{16000 \times 95}{100}\right)$

= Rs. (18400 + 15200)
= Rs. 33600
Actual price charged by B

= Rs. $\left(\frac{36000 \times 93}{100}\right)$

= Rs. 33480

55. (2) Length of cloth bought
= x metre (let)
Its cost = Rs. $32x$
According to the question,
25% of $32x = 40$

$\Rightarrow 32x \times \frac{1}{4} = 40$

$\Rightarrow 8x = 40$

$\Rightarrow x = \frac{40}{8}$ = 5 metre

56. (3) Discount given
= Rs. (540 – 496.80)
= Rs. 43.20
If the rate of discount be x%, then
x% of 540 = 43.20

$\Rightarrow \frac{540 \times x}{100} = 43.20$

$\Rightarrow x = \frac{43.20 \times 100}{540} = 8\%$

57. (3) Cost of books = Rs. 1500
Discount per cent = 15%
$\therefore$ Their S.P. = 85% of 1500

= Rs. $\left(\frac{1500 \times 85}{100}\right)$

= Rs. 1275

58. (3) Single equivalent discount for 25% and 10%

$= \left(25 + 10 - \frac{25 \times 10}{100}\right)\%$

= (35 – 2.5)% = 32.5%
$\therefore$ S.P. of Television
= (100 – 32.5)% of Rs. 2300

= Rs. $\left(\frac{2300 \times 67.5}{100}\right)$

= Rs. 1552.50

59. (3) Marked price of watch
= Rs. 230
Discount = 12%
$\therefore$ S.P. of watch = (100 – 12)% of Rs. 230

= Rs. $\left(\frac{230 \times 88}{100}\right)$

= Rs. 202.4

60. (2) Let the marked price of article be Rs. x.
According to the question,
(100– 15)% of x = 318.75

$\Rightarrow x \times \frac{85}{100} = 318.75$

$\Rightarrow x = \frac{318.75 \times 100}{85}$ = Rs. 375

61. (4) After a discount of 20%,

Price of fan = Rs. $\left(\frac{150 \times 80}{100}\right)$

= Rs. 120
Again, discount
= Rs. (120 – 108) = Rs. 12
$\therefore$ x% of 120 = 12

$\Rightarrow x \times \frac{120}{100} = 12$

$\Rightarrow x = \frac{1200}{120} = 10\%$

62. (2) S.P. of washing machine
= (100 – 6) % of Rs. 7500

= Rs. $\left(\frac{7500 \times 94}{100}\right)$

= Rs. 7050

63. (4) Single equivalent discount for two successive discounts of 7% each.

$= \left(7 + 7 - \frac{7 \times 7}{100}\right)\%$

= (14 – 0.49)% = 13.51%
Marked price of article
= Rs. 20000
$\therefore$ Required S.P.
= (100 – 13.51)% of Rs. 20000

= Rs. $\left(\frac{20000 \times 86.49}{100}\right)$

= Rs. 17298

❑❑❑

TEST YOURSELF

1. A merchant allows 5% discount on the marked price of an article to his customers. What price should he mark on an article the cost price of which is 712.50, so as to make a clear profit of $33\frac{1}{3}\%$ on his outlay ?

(1) ₹ 1000 (2) ₹ 1200
(3) ₹ 980 (4) ₹ 960

2. Sunder purchased an office bag with a price tag of ₹ 600 in a sale where 25% discount was being offered on the tag price. He was given a further discount of 10% on the amount arrived at after giving usual 25% discount. What was the final amount paid by Sunder ?

(1) ₹ 210 (2) ₹ 540
(3) ₹ 405 (4) ₹ 450

3. A bicycle originally costs ₹ 100 and was discounted 10%. After three months, it was sold after being discounted 15%. How much was the bicycle sold for ?

(1) ₹ 55.5 (2) ₹ 95.25
(3) ₹ 76.5 (4) None of these

4. A shopkeeper sold a TV set for ₹ 17940, with a discount of 8% and gained 19.6%. If no discount is allowed, then what will be his gain per cent ?

(1) 25% (2) 26.4 %
(3) 24.8% (4) 30%

5. A cash payment that will settle a bill for 250 chairs at ₹ 50 per chair less 20% and 15% with a further discount of 5% on cash payment is :

(1) ₹ 8075 (2) ₹ 7025
(3) ₹ 8500 (4) ₹ 7125

6. A shopkeeper marks the prices of his goods at 25% higher than the original price. After that, he allows a discount of 12% discount. What profit or loss did he get ?

(1) 15% profit (2) 10% profit
(3) 10% loss (4) 15% loss

7. A shopkeepers announce the same price of ₹ 700 for a shirt. The first offers successive discounts of 30% and 6% while the second offers successive discounts of 20% and 16%. The shopkeeper that offers better discount is more of

(1) ₹ 22.40 (2) ₹ 16.80
(3) ₹ 9.80 (4) ₹ 36.40

8. A tradesman gives 4% discount on the marked price and 1 article free with every 15 articles bought and still gains 35%. The marked price is more than the cost price by —

(1) 40% (2) 39%
(3) 20% (4) 50%

9. What is the maximum percentage discount that a merchant can offer on her marked price so that she ends up selling at no profit or loss, if she had initially marked her goods up by 50% ?

(1) 16.67% (2) 20%
(3) 50% (4) 33.33%

10. An article is listed at ₹ 65. A customer bought this article for ₹ 56.16 with two successive discounts of which one is 10%. The other discount of this discount scheme that was allowed by the shopkeeper is

(1) 4% (2) 3%
(3) 6% (4) 2.5%

SHORT ANSWERS

1. (1)	**2.** (3)	**3.** (3)	**4.** (4)
5. (1)	**6.** (2)	**7.** (3)	**8.** (4)
9. (4)	**10.** (1)		

EXPLANATIONS

1. (1) Let the marked price be ₹ x.

$$\therefore \frac{95x}{100} = 712.50 \times \frac{400}{300}$$

$$\Rightarrow \frac{95x}{100} = \frac{712.5 \times 4}{3}$$

$$\Rightarrow x = \frac{712.5 \times 4 \times 100}{3 \times 95} = ₹\ 1000$$

2. (3) Final amount after giving successive discounts of 25% and 10%

= 600 × 0.75 × 0.9 = ₹ 405

3. (3) According to question, SP of bicycle = 100 × 0.9 × 0.85 = ₹ 76.50

4. (4) SP = 17940, Discount = 8%

$$\therefore \text{MP} = \frac{17940}{0.92} = ₹\ 19500$$

$\therefore$ Gain = 19.6% (given)

$$\therefore \text{CP} = \frac{17940}{1.196} = ₹\ 15000$$

New SP without discount = ₹ 19500

Gain = (19500 – 15000) = ₹ 4500

$$\therefore \text{Gain per cent} = \frac{4500}{15000} \times 100 = 30\%$$

5. (1) By question, original price of 250 chairs

= 250 × 50 = ₹ 12500

Price after discount

$$= 12500 \times \frac{80}{100} \times \frac{85}{100} \times \frac{95}{100}$$

= ₹ 8075

6. (2) By question, Profit per cent or loss per cent.

$$= +25 - 12 - \frac{25 \times 12}{100} = +10\%$$

As the sign is +ve so, there is a profit of 10%.

7. (3) According to question, selling price of first shopkeeper.

$$= 700 \times \frac{70}{100} \times \frac{94}{100} = ₹\ 460.60$$

Selling price of second shopkeeper

$$= 700 \times \frac{80}{100} \times \frac{84}{100} = ₹\ 470.40$$

Required difference

= 470.40 – 460.60 = ₹ 9.80

8. (4) According to question, Discount on articles

$$\frac{1}{16} \times 100 = 6.25\%$$

Overall discount

$$= -4 - 6.25 + \frac{4 \times 6.25}{100} = -10\%$$

Let cost price = ₹ 100, then selling price = ₹ 135

So, 90% of marked price = 135

$$\text{Marked price} = \frac{135 \times 100}{90} = ₹\ 150$$

Marked price is increased by

$$= \frac{150 - 100}{90} \times 100 = 50\%$$

9. (4) Let cost price = ₹100

Marked price = ₹150

$\therefore$ Discount per cent

$$= \frac{50}{150} \times 100 = 33.33\%$$

10. (1) Let the other discount be x%.

$$65 \times \frac{90}{100} \times \frac{(100 - x)}{100} = 56.16$$

$$\Rightarrow 100 - x = \frac{56.16 \times 100 \times 100}{65 \times 90}$$

$\Rightarrow 100 - x = 96$

$\Rightarrow x = 4\%$

10 SIMPLE INTEREST

Importance : Questions on simple interest are asked in different competitive exams. Note that to solve compound interest questions, a command over simple interest questions is a must.

Scope of questions : Simple interest questions don't have much variation. Here, questions to find out. Principal, interest, rate, time or amount are asked. Questions on two interest rates for different times may also be asked.

Way to success : All questions are based on a single basic formulae, but to increase speed, direct formulae are required to?

IMPORTANT POINTS

Borrowed money is called Principal and it is denoted by 'P'.

Money is borrowed for certain time period, that time is called interest time and it is denoted by 'T' or 't'.

The principal becomes Amount when interest is added to it Amount is represented as A.

So, Amount = Principal + Interest $\Rightarrow$ A = P + S. I.

OR

Interest = Amount – Principal $\Rightarrow$ S. I. = A – P

When Interest is payable half – yearly

Rate will be half and time will be twice

When Interest is payable quarterly

Rate will be one-fourth and time will be four times.

RULE 1 : Simple Interest (S.I.)= $\dfrac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$

or,

$$S.I = \frac{P \times R \times T}{100}$$

$$P = \frac{S.I \times 100}{R \times T},\ R = \frac{S.I \times 100}{P \times T},\ T = \frac{S.I \times 100}{P \times R},$$

A = P + S.I

or,

S.I. = A – P

RULE 2 : If there are distinct rates of interest for distinct time periods i.e.

Rate for 1st t_1 years $\rightarrow R_1\%$

Rate for 2nd t_2 years $\rightarrow R_2\%$

Rate for 3rd t_3 years $\rightarrow R_3\%$

Then, Total S.I. for 3 years = $\dfrac{P(R_1t_1 + R_2t_2 + R_3t_3)}{100}$

RULE 3 : If a certain sum becomes 'n' times of itself in T years on Simple Interest, then the rate per cent per annum is.

$$R\% = \frac{(n-1)}{T} \times 100\% \text{ and,}$$

$$T = \frac{(n-1)}{R} \times 100\%$$

RULE 4 : If a certain sum becomes n_1 times of itself at $R_1\%$ rate and n_2 times of itself at $R_2\%$ rate, then,

$$R_2 = \frac{(n_2-1)}{(n_1-1)} R_1 \text{ and } T_2 = \frac{(n_2-1)}{(n_1-1)} T_1$$

RULE 5 : If Simple Interest (S.I.) becomes 'n' times of principal i.e.

S.I. = P × n then.

RT = n × 100

RULE 6 : If an Amount (A) becomes 'n' times of certain sum (P) i.e.

A = Pn then,

RT = (n – 1) × 100

RULE 7 : If the difference between two simple interests is 'x' calculated at different annual rates and times, then principal (P) is

$$P = \frac{x \times 100}{(\text{difference in rate}) \times (\text{difference in time})}$$

RULE 8 : If a sum amounts to x_1 in t years and then this sum amounts to x_2 in t yrs. Then the sum is given by

$$P = \frac{(\text{Difference in amount}) \times 100}{(\text{Change in interest Rate}) \times \text{time}}$$

RULE 9 : If a sum with simple interest rate, amounts to 'A' in t_1 years and 'B' in same t_2 years, then,

$$R\% = \frac{(B-A) \times 100}{A.t_2 - B.t_1} \text{ and}$$

$$P = \frac{At_2 - Bt_1}{t_2 - t_1}$$

RULE 10 : If a sum is to be deposited in equal instalments, then,

$$\text{Equal instalment} = \frac{A \times 200}{T[200 + (T-1)r]}$$

where T = no. of years, A = amount, r = Rate of Interest.

RULE 11 : To find the rate of interest under current deposit plan,

$$r = \frac{S.I. \times 2400}{n(n+1) \times (\text{deposited amount})}$$

where n = no. of months.

RULE 12 : If certain sum P amounts to Rs. A_1 in t_1 years at rate of R% and the same sum amounts to Rs. A_2 in t_2 years at same rate of interest R%. Then,

$$\text{(i) } R = \left(\frac{A_1 - A_2}{A_2T_1 - A_1T_2}\right) \times 100$$

$$\text{(ii) } P = \left(\frac{A_2T_1 - A_1T_2}{T_1 - T_2}\right)$$

RULE 13 : The difference between the S.I. for a certain sum P_1 deposited for time T_1 at R_1 rate of interest and another sum P_2 deposited for time T_2 at R_2 rate of interest is

$$S.I. = \frac{P_2R_2T_2 - P_1R_1T_1}{100}$$

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. What sum of money must be given as simple interest for six months at 4% per annum in order to earn ₹ 150 interest?
(1) ₹ 5000 (2) ₹ 7500
(3) ₹10000 (4) ₹ 15000
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. A sum of ₹ 1600 gives a simple interest of ₹ 252 in 2 years and 3 months. The rate of interest per annum is:
(1) $5\frac{1}{2}\%$ (2) 8%
(3) 7% (4) 6%
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

3. A sum of money lent at simple interest amounts to ₹ 880 in 2 years and to ₹ 920 in 3 years. The sum of money (in rupees) is
(1) 700 (2) 760
(3) 784 (4) 800
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

4. At some rate of simple interest, A lent ₹ 6,000 to B for 2 years and ₹ 1,500 to C for 4 years and received ₹ 9,00 as interest from both of them together. The rate of interest per annum was
(1) 5% (2) 6%
(3) 8% (4) 10%
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

5. A lent ₹ 5000 to B for 2 years and ₹ 3000 to C for 4 years on simple interest at the same rate of interest and received ₹ 2200 in all from both as interest. The rate of interest per annum is
(1) 7% (2) 5%
(3) $7\frac{1}{8}\%$ (4) 10%
(SSC CPO S.I. Exam. 12.01.2003) & (SSC SAS Exam. 26.06.2010 (Paper-I)

6. What sum of money will amount to ₹ 520 in 5 years and to ₹ 568 in 7 years at simple interest ?
(1) ₹ 400 (2) ₹ 120
(3) ₹ 510 (4) ₹ 220
(SSC CGL Prelim Exam.11.05.2003 (First Sitting)

7. ₹ 500 was invested at 12% per annum simple interest and a certain sum of money invested at 10% per annum simple interest. If the sum of the interest on both the sum after 4 years is ₹ 480, the latter sum of money is :
(1) ₹ 450 (2) ₹ 750
(3) ₹ 600 (4) ₹ 550
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. A money lender finds that due to fall in the annual rate of interest 8% to $7\frac{3}{4}\%$, his yearly income diminishes by ₹ 61.50. His capital is
(1) ₹ 22400 (2) ₹ 23800
(3) ₹ 24600 (4) ₹ 26000
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

9. A lends ₹ 2500 to B and a certain sum to C at the same time at 7% annual simple interest. If after 4 years, A altogether receives ₹ 1120 as interest from B and C, the sum lent to C is
(1) ₹ 700 (2) ₹ 6500
(3) ₹ 4000 (4) ₹ 1500
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

10. A certain sum of money amounts to ₹ 756 in 2 years and to ₹ 873 in $3\frac{1}{2}$ years at a certain rate of simple interest. The rate of interest per annum is
(1) 10% (2) 11%
(3) 12% (4) 13%
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

11. What sum will amount to ₹ 7000 in 5 years at $3\frac{1}{3}\%$ simple interest ?
(1) ₹ 6300 (2) ₹ 6500
(3) ₹ 6000 (4) ₹ 5000
(SSC CPO S.I. Exam. 07.09.2003)

12. A man took a loan from a bank at the rate of 12% per annum at simple interest. After 3 years he had to pay ₹ 5,400 as interest only for the period. The principal amount borrowed by him was :
(1) ₹ 2,000 (2) ₹ 10,000
(3) ₹ 20,000 (4) ₹ 15,000
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

13. A sum of money at simple interest amounts to ₹ 1,012 in $2\frac{1}{2}$ years and to ₹ 1,067.20 in 4 years. The rate of interest per annum is :
(1) 2.5% (2) 3%
(3) 4% (4) 5%
(SSC CGL Prelim Exam.08.02.2004 (Ist Sitting) & (SSC SAS Exam. 26.06.2010 (Paper-I) & (SSC CHSL DEO & LDC Exam. 28.10.2012)

14. A sum of money lent out at simple interest amounts to ₹ 720 after 2 years and to ₹1020 after a further period of 5 years. The sum is :
(1) ₹ 500 (2) ₹ 600
(3) ₹ 700 (4) ₹ 710
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

15. The sum of money, that will give ₹ 1 as interest per day at the rate of 5% per annum simple interest is
(1) ₹ 3650 (2) ₹ 36500
(3) ₹ 730 (4) ₹ 7300
(SSC CPO S.I. Exam. 05.09.2004)

16. If the simple interest on a certain sum of money for 15 months at $7\frac{1}{2}\%$ per annum exceeds the simple interest on the same sum for 8 months at $12\frac{1}{2}\%$ per annum by ₹ 32.50, then the sum of money (in ₹) is :
(1) 312 (2) 312.50
(3) 3120 (4) 3120.50
(SSC CPO S.I. Exam. 26.05.2005)

17. What annual instalment will discharge a debt of ₹ 6450 due in 4 years at 5% simple interest ?
(1) ₹ 1500 (2) ₹ 1835
(3) ₹ 1935 (4) ₹ 1950
(SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting) & (SSC CGL Tier-I Exam. 16.05.2010)

18. In what time will ₹ 72 become ₹ 81 at $6\frac{1}{4}\%$ per annum simple interest ?
(1) 2 years
(2) 3 years
(3) 2 years 6 months
(4) None of these
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

19. The simple interest on ₹ 7,300 from 11 May, 1987 to 10 September, 1987 (both days included) at 5% per annum is
(1) ₹ 123 (2) ₹ 103
(3) ₹ 200 (4) ₹ 223
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

20. A person borrows ₹ 5,000 for 2 years at 4% per annum simple interest. He immediately lends it to another person at $6\frac{1}{4}\%$ per annum simple interest for 2 years. His gain in the transaction is
(1) ₹ 112.50 (2) ₹ 450
(3) ₹ 225 (4) ₹ 150
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting

21. A man had ₹ 16,000, part of which he lent at 4% and the rest at 5% per annum simple interest. If the total interest received was ₹ 700 in one year, the money lent at 4% per annum was
(1) ₹ 12,000 (2) ₹ 8,000
(3) ₹ 10,000 (4) ₹ 6,000
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting

22. ₹ 1,000 is invested at 5% per annum simple interest. If the interest is added to the principal after every 10 years, the amount will become ₹ 2,000 after
(1) 15 years (2) 18 years
(3) 20 years (4) $16\frac{2}{3}$ years
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

23. A sum of money amounts to ₹ 5,200 in 5 years and to ₹ 5,680 in 7 years at simple interest. The rate of interest per annum is
(1) 3% (2) 4%
(3) 5% (4) 6%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

24. ₹ 800 becomes ₹ 956 in 3 years at a certain rate of simple interest. If the rate of interest is increased by 4%, what amount will ₹ 800 become in 3 years ?
(1) ₹ 1020.80 (2) ₹ 1025
(3) ₹ 1052 (4) ₹ 1050
(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

25. A person deposited ₹ 400 for 2 years, ₹ 550 for 4 years and ₹ 1,200 for 6 years. He received the total simple interest of ₹ 1,020. The rate of interest per annum is
(1) 10% (2) 5%
(3) 15% (4) 20%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

26. Manoj deposited ₹ 29400 for 6 years at a simple interest. He got ₹ 4200 as interest after 6 years. The annual rate of interest was
(1) $2\frac{8}{21}\%$ (2) $2\frac{7}{20}\%$
(3) $3\frac{8}{21}\%$ (4) $4\frac{8}{21}\%$
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

27. A man lent ₹ 60,000, partly at 5% and the rest at 4% simple interest. If the total annual interest is ₹ 2560, the money lent at 4% was
(1) ₹ 40000 (2) ₹ 44000
(3) ₹ 30000 (4) ₹ 45000
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

28. A sum of money at some rate of simple interest amounts to ₹ 2,900 in 8 years and to ₹ 3,000 in 10 years. The rate of interest per annum is
(1) 4% (2) $2\frac{1}{2}\%$
(3) 3% (4) 2%
(SSC CPO S.I. Exam. 09.11.2008)

29. In how many years will a sum of ₹ 3,000 yield a simple interest of ₹ 1,080 at 12% per annum ?
(1) 3 years (2) $2\frac{1}{2}$ years
(3) 2 years (4) $3\frac{1}{2}$ years
(SSC Data Entry Operator Exam. 02.08.2009)

30. A sum of money amounts to ₹ 850 in 3 years and to ₹925 in 4 years at some rate of simple interest. The sum is :
(1) ₹ 550 (2) ₹ 600
(3) ₹ 625 (4) ₹ 700
(SSC CHSL DEO & LDC Exam. 27.11.2010)

31. In what time will ₹ 1,860 amount to 2,641.20 at simple interest 12% per annum ?
(1) 3 years (2) $3\frac{1}{2}$ years
(3) 4 years (4) $4\frac{1}{2}$ years
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

32. The population of a village decreases at the rate of 20% per annum. If its population 2 years ago was 10,000, the present population is
(1) 4600 (2) 6400
(3) 7600 (4) 6000
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

33. The sum lent at 5% per annum (i.e. 365 days) simple interest, that produces interest, of ₹ 2.00 a day, is
(1) ₹ 1,400 (2) ₹ 14,700
(3) ₹ 14,600 (4) ₹ 7,300
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

34. A certain sum of money lent out at simple interest amounts to ₹ 1380 in 3 years and ₹ 1500 in 5 years. Find the rate per cent per annum.
(1) 3% (2) 3.5%
(3) 4% (4) 5%
(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

35. If a sum of money amounts to ₹ 12,900 and ₹ 14,250 at the end of 4th year and 5th year respectively at a certain rate of simple interest, then the rate of interest is
(1) 10% (2) 12%
(3) 18% (4) 20%
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

36. In what time will ₹ 8,000, at 3% per annum, produce the same interest as ₹ 6, 000 does in 5 years at 4 % simple interest ?

(1) 5 years (2) 6 years
(3) 3 years (4) 4 years

(SSC CGL Tier-I Exam. 26.10.2014)

37. The principal which gives ₹ 1 interest per day at a rate of 5% simple interest per annum is

(1) ₹ 5000 (2) ₹ 7300
(3) ₹ 36500 (4) ₹ 3650

(SSC CGL Tier-II Exam. 12.04.2015 (TF No. 567 TL 9)

38. A sum of money lent out at simple interest amounts to Rs. 720 after 2 years and Rs. 1020 after a further period of 5 years. Find the principal.

(1) Rs. 600 (2) Rs. 1740
(3) Rs. 6000 (4) Rs. 120

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

39. The simple interest on Rs. 36,000 for the period from 5th January to 31st May, 2013 at 9.5% per annum is

(1) Rs. 1,338 (2) Rs. 1,425
(3) Rs. 1,400 (4) Rs. 1,368

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

40. Alipta got some amount of money from her father. In how many years will the ratio of the money and the interest obtained from it be 10:3 at the rate of 6% simple interest per annum?

(1) 7 years (2) 3 years
(3) 5 years (4) 4 years

(SSC CGL Tier-I (CBE) Exam.10.09.2016)

41. The sum of money that will yield Rs. 60 as simple interest at the rate of 6% per annum in 5 years is

(1) 200 (2) 225
(3) 175 (4) 300

(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

42. If a sum of money becomes Rs. 4000 in 2 years and Rs. 5500 in 4 years 6 months at the same rate of simple interest per annum, then the rate of simple interest is

(1) $21\frac{3}{7}\%$ (2) $21\frac{2}{7}\%$
(3) $21\frac{1}{7}\%$ (4) $21\frac{5}{7}\%$

(SSC CGL Tier-II Online Exam.01.12.2016

43. The simple interest on a certain sum of money at the rate of 5% per annum for 8 years is Rs. 840. Rate of interest for which the same amount of interest can be received on the same sum after 5 years is :

(1) 7% per annum
(2) 8% per annum
(3) 9% per annum
(4) 10% per annum

(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

44. A sum of Rs. 2800 is divided into two parts in such a way that the interest on both the parts is equal. If the first part is lent at 9% p.a. for 5 years and second part is for 6 years at 10% p.a., find the two sums.

(1) Rs. 1800, Rs. 1000
(2) Rs. 1600, Rs. 1200
(3) Rs. 1400, Rs. 1400
(4) Rs. 1300, Rs. 1500

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

45. The simple interest on a sum for 5 years is two-fifth of the sum. The rate of interest per annum is

(1) 0.1 (2) 0.08
(3) 0.06 (4) 0.04

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

46. If the simple interest on Rs. 400 for 10 years is Rs. 280, the rate of interest per annum is

(1) 7% (2) $7\frac{1}{2}\%$
(3) $7\frac{1}{4}\%$ (4) $8\frac{1}{2}\%$

(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

47. If the simple interest on Re. 1 for 1 month is 1 paisa, then the rate per cent per annum will be

(1) 10% (2) 8%
(3) 12% (4) 6%

(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

48. How much simple interest will Rs. 4000 earn in 18 months at 12% per annum?

(1) Rs. 216 (2) Rs. 360
(3) Rs. 720 (4) Rs. 960

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

49. In how many years a sum of Rs. 3000 will yield an interest of Rs. 1080 at 12% per annum simple interest ?

(1) 4 years (2) 3 years
(3) 5 years (4) $2\frac{1}{2}$ years

(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (IST Sitting)

50. In simple interest rate per annum a certain sum amounts to Rs. 5,182 in 2 years and Rs. 5,832 in 3 years. The principal in rupees is

(1) Rs. 2882 (2) Rs. 5000
(3) Rs. 3882 (4) Rs. 4000

(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

51. For what sum will the simple interest at R% per annum for 2 years will be R ?

(1) Rs. $\frac{100}{2R}$ (2) Rs. 50
(3) Rs. $\frac{100}{R}$ (4) Rs. $\frac{200}{R}$

(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

52. The amount to be paid, when principal = Rs. 2000, rate of simple interest (R) = 5%, T = 2 years, is :

(1) Rs. 3,200 (2) Rs. 2,400
(3) Rs. 2,200 (4) Rs. 3,400

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

53. The rate of simple interest for which Rs. 6,000 will amount to Rs. 6,900 in 3 years is

(1) 5% (2) 7%
(3) 2% (4) 4%

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

TYPE–II

1. A sum of money becomes $\frac{7}{6}$ of itself in 3 years at a certain rate of simple interest. The rate per annum is :

(1) $5\frac{5}{9}\%$ (2) $6\frac{5}{9}\%$

(3) 18% (4) 25%

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A sum of money becomes $\frac{41}{40}$ of itself in $\frac{1}{4}$ years at a certain rate of simple interest. The rate of interest per annum is

(1) 10% (2) 1%

(3) 2.5% (4) 5%

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

3. A certain sum of money becomes three times of itself in 20 years at simple interest. In how many years does it become double of itself at the same rate of simple interest ?

(1) 8 years (2) 10 years

(3) 12 years (4) 14 years

(SSC CPO S.I. Exam. 26.05.2005)

4. At what rate per cent per annum will the simple interest on a sum of money be $\frac{2}{5}$ of the amount in 10 years ?

(1) 4% (2) 6%

(3) $5\frac{2}{3}\%$ (4) $6\frac{2}{3}\%$

(SSC CGL Prelim Exam. 24.02.2002) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting)

5. ₹ 6,000 becomes ₹ 7,200 in 4 years at a certain rate of simple interest. If the rate becomes 1.5 times of itself, the amount of the same principal in 5 years will be

(1) ₹ 8,000 (2) ₹ 8,250

(3) ₹ 9,250 (4) ₹ 9,000

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

6. A sum of money at simple interest trebles itself in 15 years. It will become 5 times of itself in

(1) 40 years (2) 36 years

(3) 30 years (4) 25 years

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

7. If a sum of money at simple interest doubles in 12 years, the rate of interest per annum is

(1) $16\frac{2}{3}\%$ (2) 7.5%

(3) $8\frac{1}{3}\%$ (4) 10%

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

8. At what rate of simple interest per annum will a sum become $\frac{7}{4}$ of itself in 4 years ?

(1) 18% (2) $18\frac{1}{4}\%$

(3) $18\frac{3}{4}\%$ (4) $18\frac{1}{2}\%$

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

9. A sum of money at a certain rate per annum of simple interest doubles in the 5 years and at a different rate becomes three times in 12 years. The lower rate of interest per annum is

(1) 15% (2) 20%

(3) $15\frac{3}{4}\%$ (4) $16\frac{2}{3}\%$

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

10. In how many years will a sum of money double itself at $6\frac{1}{4}\%$ simple interest per annum ?

(1) 24 years (2) 20 years

(3) 16 years (4) 12 years

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

11. At a certain rate of simple interest, a certain sum of money becomes double of itself in 10 years. It will become treble of itself in

(1) 15 years (2) 18 years

(3) 20 years (4) 30 years

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

12. In how much time, will a sum of money become double of itself at 15% per annum simple interest?

(1) $6\frac{1}{4}$ years (2) $6\frac{1}{2}$ years

(3) $6\frac{1}{3}$ years (4) $6\frac{2}{3}$ years

(SSC Data Entry Operator Exam. 31.08.2008)

13. In how many years will a sum of money double itself at 12% per annum?

(1) 8 yrs. 6 months

(2) 6 yrs. 9 months

(3) 8 yrs. 4 months

(4) 7 yrs. 6 months

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

14. A sum amounts to double in 8 years by simple interest. Then the rate of simple interest per annum is

(1) 10% (2) 12.5%

(3) 15% (4) 20%

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

15. A sum doubles itself in 16 years, then in how many years will it triple itself; rate of interest being simple

(1) 25 years (2) 24 years

(3) 48 years (4) 64 years

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

16. In certain years a sum of money is doubled to itself at $6\frac{1}{4}\%$ simple interest per annum, then the required time will be

(1) 16 years (2) $12\frac{1}{2}$ years

(3) 8 years (4) $10\frac{2}{3}$ years

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

17. The simple interest on a sum of money is $\frac{8}{25}$ of the sum. If the number of years is numerically half the rate percent per annum, then the rate percent per annum is

(1) 5 (2) 8

(3) $6\frac{1}{4}$ (4) 4

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

18. A certain sum doubles in 7 years at simple interest. The same sum under the same interest rate will become 4 times in how many years.
(1) 14 (2) 28
(3) 21 (4) 10
(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

19. A certain sum of money amounts to Rs. 2200 at 5% p.a. rate of interest, Rs. 2320 at 8% interest in the same period of time. The period of time is :
(1) 3 years (2) 4 years
(3) 5 years (4) 2 years
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

20. At what per cent of simple interest will a sum of money double itself in 15 years?
(1) $6\frac{1}{3}\%$ (2) $6\frac{2}{3}\%$
(3) $6\frac{1}{2}\%$ (4) 6%
(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

21. If a sum of money deposited in a bank at simple interest is doubled in 6 years, then after 12 years, the amount will be
(1) $\frac{5}{2}$ times the original amount
(2) 3 times the original amount
(3) $\frac{7}{2}$ times the original amount
(4) 4 times the original amount
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

22. The rate of simple interest for which a sum of money becomes 5 times of itself in 8 years is :
(1) 30% (2) 40%
(3) 50% (4) 55%
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

23. If a sum of money doubles itself in 8 years, then the interest rate in percentage is
(1) $8\frac{1}{2}\%$ (2) 10%
(3) $10\frac{1}{2}\%$ (4) $12\frac{1}{2}\%$
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

24. The rate of simple intereset per annum at which a sum of money doubles itself in $16\frac{2}{3}$ years is
(1) 4% (2) 5%
(3) 6% (4) $6\frac{2}{3}\%$
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

TYPE–III

1. In what time will the simple interest be $\frac{2}{5}$ of the principal at 8 per cent per annum?
(1) 8 years (2) 7 years
(3) 5 years (4) 6 years
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. The simple interest on a sum after 4 years is $\frac{1}{5}$ of the sum. The rate of interest per annum is
(1) 4% (2) 5%
(3) 6% (4) 8%
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

3. Simple interest on a certain sum for 6 years is $\frac{9}{25}$ of the sum. The rate of interest is
(1) 6% (2) $6\frac{1}{2}\%$
(3) 8% (4) $8\frac{1}{2}\%$
(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

4. The simple interest on a sum for 5 years is one fourth of the sum. The rate of interest per annum is
(1) 5% (2) 6%
(3) 4% (4) 8%
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

5. On a certain sum, the simple interest at the end of $6\frac{1}{4}$ years becomes $\frac{3}{8}$ of the sum. The rate of interest is
(1) 5% (2) 6%
(3) 7% (4) 8%
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

6. The present worth of a bill due 7 months hence is ₹ 1200 and if the bill were due at the end of $2\frac{1}{2}$ years its present worth would be ₹ 1016. The rate per cent is
(1) 5% (2) 10%
(3) 15% (4) 20%
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

7. At the rate of simple interest per annum, the interest on a certain sum of money for 10 years will be $\frac{2}{5}$ th part of the amount, then the rate of simple interest is
(1) 5% (2) $6\frac{2}{3}\%$
(3) 7% (4) $4\frac{1}{2}\%$
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

8. A and B borrowed Rs. 3000 and Rs. 3200 respectively at the same rate of interest for $2\frac{1}{2}$ years. If B paid Rs. 40 more interest than A, find the rate of interest.
(1) 5% (2) 7%
(3) 8% (4) 6%
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

TYPE–IV

1. The simple interest on a certain sum at 5% per annum for 3 years and 4 years differ by ₹ 42. The sum is :
(1) ₹ 210 (2) ₹ 280
(3) ₹ 750 (4) ₹ 840
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The difference between the simple interest received from two different sources on ₹ 1500 for 3 years is ₹ 13.50. The difference between their rates of interest is:
(1) 0.1% (2) 0.2%
(3) 0.3% (4) 0.4%
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. The simple interest on a sum of money is $\frac{4}{9}$ of the principal and the number of years is equal to the rate percent per annum. The rate per annum is :

(1) 5% (2) $6\frac{2}{3}\%$

(3) 6% (4) $7\frac{1}{5}\%$

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

4. The simple interest on a certain sum for 8 months at 4% per annum is ₹ 129 less than the simple interest on the same sum for 15 months at 5% per annum. The sum is :

(1) ₹ 2,580 (2) ₹ 2400

(3) ₹ 2529 (4) ₹ 3600

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

5. Mohan lent some amount of money at 9% simple interest and an equal amount of money at 10% simple interest each for two years. If his total interest was Rs. 760, what amount was lent in each case ?

(1) ₹ 1700 (2) ₹ 1800

(3) ₹ 1900 (4) ₹ 2000

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

6. Simple interest on a certain sum at a certain annual rate of interest is $\frac{16}{25}$ of the sum. If the number representing rate per cent and time in years be equal, then the rate of interest is

(1) 8% (2) $11\frac{1}{2}\%$

(3) $12\frac{1}{2}\%$ (4) $12\frac{1}{4}\%$

(SSC CGL Prelim Exam. 08.02.2004 (IInd Sitting) & (SSC CGL Tier-I Exam. 26.06.2011) (IInd Sitting)

7. A sum of ₹ 1500 is lent out in two parts in such a way that the simple interest on one part at 10% per annum for 5 years is equal to that on another part at 12.5% per annum for 4 years. The sum lent out at 12.5% is :

(1) ₹ 500 (2) ₹ 1000

(3) ₹ 750 (4) ₹ 1250

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

8. If the simple interest for 6 years be equal to 30% of the principal, it will be equal to the principal after

(1) 20 years (2) 30 years

(3) 10 years (4) 22 years

(SSC CPO S.I. Exam. 03.09.2006)

9. Simple interest on ₹ 500 for 4 years at 6.25% per annum is equal to the simple interest on ₹ 400 at 5% per annum for a certain period of time. The period of time is

(1) 4 years (2) 5 years

(3) $6\frac{1}{4}$ years (4) $8\frac{2}{3}$ years

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

10. The simple interest on a sum of money is $\frac{1}{16}$ of the principal and the number of years is equal to the rate per cent per annum. The rate per annum is

(1) $1\frac{1}{2}\%$ (2) $2\frac{1}{2}\%$

(3) $3\frac{1}{2}\%$ (4) $4\frac{1}{2}\%$

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 27.10.2013)

11. If ₹ 12,000 is divided into two parts such that the simple interest on the first part for 3 years at 12% per annum is equal to the simple interest on the second part for $4\frac{1}{2}$ years at 16% per annum, the greater part is

(1) ₹ 8,000 (2) ₹ 6,000

(3) ₹ 7,000 (4) ₹ 7,500

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

12. The simple interest on a sum of money is $\frac{1}{4}$th of the principal and the number of years is equal to rate per cent per annum. The rate per cent is

(1) 2.5% (2) 5%

(3) 7.5% (4) 10%

(SSC CPO S.I. Exam. 06.09.2009)

13. Equal sum of money are lent to X and Y at 7.5% per annum for a period of 4 years and 5 years respectively. If the difference in interest, paid by them was ₹ 150, the sum lent to each was

(1) ₹ 500 (2) ₹ 1000

(3) ₹ 2000 (4) ₹ 3000

(SSC CPO S.I. Exam. 06.09.2009)

14. A sum of ₹ 1750 is divided into two parts such that the interests on the first part at 8% simple interest per annum and that on the other part at 6% simple interest per annum are equal. The interest on each part (In rupees) is

(1) 60 (2) 65

(3) 70 (4) 40

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

15. A borrows ₹ 800 at the rate of 12% per annum simple interest and B borrows ₹ 910 at the rate of 10% per annum, simple interest. In how many years will their amounts of debt be equal ?

(1) 18 years (2) 20 years

(3) 22 years (4) 24 years

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

16. The simple interest on a sum of money is $\frac{1}{9}$ of the principal and the number of years is equal to rate per cent per annum. The rate per annum is

(1) 3% (2) $\frac{1}{3}\%$

(3) $3\frac{1}{3}\%$ (4) $\frac{3}{10}\%$

(SSC CPO SI. Exam. 12.12.2010) & (SSC CGL Tier-1 Exam. 19.06.2011) (First Sitting)

17. A person deposited ₹ 500 for 4 years and ₹ 600 for 3 years at the same rate of simple interest in a bank. Altogether he received ₹ 190 as interest. The rate of simple interest per annum was

(1) 4% (2) 5%

(3) 2% (4) 3%

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

18. The difference between the simple interest received from two different banks on ₹ 500 for 2 years is ₹ 2.50. The difference between their (per annum) rate of interest is :

(1) 0.10% (2) 0.25%
(3) 0.50% (4) 1.00%

(SSC CHSL DEO CHSL DEO & LDC Exam. 27.11.2010) & (SSC CHSL DEO & LDC Exam. 04.11.2012)

19. In how many years will the simple interest on a sum of money be equal to the principal at the rate of $16\frac{2}{3}\%$ per annum ?

(1) 4 years (2) 5 years
(3) 6 years (4) 8 years

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

20. The rate of interest per annum at which the total simple interest of a certain capital for 1 year is equal to the total simple interest of the same capital at the rate of 5% per annum for 2 years, is

(1) $\frac{5}{2}\%$ (2) 10%
(3) 25% (4) 12.5%

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

21. The simple interest on ₹ 4,000 in 3 years at the rate of x% per annum equals the simple interest on ₹ 5,000 at the rate of 12% per annum in 2 years. The value of x is

(1) 10% (2) 6%
(3) 8% (4) 9%

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

22. If x, y, z are three sum of money such that y is the simple interest on x and z is the simple interset on y for the same time and at the same rate of interest, then we have

(1) $z^2 = xy$ (2) $xyz = 1$
(3) $x^2 = yz$ (4) $y^2 = zx$

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

23. Prakash lends a part of ₹ 20,000 at 8% simple interest and remaining at $\frac{4}{3}\%$ simple interest. His total income after a year was ₹ 800. Find the sum lent at 8%.

(1) ₹ 8,000 (2) ₹ 12,000
(3) ₹ 6,000 (4) ₹ 10,000

(SSC CGL Tier-II Exam. 21.09.2014)

24. Ram deposited a certain sum of money in a company at 12% per annum simple interest for 4 years and deposited equal amount in fixed deposit in a bank for 5 years at 15% per annum simple interest. If the difference in the interest from two sources is ₹ 1350, then the sum deposited in each case is :

(1) ₹ 3000 (2) ₹ 4000
(3) ₹ 5000 (4) ₹ 6500

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

25. The difference between simple interest and the true discount on Rs. 2400 due 4 years hence at 5% per annum simple interest is

(1) Rs. 30 (2) Rs. 70
(3) Rs. 80 (4) Rs. 50

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

TYPE–V

1. A sum of ₹1550 was lent partly at 5% and partly at 8% simple interest. The total interest received after 3 years is ₹ 300. The ratio of money lent at 5% to that at 8% is :

(1) 5 : 8 (2) 8 : 5
(3) 31 : 6 (4) 16 : 15

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. A person lent ₹ 5,000 partly at the rate of 4 per cent and partly at the rate of 5 per cent per annum simple interest. The total interest after 2 years is ₹ 440. To find the sum of money lent at each of the above rates, ₹ 5,000 is to be divided in the ratio :

(1) 4 : 5 (2) 3 : 2
(3) 5 : 4 (4) 2 : 3

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

3. A person borrows some money for 5 years and loan amount : total interest amount is 5 : 2. The ratio of loan amount : interest rate is equal to :

(1) 2 : 25 (2) 2 : 1
(3) 5 : 2 (4) 25 : 2

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

4. A person invests money in three different schemes for 6 years, 10 years and 12 years at 10 per cent, 12 per cent and 15 per cent simple interest respectively. At the completion of each scheme, he gets the same interest. The ratio of his investment is

(1) 6 : 3 : 2 (2) 2 : 3 : 4
(3) 3 : 4 : 6 (4) 3 : 4 : 2

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

5. With a given rate of simple inerest, the ratio of principal and amount for a certain period of time is 4 : 5. After 3 years, with the same rate of interest, the ratio of the principal and amount becomes 5 : 7. The rate of interest is

(1) 4% (2) 6%
(3) 5% (4) 7%

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

6. Ratio of the principal and the amount after 1 year is 10:12. Then the rate of interest per annum is :

(1) 12% (2) 16%
(3) 18% (4) 20%

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

7. In a certain time, the ratio of a certain principal and the simple interest obtained from it are in the ratio 10 : 3 at 10% interest per annum. The number of years the money was invested is

(1) 1 year (2) 3 years
(3) 5 years (4) 7 years

(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

8. ₹12,000 is divided into two parts so that the simple interest on the first part for 3 years at 12% per annum may be equal to the simple interest on the second part for $4\frac{1}{2}$ years at 16% per annum. The ratio of the first part to the second part is

(1) 2 : 1 (2) 1 : 2
(3) 2 : 3 (4) 3 : 2

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

9. If ratio of principal and simple interest for 1 year is 25 : 1, then the rate of interest is

(1) 4% (2) 25%
(3) 5% (4) 20%

(SSC CGL Tier-I Re-Exam, 30.08.2015)

10. If the ratio of principal and the simple interest for 5 years is 10 : 3, then the rate of interest is :

(1) 5% (2) 6%
(3) 8% (4) 3%

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

11. A sum of Rs. 4000 is lent out in two parts, one at 8% simple interest and the other at 10% simple interest. If the annual interest is Rs. 352, the sum lent at 8% is

(1) Rs. 2900 (2) Rs. 2200
(3) Rs. 2400 (4) Rs. 3100

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

TYPE–VI

1. A sum of ₹ 400 amounts to ₹ 480 in 4 years. What will it amount to if the rate of interest is increased by 2%?

(1) ₹ 484 (2) ₹ 560
(3) ₹ 512 (4) None of these

(SSC CGL Prelim Exam. 27.02.200 (First Sitting)

2. A man loses ₹ 55.50 yearly when the annual rate of interest falls from 11.5% to 10%. His capital (in rupees) is

(1) 3700 (2) 7400
(3) 8325 (4) 11100

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

3. If the annual rate of simple interest increases from 10% to $12\frac{1}{2}\%$, a man's yearly income increases by ₹ 1250. His principal (in rupees) is

(1) 50,000 (2) 45,000
(3) 60,000 (4) 65,000

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

4. A sum was invested on simple interest at a certain rate for 2 years. Had it been put at 3% higher rate, it would have fetched ₹ 72 more. The sum is

(1) ₹ 1,200 (2) ₹ 1,500
(3) ₹ 1,600 (4) ₹ 1,800

(SSC CPO S.I. Exam. 06.09.2009)

5. A sum of money was lent at simple interest at a certain rate for 3 years. Had it been lent at 2.5% per annum higher rate, it would have fetched ₹ 540 more. The money lent was :

(1) ₹ 6400 (2) ₹ 6472
(3) ₹ 6840 (4) ₹ 7200

(SSC CHSL DEO & LDC Exam. 27.11.2010)

6. A sum of money was invested at a certain rate of simple interest for 2 years . Had it been invested at 1% higher rate, it would have fetched ₹ 24 more interest. The sum of money is :

(1) ₹ 1200 (2) ₹ 1050
(3) ₹ 1000 (4) ₹ 9600

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

7. A person who pays income tax at the rate of 4 paise per rupee, find that a fall of interest rate from 4% to 3.75% diminishes his net yearly income by ₹ 48. What is his capital ?

(1) ₹ 24,000 (2) ₹ 25,000
(3) ₹ 20,000 (4) ₹ 18,000

(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

8. A sum was lent at simple interest at a certain rate for 2 years. Had it been lent at 3% higher rate, it would have fetched ₹ 300 more. The original sum of money was :

(1) ₹ 5000 (2) ₹ 6000
(3) ₹ 7000 (4) ₹ 4000

(SSC Multi-Tasking Staff Exam. 10.03.2013)

9. A sum of ₹2,400 amounts to ₹3,264 in 4 years at a certain rate of simple interest. If the rate of interest is increased by 1%, the same sum in the same time would amount to

(1) ₹ 3,288 (2) ₹ 3,312
(3) ₹ 3,340 (4) ₹ 3,360

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

10. ₹ 800 amounts to ₹ 920 in 3 years at simple interest. If the interest rate is increased by 3%, it would amount to

(1) ₹ 1,056 (2) ₹ 1,112
(3) ₹ 1,182 (4) ₹ 992

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

11. A sum of Rs. 800 amounts to Rs. 920 in 3 years at the simple interest rate. If the rate is increased by 3% p.a., what will be the sum amount to in the same period ?

(1) ₹ 992 (2) ₹ 962
(3) ₹ 942 (4) ₹ 982

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

12. The amount ₹ 2,100 became ₹ 2,352 in 2 years at simple interest. If the interest rate is decreased by 1%, what is the new interest ?

(1) ₹ 210 (2) ₹ 220
(3) ₹ 242 (4) ₹ 252

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

13. A sum of Rs. 800 becomes Rs. 956 in 3 years at a certain rate of simple interest. If the rate of interest is increased by 4%, what amount will the same sum become in 3 years ?

(1) Rs. 1025 (2) RS. 1042
(3) Rs. 1052 (4) Rs. 1024

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

14. The rate of simple interest per annum of bank being decreased from 5% to $3\frac{1}{2}\%$, the annual income of a person from interest was less by Rs. 105. The sum deposited at the bank was

(1) Rs. 6,000 (2) Rs. 7,200
(3) Rs. 6,800 (4) Rs. 7,000

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE–VII

1. A sum of ₹ 10,000 is lent partly at 8% and remaining at 10% per annum. If the yearly interest on the average is 9.2%, the two parts are :

(1) ₹ 4000, ₹ 6000
(2) ₹ 4500, ₹ 5500
(3) ₹ 5000, ₹ 5000
(4) ₹ 5500, ₹ 4500

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. A sum of ₹ 1000 is lent out partly at 8% and the remaining at 10% per annum. If the yearly income on the average is 9.2%, the two parts respectively are

(1) ₹ 400, ₹ 600 (2) ₹ 450, ₹ 550
(3) ₹ 500, ₹ 500 (4) ₹ 550, ₹ 450

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

3. An old article is available for ₹ 12,000 at cash payment or is available for ₹ 7,000 cash payment and a monthly instalment of ₹ 630 for 8 months. The rate per cent per annum is

(1) 2.1 per cent (2) 3 per cent
(3) 3.25 per cent (4) 3.3 per cent

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

4. The effective annual rate of interest, corresponding to a nominal rate of 6% per annum payable half yearly, is :

(1) 6.06% (2) 6.07%
(3) 6.08% (4) 6.09%

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

5. A person lends 40% of his sum of money at 15% per annum, 50% of rest at 10% per annum and the rest at 18% per annum rate of interest. What would be the annual rate of interest, if the interest is calculated on the whole sum ?

(1) 13.4% (2) 14.33%
(3) 14.4% (4) 13.33%

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

6. Ramesh deposited ₹ 15600 in a fixed deposit at the rate of 10% per annum simple interest. After every second year, he adds his interest earnings to the principal. The interest at the end of fourth year is

(1) ₹ 1716 (2) ₹ 1560
(3) ₹ 3432 (4) ₹ 1872

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

7. A part of ₹ 1500 was lent at 10% per annum and the rest at 7% per annum simple interest. The total interest earned in three years was ₹ 396. The sum lent at 10% was

(1) ₹ 900 (2) ₹ 800
(3) ₹ 700 (4) ₹ 600

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

8. What equal instalment of annual payment will discharge a debt which is due as ₹ 848 at the end of 4 years at 4% per annum simple interest ?

(1) ₹ 212 (2) ₹ 200
(3) ₹ 250 (4) ₹ 225

(SSC CPO S.I. Exam. 16.12.2007)

9. Out of ₹ 50,000, that a man has, he lends ₹ 8000 at $5\frac{1}{2}\%$ per annum simple interest and Rs. 24,000 at 6 % per annum simple interest. He lends the remaining money at a certain rate of interest so that he gets total annual interest of ₹ 3680. The rate of interest per annum, at which the remaining money is lent, is

(1) 5% (2) 7%
(3) 10% (4) 12%

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

10. A man invests half his capital at the rate of 10% per annum, one-third at 9% and the rest at 12% per annum. The average rate of interest per annum, which he gets, is

(1) 9% (2) 10%
(3) 10.5% (4) 12%

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

11. John invested a sum of money at an annual simple interest rate of 10%. At the end of four years the amount invested plus interest earned was ₹ 770. The amount invested was

(1) ₹ 650 (2) ₹ 350
(3) ₹ 550 (4) ₹ 500

(SSC CISF Constable (GD) Exam. 05.06.2011)

12. Arun lends ₹ 20,000 to two of his friends. He gives ₹ 12,000 to the first at 8% p.a. simple interest. Arun wants to make a profit of 10% on the whole. The simple interest rate at which he should lend the remaining sum of money to the second friend is

(1) 8% (2) 16%
(3) 12% (4) 13%

(SSC Graduate Level Tier-II Exam.16.09.2012)

13. A person invests ₹12,000 as fixed deposit at a bank at the rate of 10% per annum simple interest. But due to some pressing needs he has to withdraw the entire money after 3 years, for which the bank allowed him a lower rate of interest. If he gets ₹3,320 less than what he would have got at the end of 5 years, the rate of interest allowed by the bank is

(1) $7\frac{5}{9}\%$ (2) $7\frac{4}{9}\%$
(3) $7\frac{8}{9}\%$ (4) $8\frac{7}{9}\%$

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

14. A certain scheme of investment in simple interest declares that it trebles the investment in 8 years. If you want to quadruple your money through that scheme, you have to invest it for :

(1) 11 years 6 months
(2) 10 years 8 months
(3) 10 years (4) 12 years

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

15. If a man receives on one-fourth of his capital 3% interest, on two third 5% and on the remainder 11%, the percentage he receives on the whole is

(1) 4.5% (2) 5%
(3) 5.5% (4) 5.2%

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

16. At the same rate of simple interest sum of the interest of ₹ 300 for 4 years and the interest of ₹ 400 for 3 years is ₹ 120. The rate of interest is

(1) 5 % (2) 4%
(3) 6% (4) 10%

(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

17. Nitin borrowed some money at the rate of 6% p.a. for the first three years, 9% p.a. for the next five years and 13% p.a. for the period beyond eight years. If the total interest paid by him at the end of eleven years is ₹ 8,160, the money borrowed by him (in ₹) was

(1) 12,000 (2) 6,000
(3) 8,000 (4) 10,000

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

18. Two equal sums were lent out at 7% and 5% S.I. respectively. The interest earned on the two loans add up to ₹ 960 for 4 years. The total sum lent out in

(1) ₹ 3500 (2) ₹ 2500
(3) ₹ 2000 (4) ₹ 3000

(SSC Constable (GD) Exam. 12.05.2013)

19. Mohan lends Rs. 500 to John and a certain sum to Tom at the same time at a simple interest of 8% per annum. If in 4 years, he altogether receives Rs. 210 as interest from the two, then the sum of money he lent to Tom was

(1) Rs. 144.75 (2) Rs. 148
(3) Rs. 156.25 (4) Rs. 165.50

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

20. What should be the least number of years in which the simple interest on Rs. 2600 at $6\frac{2}{3}$% will be an exact number of rupees ?

(1) 3 (2) 2
(3) 5 (4) 4

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

21. Ram bought a bike for Rs. 60,000. He paid Rs. 10000 cash down and the rest at the end of 2 years at 15% simple interest. How much more did he pay as simple interest ?

(1) Rs. 15,000 (2) Rs. 25,000
(3) Rs. 35,000 (4) Rs. 50,000

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

22. A sum of Rs. 7,930 is divided into three parts and given on loan at 5% simple interest to A, B and C for 2, 3 and 4 years respectively. If the amounts of all three are equal after their respective periods of loan, then A received a loan of

(1) Rs. 3,050 (2) Rs. 2,760
(3) Rs. 2,750 (4) Rs. 2,800

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

23. A man buys a TV priced at Rs. 16000. He pays Rs. 4000 at once and the rest after 15 months on which he is charged a simple interest at the rate of 12% per year. The total amount he pays for the TV is

(1) Rs. 18,200 (2) Rs. 17,800
(3) Rs. 16,800 (4) Rs. 17,200

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

24. If Rahim deposited the same amount of Rs. x in a bank at the beginning of successive 3 years and the bank pays simple interest of 5% per annum, then the amount at his credit at the end of 3rd year will be :

(1) Rs. $\frac{861x}{400}$ (2) Rs. $\frac{1261x}{400}$
(3) Rs. $\frac{21x}{20}$ (4) Rs. $\frac{26481x}{8000}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

25. A boy aged 12 years is left with Rs. 100,000 which is under a trust. The trustees invest the money at 6% per annum and pay the minor boy a sum of Rs. 2500, for his pocket money at the end of each year. The expenses of trust come out to be Rs. 500 per annum. Find the amount that will be handed over to the minor boy after he attains the age of 18 years.

(1) Rs. 120000 (2) Rs. 150000
(3) Rs. 118000 (4) Rs. 125000

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

26. If A borrowed Rs. P at x% and B borrowed Rs. Q (> P) at y% per annum at simple interest at the same time, then the amount of their debts will be equal after

(1) $100\left(\frac{Q-P}{Px-Qy}\right)$ years

(2) $100\left(\frac{Px-Qy}{Q-P}\right)$ years

(3) $100\left(\frac{Px-Qy}{P-Q}\right)$ years

(4) $100\left(\frac{P-Q}{Px-Qy}\right)$ years

(SSC CGL Tier-II Online Exam.01.12.2016))

27. A money lender claims to lend money at the rate of 10% per annum simple interest. However, he takes the interest in advance when he lends a sum for one year. At what interest rate does he lend the money actually?

(1) 10% (2) $10\frac{1}{9}$%
(3) 11% (4) $11\frac{1}{9}$%

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

28. Ramesh borrowed a sum at 5 per annum simple interest from Rahul. He returns the amount after 5years. Rahul returns 2 % of the total amount received. How much did Ramesh borrowed if he received Rs. 5?

(1) Rs. 250 (2) Rs. 200
(3) Rs. 150 (4) Rs. 175

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

29. A man buys a watch for Rs. 1950 in cash and sells it for Rs. 2200 at a credit of 1 year. If the rate of interest be 10% per annum, then how much profit or loss will he have?

(1) Rs. 55 gain (2) Rs. 30 profit
(3) Rs. 30 loss (4) Rs. 30 profit

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

30. A money lender lends Rs. 400 for 3 years to a person and lends Rs. 500 for 4 years to the other person at the same rate of simple interest. If altogether he receives Rs. 160 as interest, what is the rate of interest per annum ?

(1) 5% (2) 7%
(3) 9% (4) 10%

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

SHORT ANSWERS

TYPE-I

1. (2)	**2.** (3)	**3.** (4)	**4.** (1)
5. (4)	**6.** (1)	**7.** (3)	**8.** (3)
9. (4)	**10.** (4)	**11.** (3)	**12.** (4)
13. (3)	**14.** (2)	**15.** (4)	**16.** (3)
17. (1)	**18.** (1)	**19.** (1)	**20.** (3)
21. (3)	**22.** (4)	**23.** (4)	**24.** (3)
25. (1)	**26.** (1)	**27.** (2)	**28.** (4)
29. (1)	**30.** (3)	**31.** (2)	**32.** (2)
33. (3)	**34.** (4)	**35.** (3)	**36.** (1)
37. (2)	**38.** (1)	**39.** (4)	**40.** (3)
41. (1)	**42.** (1)	**43.** (2)	**44.** (2)
45. (2)	**46.** (1)	**47.** (3)	**48.** (3)
49. (2)	**50.** (3)	**51.** (2)	**52.** (3)
53. (1)			

TYPE-II

1. (1)	**2.** (1)	**3.** (2)	**4.** (4)
5. (2)	**6.** (3)	**7.** (3)	**8.** (3)
9. (4)	**10.** (3)	**11.** (3)	**12.** (4)
13. (3)	**14.** (2)	**15.** (*)	**16.** (1)
17. (2)	**18.** (3)	**19.** (4)	**20.** (2)
21. (2)	**22.** (3)	**23.** (4)	**24.** (3)

TYPE-III

1. (3)	**2.** (2)	**3.** (1)	**4.** (1)
5. (2)	**6.** (2)	**7.** (2)	**8.** (3)

TYPE-IV

1. (4)	**2.** (3)	**3.** (2)	**4.** (4)
5. (4)	**6.** (1)	**7.** (3)	**8.** (1)
9. (3)	**10.** (2)	**11.** (1)	**12.** (2)
13. (3)	**14.** (1)	**15.** (3)	**16.** (3)
17. (2)	**18.** (2)	**19.** (3)	**20.** (2)
21. (1)	**22.** (4)	**23.** (1)	**24.** (3)
25. (3)			

TYPE-V

1. (4)	**2.** (2)	**3.** (4)	**4.** (1)
5. (3)	**6.** (4)	**7.** (2)	**8.** (1)
9. (1)	**10.** (2)	**11.** (3)	

TYPE-VI

1. (3)	**2.** (1)	**3.** (1)	**4.** (1)
5. (4)	**6.** (1)	**7.** (3)	**8.** (1)
9. (4)	**10.** (4)	**11.** (1)	**12.** (1)
13. (3)	**14.** (4)		

TYPE-VII

1. (1)	**2.** (1)	**3.** (1)	**4.** (4)
5. (3)	**6.** (4)	**7.** (1)	**8.** (2)
9. (3)	**10.** (2)	**11.** (3)	**12.** (4)
13. (2)	**14.** (4)	**15.** (2)	**16.** (1)
17. (3)	**18.** (3)	**19.** (3)	**20.** (1)
21. (1)	**22.** (2)	**23.** (2)	**24.** (*)
25. (3)	**26.** (1)	**27.** (4)	**28.** (2)
29. (1)	**30.** (1)		

EXPLANATIONS

TYPE-I

1. (2) Using Rule 1,

$$P = \frac{150 \times 100}{4} \times \frac{2}{1} = ₹\ 7500$$

2. (3) Using Rule 1,
Principal (P) = ₹ 1600
T = 2 years 3 months

$$= \left(2 + \frac{3}{12}\right)\text{yrs.} = \left(2 + \frac{1}{4}\right)\text{yrs.} = \frac{9}{4}\text{yrs.}$$

S.I = ₹ 252
R = % rate of interest per annum

$$\Rightarrow R = \frac{100 \times S.I.}{P \times t}$$

$$= \frac{100 \times 252}{1600 \times \frac{9}{4}}$$

Rate of interest = 7% per annum.

3. (4) If the principal be x and rate of interest be r% per annum, then
SI after 1 year = 920 – 880
= ₹ 40
∴ SI after 2 years = ₹ 80
⇒ 880 = x + 80
⇒ x = ₹ (880 – 80) = ₹ 800
Aliter : Using Rule 12,

$$P = \left(\frac{A_2T_1 - A_1T_2}{T_1 - T_2}\right)$$

$$= \left(\frac{920 \times 2 - 880 \times 3}{2 - 3}\right)$$

$$= \left(\frac{1840 - 2640}{-1}\right)$$

$$= \frac{-800}{-1} = ₹\ 800$$

4. (1) Using Rule 1,
If rate of interest be R% p.a. then,

$$SI = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

$$\therefore \frac{6000 \times 2 \times R}{100} + \frac{1500 \times 4 \times R}{100}$$

= 900
⇒ 120 R + 60R = 900
⇒ 180R = 900

$$\Rightarrow R = \frac{900}{180} = 5\%$$

5. (4) Using Rule 1,
Let the rate of interest per annum be r%
According to the question,

$$\frac{5000 \times 2 \times r}{100} + \frac{3000 \times 4 \times r}{100} = 2200$$

⇒ 100r + 120r = 2200
⇒ 220 r = 2200

$$\Rightarrow r = \frac{2200}{220} = 10\%$$

6. (1) Simple interest for 2 years
= ₹ (568 – 520) = ₹ 48
∴ Interest for 5 years

$$= ₹\ \frac{48}{2} \times 5 = ₹\ 120$$

Principal = ₹ (520 – 120) = ₹ 400
Aliter : Using Rule 12,

$$P = \left(\frac{A_2T_1 - A_1T_2}{T_1 - T_2}\right)$$

$$= \left(\frac{568 \times 5 - 520 \times 7}{5 - 7}\right)$$

$$= \left(\frac{2840 - 3640}{-2}\right)$$

$$= \frac{-800}{-2} = ₹\ 400$$

7. (3) Using Rule 1,
Simple interest gained from ₹ 500

$$= \frac{500 \times 12 \times 4}{100} = ₹\ 240$$

Let the other Principal be x.
S.I. gained = ₹ (480 – 240)
= ₹ 240

$$\therefore \frac{x \times 10 \times 4}{100} = 240$$

$$\Rightarrow x = \frac{240 \times 100}{40} = ₹\ 600$$

8. (3) Difference in rate

$$= \left(8 - 7\frac{3}{4}\right)\% = \frac{1}{4}\%$$

Let the capital be ₹ x.

$$\therefore \frac{1}{4}\% \text{ of } x = 61.50$$

⇒ x = 61.50 × 100 × 4
= ₹ 24600

9. (4) Using Rule 1,
Let the sum lent to C be x
According to the question,

$$\frac{2500 \times 7 \times 4}{100} + \frac{x \times 7 \times 4}{100} = 1120$$

or $2500 \times 28 + 28x = 112000$
or $2500 + x = 4000$
or $x = 4000 - 2500 = 1500$

10. (4) S.I. for $1\frac{1}{2}$ years

= ₹ (873 – 756) = ₹ 117
S.I. for 2 years

$$= ₹\left(117 \times \frac{2}{3} \times 2\right) = ₹\ 156$$

∴ Principal = 756 – 156 = ₹ 600
Now, P = 600, T = 2,
S.I. = 156

$$\therefore R = \frac{100 \times S.I.}{P \times T}$$

$$= \frac{100 \times 156}{600 \times 2} = 13\%$$

Aliter : Using Rule 12,
Rate of interest

$$= \left(\frac{A_1 - A_2}{A_2T_1 - A_1T_2}\right) \times 100$$

$$= \left(\frac{756 - 873}{873 \times 2 - 756 \times \frac{7}{2}}\right) \times 100$$

$$= \left(\frac{-117}{1746 - 2646}\right) \times 100$$

$$= \left(\frac{-117}{-900}\right) \times 100 = 13\%$$

11. (3) Using Rule 1,

$$P = \frac{A \times 100}{100 + r \times t}$$

$$= \frac{7000 \times 100}{100 + \frac{10}{3} \times 5}$$

$$= \frac{7000 \times 100 \times 3}{350} = ₹\ 6000$$

12. (4) Using Rule 1,
Let the principal be x.

$$S.I. = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$\Rightarrow 5400 = \frac{x \times 12 \times 3}{100}$$

$$\Rightarrow x = \frac{5400 \times 100}{12 \times 3} = ₹\ 15000$$

13. (3) Principal + S.I. for $\frac{5}{2}$ years

= ₹ 1012 ...(i)
Principal + S.I. for 4 years
= ₹ 1067.20 ...(ii)
Subtracting equation (i) from (ii)

S.I. for $\frac{3}{2}$ years = ₹ 55.20

∴ S.I. for $\frac{5}{2}$ years

$$= 55.20 \times \frac{2}{3} \times \frac{5}{2} = ₹\ 92$$

∴ Principal
= ₹ (1012 – 92) = ₹ 920

$$\therefore \text{Rate} = \frac{92 \times 100}{920 \times \frac{5}{2}}$$

$$= \frac{2 \times 92 \times 100}{920 \times 5} = 4\%$$

Aliter : Using Rule 12,

$$R = \left(\frac{A_1 - A_2}{A_2T_1 - A_1T_2}\right) \times 100$$

$$= \left(\frac{1012 - 1067.20}{1067.20 \times \frac{5}{2} - 1012 \times 4}\right) \times 100$$

$$= \frac{-55.2}{(2668 - 4048)} \times 100$$

$$= \frac{-55.2}{-1380} \times 100$$

= 4%

14. (2) Principal + SI for 2 years
= ₹ 720 .... (i)
Principal + SI for 7 years
= ₹ 1020 .....(ii)
Subtracting equation (i) from (ii) get,
SI for 5 years
= ₹ (1020 – 720) = ₹ 300
∴ SI for 2 years

$$= ₹\ 300 \times \frac{2}{5} = ₹\ 120$$

∴ Principal
= ₹ (720 – 120) = ₹ 600
Aliter : Using Rule 12,

$$P = \left(\frac{A_2T_1 - A_1T_2}{T_1 - T_2}\right)$$

$$= \left(\frac{1020 \times 2 - 720 \times 7}{2 - 7}\right)$$

$$= \left(\frac{2040 - 5040}{-5}\right)$$

$$= \frac{-3000}{-5} = ₹\ 600$$

15. (4) Using Rule 1,
The sum of money will give ₹ 365 as simple interest in a year.

$$\Rightarrow S.I. = \frac{PRT}{100}$$

$$\Rightarrow 365 = \frac{P \times 5 \times 1}{100}$$

$$\Rightarrow P = \frac{365 \times 100}{5} = ₹\ 7300$$

16. (3) Using Rule 1,
Let the sum be x.

Using formula, $I = \frac{PRT}{100}$ we have

$$\frac{x \times \frac{15}{12} \times \frac{15}{2}}{100} - \frac{x \times \frac{8}{12} \times \frac{25}{2}}{100}$$

= 32.50

$$\Rightarrow \frac{25x}{2400} = 32.50$$

$$\Rightarrow x = \frac{32.50 \times 2400}{25} = 3120$$

∴ Required sum = ₹ 3120

17. (1) Let each instalment be x
Then,

$$\left(x + \frac{x \times 5 \times 1}{100}\right) + \left(x + \frac{x \times 5 \times 2}{100}\right)$$

$$+ \left(x + \frac{x \times 5 \times 3}{100}\right) + x = 6450$$

$$\Rightarrow \left(x + \frac{x}{20}\right) + \left(x + \frac{x}{10}\right) +$$

$$\left(x + \frac{3x}{20}\right) + x = 6450$$

$$\Rightarrow \frac{21x}{20} + \frac{11x}{10} + \frac{23x}{20} + x = 6450$$

$$\Rightarrow \frac{21x + 22x + 23x + 20x}{20}$$

= 6450

$$\Rightarrow \frac{86x}{20} = 6450$$

$\Rightarrow x = \dfrac{6450 \times 20}{86}$ = ₹ 1500

Aliter : Using Rule 10,
Equal instalment

$= \dfrac{6450 \times 200}{4[200 + (4-1) \times 5]}$

$= \dfrac{6450 \times 200}{4(215)}$

$= \dfrac{6450 \times 50}{215}$ = ₹ 1500

18. (1) Using Rule 1,
Interest = ₹ (81–72)= ₹ 9
Let the time be t years.

Then, $9 = \dfrac{72 \times 25 \times t}{4 \times 100}$

$\Rightarrow t = \dfrac{9 \times 400}{72 \times 25}$ = 2 years.

19. (1) Using Rule 1,
Time from 11 May to 10 September, 1987
= 21 + 30 + 31 + 31 + 10
= 123 days

$\therefore$ Time = 123 days = $\dfrac{123}{365}$ year

$\therefore$ S.I. = $\dfrac{7300 \times 123 \times 5}{365 \times 100}$ = ₹ 123

20. (3) Using Rule 1,
Case I :

S.I. = $\dfrac{5000 \times 2 \times 4}{100}$ = ₹ 400

Case II :

S.I. = $\dfrac{5000 \times 25 \times 2}{100 \times 4}$ = ₹ 625

$\therefore$ Gain = ₹ (625 – 400) = ₹ 225

21. (3) Using Rule 1,
Let the sum lent at 4% = Rs.x
$\therefore$ Amount at 5%= (16000 – x)
According to the question,

$\dfrac{x \times 4 \times 1}{100} + \dfrac{(16000 - x) \times 5 \times 1}{100}$

= 700
$\Rightarrow 4x + 80000 - 5x = 70000$
$\Rightarrow x = 80000 - 70000$
= ₹ 10000

22. (4) Using Rule 1,
After 10 years,

SI = $\dfrac{1000 \times 5 \times 10}{100}$ = ₹ 500

Principal for 11th year
= 1000 + 500 = ₹ 1500
SI = ₹ (2000 – 1500) = ₹ 500

$\therefore$ T = $\dfrac{\text{SI} \times 100}{\text{P} \times \text{R}} = \dfrac{500 \times 100}{1500 \times 5}$

= $\dfrac{20}{3}$ years = $6\dfrac{2}{3}$ years

$\therefore$Total time = $10 + 6\dfrac{2}{3}$

= $16\dfrac{2}{3}$ years

23. (4)
P + S.I. for 5 years = 5200 ..(i)
P + SI for 7 years = 5680 ...(ii)
On subtracting equation (i) from (ii),
SI for 2 years = 480
$\therefore$ SI for 1 year = ₹ 240
$\therefore$ From equation (i),
P + 5 × 240 = 5200
$\Rightarrow$ P = 5200 – 1200 = ₹ 4000

$\therefore$R = $\dfrac{\text{SI} \times 100}{\text{T} \times \text{P}}$

= $\dfrac{240 \times 100}{1 \times 4000}$ = 6%

Aliter : Using Rule 12,

R = $\left(\dfrac{A_1 - A_2}{A_2T_1 - A_1T_2}\right) \times 100$

$= \left(\dfrac{5200 - 5680}{5680 \times 5 - 5200 \times 7}\right) \times 100$

= $\dfrac{-480}{28400 - 36400} \times 100$

= $\dfrac{-480}{-8000} \times 100$

= 6%

24. (3) Using Rule 1,
S.I. = 956 – 800 = Rs. 156

$\therefore$ Rate = $\dfrac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$

= $\dfrac{156 \times 100}{800 \times 3}$ = 6.5% per annum
$\therefore$ New rate = 10.5%

$\therefore$ S.I. = $\dfrac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

= $\dfrac{800 \times 3 \times 10.5}{100}$ = ₹ 252

$\therefore$ Amount = 800 + 252 = ₹ 1052

25. (1) Using Rule 1,
Let the rate of interest be R per cent per annum.

$\therefore \dfrac{400 \times 2 \times R}{100} + \dfrac{550 \times 4 \times R}{100}$

$+ \dfrac{1200 \times 6 \times R}{100} = 1020$

$\Rightarrow$ 8R + 22 R +72 R = 1020
$\Rightarrow$ 102 R= 1020

$\Rightarrow$ R = $\dfrac{1020}{102}$ = 10%

26. (1) Using Rule 1,

$4200 = \dfrac{29400 \times 6 \times R}{100}$

$\Rightarrow$ R = $\dfrac{4200}{294 \times 6} = \dfrac{50}{21} = 2\dfrac{8}{21}\%$

27. (2) Using Rule 1,
Let the amount lent at 4% be x
$\therefore$ Amount lent at 5% = (60000 – x)
According to the question,

$\dfrac{(60000 - x) \times 5 \times 1}{100} + \dfrac{x \times 4 \times 1}{100}$

= 2560
$\Rightarrow$ 300000 – 5x + 4x = 256000
$\Rightarrow$ x = 300000 – 256000
= ₹ 44000

28. (4) Principal + interest for 8 years= ₹ 2900... (i)
Principal + interest for 10 years
= ₹ 3000 ... (ii)
Subtracting equation (i) from (ii)
Interest for 2 years = ₹ 100
$\therefore$ Interest for 8 years

= $\dfrac{100}{2} \times 8$ = ₹ 400

From equation (i),
Principal = ₹ (2900 – 400)
= ₹ 2500

$\therefore$ Rate = $\dfrac{\text{S.I} \times 100}{\text{Time} \times \text{Principal}}$

= $\dfrac{400 \times 100}{8 \times 2500}$ = 2%

Aliter : Using Rule 12,

R = $\left(\dfrac{A_1 - A_2}{A_2T_1 - A_1T_2}\right) \times 100$

$$= \left(\frac{2900-3000}{3000\times 8-2900\times 10}\right)\times 100$$

$$= \left(\frac{-100}{24000-29000}\right)\times 100$$

$$= \frac{-100}{-5000}\times 100$$

$= 2\%$

29. (1) Using Rule 1,

$$\text{Time} = \frac{\text{SI}\times 100}{\text{Principal}\times\text{Rate}}$$

$$= \frac{1080\times 100}{3000\times 12} = 3 \text{ years}$$

30. (3) Interest for 1 year
= ₹ (925 – 850) = ₹ 75

$\therefore$ If a sum becomes a_1 in t_1 years and a_2 in t_2 years then rate of

$$\text{interest} = \frac{100(a_2-a_1)}{(a_1t_2-a_2t_1)}\%$$

$$= \frac{100(925-850)}{850\times 4-3\times 925} = \frac{7500}{625} = 12\%$$

$$\therefore \text{ Principal} = \frac{\text{SI}\times 100}{\text{Time}\times\text{Rate}}$$

$$= \frac{75\times 100}{1\times 12} = ₹\ 625$$

Aliter : Using Rule 12,

$$P = \left(\frac{A_2T_1-A_1T_2}{T_1-T_2}\right)$$

$$= \frac{925\times 3-850\times 4}{3-4}$$

$$= \frac{2775-3400}{-1}$$

$$= \frac{-625}{-1} = ₹\ 625$$

31. (2) Using Rule 1,
S.I. = 2641.20 – 1860
= ₹ 781.2

$$\text{Time} = \frac{\text{S.I.}\times 100}{\text{Principal}\times\text{Rate}}$$

$$= \frac{781.2\times 100}{1860\times 12} = 3.5 = 3\frac{1}{2} \text{ years}$$

32. (2) Using Rule 18 of 'percentage' chapter,
Present population

$$= 10000\left(1-\frac{20}{100}\right)^2$$

$$= 10000\times\frac{4}{5}\times\frac{4}{5} = 6400$$

33. (3) Using Rule 1,
Annual interest
= 365 × 2 = ₹ 730

$$\text{Principal} = \frac{\text{S.I.}\times 100}{\text{Time}\times\text{Rate}}$$

$$= \frac{730\times 100}{1\times 5} = ₹\ 14600$$

34. (4) If principal = x and rate = r% per annum, then

$$1380 = x + \frac{x\times 3\times r}{100} \quad .....(i)$$

$$1500 = x + \frac{x\times 5\times r}{100} \quad .....(ii)$$

S.I. for two years = 1500 – 1380
= ₹ 120

$$\therefore \frac{x\times 2\times r}{100} = 120$$

$$\therefore \frac{xr}{100} = 60 \quad .....(iii)$$

$\therefore$ From equation (i)

$1380 = x + 60 \times 3$

$\Rightarrow x = 1380 - 180 =$ ₹ 1200

From equation (iii)

$$\frac{1200\times r}{100} = 60$$

$$\Rightarrow r = \frac{6000}{1200} = 5\% \text{ per annum}$$

Aliter : Using Rule 12,

$$R = \left(\frac{A_1-A_2}{A_2T_1-A_1T_2}\right)\times 100\%$$

$$= \left(\frac{1380-1500}{1500\times 3-1380\times 5}\right)\times 100\%$$

$$= \frac{-120}{4500-6900}\times 100$$

$$= \frac{-120}{-2400}\times 100$$

$= 5\%$

35. (3) S.I. for 1 year
= 14250 – 12900 = Rs. 1350
S.I. for 4 years = 1350 × 4
= ₹ 5400
$\therefore$ Principal = 12900 – 5400
= ₹ 7500

$$\therefore \text{ Rate} = \frac{\text{S.I.}\times 100}{\text{Principal}\times\text{Time}}$$

$$= \frac{5400\times 100}{7500\times 4}$$

= 18% per annum

Aliter : Using Rule 12,

$$R = \left(\frac{A_1-A_2}{A_2T_1-A_1T_2}\right)\times 100$$

$$= \left(\frac{12900-14250}{14250\times 4-12900\times 5}\right)\times 100$$

$$= \frac{-1350}{57000-64500}\times 100$$

$$= \frac{1350}{7500}\times 100$$

$= 18\%$

36. (1) Using Rule 1,
Required time = t years

$$\text{S.I.} = \frac{\text{Principal}\times\text{Rate}\times\text{Time}}{100}$$

$$\therefore \frac{6000\times 4\times 5}{100} = \frac{8000\times 3\times t}{100}$$

$\Rightarrow 6000 \times 4 \times 5 = 8000 \times 3 \times t$

$$\therefore t = \frac{6000\times 4\times 5}{8000\times 3} = 5 \text{ years}$$

37. (2) Using Rule 1,

$$\text{Principal} = \frac{\text{S.I.}\times 100}{\text{Time}\times\text{Rate}}$$

$$= \frac{1\times 100}{\frac{1}{365}\times 5} = \frac{365\times 100}{5}$$

= Rs. 7300

38. (1) S.I. for 5 years
= Rs. (1020 – 720) = Rs. 300
$\therefore$ S.I. for 2 years

$$= \frac{300}{5}\times 2 = \text{Rs. } 120$$

$\therefore$ Principal = Rs. (720 – 120)
= Rs. 600

39. (4) Using Rule 1,
Number of days from 5th January to 31st May = 26 + 28 + 31 + 30 + 31 = 146
$\therefore$ S.I.

$$= \frac{\text{Principal}\times\text{Time}\times\text{Rate}}{100}$$

$$= \frac{36000\times 146\times 9.5}{365\times 100}$$

= Rs. 1368

40. (3) $\frac{\text{Principal}}{\text{Interest}} = \frac{10}{3}$

$\Rightarrow \frac{\text{Interest}}{\text{Principal}} = \frac{3}{10}$

$\therefore$ Time $= \frac{\text{S.I} \times 100}{\text{Principal} \times \text{Rate}}$

$= \frac{3}{10} \times \frac{100}{6} = 5$ years

41. (1) Principal

$= \frac{\text{S.I.} \times 100}{\text{Time} \times \text{Rate}}$

$= \frac{60 \times 100}{5 \times 6} = \text{Rs. } 200$

42. (1) According to the question,
S.I. for 2 years 6 months
= Rs. (5500 – 4000)

$\Rightarrow$ S.I. for $\frac{5}{2}$ years = Rs. 1500

$\therefore$ S.I. for 1 year $= \frac{1500 \times 2}{5}$
= Rs. 600
$\therefore$ S.I. for 2 years = Rs. 1200
$\therefore$ Principal = Rs. (4000 – 1200)
= Rs. 2800

$\therefore$ Rate $= \frac{\text{S.I.} \times 100}{\text{Pricipal} \times \text{Time}}$

$= \frac{1200 \times 100}{2800 \times 2} = \frac{150}{7}$

$= 21\frac{3}{7}\%$ per annum.

43. (2) Principal $= \frac{\text{S.I.} \times 100}{\text{Time} \times \text{Rate}}$

$= \frac{840 \times 100}{8 \times 5} = \text{Rs. } 2100$

Case II,
S.I. = Rs. 840
Principal = Rs. 2100
Time = 5 years

Rate $= \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$

$= \frac{840 \times 100}{2100 \times 5} = 8\%$ per annum

44. (2) Let first part be x.
$\therefore$ Second part
= Rs. $(2800 - x)$
According to the question,

S.I. $= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$\therefore \frac{x \times 5 \times 9}{100}$

$= \frac{(2800 - x) \times 6 \times 10}{100}$

$\Rightarrow 3x = 4 \times 2800 - 4x$
$\Rightarrow 7x = 4 \times 2800$

$\Rightarrow x = \frac{4 \times 2800}{7} = \text{Rs. } 1600$

$\therefore$ Second part
= Rs. (2800 – 1600) = Rs. 1200

45. (2) According to the question,

$\frac{\text{S.I.}}{\text{Principal}} = \frac{2}{5}$

Rate $= \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$

$= \frac{2}{5} \times \frac{100}{5} = 8\%$ per annum
= 0.08 per annum

46. (1) Rate $= \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$

$= \frac{280 \times 100}{400 \times 10}$
= 7% per annum

47. (3) Rate $= \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$

$= \frac{\frac{1}{100} \times 100}{1 \times \frac{1}{12}} = 12\%$ p.a.

48. (3) S.I.

$= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$= \text{Rs. } \left(4000 \times \frac{18}{12} \times \frac{12}{100}\right)$

= Rs. 720

49. (2) Time $= \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Rate}}$

$= \frac{1080 \times 100}{3000 \times 12} = 3$ years

50. (3) Let the principal be Rs. x.
According to the question,
x + S.I. for 2 years
= Rs. 5182 ...(i)
x + S.I. for 3 years
= Rs. 5832 ...(ii)

By equation (ii) – (i),
S.I. for 1 year
= Rs. (5832 – 5182)
= Rs. 650
$\therefore$ S.I. for 2 years
= Rs. (2 × 650) = Rs. 1300
$\therefore$ Principal
= Rs. (5182 – 1300)
= Rs. 3882

51. (2) Principal $= \frac{\text{S.I.} \times 100}{\text{Time} \times \text{Rate}}$

$= \frac{\text{R} \times 100}{2 \times \text{R}} = \text{Rs. } 50$

52. (3)

S.I. $= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$= \frac{2000 \times 2 \times 5}{100} = \text{Rs. } 200$

$\therefore$ Required amount
= Rs. (2000 + 200)
= Rs. 2200

53. (1) S.I. = Amount – Principal
= Rs. (6900 – 6000)
= Rs. 900

$\therefore$ Rate $= \frac{\text{Interest} \times 100}{\text{Principal} \times \text{Time}}$

$= \frac{900 \times 100}{6000 \times 3}$
= 5% per annum

TYPE-II

1. (1) Principal = P

Amount $= \frac{7p}{6}$

S.I. $= \frac{7p}{6} - \text{P} = \frac{P}{6}$

$\therefore R = \frac{S.I \times 100}{P \times T} = \frac{P \times 100}{6 \times p \times 3}$

$= \frac{50}{9} = 5\frac{5}{9}\%$

Aliter : Using Rule 3,

$\text{R\%} = \frac{\left(\frac{7}{6} - 1\right) \times 100\%}{3}$

$= \frac{1}{18} \times 100\%$

$= \frac{50}{9}\%$

$= 5\frac{5}{9}\%$

2. (1) Let the principal be Re.1

$\therefore$ S.I. $= \frac{41}{40} - 1 = \frac{1}{40}$

Now, rate $= \frac{\text{Interest} \times 100}{\text{Principal} \times \text{Time}}$

$= \frac{\frac{1}{40} \times 100}{1 \times \frac{1}{4}} = \frac{100 \times 4}{40} = 10\%$

Aliter : Using Rule 3,

$R = \frac{\left(\frac{41}{40} - 1\right) \times 100\%}{\frac{1}{4}}$

$= \frac{1}{40} \times 4 \times 100\%$

$= 10\%$

3. (2) **Case-I**

Let the principal be x

Amount = $3x$

$\therefore$ Interest = $2x$

Time = 20 years

$\therefore I = \frac{PRT}{100} \Rightarrow 2x = \frac{x \times R \times 20}{100}$

$\Rightarrow R = 10\%$

Case-II

I = x

P = x

R = 10

T = ?

$\therefore I = \frac{PRT}{100} \Rightarrow x = \frac{x \times 10 \times T}{100}$

$\therefore$ T = 10 years.

Aliter : Using Rule 3,

$R\% = \frac{(3-1)}{20} \times 100\%$

$R\% = 10\%$

Now, $T = \frac{(n-1)}{R}$ years

$T = \frac{2-1}{10} \times 100$

$\boxed{T = 10 \text{ years}}$

4. (4) Using Rule 1,

Let P be the principal and R% rate of interest.

$\therefore$ S.I. $= \frac{PR \times 10}{100} = \frac{PR}{10}$

According to the question,

$\frac{PR}{10} = \left(P + \frac{PR}{10}\right) \times \frac{2}{5}$

$\Rightarrow \frac{R}{10} = \left(1 + \frac{R}{10}\right) \times \frac{2}{5}$

$\Rightarrow \frac{R}{10} = \frac{2}{5} + \frac{R}{25}$

$\Rightarrow \frac{R}{10} - \frac{R}{25} = \frac{2}{5}$

$\Rightarrow \frac{5R - 2R}{50} = \frac{2}{5}$

$\Rightarrow \frac{3R}{50} = \frac{2}{5}$

$\Rightarrow R = \frac{50 \times 2}{3 \times 5} = \frac{20}{3} = 6\frac{2}{3}\%$

5. (2) Using Rule 1,

SI = ₹ (7200–6000)

= ₹ 1200

$\therefore$ SI $= \frac{PRT}{100}$

$\Rightarrow 1200 = \frac{6000 \times R \times 4}{100}$

$\Rightarrow R = \frac{1200 \times 100}{6000 \times 4} = 5\%$

New rate of R = 5×1.5 = 7.5%

Then, SI $= \frac{6000 \times 7.5 \times 5}{100}$

= ₹ 2250

$\therefore$ Amount = ₹ (6000 + 2250)

= ₹ 8250

6. (3) Let the principal be x.

Case-I

$2x = \frac{x \times R \times 15}{100}$

$\Rightarrow R = \frac{2 \times 100}{15} = \frac{40}{3}\%$

Case-II

SI = $4x$

$\therefore 4x = \frac{x \times 40 \times T}{300}$

$\Rightarrow T = \frac{4 \times 300}{40} = 30$ years

Aliter : Using Rule 3,

$R = \frac{(3-1)}{15} \times 100\%$

$= \frac{2}{15} \times 100\%$

$= \frac{2}{3} \times 20\%$

$= \frac{40}{3}\%$

$T = \frac{(n-1)}{R}$ Years

$= \frac{(5-1)}{\frac{40}{3}} \times 100$

= 30 years.

7. (3) Let the principal be x.

$\therefore$ Amount = $2x$

$\therefore$ Interest = $(2x - x) = x$

$\therefore$ Rate $= \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$

$= \frac{x \times 100}{x \times 12} = \frac{25}{3} = 8\frac{1}{3}\%$

Aliter : Using Rule 3,

$R = \frac{(2-1)}{12} \times 100\%$

$R = \frac{25}{3}\%$

$R = 8\frac{1}{3}\%$

8. (3) Let the principal be x

$\therefore$ Principal + SI $= \frac{7x}{4}$

$\therefore$ SI $= \frac{7x}{4} - x = \frac{3x}{4}$

Rate $= \frac{\text{SI} \times 100}{\text{Principal} \times \text{Time}}$

$= \frac{3x \times 100}{4 \times x \times 4} = 18\frac{3}{4}\%$

Aliter : Using Rule 3,

$R = \frac{\left(\frac{7}{4} - 1\right)}{4} \times 100\%$

$= \frac{3}{16} \times 100\%$

$= \frac{75}{4}\%$

$R = 18\frac{3}{4}\%$

9. (4) The sum gets doubled in 5 years and tripled in 12 years. Clearly rate of interest for 12 years will be lower.
Let Principal be x.

then, Rate $= \dfrac{SI \times 100}{Principal \times Time}$

$= \dfrac{2x \times 100}{x \times 12} = \dfrac{50}{3} = 16\dfrac{2}{3}\%$

Aliter : Using Rule 3,

$R_1 = \dfrac{(2-1)}{5} \times 100\%$

$= 20\%$

$R_2 = \dfrac{(3-1)}{12} \times 100\%$

$= 16\dfrac{2}{3}\%$

$\Rightarrow$ Lower rate of interest $= 16\dfrac{2}{3}\%$

10. (3) TIme $= \dfrac{SI \times 100}{Principal \times Rate}$

$= \dfrac{x \times 100}{x \times \dfrac{25}{4}} = 16$ years

Aliter : Using Rule 3,

$T = \dfrac{(n-1)}{R\%}$ years

$= \dfrac{(2-1)}{\dfrac{25}{4}} \times 100$ years

$= 16$ years.

11. (3) If principal be x, interest $= x$ and rate = r% p.a. then

Rate $= \dfrac{SI \times 100}{Principal \times Time}$

$= \dfrac{x \times 100}{x \times 10} = 10\%$

Now, $p = x$, interest $= 2x$

Then, time $= \dfrac{SI \times 100}{Principal \times Rate}$

$= \dfrac{2x \times 100}{x \times 10} = 20$ years

Aliter : Using Rule 3,

$R = \dfrac{(2-1)}{10} \times 100\%$

$R = 10\%$

$T = \dfrac{(n-1)}{R} \times 100$ years

$= \dfrac{3-1}{10} \times 100$

$= 20$ years.

12. (4) If the principal be x, the amount $= 2x$

$\therefore$ SI $= x$

$\therefore$ Time $= \dfrac{SI \times 100}{Principal \times Rate}$

$= \dfrac{x \times 100}{x \times 15} = \dfrac{20}{3} = 6\dfrac{2}{3}$ years

Aliter : Using Rule 3,

$T = \dfrac{(n-1)}{R} \times 100\%$

$= \left(\dfrac{2-1}{15}\right) \times 100$

$= \dfrac{100}{15} = \dfrac{20}{3}$ Years

$= 6\dfrac{2}{3}$ years

13. (3) If the principal be ₹ 100 then S.I. = ₹ 100.

$\therefore$ Time $= \dfrac{S.I. \times 100}{Principal \times Rate}$

$= \dfrac{100 \times 100}{100 \times 12} = \dfrac{25}{3}$ years

= 8 years 4 months

Aliter : Using Rule 3,

$T = \dfrac{(n-1)}{R} \times 100\%$

$= \dfrac{(2-1)}{12} \times 100\%$

$= \dfrac{100}{12} = \dfrac{25}{3}$ years.

$= 8\dfrac{1}{3}$ years

= 8 years, 4 months.

14. (2) Principal = Rs. x

Amount = Rs. $2x$

$\therefore$ Interest $= 2x - x$

= Rs. x

$\therefore$ Rate $= \dfrac{S.I. \times 100}{Principal \times Time}$

$= \dfrac{x \times 100}{x \times 8} = \dfrac{25}{2}$

= 12.5 % per annum

Aliter : Using Rule 3,

R % $= \dfrac{(n-1)}{T} \times 100\%$

$= \dfrac{(2-1)}{8} \times 100\%$

$= 12.5\%$

15. (*) Principal = Rs. x

Interest = Rs. x

Rate $= \dfrac{S.I \times 100}{Principal \times Time}$

$= \dfrac{x \times 100}{x \times 16} = \dfrac{25}{4}$ % per annum

Case II,

Interest = Rs. $2x$

$\therefore$ Time $= \dfrac{S.I \times 100}{Principal \times Rate}$

$= \dfrac{2x \times 100 \times 4}{x \times 25} = 32$ years

Aliter : Using Rule 3,

$R = \dfrac{(n-1)}{T} \times 100\%$

$= \dfrac{(2-1)}{16} \times 100\%$

$= \dfrac{25}{4}\%$

$= 6\dfrac{1}{4}\%$

Now, $T = \dfrac{(n-1)}{R} \times 100$

$= \dfrac{(3-1)}{\dfrac{25}{4}} \times 100$

$= \dfrac{800}{25} = 32$ years.

16. (1) According to the question,
If principal be Rs. x, then
S.I. = Rs. x

$\therefore$ Time $= \dfrac{S.I. \times 100}{Principal \times Rate}$

$= \dfrac{x \times 100}{x \times \dfrac{25}{4}} = \dfrac{400}{25} = 16$ years

Aliter : Using Rule 3,

$$T = \left(\frac{(n-1)}{R}\right) \times 100\%$$

$$= \frac{2-1}{\frac{25}{4}} \times 100$$

$$= \frac{400}{25} = 16 \text{ years.}$$

17. (2) Using Rule 1,
Rate = R% per annum

$$\therefore \text{ Time} = \frac{R}{2} \text{ years}$$

$$\therefore \text{ Rate} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$$

$$\Rightarrow R = \frac{8}{25} \times \frac{100}{\frac{R}{2}}$$

$$\Rightarrow R^2 = \frac{8 \times 200}{25} = 64$$

$$\Rightarrow R = \sqrt{64} = 8\% \text{ per annum}$$

18. (3) Case I,
Interest = Principal

$$\text{Rate} = \frac{\text{Interest} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{100}{7}\% \text{ per annum}$$

Case II,
Interest = 3 × Principal

$$\text{Time} = \frac{\text{Interest} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{3 \times 100}{\frac{100}{7}} = 3 \times 7 = 21 \text{ years}$$

19. (4) Principal = Rs. P and time = T years

$$\therefore \text{ S.I.} = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

According to the question,

$$\therefore P + \frac{PT \times 5}{100} = 2200$$

$$\Rightarrow P + \frac{PT}{20} = 2200 \text{ ....(i)}$$

$$\text{Again, } \frac{PT \times 8}{100} - \frac{PT \times 5}{100}$$

$$= 2320 - 2200$$

$$\Rightarrow \frac{3PT}{100} = 120$$

$$\Rightarrow PT = \frac{120 \times 100}{3} = 4000 \text{ ...(ii)}$$

∴ From equation (i),

$$P + \frac{4000}{20} = 2200$$

$$\Rightarrow P = 2200 - 200 = \text{Rs. } 2000$$

∴ From equation (ii),
PT = 4000

$$\Rightarrow T = \frac{4000}{2000} = 2 \text{ years}$$

Alternative Method

Difference in rates
= 8 – 5 = 3%
∵ 3% ≡ 2320 – 2200 = 120

$$\therefore 5\% \equiv \frac{120}{3} \times 5 = 200$$

∴ Principal = Rs. (2200 – 200)
= Rs. 2000

$$\therefore \text{ Time} = \frac{200 \times 100}{2000 \times 5} = 2 \text{ years}$$

20. (2) Let principal be Rs. x.
∴ Amount = Rs. $2x$
∴ Interest = Rs. $(2x - x)$
= Rs. x

$$\therefore \text{ Rate} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{x \times 100}{x \times 15} = \frac{20}{3}$$

$$= 6\frac{2}{3}\% \text{ per annum}$$

21. (2) Principal = Rs. x
Interest = Rs. x
Time = 6 years

$$\therefore \text{ Rate} = \frac{\text{Interest} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{x \times 100}{x \times 16} = \frac{50}{3}\% \text{ per annum}$$

Case II,

$$\text{Interest} = \frac{x \times 12 \times 50}{100 \times 3} = \text{Rs. } 2x$$

i.e., Amount is thrice the principal.

22. (3) Principal = Rs. x (let)
∴ Amount = Rs. $5x$
Interest = Rs. $(5x - x)$ = Rs. $4x$

$$\therefore \text{ Rate} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{4x \times 100}{x \times 8} = 50\% \text{ per annum}$$

23. (4) Let principal be Rs. x.
∴ Amount = Rs. $2x$
Interest = Rs. $(2x - x)$ = Rs. x

$$\therefore \text{ Rate} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{x \times 100}{x \times 8} = \frac{25}{2}$$

$$= 12\frac{1}{2}\% \text{ per annum}$$

24. (3) According to the question,
Principal = Rs. x.
Interest = Rs. x.

$$\text{Time} = \frac{50}{3} \text{ years}$$

$$\therefore \text{ Rate} = \frac{\text{Interest} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{x \times 100}{x \times \frac{50}{3}} = \frac{100 \times 3}{50}$$

= 6% per annum

TYPE-III

1. (3) Let the principal be x

$$\therefore \text{ Interest} = \frac{2}{5}x$$

Rate = 8% per annum

$$\therefore \text{ Time} = \frac{\text{Interest} \times 100}{\text{Principal} \times \text{Rate}}$$

$$= \frac{\frac{2}{5}x \times 100}{x \times 8} = \frac{40}{8} = 5 \text{ years}$$

Aliter : Using Rule 5,

Here, $n = \frac{2}{5}$ and R = 8%

$$\Rightarrow RT = (n \times 100)$$

$$T = \frac{n \times 100}{R}$$

$$T = \frac{2}{5} \times \frac{100}{8}$$

$$\boxed{T = 5 \text{ years}}$$

2. (2) Let Prinicpal = ₹ 100

S.I. $= 100 \times \frac{1}{5} =$ ₹ 20

Rate $= \frac{20 \times 100}{100 \times 4} = 5\%$

Aliter : Using Rule 5,

Here, $n = \frac{1}{5}$, T = 4 years.

$R = \frac{n \times 100}{T}$

$R = \frac{1}{5} \times \frac{100}{4}$

R = 5%

3. (1) Rate $= \frac{SI \times 100}{Principal \times Time}$

$= \frac{9}{25} \times \frac{100}{6} = 6\%$ per annum

Aliter : Using Rule 5,

Here, $n = \frac{9}{25}$, T = 6 years.

$R = \frac{n \times 100}{T}$

$R = \frac{9}{25} \times \frac{100}{6}$

R = 6%

4. (1) $\frac{\text{Simple interest}}{\text{Principal}} = \frac{1}{4}$

$\therefore$ Rate $= \frac{S.I. \times 100}{Principal \times Time}$

$= \frac{1 \times 100}{4 \times 5} = 5\%$ per annum

Aliter : Using Rule 5,

Here, $n = \frac{1}{4}$, T = 5 years

$R = \frac{n \times 100}{T}$

$= \frac{1}{4} \times \frac{100}{5} = R = 5\%$

5. (2) $\frac{\text{Interest}}{\text{Principal}} = \frac{3}{8}$

$\therefore$ Rate $= \frac{S.I. \times 100}{Principal \times Time}$

$= \frac{3}{8} \times \frac{100}{\frac{25}{4}}$

$= \frac{3}{8} \times \frac{400}{25} = 6\%$ per annum

Aliter : Using Rule 5,

Here, $n = \frac{3}{8}$, $T = \frac{25}{4}$ years.

$R = \frac{n \times 100}{T}$

$= \frac{3}{8} \times \frac{100}{\frac{25}{4}}$

R = 6%

6. (2) Using Rule 1,

S.I. $= \frac{Principal \times Time \times Rate}{100}$

$\therefore 1200 + \frac{1200 \times 7 \times r}{12 \times 100}$

= Amount (A)

$\Rightarrow 1200 + 7r = A$ .....(i)

and, $1016 + \frac{1016 \times 5 \times r}{2 \times 100} = A$

$\therefore 1016 + 25.4r = A$ ...(ii)

$\therefore 1016 + 25.4r = 1200 + 7r$

$\Rightarrow 25.4r - 7r = 1200 - 1016$

$\Rightarrow 18.4r = 184 \Rightarrow r = \frac{184}{18.4}$

= 10% per annum

7. (2) Amount after 10 years

$= P\left(1 + \frac{RT}{100}\right) = P\left(1 + \frac{R \times 10}{100}\right)$

$= \text{Rs. } P\left(1 + \frac{R}{10}\right)$

$\therefore$ Interest = Rs. $P\left(1 + \frac{R}{10}\right) \times \frac{2}{5}$

$\therefore$ Rate= $\frac{S.I \times 100}{Principal \times Time}$

$\Rightarrow R = \frac{P\left(1 + \frac{R}{10}\right) \times \frac{2}{5} \times 100}{P \times 10}$

$\Rightarrow R = 4\left(1 + \frac{R}{10}\right)$

$\Rightarrow \frac{R}{4} = 1 + \frac{R}{10}$

$\Rightarrow \frac{R}{4} - \frac{R}{10} = 1$

$\Rightarrow \frac{5R - 2R}{20} = 1$

$\Rightarrow 3R = 20$

$\Rightarrow R = \frac{20}{3} = 6\frac{2}{3}\%$

Aliter : Using Rule 5,

Here, S.I. $= \frac{2}{5}$ amount

S.I. $= \frac{2}{5}$ (P + S.I.)

$\Rightarrow$ S.I. $= \frac{2}{5}$ S.I. $+ \frac{2}{5}$ P

$\Rightarrow \frac{3}{5}$ S.I. $= \frac{2}{5}$P

S.I. $= \frac{2}{3}$P

Now, n $= \frac{2}{3}$, T = 10 years.

$\Rightarrow R = \frac{n \times 100}{T}$

$= \frac{2}{3} \times \frac{100}{10}$

$= \frac{20}{3} = 6\frac{2}{3}\%$

8. (3) Rate of interest

= r % per annum

S.I. $= \frac{Principal \times Time \times Rate}{100}$

According to the question,

$\frac{3200 \times 5 \times r}{100 \times 2} - \frac{3000 \times 5 \times r}{200} = 40$

$\Rightarrow 80r - 75r = 40$

$\Rightarrow 5r = 40 \Rightarrow r = \frac{40}{5}$

= 8% per annum

Aliter : Using Rule 13,

Here, P_1 = Rs. 3000, R_1

= R, $T_1 = \frac{5}{2}$ years

P_2 = Rs. 3200,

$R_2 = R,\ T_2 = \frac{5}{2}$ years

Difference S.I. = Rs. 40

$\Rightarrow$ 40 =

$$\frac{3200 \times R \times \frac{5}{2} - 3000 \times R \times \frac{5}{2}}{100}$$

4000 = 8000 R – 7500 R

R = 8%

TYPE-IV

1. (4) According to question,
Interest of one year = ₹ 42
Rate = 5% and Time = 1 year

$$\therefore \text{Principal} = \frac{\text{Interest} \times 100}{\text{Rate} \times \text{Time}}$$

$$= \frac{42 \times 100}{5 \times 1} = ₹\ 840$$

Aliter : Using Rule 13,
P_1 = P, R_1 = 5%, T_1 = 3years.
P_2 = P, R_2 = 5%, T_2 = 4 years.
S.I.= 42

$$42 = \frac{20P - 15P}{100}$$

P = 42 × 20

P = ₹ 840

2. (3) Let r_1, and r_2 be the required rate of interest
Then,

$$13.50 = \frac{1500 \times 3 \times r_1}{100} - \frac{1500 \times 3 \times r_2}{100}$$

$$= \frac{4500}{100}(r_1 - r_2)$$

$$r_1 - r_2 = \frac{135}{450} = \frac{27}{90}$$

$$= \frac{3}{10} = 0.3\%$$

Aliter : Using Rule 13,
P_1 = Rs. 1500, R_1, T_1 = 3 years.
P_2 = Rs. 1500, R_2, T_2 = 3 years.
S.I. = Rs. 13.50
13.50

$$= \frac{1500 \times R_2 \times 3 - 1500 \times R_1 \times 3}{100}$$

$$\frac{1350}{100} = \frac{4500(R_2 - R_1)}{100}$$

$$R_2 - R_1 = \frac{1350}{4500} = \frac{27}{90}$$

$$= \frac{3}{10} = 0.3\%$$

3. (2) Using Rule 1,
We know that

$$\text{S.I.} = \frac{PRT}{100}$$

According to question,

$$\text{S.I.} = \frac{4}{9}P$$

& R = T (numerically)

$$\therefore \frac{4}{9}P = \frac{P \times R \times R}{100}$$

$$\therefore R^2 = \frac{400}{9}$$

$$R = \sqrt{\frac{400}{9}} = \frac{20}{3} = 6\frac{2}{3}\%$$

4. (4) Let the sum be x

$$\frac{x \times 5 \times 15}{100 \times 12} - \frac{x \times 4 \times 8}{100 \times 12} = 129$$

$$\Rightarrow \frac{x}{100 \times 12}(75 - 32) = 129$$

$$\Rightarrow x = \frac{129 \times 1200}{43} = ₹\ 3600$$

Aliter : Using Rule 13,
P_1 = P, R_1 = 4%, T_1

= 8 months = $\frac{8}{12}$ years

P_2 = P, R_2 = 5%, T_2

= 15 month = $\frac{15}{12}$ years

S.I. = ₹ 129

$$129 = \frac{P \times 5 \times \frac{15}{12} - P \times \frac{4 \times 8}{12}}{100}$$

$$12900 = \frac{75P - 32P}{12}$$

$$12900 = \frac{43P}{12}$$

P = ₹ 3600

5. (4) Using Rule 1,
Let the sum lent in each case be x.
Then,

$$\frac{x \times 9 \times 2}{100} + \frac{x \times 10 \times 2}{100} = 760$$

$$\frac{x \times 2}{100}(9 + 10) = 760$$

$$\Rightarrow \frac{2 \times 19x}{100} = 760$$

$$\Rightarrow x = \frac{760 \times 100}{2 \times 19} = ₹\ 2000$$

6. (1) Let the rate of interest be r% and principal be P.
According to the question.

$$\frac{16P}{25} = \frac{P \times r \times r}{100}$$

[$\because$ r = t numerically]

$$\Rightarrow r^2 = \frac{1600}{25}$$

$$\Rightarrow r = \frac{40}{5} = 8\ \%$$

Aliter : Using Rule 5,

Here, $n = \frac{16}{25}$, R = T

Now $R \times R = \frac{16}{25} \times 100$

$$R^2 = \frac{1600}{25}$$

$$R = \sqrt{\frac{1600}{25}}$$

$$R = \frac{40}{5}$$

R = 8%

7. (3) Using Rule 1,
Let the sum lent out at 12.5% be x
$\therefore$ Sum lent out at 10%
= 1500 – x

Now, $\frac{(1500 - x) \times 10 \times 5}{100}$

$$= \frac{x \times 12.5 \times 4}{100}$$

$\Rightarrow 50(1500 - x) = 50x$

$\Rightarrow 2x = 1500$

$\Rightarrow x = \frac{1500}{2} = ₹\ 750$

8. (1) Let the principal be P and rate of interest be r %

According to the question,

$\frac{30P}{100} = \frac{P \times R \times 6}{100}$

$\Rightarrow 30 = 6R$

$\Rightarrow R = 5$

Now, let interest be equal to principal in T years.

$\therefore P = \frac{P \times 5 \times T}{100}$

$\Rightarrow T = \frac{100}{5} = 20$ years.

Aliter : Using Rule 5,

Here, $n = \frac{30}{100} = \frac{3}{10}$, T = 6 years.

$\Rightarrow RT = n \times 100$

$R \times 6 = \frac{3}{10} \times 100$

$R = 5\%$

As, S.I. = P

$\Rightarrow S.I. = \frac{P \times R \times T}{100}$

$100 = RT$

$100 = 5 \times T$

This is possible only when T = 20.

9. (3) Using Rule 1,

Let the period of time be T years.

Then,

$\frac{400 \times 5 \times T}{100} = \frac{500 \times 4 \times 6.25}{100}$

$\Rightarrow T = \frac{500 \times 4 \times 6.25}{400 \times 5} = \frac{25}{4}$

$= 6\frac{1}{4}$ years

10. (2) Let the annual rate of interest = r%

Time = r years

Let the principal be x.

$\therefore$ Interest = $\frac{x}{16}$

According to the question,

$\frac{x}{16} = \frac{x \times r \times r}{100}$ [$\because$ r = t]

$\Rightarrow 16r^2 = 100$

$\Rightarrow r^2 = \frac{100}{16} = \frac{25}{4}$

$\therefore r = \sqrt{\frac{25}{4}} = \frac{5}{2} = 2\frac{1}{2}\%$

Aliter : Using Rule 5,

Here, $n = \frac{1}{16}$, R = T

$RT = n \times 100$

$R^2 = \frac{100}{16}$

$R = \sqrt{\frac{100}{16}}$

$R = \frac{10}{4}$

$R = 2\frac{1}{2}\%$

11. (1) Using Rule 1,

Let the larger part of the sum be x

$\therefore$ Smaller part = ₹ $(12000 - x)$

According to the question,

$\frac{x \times 3 \times 12}{100} = \frac{(12000 - x) \times 9 \times 16}{2 \times 100}$

$\Rightarrow 36x = (12000 - x)\ 72$

$\Rightarrow x = (12000 - x) \times 2$

$\Rightarrow x + 2x = 24000$

$\Rightarrow 3x = 24000$

$\Rightarrow x = \frac{24000}{3} = ₹\ 8000$

12. (2) Let the principal be x and rate be y% per annum.

According to the question,

$\therefore SI = \frac{P \times R \times T}{100}$

$\Rightarrow \frac{x}{4} = \frac{x \times y \times y}{100}$

$\Rightarrow y^2 = \frac{100}{4} = 25$

$\Rightarrow y = \sqrt{25} = 5\%$ per annum

Aliter : Using Rule 5,

$n = \frac{1}{5}$, R = T

$RT = n \times 100$

$R^2 = \frac{1}{4} \times 100$

$R^2 = 25$

$R = 5\%$

13. (3) Let the sum lent be x.

$\therefore \frac{x \times 7.5 \times 5}{100} - \frac{x \times 7.5 \times 4}{100} = 150$

$\Rightarrow \frac{x \times 7.5 \times 1}{100} = 150$

$\Rightarrow x = \frac{150 \times 100}{7.5} = ₹\ 2000$

Aliter : Using Rule 13,

Here, $P_1 = P$, $R_1 = 7.5\%$,

$T_1 = 4$ years.

$P_2 = P$, $R_2 = 7.5\%$, $T_2 = 5$ years.

S.I. = Rs. 150

$S.I. = \frac{P_2R_2T_2 - P_1R_1T_1}{100}$

$150 = \frac{P \times 7.5 \times 5 - P \times 7.5 \times 4}{100}$

$15000 = 7.5P$

$P = \frac{15000}{7.5}$

$P = \frac{150000}{75}$

P = ₹ 2000

14. (1) Using Rule 1,

Let first part be x and second part be $(1750 - x)$

According to the question,

$x \times \frac{8}{100} = (1750 - x) \times \frac{6}{100}$

$\Rightarrow 8x + 6x = 1750 \times 6$

$\Rightarrow 14x = 1750 \times 6$

$\Rightarrow x = \frac{1750 \times 6}{14} = ₹\ 750$

$\therefore$ Interest = 8% of 750

$= 750 \times \frac{8}{100} = ₹\ 60$

15. (3) Using Rule 1,

Let the period of time be T years.

$\therefore 800 + \frac{800 \times 12 \times T}{100}$

$= 910 + \frac{910 \times 10 \times T}{100}$

$\Rightarrow 800 + 96T = 910 + 91T$

$\Rightarrow 96T - 91T = 910 - 800$

$\Rightarrow 5T = 110$

$\Rightarrow T = \frac{110}{5} = 22$ years.

16. (3) $\frac{\text{Simple interest}}{\text{Principal}} = \frac{1}{9}$

If the annual rate of interest be r%, then

$$\text{Rate} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$$

$$\Rightarrow r = \frac{1}{9} \times \frac{100}{r}$$

$$\Rightarrow r^2 = \frac{100}{9}$$

$$\Rightarrow r = \sqrt{\frac{100}{9}} = \frac{10}{3} = 3\frac{1}{3}\%$$

Aliter : Using Rule 5,

Here, $n = \frac{1}{9}$, R = T

$$RT = n \times 100$$

$$R^2 = \frac{1}{9} \times 100$$

$$R^2 = \frac{100}{9}$$

$$R = \sqrt{\frac{100}{9}}$$

$$R = \frac{10}{3}$$

$$R = 3\frac{1}{3}\%$$

17. (2) 411, Using Rule 1,

Let 'r' be the rate of interest

$$190 = \frac{500 \times 4 \times r}{100} + \frac{600 \times 3 \times r}{100}$$

$\Rightarrow 20r + 18r = 190$

$\Rightarrow 38r = 190$

$$\Rightarrow r = \frac{190}{38} = 5\%$$

18. (2) $\frac{500 \times 2 \times R_1}{100} - \frac{500 \times 2 \times R_2}{100}$

= 2.5, where R_1 & R_2 are rate% of both banks

$\Rightarrow 10\,(R_1 - R_2) = 2.5$

$$\Rightarrow R_1 - R_2 = \frac{2.5}{10}$$

= 0.25 % per annum

Aliter : Using Rule 7,

Here, P = Rs. 500, x = Rs. 2.50,

Difference in time = 2 years.

Difference in rate = ?

$$500 = \frac{2.50 \times 100}{(\text{diff. in rate}) \times 2}$$

Different in rate = 0.25%

19. (3) Using Rule 1,

Let the principal be x.

$$\text{Time} = \frac{\text{SI} \times 100}{\text{Principal} \times \text{Rate}}$$

$$= \frac{x \times 100 \times 3}{x \times 50} = 6 \text{ years}$$

20. (2) Using Rule 1,

$$\frac{P \times r \times 1}{100} = \frac{P \times 5 \times 2}{100}$$

[$\because$ Capital is same in both cases]

$r \times 1 = 5 \times 2$

$\Rightarrow r = 10\%$

21. (1) Using Rule 1,

$$\text{S.I.} = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

$$\therefore \frac{4000 \times 3 \times x}{100}$$

$$= \frac{5000 \times 2 \times 12}{100}$$

$$\Rightarrow x = \frac{5 \times 2 \times 12}{4 \times 3}$$

= 10% per annum

22. (4) Using Rule 1,

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$\therefore y = \frac{x \times T \times R}{100}$$

$$\text{and } z = \frac{y \times T \times R}{100}$$

$$\text{So, } \frac{y}{z} = \frac{x}{y} \Rightarrow y^2 = zx$$

23. (1) Using Rule 1,

Amount lent at 8% rate of interest = ₹ x

$\therefore$ Amount lent at $\frac{4}{3}\%$ rate of interest = ₹ $(20{,}000 - x)$

$$\therefore \text{S.I.} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$\therefore \frac{x \times 8 \times 1}{100} + \frac{(20{,}000 - x) \times \frac{4}{3} \times 1}{100}$$

= 800

$$\Rightarrow \frac{2x}{25} + \frac{20{,}000 - x}{75} = 800$$

$$\Rightarrow \frac{6x + 20{,}000 - x}{75} = 800$$

$\Rightarrow 5x + 20{,}000 = 75 \times 800$

$= 60{,}000$

$\Rightarrow 5x = 60{,}000 - 20{,}000 = 40{,}000$

$$\Rightarrow x = \frac{40{,}000}{5} = ₹\ 8000$$

24. (3) Let amount invested in each company be Rs. x.

$$\text{S.I.} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

According to the question,

$$\frac{x \times 15 \times 5}{100} - \frac{x \times 12 \times 4}{100}$$

= 1350

$$\Rightarrow \frac{75x}{100} - \frac{48x}{100} = 1350$$

$$\Rightarrow \frac{27x}{100} = 1350$$

$$\Rightarrow x = \frac{1350 \times 100}{27} = \text{Rs. } 5000$$

Aliter : Using Rule 13.

Here, P_1 = Rs. P, R_1 = 12%,

T_1 = 4 years

P_2 = Rs. P, R_2 = 15%,

T_2 = 5 years

S.I. = Rs. 1350

$$\text{S.I.} = \frac{P_2 \times R_2 \times T_2 - P_1 \times R_1 \times T_1}{100}$$

$$1350 = \frac{P \times 15 \times 5 - P \times 12 \times 4}{100}$$

135000 = 75 P – 48P

135000 = 75 P

$\Rightarrow$ P = Rs. 5000

25. (3) Using Rule 1,

True discount

$$= \frac{\text{Amount} \times \text{Rate} \times \text{Time}}{100 + (\text{Rate} \times \text{Time})}$$

$$= \frac{2400 \times 5 \times 4}{100 + (5 \times 4)}$$

$= \frac{2400 \times 5 \times 4}{120}$ = Rs. 400

S.I. = $\frac{2400 \times 5 \times 4}{100}$ = Rs. 480

Required difference

= Rs. (480 – 400) = Rs. 80

TYPE-V

1. (4) Using Rule 1,

Let the sum lent at the rate of interest 5% per annum is x and at the rate of interest 8% per annum is (1550 – x)

According to the question,

$$\frac{x \times 5 \times 3}{100} + \frac{(1550 - x) \times 8 \times 3}{100} = 300$$

$$\Rightarrow \frac{15x}{100} + \frac{37200 - 24x}{100} = 300$$

$\Rightarrow$ 15x + 37200 – 24x = 300 × 100

$\Rightarrow$ 9x = 7200

$\therefore$ x = ₹ 800 and,

1550 – x = 1550 – 800 = ₹ 750

$\therefore$ Ratio of money lent at 5% to that at 8% = 800 : 750 = 16 : 15

2. (2) Using Rule 1,

Let the sum of x be lent at the rate of 4% and (5000 – x) at the rate of 5%

$$\therefore \frac{x \times 4 \times 2}{100} + \frac{(5000 - x) \times 5 \times 2}{100} = 440$$

$\Rightarrow$ 8x + 50000 – 10x = 44000

$\Rightarrow$ 2x = 50000 – 44000 = 6000

$\Rightarrow$ x = ₹ 3000

$\therefore$ ₹ (5000 – x)

= ₹ (5000 – 3000) = ₹ 2000

Now, Required ratio

= 3000 : 2000 = 3 : 2

3. (4) Required ratio = 5 : $\frac{2}{5}$ = 25 : 2

$$\frac{\text{loan amount}}{\text{Interest amount}} = \frac{5}{2}$$

$$\Rightarrow \text{Interest rate} = \frac{2}{5}$$

$$\left[\because \frac{P+I}{I} = \frac{5}{2} \Rightarrow \frac{P}{I} + 1 = \frac{5}{2}\right.$$

$$\left.\Rightarrow \frac{P}{I} = \frac{3}{2}, \text{then } I = \frac{2}{5}\right]$$

$$\frac{\text{loan amount}}{\text{Interest rate}} = \frac{5}{2/5}$$

$= \frac{25}{2}$ or 25:2

4. (1) Using Rule 1,

$$P_1 : P_2 : P_3 = \frac{1}{r_1t_1} : \frac{1}{r_2t_2} : \frac{1}{r_3t_3}$$

$$= \frac{1}{6 \times 10} : \frac{1}{10 \times 12} : \frac{1}{12 \times 15}$$

$$= \frac{1}{60} : \frac{1}{120} : \frac{1}{180}$$

= 6 : 3 : 2

5. (3) Using Rule 1,

Case-I,

Interest = 5x – 4x = x

$$\therefore x = \frac{4x \times R \times T}{100}$$

$$\Rightarrow T = \frac{25}{R} \text{ years}$$

Case-II,

$$T = \frac{25}{R} + 3 = \left(\frac{25 + 3R}{R}\right) \text{years}$$

SI = 7 y – 5y = 2y

$$\therefore 2y = \frac{5y \times R \times (25 + 3R)}{R \times 100}$$

$\Rightarrow$ 40 = 25 + 3R

$\Rightarrow$ 3R = 40 –25 = 15 %

$$\Rightarrow R = \frac{15}{3} = 5\%$$

6. (4) Using Rule 1,

$$\frac{\text{Principal}}{\text{Amount}} = \frac{10}{12}$$

$$\frac{\text{Amount}}{\text{Principal}} = \frac{\text{Principal} + \text{interest}}{\text{Principal}}$$

$$= \frac{12}{10}$$

$$\Rightarrow 1 + \frac{\text{Interest}}{\text{Principal}} = \frac{12}{10}$$

$$\Rightarrow \frac{\text{Interest}}{\text{Principal}} = \frac{2}{10} = \frac{1}{5}$$

$$\therefore \text{Rate} = \frac{1}{5} \times 100 = 20\%$$

7. (2) Using Rule 1,

$$\text{Time} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Rate}}$$

$= \frac{3}{10} \times \frac{100}{10} = 3$ years

8. (1) Using Rule 1,

First part = Rs. x and second part = (12000 – x)

$$\therefore \frac{x \times 3 \times 12}{100}$$

$$= \frac{(12000 - x) \times 9 \times 16}{200}$$

$$\Rightarrow \frac{x}{12000 - x}$$

$$= \frac{9 \times 16 \times 100}{3 \times 12 \times 200} = \frac{2}{1} = 2 : 1$$

9. (1) Using Rule 1,

Principal : Interest = 25 : 1

$\Rightarrow$ Interest : Principal = 1 : 25

$$\therefore \text{Rate} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$$

$= \frac{1}{25} \times 100 = 4\%$ per annum

10. (2) Using Rule 1,

$$\frac{\text{Principal}}{\text{Interest}} = \frac{10}{3}$$

$$\Rightarrow \frac{\text{Interest}}{\text{Principal}} = \frac{3}{10}$$

$$\therefore \text{Rate} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$$

$= \frac{3}{10} \times \frac{100}{5} = 6\%$ per annum

11. (3) Principal lent at 8% S.I.

= Rs. x.

$\therefore$ Principal lent at 10% S.I.

= Rs. (4000 – x)

$$\text{S.I.} = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

$$\therefore \frac{x \times 8}{100} + \frac{(4000 - x) \times 10}{100}$$

= 352

$\Rightarrow$ 8x + 40000 – 10x = 35200

$\Rightarrow$ 2x = 40000 – 35200 = 4800

$$\Rightarrow x = \frac{4800}{2} = \text{Rs. } 2400$$

TYPE-VI

1. (3) Using Rule 1,

Interest = ₹. (480–400) = ₹ 80

$\therefore\ 80 = \dfrac{400 \times r \times 4}{100} \Rightarrow r = 5$

Now, r = 7% (2% increase)

$\therefore$ S.I. = $\dfrac{400 \times 7 \times 4}{100} = 112$

$\therefore$ Amount = ₹ (400+112) = ₹ 512

2. (1) Using Rule 1,
Let his capital be x.
According to the question,

$\dfrac{x \times 11.5}{100} - \dfrac{x \times 10}{100} = 55.50$

or $(11.5 - 10)x = 5550$

or $1.5x = 5550$

or $x = \dfrac{5550}{1.5}$ = ₹ 3700

3. (1) Using Rule 1,
Change in SI

$= \left(\dfrac{25}{2} - 10\right)\% = \dfrac{5}{2}\%$

$\therefore\ \dfrac{5}{2}\%$ of principal = ₹ 1250

$\therefore$ Principal

= ₹ $\dfrac{1250 \times 2 \times 100}{5}$ = ₹ 50000

4. (1) Let the sum = P and original rate = R% per annum.
Then,

$\dfrac{P \times (R+3) \times 2}{100} - \dfrac{P \times R \times 2}{100} = 72$

$\Rightarrow\ \dfrac{P \times 3 \times 2}{100} = 72$

$\Rightarrow\ P = \dfrac{72 \times 100}{3 \times 2}$ = ₹ 1200

Aliter : Using Rule 13,
$P_1 = P,\ R_1 = R,\ T_1 = 2$
$P_2 = P,\ R_2 = R + 3,\ T_2 = 2$
S.I.= 72

$72 = \dfrac{P \times (R+3) \times 2 - P \times R \times 2}{100}$

7200 = 6P
P = ₹ 1200

5. (4) If the sum lent be Rs. x, then

$\dfrac{x \times 2.5 \times 3}{100} = 540$

$\Rightarrow x = \dfrac{540 \times 100}{2.5 \times 3}$ = ₹ 7200

Aliter : Using Rule 13,
$P_1 = P,\ R_1 = R,\ T_1 = 3$
$P_2 = P,\ R_2 = R + 2.5\%\ T_2 = 3$
S.I. = Rs. 540

$540 = \dfrac{P \times (R + 2.5\%) \times 3 - P \times R \times 3}{100}$

54000 = 7.5P

$P = \dfrac{540000}{75}$

P = ₹ 7200

6. (1) $\dfrac{P \times 1 \times 2}{100} = 24$

$\Rightarrow\ P = \dfrac{2400}{2}$ = ₹ 1200

Aliter : Using Rule 13,
$P_1 = P,\ R_1 = R,\ T_1 = 2.$
$P_2 = P,\ R_2 = R + 1,\ T_2 = 2$
S.I.= Rs. 24

$24 = \dfrac{P(R+1)2 - PR2}{100}$

2400 = 2PR + 2P – 2PR
P = ₹ 1200

7. (3) If the capital after tax deduction be x, then
$x \times (4 - 3.75)\ \% = 48$

$\Rightarrow \dfrac{x \times 0.25}{100} = 48$

$\Rightarrow \dfrac{x \times 25}{10000} = 48$

$\Rightarrow \dfrac{x}{400} = 48$

$\Rightarrow x = 48 \times 400$ = ₹ 19200

$\therefore$ Required capital

= $\dfrac{19200 \times 100}{96}$ = ₹ 20000

8. (1) If the principal be x, then

$\dfrac{x \times 3 \times 2}{100} = 300$

$\Rightarrow x = \dfrac{300 \times 100}{3 \times 2}$ = ₹ 5000

Aliter : Using Rule 13.
$P_1 = P,\ R_1 = R,\ T_1 = 2.$
$P_2 = P,\ R_2 = R + 3,\ T_2 = 2.$
S.I.= ₹ 300

$300 = \dfrac{P \times (R+3) \times 2 - PR2}{100}$

$300 = \dfrac{6P}{100}$

P = ₹ 5000

9. (4) Using Rule 1,
S.I. = 3264 – 2400 = ₹ 864

Rate = $\dfrac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$

$= \dfrac{864 \times 100}{2400 \times 4}$ = 9% per annum

New rate = 10% per annum

$\therefore$ S.I. = $\dfrac{2400 \times 10 \times 4}{100}$ = ₹ 960

$\therefore$ Amount = 2400 + 960
= ₹ 3360

10. (4) Using Rule 1,
S.I. = ₹ (920 – 800) = ₹ 120

$\therefore$ Rate = $\dfrac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$

$= \dfrac{120 \times 100}{800 \times 3}$

= 5% per annum
New rate = 8% per annum

$\therefore$ S.I. = $\dfrac{800 \times 3 \times 8}{100}$ = ₹ 192

$\therefore$ Amount = (800 + 192) = ₹ 992

11. (1) Using Rule 1,
Case I,
S.I. = 920 – 800 = ₹ 120

Rate = $\dfrac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$

$= \dfrac{120 \times 100}{800 \times 3}$ = 5% per annum

Case II,
Rate = 8% per annum

S.I. = $\dfrac{800 \times 8 \times 3}{100}$ = ₹ 192

$\therefore$ Amount = Principal + S.I.
= (800 + 192) = ₹ 992

12. (1) Using Rule 1,
S.I. = 2352 – 2100 = ₹ 252

Rate = $\dfrac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$

$= \frac{252 \times 100}{2100 \times 2} = 6\%$ per annum

New rate = 5%

$\therefore$ S.I. $= \frac{252 \times 5}{6} =$ ₹ 210

13. (3) Using Rule 1,
S.I. = 956 – 800 = Rs. 156

$\therefore$ Rate $= \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$

$= \frac{156 \times 100}{800 \times 3} = 6.5\%$

New rate = (6.5 + 4)%
= 10.5%

$\therefore$ S.I. $= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$= \frac{800 \times 3 \times 10.5}{100} =$ Rs. 252

$\therefore$ Amount = Rs.(800 + 252)
= Rs.1052

14. (4) Using Rule 1,
Amount deposited in bank = Rs. x (let)

Difference of rates $= 5 - \frac{7}{2}$

$= \frac{3}{2}\%$ per annum

$\therefore$ S.I.

$= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$\Rightarrow \frac{x \times 1 \times 3}{100 \times 2} = 105$

$\Rightarrow x = \frac{105 \times 200}{3} =$ Rs. 7000

TYPE-VII

1. (1) Using Rule 1,
Let x be lent at 8%, then (10000 – x) is lent at 10%.
Accordingly,

$\frac{10000 \times 9.2 \times t}{100} = \frac{x \times 8 \times t}{100} + \frac{(10000 - x) \times 10 \times t}{100}$

$\Rightarrow \frac{92000t}{100} = \frac{8xt}{100} + \frac{(10000 - x)10t}{100}$

$\Rightarrow$ 92000t = 8xt + (10000 – x) 10t

$\Rightarrow$ 92000 = 8x + 100000 – 10x
$\Rightarrow$ 2x = 8000
$\Rightarrow$ x = 4000
$\therefore$ First part = ₹ 4000
Second part = ₹. 6000

2. (1) Let x be lent on 8%.
$\therefore$ (1000 – x) is lent on 10%.
Interest = 9.2% of 1000 = ₹ 92

$\therefore 92 = \frac{x \times 8}{100} + \left(\frac{1000 - x}{100}\right) \times 10$

$\Rightarrow 8x + 10000 - 10x = 9200$
$\Rightarrow -2x = 9200 - 10000$

$\Rightarrow x = \frac{800}{2} =$ ₹ 400 = first part

$\therefore$ Second part = ₹ 600

3. (1) Interest
= (7000 + 630 × 8) – 12000
= (7000 + 5040) – 12000
= 12040 – 12000 = ₹ 40
Total Principal
= 5000 + 4370 + 3740 + 3110 + 2480 + 1850 + 1220 + 590
= ₹ 22360

$\text{Rate} = \frac{40 \times 100 \times 12}{22360 \times 1} \approx 2.1$ per cent

4. (4) Let the sum be ₹ 100.
For initial six months, Interest

$= 100 \times \frac{6}{100} \times \frac{6}{12} = 3\%$

Now, sum = 100 + 3 = ₹ 103
For another six months,
Interest

$= 103 \times \frac{6}{100} \times \frac{6}{12} = 3.09$

$\therefore$ Rate of interest per annum
= 3 + 3.09 = 6.09%

5. (3) Let the person have ₹ 100.
Then SI for 1 year

$= ₹ \left(\frac{40 \times 15 \times 1}{100} + \frac{30 \times 10 \times 1}{100} + \frac{30 \times 18 \times 1}{100}\right)$

= ₹ (6 + 3 + 5.4) = ₹ 14.4
$\therefore$ Rate of interest on whole sum
= 14.4%

6. (4) SI earned after two years

$= \frac{15600 \times 10 \times 2}{100} =$ ₹ 3120

$\therefore$ Principal for next two years
= ₹ (15600 + 3120)
= ₹ 18720
SI earned at the end of fourth year $= \frac{18720 \times 10 \times 1}{100} =$ ₹ 1872

7. (1) Let x be lent at 10% per annum.
$\therefore$ (1500 – x) is lent at 7% per annum.
Now,

$\frac{x \times 10 \times 3}{100} + \frac{(1500 - x) \times 7 \times 3}{100} = 396$

$\Rightarrow 30x + 31500 - 21x$
$= 39600$
$\Rightarrow 9x = 39600 - 31500$

$\Rightarrow x = \frac{8100}{9} =$ ₹ 900

8. (2) Let each instalment be x.
Then,

$\left(x + \frac{x \times 4 \times 1}{100}\right) + \left(x + \frac{x \times 4 \times 2}{100}\right) + \left(x + \frac{x \times 4 \times 3}{100}\right) + x = 848$

$\Rightarrow \left(x + \frac{x}{25}\right) + \left(x + \frac{2x}{25}\right) + \left(x + \frac{3x}{25}\right) + x$
$= 848$

$\Rightarrow \frac{26x}{25} + \frac{27x}{25} + \frac{28x}{25} + x = 848$

$\Rightarrow \frac{26x + 27x + 28x + 25x}{25} = 848$

$\Rightarrow 106x = 848 \times 25$

$\Rightarrow x = \frac{848 \times 25}{106} =$ ₹ 200

Aliter : Using Rule 10,
Here, A = ₹ 848,
T = 4 years, r = 4%
Equal instalment

$= \frac{848 \times 200}{4[200 + (4 - 1)4]}$

$= \frac{848 \times 200}{4 \times 212} =$ ₹ 200

9. (3) Using Rule 1.
Remaining amount
= ₹ (50000 – (8000 + 24000))
= ₹18000
Let ₹ 18000 be lent at the rate of r% p.a.
According to the question,

$$\frac{8000\times11\times1}{2\times100}+\frac{24000\times6\times1}{100}$$

$$+\frac{18000\times r\times1}{100}=3680$$

$\Rightarrow 440 + 1440 + 180r = 3680$

$\Rightarrow 1880 + 180r = 3680$

$\Rightarrow 180r = 3680 - 1880 = 1800$

$$\Rightarrow r=\frac{1800}{180}=10\%$$

10. (2) Using Rule 1.

Let the principal be x.

$$\therefore\ I_1=\frac{x\times10\times1}{2\times100}=\frac{x}{20}$$

$$I_2=\frac{x\times9\times1}{3\times100}=\frac{3x}{20}$$

$$I_3=\frac{x}{6}\times\frac{12\times1}{100}=\frac{x}{50}$$

$\therefore\ I_1 + I_2 + I_3$

$$=\left(\frac{x}{20}+\frac{3x}{100}+\frac{x}{50}\right)$$

$$=\left(\frac{5x+3x+2x}{100}\right)=\frac{x}{10}$$

$\therefore$ Average annual rate = 10%

11. (3) Using Rule 1.

If the principal be x, then

Simple interest $= (770 - x)$

$$\therefore\ \text{Principal}=\frac{\text{S.I.}\times100}{\text{Time}\times\text{Rate}}$$

$$\Rightarrow x=\frac{(770-x)\times100}{4\times10}$$

$\Rightarrow 2x = (770 - x) \times 5$

$\Rightarrow 2x + 5x = 770 \times 5$

$\Rightarrow 7x = 770 \times 5$

$$\therefore x=\frac{770\times5}{7}=₹\ 550$$

12. (4) Using Rule 1.

S.I. on ₹ 12000

$$=\frac{12000\times8\times1}{100}=₹\ 960$$

Desired gain on ₹ 20000

$$=20000\times\frac{10}{100}=₹\ 2000$$

$\therefore$ S.I. on ₹ 8000 = 2000 – 960

= ₹ 1040

$$\therefore\ \text{Rate}=\frac{\text{S.I.}\times100}{\text{Principal}\times\text{Time}}$$

$$=\frac{1040\times100}{8000}$$

= 13% per annum

13. (2) Using Rule 1.

S.I. after five years

$$=\frac{\text{Principal}\times\text{Time}\times\text{Rate}}{100}$$

$$=\frac{12000\times5\times10}{100}=₹\ 6000$$

Interest earned

= ₹— (6000 – 3320) = ₹ 2680

$$\therefore\ \text{Rate}=\frac{\text{S.I.}\times100}{\text{Principal}\times\text{Time}}$$

$$=\frac{2680\times100}{12000\times3}=\frac{67}{9}=7\frac{4}{9}\%$$

14. (4) Using Rule 1.

Case I

Let principal be x then Amount $= 3x$

S.I. $= 2x$

$$\therefore\ \text{Rate}=\frac{\text{S.I.}\times100}{\text{Principal}\times\text{Time}}$$

$$=\frac{2x\times100}{x\times8}=25\%$$

Case II

$$\text{Time}=\frac{\text{S.I.}\times100}{\text{Principle}\times\text{Rate}}$$

$$=\frac{3x\times100}{x\times25}=12\ \text{years}$$

15. (2) Using Rule 1.

Required percent

$$=\frac{1}{4}\times3+\frac{2}{3}\times5+\left(1-\frac{1}{4}-\frac{2}{3}\right)\times11$$

$$=\frac{3}{4}+\frac{10}{3}+\frac{11}{12}=\frac{9+40+11}{12}=5\%$$

16. (1) Using Rule 1.

$$120=\frac{300\times4\times r}{100}+\frac{400\times3\times r}{100}$$

$\Rightarrow 24r = 120$

$$\Rightarrow r=\frac{120}{24}=5\%\ \text{per annum}$$

17. (3) Using Rule 1.

If the sum of money be x, then

$$\frac{x\times6\times3}{100}+\frac{x\times5\times9}{100}+\frac{x\times3\times13}{100}$$

= 8160

$\Rightarrow 18x + 45x + 39x = 816000$

$\Rightarrow 102x = 816000$

$$\Rightarrow x=\frac{816000}{102}=₹\ 8000$$

18. (3) Using Rule 1.

If each amount lent be x, then

$$\frac{x\times7\times4}{100}+\frac{x\times5\times4}{100}=960$$

$$\Rightarrow\frac{48x}{100}=960$$

$$\Rightarrow x=\frac{960\times100}{48}=₹\ 2000$$

19. (3) Using Rule 1.

Let the money lent to Tom be Rs. x.

Simple interest

$$=\frac{\text{Principal}\times\text{Time}\times\text{Rate}}{100}$$

$$\therefore\ \frac{500\times8\times4}{100}+\frac{x\times8\times4}{100}$$

= 210

$$\Rightarrow 160+\frac{32x}{100}=210$$

$$\Rightarrow\frac{32x}{100}=210-160=50$$

$$\Rightarrow x=\frac{50\times100}{32}=\text{Rs. }156.25$$

20. (1) Using Rule 1.

$$\text{Rate}=\frac{20}{3}\%\ \text{per annum}$$

$\therefore$ S.I.

$$=\frac{\text{Principal}\times\text{Time}\times\text{Rate}}{100}$$

$$=\frac{2600\times20\times T}{3\times100}$$

$\therefore$ Required Time = 3 years

21. (1) Using Rule 1.

Principal = Rs. (60000 – 10000)

= Rs. 50000

$\therefore$ S.I. = $\dfrac{50000 \times 15 \times 2}{100}$

= Rs. 15000

22. (2) Using Rule 1.

Let the loans taken by A, B and C be Rs. x, Rs. y and Rs. z respectively.

$\therefore$ $x + y + z$ = Rs. 7930

S.I. = $\dfrac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

According to the question,

$x + \dfrac{x \times 2 \times 5}{100} = y + \dfrac{y \times 3 \times 5}{100}$

$= z + \dfrac{z \times 4 \times 5}{100}$

$\Rightarrow \dfrac{100x + 10x}{100}$

$= \dfrac{100y + 15y}{100} = \dfrac{100z + 20z}{100}$

$\Rightarrow 110x = 115y = 120z$

$\Rightarrow 22x = 23y = 24z$

$\Rightarrow \dfrac{22x}{6072} = \dfrac{23y}{6072} = \dfrac{24z}{6072}$

[LCM of 22, 23 and 24 = 6072]

$\Rightarrow \dfrac{x}{276} = \dfrac{y}{264} = \dfrac{z}{253}$

$\therefore$ $x : y : z$ = 276 : 264 : 253

Sum of terms of ratio

= 276 + 264 + 253 = 793

$\therefore$ A's loan = $\dfrac{276}{793} \times 7930$

= Rs. 2760

23. (2) Using Rule 1.

Remaining amount

= Rs. (16000 – 4000)

= Rs. 12000

$\therefore$ S.I.

= $\dfrac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

= $\dfrac{12000 \times 15 \times 12}{12 \times 100}$ = Rs. 1800

$\therefore$ Total amount paid

= Rs. (16000 + 1800)

= Rs. 17800

24. (*) Using Rule 1.

S.I. after 1 year

= $\dfrac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

= $\dfrac{x \times 5}{100}$ = Rs. $\dfrac{x}{20}$

Principal for 2nd year

= Rs. $\left(2x + \dfrac{x}{20}\right)$ = Rs. $\dfrac{41x}{20}$

S.I. after second year

= Rs. $\left(\dfrac{41x}{20} \times \dfrac{5}{100}\right)$

= Rs. $\dfrac{41x}{400}$

Principal for third year

= Rs. $\left(3x + \dfrac{41x}{400}\right)$

= Rs. $\left(\dfrac{1200x + 41x}{400}\right)$

= Rs. $\dfrac{1241x}{400}$

$\therefore$ S.I. after 3rd year

= Rs. $\left(\dfrac{1241x}{400} \times \dfrac{5}{100}\right)$

= Rs. $\dfrac{1241x}{8000}$

$\therefore$ Required amount

= Rs. $\left(3x + \dfrac{1241x}{8000}\right)$

= Rs. $\left(\dfrac{24000x + 1241x}{8000}\right)$

= Rs. $\left(\dfrac{25241x}{8000}\right)$

25. (3) Using Rule 1.

S.I. = $\dfrac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

= $\dfrac{100000 \times 6 \times 6}{100}$ = Rs. 36000

Total pocket money

= 6 × 2500 = Rs. 15000

Total expenses of trust

= 6 × 500 = Rs. 3000

Total expenses

= Rs. (15000 + 3000)

= Rs. 18000

$\therefore$ Amount to be received by the boy

= Rs. (100000 + 36000 – 18000)

= Rs. 118000

26. (1) Let amounts be equal in T years.

S.I. = $\dfrac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$\therefore$ P + $\dfrac{\text{P} \times x \times \text{T}}{100}$

= Q + $\dfrac{\text{Q} \times y \times \text{T}}{100}$

$\Rightarrow \dfrac{\text{P}\,x\,\text{T}}{100} - \dfrac{\text{Q}\,y\,\text{T}}{100} = \text{Q} - \text{P}$

$\Rightarrow \text{T}\left(\dfrac{\text{P}x - \text{Q}y}{100}\right) = \text{Q} - \text{P}$

$\Rightarrow \text{T} = 100\left(\dfrac{\text{Q} - \text{P}}{\text{P}x - \text{Q}y}\right)$

27. (4) Let the principal be Rs. 100

Interest = Rs. 10

Actual principal = Rs. 90

$\because$ Interest on Rs. 90 = Rs. 10

$\therefore$ Interest on Rs. 100

= $\dfrac{10}{90} \times 100$

= $\dfrac{100}{9} = 11\dfrac{1}{9}\%$

28. (2) Let the principal be Rs. P.

S.I. = $\dfrac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

= $\dfrac{\text{P} \times 5 \times 5}{100}$ = Rs. $\dfrac{\text{P}}{4}$

Amount = P + $\dfrac{\text{P}}{4}$ = Rs. $\dfrac{5\text{P}}{4}$

According to the question,

$\dfrac{5\text{P}}{4} \times \dfrac{2}{100} = 5$

$\Rightarrow \dfrac{\text{P}}{40} = 5$

$\Rightarrow$ P = 40 × 5

= Rs. 200

29. (1) Principal = Rs. 1950, Rate = 10% per annum

S. I. = $\dfrac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

= $\dfrac{1950 \times 1 \times 10}{100}$ = Rs. 195

TEST YOURSELF

1. A Co-operative Bank gives H.B. loans under the condition that if the loan be cleared with interest in five years, the rate of simple interest per year is 5%, otherwise it will be 7%. Mr. Rahim and Mr. Ram take the same amount of H.B. loan and clear the loan with interest in 5 and 8 years respectively. If Ram pays Rs. 62,000 more, what is the amount of loan taken by each of them ?

(1) Rs. 200000 (2) Rs. 180000
(3) Rs. 190000 (4) Rs. 210000

2. A person on retirement gets Rs. 3,20,000 from his gratuity and P.F. He wants to invest this amount in Post Office and Bank in such a way that he earns a total interest of Rs. 27,600 every year. If the annual rate of interest in Post Office and Bank be respectively 9% and 8%, What are the amounts invested in Post Office and Bank respectively ?

(1) Rs. 200000, Rs. 120000
(2) Rs. 180000 and Rs. 140000
(3) Rs. 185000, Rs. 135000
(4) None of these

3. Rahim lent a sum to Anil at a simple interest of 10% per annum, and at the same time lent to Sunil a sum, which was Rs. 2000 more than the amount lent to Anil at the simple interest of 12% per annum. At the end of 3 years, both Anil and Sunil returned the principal and interest to Rahim. If Rahim got Rs. 1020 more interest from Sunil than that from Anil, how much did each borrow from Rahim ?

(1) Rs. 2500, Rs. 4500
(2) Rs. 4000, Rs. 6000
(3) Rs. 5000, Rs. 7000
(4) Rs. 6000, Rs. 8000

4. A person made a fixed deposit of Rs. 30,000 in a bank for 5 years at 10% simple interest per annum. He had to withdraw the whole amount after 3 years to meet the expenses of his daughter's marriage and he received Rs. 7800 less than what he would have got after 5 years. What is the rate of simple interest per annum paid by the bank for this premature encashment ?

(1) 6% (2) 7%
(3) 8% (4) 9%

5. In 4 years, ₹ 6000 amounts to ₹ 8,000. In what time at the same rate will ₹ 525 amount to ₹ 700 ?

(1) 5 years (2) 3 years
(3) 4 years (4) None of these

6. Find the interest on ₹ 1460 at 10% from 5th February, 1992 to 25th April, 1992.

(1) ₹ 32 (2) ₹ 36
(3) ₹ 40 (4) ₹ 34

7. Find the amount Ram will get after 2 years when he invests ₹ 15000 at 15% interest.

(1) ₹ 18500 (2) ₹ 19500
(3) ₹ 17500 (4) ₹ 16500

8. At what rate per annum will a sum of ₹ 5000 amount to ₹ 6000 in 4 years?

(1) 6% Percent Per annum
(2) 4% Percent Per annum
(3) 5% Percent Per annum
(4) 4.5% Percent Per annum

9. Ram lent ₹ 1200 to Shyam for 5 years and ₹ 1500 to Mohan for 2 years received altogether ₹ 900 as interest. Find the rate per annum.

(1) 8.5% (2) 8%
(3) 9% (4) 10%

10. A certain sum of money amounts to Rs. 1680 in 3 years and to ₹ 1800 in 5 years. Find the sum and the rate of interest.

(1) ₹ 1500; 4% (2) ₹ 1200; 4%
(3) ₹ 1600; 5% (4) ₹ 1800; 5%

11. In how many years will a sum of money double itself at 5% rate of interest?

(1) 18 years (2) 20 years
(3) 22 years (4) 15 years

12. A man lends a certain sum of money and gets an interest equal to $\frac{1}{16}$th of the principal. The time for which money was lent is equal to the rate of interest. Find the rate of interest per annum.

(1) 4% (2) 3.5%
(3) 3% (4) 2.5%

13. A man borrowed ₹ 16000 from two persons. He paid 6% interest to one and 10% per annum to the other. In one year he paid total interest ₹1120. How much did he borrow at each rate?

(1) ₹ 10000 ; ₹ 6000
(2) ₹ 12000 ; ₹ 4000
(3) ₹ 11000 ; ₹ 5000
(4) ₹ 12500 ; ₹ 3500

14. A borrowed ₹ 1500 at 4% per annum and ₹1400 at 5% per annum for the same period. He paid ₹ 390 as total interest. Find the time for which he borrowed the sum.

(1) 3.5 years (2) 2.5 years
(3) 3 years (4) 4 years

15. Find the annual instalment that will discharge a debt of ₹12900 due in 4 years at 5% per annum simple interest.

(1) ₹ 2750 (2) ₹ 2150
(3) ₹ 2500 (4) ₹ 3000

16. A certain sum of money amounts to ₹ 6780 in 2 years and to ₹ 7360.50 in $3\frac{1}{2}$ years. Find the sum and the rate of interest.

(1) ₹ 6006 ; 6.4 Percent Per annum
(2) ₹ 8006 ; 6.4 Percent Per annum
(3) ₹ 5006 ; 5 Percent Per annum
(4) ₹ 5506 ; 5 Percent Per annum

17. If ₹ 5600 amounts to ₹ 6678 in $3\frac{1}{2}$ years, what will ₹ 9600 amount to in $5\frac{1}{4}$ years at the same rate of interest ?

(1) ₹ 12732 (2) ₹ 12372
(3) ₹ 12722 (4) ₹ 12237

18. A man promises to his wife a birthday present, given her each year a number of rupees equal to the number of years in her age. If her birthday falls on August 8, what sum must be placed at simple interest at 7% on January 1 before she is 63 (non leap year) in order to raise the required sum ?

(1) ₹ 1600 (2) ₹ 1550
(3) ₹ 1500 (4) ₹ 1450

19. It is decided that a loan of ₹ 10,000 will be paid off at the rate of ₹ 800 per month in 15 equal instalments. Find out the rate of return on investment.

(1) 17% P.a. (2) 18% P.a.
(3) 15% P.a. (4) 16% P.a.

20. A person takes loan of ₹ 4,000 on the condition that he would pay it in the monthly instalment of ₹ 500. He has to pay interest @ 6% on the outstanding balances, then find out the average rate of interest received by the creditor.

(1) $3\frac{3}{8}$% Percent Per annum

(2) $2\frac{3}{8}$% Percent Per annum

(3) $4\frac{3}{8}$% Percent Per annum

(4) $3\frac{1}{8}$% Percent Per annum

21. Divide ₹ 6800 into two parts so that S.I. on the first part for $3\frac{1}{3}$ years at 6% may be equal to the interest on the second part for $3\frac{1}{2}$ years at 4% Percent Per annum

(1) ₹ 2600 ; ₹ 4200
(2) ₹ 2800 ; ₹ 4000
(3) ₹ 2500 ; ₹ 4300
(4) ₹ 2700 ; ₹ 4100

SHORT ANSWERS

1. (1)	**2.** (1)	**3.** (3)	**4.** (3)
5. (3)	**6.** (1)	**7.** (2)	**8.** (3)
9. (4)	**10.** (1)	**11.** (2)	**12.** (4)
13. (2)	**14.** (3)	**15.** (4)	**16.** (1)
17. (2)	**18.** (3)	**19.** (4)	**20.** (1)
21. (2)			

EXPLANATIONS

1. (1) Let amount of loan per head be Rs. x.

$$\text{S.I.} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$\therefore \frac{x \times 7 \times 8}{100} - \frac{x \times 5 \times 5}{100}$$

$= 62000$

$$\Rightarrow \frac{56x}{100} - \frac{25x}{100} = 62000$$

$\Rightarrow 31x = 6200000$

$\Rightarrow x =$ Rs. 200000

2. (1) Let the amount in Post office be Rs. x.

$\therefore$ Amount in Bank

$=$ Rs. $(320000 - x)$

$$\text{S.I.} = \frac{\text{P} \times \text{R} \times \text{T}}{100}$$

$$\therefore \frac{x \times 9}{100} + \frac{(320000 - x) \times 8}{100}$$

$= 27600$

$\Rightarrow 9x + 2560000 - 8x = 2760000$

$\Rightarrow x = 2760000 - 2560000$

$=$ Rs. 200000

$\therefore$ Amount in bank

$=$ Rs. $(320000 - 200000)$

$=$ Rs. 120000

3. (3) Sum given to Anil = Rs. x

Sum given to Sunil =Rs. $(x + 2000)$

$$\text{S.I.} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$\Rightarrow \frac{(x + 2000) \times 12 \times 3}{100} - \frac{x \times 10 \times 3}{100}$$

$= 1020$

$\Rightarrow 36x + 72000 - 30x = 102000$

$\Rightarrow 6x = 102000 - 72000 = 30000$

$\Rightarrow x =$ Rs. 5000

$\therefore$ Sum given to Sunil

$=$ Rs. 7000

4. (3) $\text{S.I.} = \frac{\text{P} \times \text{R} \times \text{T}}{100}$

Let the required rate of interest be R% per annum.

$$\therefore \frac{30000 \times 5 \times 10}{100} - \frac{30000 \times 3 \times \text{R}}{100}$$

$= 7800$

$\Rightarrow 15000 - 900\text{R} = 7800$

$\Rightarrow 900\text{R} = 15000 - 7800 = 7200$

$\Rightarrow \text{R} = \frac{7200}{900} = 8\%$ per annum.

5. (3) Case-I,

Interest = 8000 – 6000

= Rs. 2000

$$\text{Rate} = \frac{\text{Interest} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{2000 \times 100}{6000 \times 4} = \frac{25}{3}\%$$

$\therefore$ Case-II,

$$\text{Time} = \frac{175 \times 100}{525 \times \frac{25}{3}} = 4 \text{ years}$$

6. (1) $P =$ ₹ 1460

$R = 10\%$

1992 is a leap year

$\therefore T = (24 + 31 + 25)$ days = 80 days.

$$I = \frac{PRD}{36500}$$

$$I = \frac{1460 \times 10 \times 80}{36500}$$

$I =$ ₹ 32.

Note : We have excluded 5th February but included 25th

7. (2) Here, $P =$ ₹ 15000

$R = 15\%$

$T = 2$ years

$$A = P\left(\frac{100 + RT}{100}\right)$$

$$= 15000\left(\frac{100 + 15 \times 2}{100}\right)$$

$$= 15000 \times \frac{130}{100}$$

$A =$ ₹19500.

8. (3) Here, P = ₹ 5000
A = ₹ 6000
T = 4 years
So, $I = A - P$
= ₹ (6000 – 5000) = ₹ 1000

$$R = \frac{100I}{PT}$$

$$R = \frac{100 \times 1000}{5000 \times 4}$$

R = 5%.

9. (4) $I = I_1 + I_2$

$$I = \frac{P_1RT_1}{100} + \frac{P_1RT_2}{100}$$

$$I = \frac{R}{100}(P_1T_1 + P_2T_2)$$

or, $\boxed{R = \frac{100\,I}{P_1T_1 + P_2T_2}}$

Here, I = ₹ 900
P_1 = ₹ 1200
T_1 = 5 years
P_2 = ₹ 1500
T_2 = 2 years

$$R = \frac{100 \times 900}{(1200 \times 5) + (1500 \times 2)}$$

$$R = \frac{90{,}000}{9{,}000}$$

R = 10%.

Note : In case of more than two investment, sum the products of principal and time of each case.

10. (1) $A = P + I$
So, P remains same in both cases. Only amount of interest is different in two cases because the time period are different.
P + Interest for 5 years = ₹ 1800
and P + Interest for 3 years
= ₹ 1680
On subtraction we get,
Interest for 2 years = ₹ 120
Now, we solve for the case of 3 years.
Interest for 3 years

$$= ₹120 \times \frac{3}{2} = ₹\ 180$$

And amount after 3 years
= ₹1680
Principal (P) = $A - I$
= ₹ (1680 – 180) = ₹ 1500.

$$R = \frac{100\,I}{PT}$$

$$\Rightarrow R = \frac{100 \times 180}{1500 \times 3} \Rightarrow R = 4\%.$$

Note : Alternatively, we could have solved for 5 years too and got the same answer.

11. (2) A sum doubles itself when amount of interest becomes equal to the principal.
So, $I = P$
Given, R = 5%

$$T = \frac{100\,I}{PR}$$

On substitution we get,

$$T = \frac{100 \times P}{P \times 5}$$

T = 20 years.

12. (4) $I = \frac{PRT}{100}$

Given : $I = \frac{P}{16}$

and $T = R$
So, on substitution we get

$$\frac{P}{16} = \frac{P \times R \times R}{100}$$

$$\Rightarrow R^2 = \frac{100}{16}$$

$$\Rightarrow R = \frac{10}{4}\% = \frac{5}{2}\% = 2\frac{1}{2}\%.$$

13. (2) Let the sum borrowed at 6% be ₹ $x = P_1$
Then the sum borrowed at 10% = ₹ (16000 – x) = P_2
Time is one year in both cases
R_1 = 6%
R_2 = 10%
$I = I_1 + I_2$

$$I = \frac{P_1R_1T}{100} + \frac{P_2R_2T}{100}$$

$$I = \frac{T}{100}(P_1R_1 + P_2R_2)$$

or $P_1R_1 + P_2R_2 = \frac{100\,I}{T}$

On substitution we get,
$(x \times 6) + (16000 - x)10$

$$= \frac{100 \times 1120}{1}$$

$\Rightarrow$ 160000 – 4x = 112000
$\Rightarrow$ 4x = 48000
$\Rightarrow x$ = ₹ 12000
and 16000 – x = ₹ 4000.

14. (3) $I = I_1 + I_2$

$$I = \frac{P_1R_1T}{100} + \frac{P_2R_2T}{100}$$

or $T = \frac{100\,I}{P_1R_1 + P_2R_2}$

$$= \frac{100 \times 390}{(1500 \times 4) + (1400 \times 5)}$$

$$= \frac{39000}{13000}$$

T = 3 years.

15. (4) Let each equal annual instalment be x.
First instalment is paid after 1 year and hence will remain with the lender for the remaining (4 – 1) = 3 years.
Similarly, second instalment will remain with the lender for 2 years, third instalment for 1 year and the final fourth instalment remain x as such.
$A = A_1 + A_2 + A_3 + A_4$

$$A = P\left(\frac{100 + RT}{100}\right)$$

$\Rightarrow A$

$$= x\left[\frac{100 + 5 \times 3}{100} + \frac{100 + 5 \times 2}{100} + \frac{100 + 5 \times 1}{100} + \frac{100 + 5 \times 0}{100}\right]$$

$\Rightarrow$ 12900

$= x\left[\frac{115+110+105+100}{100}\right]$

$\Rightarrow 12900 = \frac{430}{100}x$

$\Rightarrow x = \frac{12900 \times 100}{430}$

$\Rightarrow x =$ ₹ 3000

16. (1) Principal + S.I. for $3\frac{1}{2}$ years

= ₹ 7360.50 ..... (i)

Principal + S.I. for 2 years

= ₹ 6780 ..... (ii)

On subtracting equation (ii) from (i),

S.I. for $1\frac{1}{2}$ years = ₹ 580.50

∴ S.I. for 2 years

$= ₹\left(\frac{580.50 \times 2 \times 2}{3}\right) = ₹\ 774$

∴ Principal = ₹ (6780 – 774)

= ₹ 6006

And, rate of interest

$= \frac{774 \times 100}{6006 \times 2} = 6.4\%$ per annum.

17. (2) Interest = ₹ (6678 – 5600)

= ₹ 1078

$\text{Rate} = \frac{\text{Interest} \times 100}{\text{Principal} \times \text{Time}}$

$= \frac{1078 \times 100 \times 2}{5600 \times 7}$

$= 5\frac{1}{2}\%$ per annum

∴ S.I. on ₹ 9600 for $5\frac{1}{4}$ years

$= ₹\left(\frac{9600}{100} \times \frac{21}{4} \times \frac{11}{2}\right) = ₹\ 2772$

∴ Amount = ₹ (9600 + 2772)

= ₹ 12372

18. (3) Let the sum be ₹ 100.

Number of days from January 1 to August 8 = 31 + 28 + 31 + 30 + 31 + 30 + 31 + 7 = 219 days

$= \frac{219}{365}$ year $= \frac{3}{5}$ year

S.I. on ₹ 100 for $\frac{3}{5}$ year at 7%

$= ₹\left(\frac{100 \times 3 \times 7}{100 \times 5}\right) = ₹\ \frac{21}{5}$

If required money is ₹ $\frac{21}{5}$, sum

= ₹ 100

If required money is Rs. 63, sum

$= ₹\left(100 \times \frac{5}{21} \times 63\right)$

= ₹ 1500

19. (4) Number of monthly instalments = 15

Monthly instalment = ₹ 800

Time (T) = $\frac{15}{12} = 1\frac{1}{4}$

∴ Total amount paid

= ₹ (800 × 15) = ₹ 12,000

Interest = ₹ (12,000 – 10,000)

= ₹ 2,000

When

Investment	Interest	Years
10,000 ↑	2000 ↑	$1\frac{1}{4}$ ↓
100	?	1

∴ Rate of return

$= \frac{100 \times 2{,}000 \times 1 \times 4}{10{,}000 \times 5} = 16\%$

20. (1) Monthly instalment = ₹ 500

Total loan = ₹ 4000

∴ Number of instalments

$= \frac{4{,}000}{500} = 8$

Once the payment starts, outstanding balances will go on diminishing.

Hence, from point of view of interest, principal = 4000 + 3500 + 3000 + 2,500 + 2000 + 1500 + 1,000 + 500 = ₹ 18,000

∴ Interest on ₹ 18,000 for 1 month at 6% P.a.

$= \frac{18000 \times 6 \times 1}{100 \times 12} =$ ₹ 90

Average rate of interest

$= \frac{I \times 100}{P \times T}$

$\boxed{T = 8\text{ months} = \frac{8}{12}}$ year

$= \frac{90 \times 100 \times 12}{4000 \times 8}$

$= \frac{27}{8}\% = 3\frac{3}{8}\%$

21. (2) Let the first part be x. Then second part = (6800 – x)

Interest on first part for $3\frac{1}{3}$ years at 6%

$= \frac{x \times 6 \times \frac{10}{3}}{100} = \frac{x}{5}$

Interest on second part for $3\frac{1}{2}$ years at 4%

$= \frac{(6800 - x) \times 4 \times \frac{7}{2}}{100}$

$= ₹\frac{(6800 - x)\ 7}{50}$

According to the problem,

$\frac{x}{5} = \frac{(6800 - x)\ 7}{50}$

$\Rightarrow 10x = (6800 - x)\ 7$

$\Rightarrow 10x = 47600 - 7x$

$\Rightarrow 17x = 47600$

$\Rightarrow x = 2800$

Hence, first part = ₹ 2800 and second part

= ₹ (6800 – 2800) = ₹ 4000.

11 COMPOUND INTEREST

Importance : In examinations of different levels 1 or 2 questions of compound interest are essentially asked, they differ in difficulty level. Questions are of limited variety and hence, marks may be ensured with preparation.

Scope of questions : Questions asked in different examinations are mainly of two types – Based on compound interest only and based on both of simple interest and compound interest. Rate of interest may be yearly, half yearly or quarterly. EMI (Equal Monthly Installments) based questions are also asked.

Way to success : Questions can be solved easily by learning basic concepts and formulae learning squares and cubes of numbers will increase speed.

RULE 1 : If A = Amount, P = Principal, r = Rate of Compound Interest (C.I.), n = no. of years then,

$$A = P\left(1+\frac{r}{100}\right)^n, \text{ C.I.} = A - P$$

$$\text{C.I.} = P\left[\left(1+\frac{r}{100}\right)^n - 1\right]$$

RULE 2 : Compound interest is calculated on four basis:

	Rate	Time(n)
Annually	r%	t years
Half–yearly (Semi-annually)	$\frac{r}{2}$%	t × 2 years
Quarterly	$\frac{r}{4}$%	t × 4 years
Monthly	$\frac{r}{12}$%	t × 12 years

RULE 3 : If there are distinct 'rates of interest' for distinct time periods i.e.,

Rate for 1st year $\rightarrow r_1$%

Rate for 2nd year $\rightarrow r_2$ %

Rate for 3rd year $\rightarrow r_3$ % and so on

$$\text{Then } A = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)\left(1+\frac{r_3}{100}\right)\ldots\ldots\ldots\ldots$$

C.I. = A – P

RULE 4 : If the time is in fractional form i.e., t = nF, then

$$A = P\left(1+\frac{r}{100}\right)^n\left(1+\frac{rF}{100}\right) \text{ e.g. } t = 3\frac{5}{7} \text{ yrs, then}$$

$$A = P\left(1+\frac{r}{100}\right)^3\left(1+\frac{r}{100}\times\frac{5}{7}\right)$$

RULE 5 : A certain sum becomes 'm' times of itself in 't' years on compound interest then the time it will take to become m^n times of itself is t × n years.

RULE 6 : The difference between C.I. and S.I. on a sum 'P' in 2 years at the rate of R% rate of compound interest will be

$$\text{C.I} - \text{S.I.} = P\left(\frac{R}{100}\right)^2 = \frac{\text{S.I.}\times R}{200}$$

$$\text{For 3 years, C.I.} - \text{S.I.} = P\left(\frac{R}{100}\right)^2 \times\left(3+\frac{R}{100}\right)$$

RULE 7 : If on compound interest, a sum becomes ₹ A in 'a' years and ₹ B in 'b' years then,

(i) If b – a = 1, then, $R\% = \left(\frac{B}{A}-1\right)\times 100\%$

(ii) If b – a = 2, then, $R\% = \left(\sqrt{\frac{B}{A}}-1\right)\times 100\%$

(iii) If b – a = n then, $R\% = \left[\left(\frac{B}{A}\right)^{\frac{1}{n}}-1\right]\times 100\%$

where n is a whole number.

RULE 8 : If a sum becomes 'n' times of itself in 't' years on compound interest, then $R\% = \left[n^{\frac{1}{t}}-1\right]\times 100\%$

RULE 9 : If a sum 'P' is borrowed at r% annual compound interest which is to be paid in 'n' equal annual installments including interest, then

(i) for n = 2, Each annual installment

$$= \frac{P}{\left(\frac{100}{100+r}\right)+\left(\frac{100}{100+r}\right)^2}$$

(ii) For n = 3, Each annual installment

$$= \frac{P}{\left(\frac{100}{100+r}\right)+\left(\frac{100}{100+r}\right)^2+\left(\frac{100}{100+r}\right)^3}$$

RULE 10 : The simple interest for a certain sum for 2 years at an annual rate interest R% is S.I., then

$$\text{C.I.} = \text{S.I.}\left(1+\frac{R}{200}\right)$$

RULE 11 : A certain sum at C.I. becomes x times in n_1 year and y times in n_2 years then $x^{\frac{1}{n_1}} = y^{\frac{1}{n_2}}$

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. At what percent per annum will ₹ 3000/- amounts to ₹ 3993/- in 3 years if the interest is compounded annually?
(1) 9% (2) 10%
(3) 11% (4) 13%
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting) & (SSC SAS Exam. 26.06.2010 (Paper-I)

2. The compound interest on ₹ 10,000 in 2 years at 4% per annum, the interest being compounded half-yearly, is :
(1) ₹ 636.80 (2) ₹ 824.32
(3) ₹ 912. 86 (4) ₹ 828. 82
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. In how many years will ₹ 2,000 amounts to ₹ 2,420 at 10% per annum compound interest?
(1) 3 years (2) $2\frac{1}{2}$ years
(3) 2 years (4) $1\frac{1}{2}$ years
(SSC CGL Prelim Exam. 27.02.2000 (IInd Sitting & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting)

4. In what time will ₹ 1000 becomes ₹ 1331 at 10% per annum compounded annually ?
(1) 3 years (2) $2\frac{1}{2}$ years
(3) 2 years (4) $3\frac{1}{2}$ years
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting) & (SSC MTS Exam-. 24.03.2013 (Ist Sitting)

5. The principal, which will amount to ₹ 270.40 in 2 years at the rate of 4% per annum compound interest, is
(1) ₹ 200 (2) ₹ 225
(3) ₹ 250 (4) ₹ 220
(SSC CPO S.I. Exam. 05.09.2004)

6. A sum of money on compound interest amounts to ₹ 10648 in 3 years and ₹ 9680 in 2 years. The rate of interest per annum is :
(1) 5% (2) 10%
(3) 15% (4) 20%
(SSC CPO S.I. Exam. 26.05.2005)

7. At what rate per cent per annum will ₹ 2304 amount to ₹ 2500 in 2 years at compound interest ?
(1) $4\frac{1}{2}\%$ (2) $4\frac{1}{5}\%$
(3) $4\frac{1}{6}\%$ (4) $4\frac{1}{3}\%$
(SSC CPO S.I. Exam. 05.09.2004) & (SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

8. A sum becomes ₹ 1,352 in 2 years at 4% per annum compound interest. The sum is
(1) ₹ 1,225 (2) ₹ 1,270
(3) ₹ 1,245 (4) ₹ 1,250
(SSC CGL Prelim Exam. 11.05.2003 (IInd Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting) & (SSC CISF ASI Exam. 29.08.2010)

9. The compound interest on ₹ 16,000 for 9 months at 20% per annum, interest being compounded quarterly, is
(1) ₹ 2,520 (2) ₹ 2,524
(3) ₹ 2,522 (4) ₹ 2,518
(SSC CPO S.I. Exam. 03.09.2006)

10. If the rate of interest be 4% per annum for first year, 5% per annum for second year and 6% per annum for third year, then the compound interest of ₹ 10,000 for 3 years will be
(1) ₹ 1,600 (2) ₹ 1,625.80
(3) ₹ 1,575.20 (4) ₹ 2,000
(SSC CPO S.I. Exam. 03.09.2006)

11. The compound interest on ₹ 2000 in 2 years if the rate of interest is 4% per annum for the first year and 3% per annum for the second year, will be
(1) ₹ 142.40 (2) ₹ 140.40
(3) ₹ 141.40 (4) ₹ 143.40
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

12. At what rate per annum will ₹ 32000 yield a compound interest of ₹ 5044 in 9 months interest being compounded quarterly ?
(1) 20% (2) 32%
(3) 50% (4) 80%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

13. The compound interest on ₹ 8,000 at 15% per annum for 2 years 4 months, compounded annually is:
(1) ₹ 2980 (2) ₹ 3091
(3) ₹ 3109 (4) ₹ 3100
(SSC CPO S.I. Exam. 16.12.2007)

14. In what time will ₹ 10,000 amount to ₹ 13310 at 20% per annum compounded half yearly?
(1) $1\frac{1}{2}$ years (2) 2 years
(3) $2\frac{1}{2}$ years (4) 3 years
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

15. A certain sum of money yields ₹ 1261 as compound interest for 3 years at 5% per annum. The sum is
(1) ₹ 9000 (2) ₹ 8400
(3) ₹ 7500 (4) ₹ 8000
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

16. A certain sum, invested at 4% per annum compound interest, compounded halfyearly, amounts to ₹ 7,803 at the end of one year. The sum is
(1) ₹ 7,000 (2) ₹ 7,200
(3) ₹ 7,500 (4) ₹ 7,700
(SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting)

17. A certain sum amounts to ₹ 5,832 in 2 years at 8% per annum compound interest, the sum is
(1) ₹ 5,000 (2) ₹ 5,200
(3) ₹ 5,280 (4) ₹ 5,400
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

18. The compound interest on ₹ 6,000 at 10% per annum for $1\frac{1}{2}$ years, when the interest being compounded annually, is
(1) ₹ 910 (2) ₹ 870
(3) ₹ 930 (4) ₹ 900
(SSC CPO S.I. Exam. 09.11.2008)

19 In what time ₹ 8,000 will amount to ₹ 9,261 at 10% per annum compound interest, when the interest is compounded half yearly ?
(1) $3\frac{1}{2}$ years (2) $1\frac{1}{2}$ years
(3) $2\frac{1}{2}$ years (4) 2 years
(SSC CPO S.I. Exam. 09.11.2008)

20. At what rate per cent per annum will a sum of ₹ 1,000 amounts to ₹ 1,102.50 in 2 years at compound interest ?

(1) 5% (2) 5.5%
(3) 6% (4) 6.5%

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

21. In how many years will a sum of ₹ 800 at 10% per annum compound interest, compounded semi-annually becomes ₹ 926.10 ?

(1) $1\frac{1}{2}$ years (2) $1\frac{2}{3}$ years
(3) $2\frac{1}{3}$ years (4) $2\frac{1}{2}$ years

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

22. An amount of ₹ 6,000 lent at 5% per annum compound interest for 2 years will become

(1) ₹ 600 (2) ₹ 6,600
(3) ₹ 6,610 (4) ₹ 6,615

(SSC (South Zone) Investigator Exam. 12.09.2010)

23. In what time will ₹ 1000 amounts to ₹ 1331 at 20% per annum, compounded half yearly ?

(1) $1\frac{1}{2}$ years (2) 2 years
(3) 1 year (4) $2\frac{1}{2}$ years

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

24. The compound interest on ₹30,000 at 7% per annum for a certain time is ₹4,347. The time is

(1) 3 years (2) 4 years
(3) 2 years (4) 2.5 years

(SSC Sub-Inspector & LDC Exam. 21.10.2012 (Ist Sitting)

25. A sum of ₹ 8000 will amount to ₹ 8820 in 2 years if the interest is calculated every year. The rate of compound interest is

(1) 6% (2) 7%
(3) 3% (4) 5%

(SSC Sub-Inspector & LDC Exam. 28.10.2012, Ist Sitting)

26. A principal of ₹ 10,000, after 2 years compounded annually, the rate of interest being 10% per annum during the first year and 12% per annum during the second year (in rupees) will amount to :

(1) ₹ 12,000 (2) ₹ 12,320
(3) ₹ 12,500 (4) ₹ 11,320

(SSC Sub-Inspector & LDC Exam. 04.11.2012, Ist Sitting)

27. The sum of money that yields a compound interest of ₹420 during the second year at 5% p.a is

(1) ₹4,000 (2) ₹42,000
(3) ₹8,000 (4) ₹21,000

(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

28. A man saves ₹ 2000 at the end of each year and invests the money at 5% compound interest. At the end of 3 years he will have :

(1) ₹ 4305 (2) ₹ 6305
(3) ₹ 4205 (4) ₹ 2205

(SSC Multi-Tasking Staff Exam. 10.03.2013)

29. The time in which ₹ 80,000 amounts to ₹ 92,610 at 10% p.a. compound interest, interest being compounded semi annually is :

(1) $1\frac{1}{2}$ years (2) 2 years
(3) $2\frac{1}{2}$ years (4) 3 years

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

30. A man borrows ₹ 21000 at 10% compound interest. How much he has to pay annually at the end of each year, to settle his loan in two years ?

(1) ₹ 12000 (2) ₹ 12100
(3) ₹ 12200 (4) ₹ 12300

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

31. ₹ 800 at 5% per annum compounded annually will amount to ₹ 882 in

(1) 1 year (2) 2 years
(3) 3 years (4) 4 years

(SSC Constable (GD) Exam. 12.05.2013)

32. The compound interest on ₹ 5,000 for 3 years at 10% p. a. will amount to

(1) ₹ 1,654 (2) ₹ 1,655
(3) ₹ 1,600 (4) ₹ 1,565

(SSC Graduate Level Tier-II Exam. 29.09.2013)

33. A sum of ₹ 3,200 invested at 10% p.a. compounded quarterly amounts to ₹ 3,362. Compute the time period.

(1) $\frac{1}{2}$ year (2) 1 year
(3) 2 years (4) $\frac{3}{4}$ year

(SSC Graduate Level Tier-II Exam. 29.09.2013)

34. The compound interest on a certain sum of money for 2 years at 5% is ₹ 328, then the sum is

(1) ₹ 3000 (2) ₹ 3600
(3) ₹ 3200 (4) ₹ 3400

(SSC CGL Tier-II Exam. 21.09.2014)

35. Two years ago, the value of my motorbike was ₹ 62500. If the value depreciates by 4% every year, now its value is

(1) ₹ 56700 (2) ₹ 57600
(3) ₹ 57500 (4) ₹ 55700

(SSC CGL Tier-II Exam. 21.09.2014)

36. The compound interest on a sum of money for 2 years is ₹ 615 and the simple interest for the same period is ₹ 600. Find the principal.

(1) ₹ 6,500 (2) ₹ 6,000
(3) ₹ 8,000 (4) ₹ 9,500

(SSC CHSL DEO Exam. 16.11.2014) (Ist Sitting)

37. Rekha invested a sum of ₹ 12000 at 5% per annum compound interest. She received an amount of ₹ 13230 after n years. Find n.

(1) 2.8 years (2) 3.0 years
(3) 2.5 years (4) 2.0 years

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

38. When principal = ₹ S, rate of interest = 2r % p.a, then a person will get after 3 years at compound interest

(1) ₹ $\frac{6Sr}{100}$

(2) ₹ $S\left(1+\frac{r}{100}\right)^3$

(3) ₹ $S\left(1+\frac{r}{50}\right)^3$

(4) ₹ $3S\left(1+\frac{r}{100}\right)^3$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

39. The sum of money which becomes ₹ 2420 at 10 % rate of compound interest after two years is
(1) ₹ 2000 (2) ₹ 1000
(3) ₹ 2500 (4) ₹ 1500
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

40. On a certain principal the compound interest compounded annually for the second year at 10% per annum is ₹ 132. The principal is
(1) ₹ 1250 (2) ₹ 1000
(3) ₹ 1200 (4) ₹ 1320
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

41. The principal that yields a compound interest of Rs. 420 during the second year at 5% per annum is
(1) Rs. 7,000 (2) Rs. 5,000
(3) Rs. 8,000 (4) Rs. 6,000
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

42. In what time will Rs. 64,000 amount to Rs. 68,921 at 5% per annum, interest being compounded half yearly ?
(1) 3 years (2) $2\frac{1}{2}$ years
(3) 2 years (4) $1\frac{1}{2}$ years
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

43. A certain sum will amount to ₹ 12,100 in 2 years at 10% per annum of compound interest, interest being compounded annually. The sum is
(1) ₹ 8000 (2) ₹ 6000
(3) ₹ 12000 (4) ₹ 10000
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

44. At what rate of compound interest per annum will a sum of Rs. 1200 become Rs. 1348.32 in 2 years?
(1) 7.5% (2) 6.5%
(3) 7% (4) 6%
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

45. The compound interest on Rs. 12000 for 9 months at 20% per annum, interest being compounded quarterly is :
(1) Rs. 1750 (2) Rs. 2089.70
(3) Rs. 1891.50 (4) Rs. 2136.40
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

46. The compound interest on Rs. 30,000 at 7% per annum for n years is Rs. 4347. The value of n is
(1) 3 (2) 2
(3) 4 (4) 5
(SSC CGL Tier-II Online Exam.01.12.2016)

47. A sum of Rs. 2420 is accumulated in 2 years at 10% compund interest on a certain amount. Then the original amount is :
(1) Rs. 1000 (2) Rs. 2000
(3) Rs. 1500 (3) Rs. 2500
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

48. The compound interest on a sum of Rs. 5000 at 8% per annum for 9 months when interest is compound quarterly is :
(1) Rs. 300 (2) Rs. 300.12
(3) Rs. 306.04 (4) Rs. 308
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

49. A sum of money invested at compound interest amounts to Rs. 800 in 3 years and to Rs. 840 in 4 years. The rate of interest per annum is :
(1) $2\frac{1}{2}\%$ (2) 4%
(3) 5% (4) $6\frac{2}{3}\%$
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

50. In how many years will a sum of Rs. 800 at 10% per annum compounded semi-annually become Rs. 926.10?
(1) $2\frac{1}{2}$ years (2) 3 years
(3) 2 years (4) $1\frac{1}{2}$ years
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

51. A sum of Rs. 2000 amounts to Rs. 4000 in two years at compound interest. In how many years will the same amount become Rs. 8000 ?
(1) 2 (2) 4
(3) 6 (4) 8
(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

52. The compound interest on Rs. 64,000 for 3 years, compounded annually at 7.5% p.a. is
(1) Rs. 14,400 (2) Rs. 15,705
(3) Rs. 15,507 (4) Rs. 15,075
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

53. Find the amount which Shyam will get on Rs. 4096, if he gives it for 18 months at $12\frac{1}{2}\%$ per annum, interest being compounded half yearly.
(1) Rs. 5,813 (2) Rs. 4,515
(3) Rs. 4,913 (4) Rs. 5,713
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

54. If Rs. 10000 amounts to Rs. 11664 invested in compound interest (compounded annually) for two years then the annual rate of compound interest is
(1) 10% (2) 9%
(3) 8% (4) 6%
(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

55. The compound interest on Rs. 4000 for 4 years at 10% per annum will be
(1) Rs. 1856.40 (2) Rs. 1600
(3) Rs. 1856 (4) Rs. 1756.60
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

56. A man invested a sum of money at compound interest. It amounted to Rs. 2420 in 2 years and to Rs. 2662 in 3 years. Find the sum.
(1) Rs. 1000 (2) Rs. 2000
(3) Rs. 5082 (4) Rs. 3000
(SSC CGL Tier-II Online Exam.01.12.2016)

57. A sum of Rs. 3000 amounts to Rs. 6000 in two years at compound interest. The interest for four years is :
(1) Rs. 9000 (2) Rs. 12000
(3) Rs. 6000 (4) Rs. 3000
(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

58. If a sum of Rs.12500 is invested for 1 year at 12% per annum interest being compounded semi-annually, then interest earned is :
(1) Rs.1505 (2) Rs.1535
(3) Rs.1545 (4) Rs.1550
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

59. A sum of money amounts to Rs. 6655 at the rate of 10% compounded annually for 3 years. The sum of money is
(1) Rs. 5000 (2) Rs. 5500
(3) Rs. 6000 (4) Rs. 6100
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

60. In what time (in years) will Rs. 8000 amount to Rs. 9261 at 5% per annum, compounded annually?

(1) 3 (2) $3\frac{1}{2}$

(3) 4 (4) $4\frac{1}{2}$

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

61. The compound interest on Rs. 1000 at 10% per annum for 3 years in (Rs.) is :

(1) Rs. 1331 (2) Rs. 331

(3) Rs. 300 (4) Rs. 1300

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

62. What would be the compound interest of Rs. 25000 for 2 years at the rate of 5% per annum ?

(1) Rs. 2500 (2) Rs. 2562.5

(3) Rs. 2425.25 (4) Rs. 5512.5

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

63. The compound interest on Rs. 24000 at 10% per annum for $1\frac{1}{2}$ years, interest being compounded semi-annually is :

(1) Rs. 3783 (2) Rs. 3777

(3) Rs. 3780 (4) Rs. 3781

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

64. The sum for 2 years gives a compound interest of Rs. 3225 at the rate of 15% per annum. The sum is

(1) Rs. 10000 (2) Rs. 20000

(3) Rs. 15000 (4) Rs. 32250

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

65. In 3 years Rs. 3000 amounts to Rs. 3993 at x% compound interest, compounded annually. The value of x is

(1) 10 (2) 8

(3) 5 (4) $3\frac{1}{3}$

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

66. The least number of years in which a sum of money on 19% p.a. compound interest will be more than double is

(1) 3 years (2) 4 years

(3) 5 years (4) 2 years

(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE–II

1. If the compound interest on a certain sum for 2 years at 3% per annum is ₹ 101.50, then the simple interest on the same sum at the same rate and for the same time will be

(1) ₹ 90.00 (2) ₹ 95.50

(3) ₹ 100.00 (4) ₹ 98.25

(SSC CPO S.I. Exam. 12.01.2003

2. If the compound interest on a sum of money for 3 years at the rate of 5% per annum is ₹ 252.20, the simple interest on the same sum at the same rate and for the same time is

(1) ₹ 220 (2) ₹ 240

(3) ₹ 245 (4) ₹ 250

(SSC CPO S.I. Exam. 07.09.2003)

3. On a certain sum of money the compound interest for 2 years is ₹ 282.15 and the simple interest for the same period of time is ₹ 270. The rate of interest per annum is

(1) 6.07% (2) 10%

(3) 9% (4) 12.15%

(SSC CPO S.I. Exam. 07.09.2003)

4. If the compound interest on a sum for 2 years at $12\frac{1}{2}$% per annum is ₹ 510, the simple interest on the same sum at the same rate for the same period of time is :

(1) ₹ 400 (2) ₹ 480

(3) ₹ 450 (4) ₹ 460

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

5. The compound interest on a certain sum of money at a certain rate for 2 years is ₹ 40.80 and the simple interest on the same sum is ₹ 40 at the same rate and for the same time. The rate of interest is

(1) 2% per annum

(2) 3% per annum

(3) 4% per annum

(4) 5% per annum

(SSC CPO S.I. Exam. 05.09.2004)

6. The compound interest on a certain sum of money invested for 2 years at 5% per annum is ₹ 328. The simple interest on the sum, at the same rate and for the same period will be

(1) ₹ 320 (2) ₹ 308

(3) ₹ 300 (4) ₹ 287

(SSC CPO S.I. Exam. 05.09.2004) & (SSC CPO S.I. Exam. 26.05.2005)

7. Compound interest on a sum of money for 2 years at 4 per cent per annum is ₹ 2, 448. Simple interest of the same sum of money at the same rate of interest for 2 years will be

(1) ₹ 2,500 (2) ₹ 2,400

(3) ₹ 2,360 (4) ₹ 2,250

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

8. At a certain rate per annum, the simple interest on a sum of money for one year is ₹ 260 and the compound interest on the same sum for two years is ₹ 540.80. The rate of interest per annum is

(1) 4% (2) 6%

(3) 8% (4) 10%

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

9. The simple interest on a sum of money at 4% per annum for 2 years is ₹ 80. The compound interest in the same sum for the same period is

(1) ₹ 82.60 (2) ₹ 82.20

(3) ₹ 81.80 (4) ₹ 81.60

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

10. The compound interest on a certain sum of money at 5% per annum for 2 years is ₹ 246. The simple interest on the same sum for 3 years at 6% per annum is

(1) ₹ 435 (2) ₹ 450

(3) ₹ 430 (4) ₹ 432

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

11. The simple interest and compound interest (compounded annually) on a certain sum of money with a given rate for a period of 2 years are ₹ 900 and ₹ 954 respectively. The sum of money is

(1) ₹ 3700 (2) ₹ 3650

(3) ₹ 3850 (4) ₹ 3750

(SSC CPO S.I. Exam. 09.11.2008)

12. The compound interest on a certain sum of money for 2 years at 10% per annum is ₹420. The simple interest on the same sum at the same rate and for the same time will be

(1) ₹350 (2) ₹375

(3) ₹380 (4) ₹400

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

13. If the compound interest on a certain sum for 2 years at 4% p.a. is ₹ 102, the simple interest at the same rate of interest for two years would be

(1) ₹ 200 (2) ₹ 50
(3) ₹ 150 (4) ₹ 100

(SSC CGL Exam. 04.07.1999 (Ist Sitting) & (SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

14. There is 100% increase to an amount in 8 years, at simple interest. Find the compound interest of ₹ 8000 after 2 years at the same rate of interest.

(1) ₹ 2500 (2) ₹ 2000
(3) ₹ 2250 (4) ₹ 2125

(SSC Graduate Level Tier-I Exam. 21.04.2013)

15. If the compound interest on a certain sum for two years at 12% per annum is ₹ 2,544, the simple interest on it at the same rate for 2 years will be

(1) ₹ 2,400 (2) ₹ 2,500
(3) ₹ 2,480 (4) ₹ 2,440

(SSC Graduate Level Tier-I Exam. 19.05.2013)

16. A sum becomes ₹ 2,916 in 2 years at 8% per annum compound interest. The simple interest at 9% per annum for 3 years on the same amount will be

(1) ₹ 600 (2) ₹ 675
(3) ₹ 650 (4) ₹ 625

(SSC Sub-Inspector & LDC Exam. 20.10.2013)

17. The compound interest on a certain sum of money at a certain rate per annum for two years is ₹ 2,050, and the simple interest on the same amount of money at the same rate for 3 years is ₹ 3, 000. Then the sum of money is

(1) ₹ 20,000 (2) ₹ 18,000
(3) ₹ 21,000 (4) ₹ 25, 000

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

18. The compound interest on a certain sum of money for 2 years at 5% per annum is ₹ 410. The simple interest on the same sum at the same rate and for the same time is

(1) ₹ 400 (2) ₹ 300
(3) ₹ 350 (4) ₹ 405

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

19. If the compound interest on a sum for 2 years at $12\frac{1}{2}$ p.a is ₹ 510, the simple interest on the same sum at the same rate for the same period of time is

(1) ₹ 400 (2) ₹ 450
(3) ₹ 460 (4) ₹ 480

(SSC CGL Tier-II Exam. 21.09.2014)

20. A man borrowed some money from a private organisation at 5% simple interest per annum. He lended 50% of this money to another person at 10% compound interest per annum and thereby the man made a profit of Rs. 3,205 in 4 years. The man borrowed.

(1) Rs. 80,000
(2) Rs. 1,00,000
(3) Rs. 1,20,000
(4) Rs. 1,50,000

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

21. A certain amount of money earns Rs. 540 as Simple Interest in 3 years. If it earns a Compound Interest of Rs. 376.20 at the same rate of interest in 2 years, find the amount (in Rupees).

(1) 1600 (2) 1800
(3) 2000 (4) 2100

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

22. On a certain sum of money, the simple interest for 2 years is Rs. 350 at the rate of 4% per annum. If it was invested at compound interest at the same rate for the same duration as before, how much more interest would be earned ?

(1) Rs. 3.50 (2) Rs. 7
(3) Rs. 14 (4) Rs. 35

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

23. The simple interest on a sum of money for 3 years is Rs. 240 and the compound interest on the same sum, at the same rate for 2 years is Rs. 170. The rate of interest is :

(1) 8% (2) $29\frac{1}{6}\%$
(3) $12\frac{1}{2}$ (4) $5\frac{5}{17}\%$

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

24. The simple interest on a certain sum of money for 2 years at 5% is Rs. 1600. The compound interest at the same rate after 3 years interest compound annually, is

(1) Rs.2520 (2) Rs.2522
(3) Rs.2555 (4) Rs.2535

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

25. A man borrowed some money from a private organisation at 5% simple interest per annum. He lended this money to another person at 10% compound interest per annum, and made a profit of Rs. 26,410 in 4 years. The man borrowed

(1) Rs. 200000 (2) Rs. 150000
(3) Rs. 132050 (4) Rs. 100000

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

26. If the simple interest on a sum of money for 2 years at 5% per annum is Rs. 50, the compound interest on the same at the same rate and for the same time is :

(1) Rs. 50.50 (2) Rs. 51.25
(3) Rs. 51.50 (4) Rs. 50.05

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

27. There is 40% increase in an amount in 8 years at simple interest. What will be the compound interest (in rupees) of Rs 30000 after 2 years at the same rate ?

(1) 6150 (2) 7687.5
(3) 4612.5 (4) 3075

(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

TYPE–III

1. If the difference between the compound interest, compounded every six months, and the simple interest on a certain sum of money at the rate of 12% per annum for one year is ₹ 36, the sum is :

(1) ₹ 10,000 (2) ₹ 12,000
(3) ₹ 15,000 (4) ₹ 9,000

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. What is the difference between compound interest on ₹ 5,000 for $1\frac{1}{2}$ years at 4% per annum according as the interest is compounded yearly or half-yearly?

(1) ₹ 2.04 (2) ₹ 3.06
(3) ₹ 8.30 (4) ₹ 4.80

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. The difference between the simple and compound interest on a certain sum of money at 5% rate of interest per annum for 2 years is ₹ 15. Then the sum is :
(1) ₹ 6,500 (2) ₹ 5,500
(3) ₹ 6,000 (4) ₹ 7,000
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. If the difference between the compound interest and simple interest on a sum at 5% rate of interest per annum for three years is ₹ 36.60, then the sum is
(1) ₹ 8000 (2) ₹ 8400
(3) ₹ 4400 (4) ₹ 4800
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

5. The difference between compound interest and simple interest on ₹ 2500 for 2 years at 4% per annum is
(1) ₹ 40 (2) ₹ 45
(3) ₹ 14 (4) ₹ 4
(SSC CPO S.I. Exam. 12.01.2003

6. The difference between simple and compound interest (compounded annually) on a sum of money for 2 years at 10% per annum is ₹ 65. The sum is
(1) ₹ 65650 (2) ₹ 65065
(3) ₹ 6565 (4) ₹ 6500
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

7. The difference between the compound interest (compounded annually) and the simple interest on a sum of ₹ 1000 at a certain rate of interest for 2 years is ₹ 10. The rate of interest per annum is :
(1) 5% (2) 6%
(3) 10% (4) 12%
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

8. If the difference between the simple and compound interests on a sum of money for 2 years at 4% per annum is ₹ 80, the sum is :
(1) ₹ 5000 (2) ₹ 50000
(3) ₹ 10000 (4) ₹ 1000
(SSC CPO S.I. Exam. 26.05.2005

9. The difference between simple and compound interest on a certain sum of money for 2 years at 4 per cent per annum is ₹ 1. The sum of money is :
(1) ₹ 600 (2) ₹ 625
(3) ₹ 560 (4) ₹ 650
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting) Exam. 26.05.2005)

10. The difference between the simple and compound interest on a certain sum of money for 2 years at 4% per annum is ₹ 4. The sum is
(1) ₹ 2500 (2) ₹ 2,400
(3) ₹ 2,600 (4) ₹ 2,000
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

11. If the difference between the compound and simple interests on a certain sum of money for 3 years at 5% per annum is ₹ 15.25, then the sum is
(1) ₹ 2,000 (2) ₹ 1,000
(3) ₹ 1,500 (4) ₹ 2,500
(SSC CPO S.I. Exam. 03.09.2006)

12. The difference between compound interest and simple interest of a sum for 2 years at 8 per cent is ₹ 768. The sum is
(1) ₹ 1,00,000 (2) ₹ 1,10,000
(3) ₹ 1,20,000 (4) ₹ 1,70,000
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

13. The difference between the compound and the simple interest on a sum for 2 years at 10% per annum, when the interest is compounded annually, is ₹ 28. If the interest were compounded half-yearly, the difference in the two interests will be
(1) ₹ 44 (2) ₹ 28.35
(3) ₹ 43.41 (4) ₹ 43.29
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

14. A sum of ₹ 6,000 is deposited for 3 years at 5% per annum compound interest (compounded annually). The difference of interests for 3 and 2 years will be
(1) ₹ 75.00 (2) ₹ 30.75
(3) ₹ 330.75 (4) ₹ 375.00
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

15. The difference between compound interest (compounded annually) and simple interest on a certain sum of money at 10% per annum for 2 years is ₹ 40. The sum is :
(1) ₹ 4000 (2) ₹ 3600
(3) ₹ 4200 (4) ₹ 3200
(SSC CPO S.I. Exam. 16.12.2007)

16. The difference between compound and simple interest on a certain sum for 3 years at 5% per annum is Rs. 122. The sum is
(1) ₹ 16,000 (2) ₹ 15,000
(3) ₹ 12,000 (4) ₹ 10,000
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

17. The difference between simple interest and compound interest of a certain sum of money at 20% per annum for 2 years is ₹ 48. Then the sum is
(1) ₹ 1,000 (2) ₹ 1, 200
(3) ₹ 1, 500 (4) ₹ 2, 000
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

18. The difference between the compound interest and simple interest on ₹ 10,000 for 2 years is ₹ 25. The rate of interest per annum is
(1) 5% (2) 7%
(3) 10% (4) 12%
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

19. If the difference between S.I. and C.I. for 2 years on a sum of money lent at 5% is ₹ 6, then the sum is
(1) ₹ 2200 (2) ₹ 2400
(3) ₹ 2600 (4) ₹ 2000
(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

20. On a certain sum of money lent out at 16% p.a. the difference between the compound interest for 1 year, payable half yearly, and the simple interest for 1 year is ₹ 56. The sum is
(1) ₹ 1080 (2) ₹ 7805
(3) ₹ 8750 (4) ₹ 5780
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

21. On what sum does the difference between the compound interest and the simple interest for 3 years at 10% is ₹ 31 ?
(1) ₹ 1500 (2) ₹ 1200
(3) ₹ 1100 (4) ₹ 1000
(SSC CGL Prelim Exam. 27.02.200 (First Sitting)

22. The difference between simple and compound interests on a sum of money at 4% per annum for 2 years is ₹ 8. The sum is
(1) ₹ 400 (2) ₹ 800
(3) ₹ 4,000 (4) ₹ 5,000
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

23. On a certain sum of money, the difference between the compound interest for a year, payable half-yearly, and the simple interest for a year is ₹ 180. If the rate of interest in both the cases is 10%, then the sum is

(1) ₹ 60,000 (2) ₹ 72,000
(3) ₹ 62,000 (4) ₹ 54,000

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

24. The difference between the compound interest and the simple interest on a certain sum at 5% per annum for 2 years is ₹ 1.50. The sum is

(1) ₹ 600 (2) ₹ 500
(3) ₹ 400 (4) ₹ 300

(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

25. What sum will give ₹ 244 as the difference between simple interest and compound interest at 10% in $1\frac{1}{2}$ years compounded half yearly ?

(1) ₹ 40,000 (2) ₹ 36,000
(3) ₹ 32,000 (4) ₹ 28,000

(SSC Graduate Level Tier-II Exam. 29.09.2013

26. The difference between simple and compound interest compounded annually, on a certain sum of money for 2 years at 4% per annum is ₹ 1. The sum (in ₹) is :

(1) 650 (2) 630
(3) 625 (4) 640

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

27. The difference between the compound interest and simple interest for the amount ₹ 5,000 in 2 years is ₹ 32. The rate of interest is

(1) 5% (2) 8%
(3) 10% (4) 12%

(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

28. On what sum of money will the difference between S.I and C.I for 2 years at 5% per annum be equal to ₹ 25 ?

(1) ₹ 10,000 (2) ₹ 10,500
(3) ₹ 9,500 (4) ₹ 9000

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

29. The difference between the compound interest and simple interest on a certain sum for 2 years at 10% per annum is ₹ 300. Find the sum.

(1) ₹ 31,000 (2) ₹ 31,500
(3) ₹ 30,000 (4) ₹ 30,500

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

30. Find the difference between the compound interest and the simple interest on ₹ 32,000 at 10% p.a. for 4 years.

(1) ₹ 2051.20 (2) ₹ 2052.50
(3) ₹ 2025.20 (4) ₹ 2501.20

(SSC CHSL DEO & LDC Exam. 16.11.2014)

31. On what sum of money will the difference between simple interest and compound interest for 2 years at 5% per annum be equal to Rs. 63?

(1) Rs. 24,600 (2) Rs. 24,800
(3) Rs. 25,200 (4) Rs. 25,500

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

32. The difference between simple and compound interests compounded annually on a certain sum of money for 2 years at 4% per annum is Re. 1. The sum (in Rs.) is :

(1) 620 (2) 630
(3) 640 (4) 625

(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

33. The difference between C I and S I for 2 years at 10% rate of interest is Rs. 4. Find the sum of money.

(1) Rs. 400 (2) Rs. 200
(3) Rs. 300 (4) Rs. 800

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

34. The difference between simple and compound interest (compounded annually) on a sum of money for 3 years at 10% per annum is Rs. 93. The sum (in Rs.) is :

(1) 30000 (2) 30300
(3) 3000 (4) 3030

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

35. The difference between compound interest and simple interest on a certain sum of money for 2 years at 5% per annum is Rs. 41. What is the sum of money ?

(1) Rs. 7200 (2) Rs. 9600
(3) Rs. 16400 (4) Rs. 8400

(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

36. If the difference of the compound interest and the simple interest on a sum of money for 3 years is Rs. 186. Find the sum of money, if the rate of interest in both cases be 10%.

(1) Rs. 5500 (2) Rs. 7200
(3) Rs. 6500 (4) Rs. 6000

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

37. The difference between the simple interest and compound interest (compounded annually) on Rs. 40,000 for 3 years at 8% per annum is :

(1) Rs. 684.32 (2) Rs. 788.48
(3) Rs. 784.58 (4) Rs. 4000

(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (IST Sitting)

38. The difference between compound interest and simple interest on an amount of Rs. 15,000 for 2 years is Rs. 96. The rate of interest per annum is

(1) 6% (2) 7%
(3) 8% (4) 9%

(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

39. The difference between compound interest and simple interest on Rs. 5000 for 2 years at 8% per annum payable yearly is

(1) Rs. 30 (2) Rs. 31
(3) Rs. 33 (4) Rs. 32

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

40. If the difference between the compound interest and the simple interest on a certain sum at the rate of 5% per annum for 2 years is Rs. 20, then the sum is :

(1) Rs. 2000 (2) Rs. 4000
(3) Rs. 6000 (4) Rs. 8000

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

TYPE–IV

1. If the amount is 2.25 times of the sum after 2 years at compound interest (compound annually), the rate of interest per annum is :
(1) 25% (2) 30%
(3) 45% (4) 50%
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. A sum of money doubles itself in 4 years at compound interest. It will amount to 8 times itself at the same rate of interest in :
(1) 18 years (2) 12 years
(3) 16 years (4) 24 years
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting) & (SSC CPO S.I. Exam. 16.12.2007)

3. A sum borrowed under compound interest doubles itself in 10 years. When will it become fourfold of itself at the same rate of interest ?
(1) 15 years (2) 20 years
(3) 24 years (4) 40 years
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. A sum of money becomes eight times of itself in 3 years at compound interest. The rate of interest per annum is
(1) 100% (2) 80%
(3) 20% (4) 10%
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

5. A sum of money invested at compound interest doubles itself in 6 years. At the same rate of interest it will amount to eight times of itself in :
(1) 15 years (2) 12 years
(3) 18 years (4) 10 years
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

6. A sum of money placed at compound interest doubles itself in 5 years. In how many years, it would amount to eight times of itself at the same rate of interest ?
(1) 10 years (2) 15 years
(3) 7 years (4) 20 years
(SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting) & (SSC CPO S.I. Exam. 06.09.2009) & (SSC CAPs S.I. & CISF ASI Exam. 23.06.2013)

7. A sum of money at compound interest doubles itself in 15 years. It will become eight times of itself in
(1) 45 years (2) 48 years
(3) 54 years (4) 60 years
(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

8. A sum of ₹ 12,000, deposited at compound interest becomes double after 5 years. How much will it be after 20 years ?
(1) ₹ 1,44,000 (2) ₹ 1,20,000
(3) ₹ 1,50,000 (4) ₹ 1,92,000
(SSC CGL Tier-I Exam. 16.05.2010 (IInd Sitting) & (SSC CGL Tier-I 19.06.2011 (IInd Sitting)

9. At what rate percent per annum of compound interest, will a sum of money become four times of itself in two years ?
(1) 100% (2) 75%
(3) 50% (4) 20%
(SSC (South Zone) Investigator Exam. 12.09.2010)

10. A sum of money becomes double in 3 years at compound interest compounded annually. At the same rate, in how many years will it become four times of itself ?
(1) 4 years (2) 6 years
(3) 6.4 years (4) 7.5 years
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

11. A sum of money becomes eight times in 3 years, if the rate is compounded annually. In how much time will the same amount at the same compound rate become sixteen times?
(1) 6 years (2) 4 years
(3) 8 years (4) 5 years
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

12. A sum of money placed at compound interest doubles itself in 4 years. In how many years will it amount to four times itself ?
(1) 12 years (2) 13 years
(3) 8 years (4) 16 years
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

13. A sum of money at compound interest amounts to thrice itself in 3 years. In how many years will it be 9 times itself ?
(1) 9 years (2) 27 years
(3) 6 years (4) 3 years
(SSC Graduate Level Tier-II Exam.16.09.2012)

14. A sum of money becomes 1.331 times in 3 years as compound interest. The rate of interest is
(1) 8% (2) 7.5%
(3) 10% (4) 50%
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

15. If a sum of money compounded annually becomes 1.44 times of itself in 2 years, then the rate of interest per annum is
(1) 25% (2) 22%
(3) 21% (4) 20%
(SSC Graduate Level Tier-II Exam. 29.09.2013

16. If the amount is $3\frac{3}{8}$ times the sum after 3 years at compound interest compounded annually, then the rate of interest per annum is
(1) 25% (2) 50%
(3) $16\frac{2}{3}\%$ (4) $33\frac{1}{3}\%$
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

TYPE–V

1. A sum of money amounts to ₹ 4,840 in 2 years and to ₹ 5,324 in 3 years at compound interest compounded annually. The rate of interest per annum is :
(1) 10% (2) 9%
(3) 11% (4) 8%
(SSC CPO S.I. Exam. 16.12.2007)

2. A certain sum of money amounts to ₹ 2,420 in 2 years and ₹ 2,662 in 3 years at some rate of compound interest, compounded annually. The rate of interest per annum is
(1) 6% (2) 8%
(3) 9% (4) 10%
(SSC CPO S.I. Exam. 09.11.2008)

3. An amount of money at compound interest grows up to ₹ 3,840 in 4 years and up to ₹ 3,936 in 5 years. Find the rate of interest.
(1) 2.5% (2) 2%
(3) 3.5% (4) 2.05%
(SSC Graduate Level Tier-II Exam.16.09.2012)

4. A certain amount of money at r%, compounded annually after two and three years becomes ₹1440 and ₹ 1728 respectively. r is
(1) 5 (2) 10
(3) 15 (4) 20
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

5. The compound interest on a certain sum for two successive years are ₹ 225 and ₹ 238.50. The rate of interest per annum is :
(1) $7\frac{1}{2}\%$ (2) 5%
(3) 10% (4) 6%
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

6. An amount of money appreciates to ₹ 7,000 after 4 years and to ₹ 10,000 after 8 years at a certain compound interest compounded annually. The initial amount of money was
(1) ₹ 4,700 (2) ₹ 4,900
(3) ₹ 4,100 (4) ₹ 4,300
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

7. A sum of money invested at compound interest amounts to ₹ 650 at the end of first year and ₹ 676 at the end of second year. The sum of money is :
(1) ₹ 600 (2) ₹ 540
(3) ₹ 625 (4) ₹ 560
(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & (SSC CPO S.I. Exam. 07.09.2003)

8. A sum of money invested at compound interest amounts in 3 years to ₹ 2,400 and in 4 years to ₹ 2,520. The interest rate per annum is :
(1) 5% (2) 6%
(3) 10% (4) 12%
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

9. A sum becomes ₹ 4500 after two years and ₹ 6750 after four years at compound interest. The sum is
(1) ₹ 4000 (2) ₹ 2500
(3) ₹ 3000 (4) ₹ 3050
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Exam. 13.11.2005)

10. A sum of money at compound interest will amount to ₹ 650 at the end of the first year and ₹ 676 at the end of the second year. The amount of money is
(1) ₹ 1,300 (2) ₹ 650
(3) ₹ 1,250 (4) ₹ 625
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

11. On a certain sum of money, the simple interest for 2 years is Rs. 350 at the rate of 4% per annum. It was invested at compound interest at the same rate for the same duration as before, how much more interest would be earned?
(1) Rs. 3.50 (2) Rs. 7
(3) Rs. 14 (4) Rs. 35
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

12. A certain amount grows at an annual interest rate of 12%, compounded monthly. Which of the following equations can be solved to find the number of years, y, that it would take for the investment to increase by a factor of 64 ?
(1) $64 = (1.01)^{12y}$
(2) $\frac{1}{64} = (1.04)12y$
(3) $64 = (1.04)12y$
(4) $8 = (1.01)6y$
(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

13. The compound interest on a certain sum for 2 years at 10% per annum is Rs. 525 . The simple interest on the same sum for double the time at half the rate per cent per annum is :
(1) Rs. 520 (2) Rs. 550
(3) Rs. 500 (4) Rs. 515
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

14. A sum of money is invested at 20% compound interest (compounded annually). It would fetch Rs. 723 more in 2 years if interest is compounded half yearly. The sum is
(1) Rs.15,000 (2) Rs.30,000
(3) Rs.20,000 (4) Rs.7,500
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

TYPE–VI

1. A builder borrows ₹ 2550 to be paid back with compound interest at the rate of 4% per annum by the end of 2 years in two equal yearly instalments. How much will each instalment be ?
(1) ₹ 1352 (2) ₹ 1377
(3) ₹ 1275 (4) ₹ 1283
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. A man buys a scooter on making a cash down payment of ₹ 16224 and promises to pay two more yearly instalments of equivalent amount in next two years. If the rate of interest is 4% per annum, compounded yearly, the cash value of the scooter, is
(1) ₹ 40000 (2) ₹ 46824
(3) ₹ 46000 (4) ₹ 50000
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

3. Kamal took ₹ 6800 as a loan which along with interest is to be repaid in two equal annual instalments. If the rate of interest is $12\frac{1}{2}\%$, compounded annually, then the value of each instalment is
(1) ₹ 8100 (2) ₹ 4150
(3) ₹ 4050 (4) ₹ 4000
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

4. A loan of ₹ 12,300 at 5% per annum compound interest, is to be repaid in two equal annual instalments at the end of every year. Find the amount of each instalment.
(1) ₹ 6,651 (2) ₹ 6,615
(3) ₹ 6,516 (4) ₹ 6,156
(SSC CPO S.I. Exam. 06.09.2009)

5. A sum of ₹ 210 was taken as a loan. This is to be paid back in two equal instalments. If the rate of interest be 10% compounded annually, then the value of each instalment is
(1) ₹ 127 (2) ₹ 121
(3) ₹ 210 (4) ₹ 225
(SSC CHSL DEO & LDC Exam. 9.11.2014)

6. Rs. 16,820 is divided between two brothers of age 27 years and 25 years. They invested their money at 5% per annum compound interest in such a way that both will receive equal money at the age of 40 years. The share (in Rs.) of elder brother is
(1) 8,280 (2) 8,410
(3) 8,820 (4) 8,000
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

7. A sum of money is paid back in two annual instalments of Rs. 17, 640 each, allowing 5% compound interest compounded annually. The sum borrowed was
(1) Rs. 32,800 (2) Rs. 32,200
(3) Rs. 32,000 (4) Rs. 32,400
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

8. Mr. Dutta desired to deposit his retirement benefit of Rs. 3 lacs partly to a post office and partly to a bank at 10% and 6% interests respectively. If his monthly interest income was Rs. 2000, then the difference of his deposits in the post office and in the bank was :

(1) Rs. 50,000 (2) Rs. 40,000
(3) Nil (4) Rs.1,00,000

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

9. The income of a company increases 20% per year. If the income is Rs. 26,64,000 in the year 2012, then its income in the year 2010 was :

(1) Rs. 28,55,000
(2) Rs. 18,50,000
(3) Rs. 28,20,000
(4) Rs. 21,20,000

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

TYPE–VII

1. A person deposited a sum of ₹ 6,000 in a bank at 5% per annum simple interest. Another person deposited ₹ 5,000 at 8% per annum compound interest. After two years, the difference of their interests will be

(1) ₹ 230 (2) ₹ 232
(3) ₹ 832 (4) ₹ 600

(SSC CPO S.I. Exam. 03.09.2006)

2. A money-lender borrows money at 4% per annum and pays the interest at the end of the year. He lends it at 6% per annum compound interest compounded half yearly and receives the interest at the end of the year. In this way, he gains ₹ 104.50 a year. The amount of money he borrows, is

(1) ₹ 6,000 (2) ₹ 5,500
(3) ₹ 5,000 (4) ₹ 4,500

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

3. A sum of ₹ 13,360 was borrowed at $8\frac{3}{4}$% per annum compound interest and paid back in two years in two equal annual instalments. What was the amount of each instalment ?

(1) ₹ 5,769 (2) ₹ 7,569
(3) ₹ 7,009 (4) ₹ 7,500

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

4. Sita deposited ₹ 5,000 at 10% simple interest for 2 years. How much more money will Sita have in her account at the end of two years, if it is compounded semi-annually.

(1) ₹ 50 (2) ₹ 40
(3) ₹ 77.50 (4) ₹ 85.50

(SSC Graduate Level Tier-II Exam.16.09.2012)

5. What does ₹ 250 amounts to in 2 years with compound interest at the rate of 4% in the 1st year and 8% in the second year ?

(1) ₹ 280 (2) ₹ 280.80
(3) ₹ 468 (4) ₹ 290.80

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

6. A man gave 50% of his savings of ₹ 84,100 to his wife and divided the remaining sum among his two sons A and B of 15 and 13 years of age respectively. He divided it in such a way that each of his sons, when they attain the age of 18 years, would receive the same amount at 5% compound interest per annum. The share of B was

(1) ₹ 20,000 (2) ₹ 20,050
(3) ₹ 22,000 (4) ₹ 22,050

(SSC CGL Tier-I Exam. 19.10.2014)

7. Find the rate percent per annum, if Rs. 2000 amounts to Rs. 2,315.25 in a year and a half, interest being compounded half yearly.

(1) 11.5% (2) 10%
(3) 5% (4) 20%

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

8. A sum of money placed at compound interest doubles itself in 5 years. It will amount to eight times of itself at the same rate of interest in

(1) 20 years (2) 10 years
(3) 12 years (4) 15 years

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

9. The sum of money which when given on compound interest at 18% per annum would fetch Rs. 960 more when the interest is payable half yearly than when it was payable annually for 2 years is :

(1) Rs.60,000 (2) Rs. 30,000
(3) Rs. 40,000 (4) Rs. 50,000

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

10. The amount on Rs. 25,000 in 2 years at annual compound interest, if the rates for the successive years be 4% and 5% per annum respectively is :

(1) Rs. 30,000 (2) Rs. 26,800
(3) Rs. 27,300 (4) Rs. 28,500

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

11. The amount of Rs. 10,000 after 2 years, compounded annually with the rate of interest being 10% per annum during the first year and 12% per annum during the second year, would be (in rupees)

(1) 11,320 (2) 12,000
(3) 12,320 (4) 12,500

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

12. On a certain principal if the simple interest for two years is Rs. 1400 and compound interest for the two years is Rs. 1449, what is the rate of interest?

(1) 7 per cent (2) 3.5 per cent
(3) 14 per cent (4) 10.5 per cent

(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

13. A man borrowed some money and agreed to pay-off by paying Rs. 3150 at the end of the 1st year and Rs. 4410 at the end of the 2nd year. If the rate of compound interest is 5% per annum, then the sum is

(1) Rs. 5000 (2) Rs. 6500
(3) Rs. 7000 (4) Rs. 9200

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

14. Rs. 260200 is divided between Ram and Shyam so that the amount that Ram receives in 4 years is the same as that Shyam receives in 6 years. If the interest is compounded annually at the rate of 4% per annum then Ram's share is

(1) Rs. 125000 (2) Rs. 135200
(3) Rs. 152000 (4) Rs. 108200

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

15. B borrows ₹ 5,000 from A at 6% p.a. simple interest and lends it to C at compound interest of 10% p.a. If B collects the money back from C after 2 years and repays A, the profit made by B in the transaction is

(1) ₹ 1,050 (2) ₹ 500
(3) ₹ 450 (4) ₹ 600

(SSC Multi-Tasking Staff Exam. 30.04.2017)

SHORT ANSWERS

TYPE-I

1. (2)	**2.** (2)	**3.** (3)	**4.** (1)
5. (3)	**6.** (2)	**7.** (3)	**8.** (4)
9. (3)	**10.** (3)	**11.** (1)	**12.** (1)
13. (3)	**14.** (1)	**15.** (4)	**16.** (3)
17. (1)	**18.** (3)	**19.** (2)	**20.** (1)
21. (1)	**22.** (4)	**23.** (1)	**24.** (3)
25. (4)	**26.** (2)	**27.** (3)	**28.** (2)
29. (1)	**30.** (2)	**31.** (2)	**32.** (2)
33. (1)	**34.** (3)	**35.** (2)	**36.** (2)
37. (4)	**38.** (3)	**39.** (1)	**40.** (3)
41. (3)	**42.** (4)	**43.** (4)	**44.** (4)
45. (3)	**46.** (2)	**47.** (2)	**48.** (3)
49. (3)	**50.** (4)	**51.** (2)	**52.** (3)
53. (3)	**54.** (3)	**55.** (1)	**56.** (2)
57. (1)	**58.** (3)	**59.** (1)	**60.** (1)
61. (2)	**62.** (2)	**63.** (1)	**64.** (1)
65. (1)	**66.** (2)		

TYPE-II

1. (3)	**2.** (2)	**3.** (3)	**4.** (2)
5. (3)	**6.** (1)	**7.** (2)	**8.** (3)
9. (4)	**10.** (4)	**11.** (4)	**12.** (4)
13. (4)	**14.** (4)	**15.** (1)	**16.** (2)
17. (1)	**18.** (1)	**19.** (4)	**20.** (2)
21. (3)	**22.** (2)	**23.** (3)	**24.** (2)
25. (4)	**26.** (2)	**27.** (4)	

TYPE-III

1. (1)	**2.** (2)	**3.** (3)	**4.** (4)
5. (4)	**6.** (4)	**7.** (3)	**8.** (2)
9. (2)	**10.** (1)	**11.** (1)	**12.** (3)
13. (3)	**14.** (3)	**15.** (1)	**16.** (1)
17. (2)	**18.** (1)	**19.** (2)	**20.** (3)
21. (4)	**22.** (4)	**23.** (2)	**24.** (1)
25. (3)	**26.** (3)	**27.** (2)	**28.** (1)
29. (3)	**30.** (1)	**31.** (3)	**32.** (4)
33. (1)	**34.** (1)	**35.** (3)	**36.** (4)
37. (2)	**38.** (3)	**39.** (4)	**40.** (4)

TYPE-IV

1. (4)	**2.** (2)	**3.** (2)	**4.** (1)
5. (3)	**6.** (2)	**7.** (1)	**8.** (4)
9. (1)	**10.** (2)	**11.** (2)	**12.** (3)
13. (3)	**14.** (3)	**15.** (4)	**16.** (2)

TYPE-V

1. (1)	**2.** (4)	**3.** (1)	**4.** (4)
5. (4)	**6.** (2)	**7.** (3)	**8.** (1)
9. (3)	**10.** (4)	**11.** (2)	**12.** (1)
13. (3)	**14.** (2)		

TYPE-VI

1. (1)	**2.** (2)	**3.** (3)	**4.** (2)
5. (2)	**6.** (3)	**7.** (1)	**8.** (3)
9. (2)			

TYPE-VII

1. (2)	**2.** (3)	**3.** (2)	**4.** (3)
5. (2)	**6.** (1)	**7.** (2)	**8.** (4)
9. (4)	**10.** (3)	**11.** (3)	**12.** (1)
13. (3)	**14.** (2)	**15.** (3)	

EXPLANATIONS

TYPE-I

1. (2) Using Rule 1,
P = ₹ 3000, A = ₹ 3993, n = 3 years

$$A = P\left(1+\frac{r}{100}\right)^n$$

$$\therefore \left(1+\frac{r}{100}\right)^n = \frac{A}{P}$$

$$\left(1+\frac{r}{100}\right)^3 = \frac{3993}{3000} = \frac{1331}{1000}$$

$$\left(1+\frac{r}{100}\right)^3 = \left(\frac{11}{10}\right)^3$$

$$\Rightarrow 1+\frac{r}{100} = \frac{11}{10}$$

$$\Rightarrow \frac{r}{100} = \frac{11}{10} - 1$$

$$\Rightarrow \frac{r}{100} = \frac{1}{10} \Rightarrow r = \frac{100}{10}$$

$\therefore$ r = 10%

2. (2) Using Rule 1,

$$A = 10{,}000\left(1+\frac{2}{100}\right)^4$$

$$= 10{,}000\left(\frac{51}{50}\right)^4 = 10824.3216$$

$\therefore$ Interest
= 10,824.3216 – 10,000
= ₹ 824.32

3. (3) Using Rule 1,
According to question,

$$2420 = 2000\left(1+\frac{10}{100}\right)^t$$

$$\frac{2420}{2000} = \left(\frac{11}{10}\right)^t$$

$$\text{or,} \left(\frac{11}{10}\right)^t = \frac{121}{100}$$

$$\text{or,} \left(\frac{11}{10}\right)^t = \left(\frac{11}{10}\right)^2$$

$\therefore$ t = 2 years

4. (1) Using Rule 1,
Let the required time be n years.
Then,

$$1331 = 1000\left(1+\frac{10}{100}\right)^n$$

$$\left[\therefore P_1 = P\left(1+\frac{r}{100}\right)^n\right]$$

$$\Rightarrow \frac{1331}{1000} = \left(\frac{10+1}{10}\right)^n$$

$$\Rightarrow \left(\frac{11}{10}\right)^n = \left(\frac{11}{10}\right)^3$$

$\Rightarrow n = 3$

5. (3) Using Rule 1,
Let the principal be ₹ P.

$$\therefore 270.40 = P\left(1+\frac{4}{100}\right)^2$$

$$\Rightarrow 270.40 = P\,(1 + 0.04)^2$$

$$\Rightarrow P = \frac{270.40}{1.04 \times 1.04} = ₹\ 250$$

6. (2) Using Rule 1,
Let the sum be ₹ P and rate of interest be R% per annum. Then,

$$P\left(1+\frac{R}{100}\right)^2 = 9680 \quad ...(i)$$

$$P\left(1+\frac{R}{100}\right)^3 = 10648 \quad ...(ii)$$

On dividing equation (ii) by (i)

$$1+\frac{R}{100} = \frac{10648}{9680}$$

$$\Rightarrow \frac{R}{100} = \frac{10648}{9680} - 1$$

$$= \frac{10648-9680}{9680}$$

$$\Rightarrow \frac{R}{100} = \frac{968}{9680} = \frac{1}{10}$$

$$\Rightarrow R = \frac{1}{10} \times 100 = 10\%$$

7. (3) Using Rule 1,
Let the rate per cent per annum be *r*. Then,

$$2500 = 2304\left(1+\frac{r}{100}\right)^2$$

$$\Rightarrow \left(1+\frac{r}{100}\right)^2 = \frac{2500}{2304} = \left(\frac{50}{48}\right)^2$$

$$\Rightarrow 1+\frac{r}{100} = \frac{50}{48} = \frac{25}{24}$$

$$\Rightarrow \frac{r}{100} = \frac{25}{24} - 1 = \frac{1}{24}$$

$$\Rightarrow r = \frac{100}{24} = \frac{25}{6} = 4\frac{1}{6}\%$$

8. (4) Using Rule 1,
Let the sum be ₹ *x*.

$$\therefore 1352 = x\left(1+\frac{4}{100}\right)^2$$

$$\Rightarrow 1352 = x\left(1+\frac{1}{25}\right)^2$$

$$\Rightarrow 1352 = x\left(\frac{26}{25}\right)^2$$

$$\Rightarrow x = \frac{1352 \times 25 \times 25}{26 \times 26}$$

= ₹ 1250

9. (3) Using Rule 1,
The interest is compounded quarterly.

$$\therefore R = \frac{20}{4} = 5\%$$

Time = 3 quarters

$$\therefore \text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$= 16000\left[\left(1+\frac{5}{100}\right)^3 - 1\right]$$

$$= 16000\left[\left(\frac{21}{20}\right)^3 - 1\right]$$

$$= 16000\left(\frac{9261-8000}{8000}\right)$$

$$= 16000 \times \frac{1261}{8000} = ₹\ 2522$$

10. (3) Using Rule 3,
Amount

$$= P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)\left(1+\frac{R_3}{100}\right)$$

$$= 10000\left(1+\frac{4}{100}\right)\left(1+\frac{5}{100}\right)\left(1+\frac{6}{100}\right)$$

$$= 10000 \times \frac{26}{25} \times \frac{21}{20} \times \frac{53}{50}$$

A = ₹ 11575.2
∴ C.I. = ₹ (11575.2–10000)
= ₹ 1575.2

11. (1) Using Rule 3,
Amount

$$= 2000\left(1+\frac{4}{100}\right)\left(1+\frac{3}{100}\right)$$

= 2000 ×1.04 ×1.03
= ₹ 2142.40
∴ CI = ₹ (2142.40 – 2000)
= ₹ 142.40

12. (1) Using Rule 1,
Let the rate of CI be R per cent per annum.

$$\therefore \text{CI} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$\Rightarrow 5044 = 32000\left[\left(1+\frac{R}{400}\right)^3 - 1\right]$$

[∵ Interest is compounded quarterly]

$$\Rightarrow \frac{5044}{32000} = \left(1+\frac{R}{400}\right)^3 - 1$$

$$\Rightarrow \left(1+\frac{R}{400}\right)^3 - 1 = \frac{1261}{8000}$$

$$\Rightarrow \left(1+\frac{R}{400}\right)^3 = 1+\frac{1261}{8000}$$

$$\Rightarrow \left(1+\frac{R}{400}\right)^3 = \frac{9261}{8000} = \left(\frac{21}{20}\right)^3$$

$$\Rightarrow 1+\frac{R}{400} = \frac{21}{20} \Rightarrow \frac{R}{400} = \frac{21}{20} - 1 = \frac{1}{20}$$

$$\Rightarrow R = \frac{400}{20} = 20$$

13. (3) Using Rule 1,

$$\text{Amount} = P\left(1+\frac{R}{100}\right)^t$$

$$= 8000\left(1+\frac{15}{100}\right)^{2\frac{1}{3}}$$

$$= 8000\left(1+\frac{3}{20}\right)^2\left(1+\frac{3}{20\times 3}\right)$$

$$= 8000 \times \frac{23}{20} \times \frac{23}{20} \times \frac{21}{20}$$

= ₹ 11109
∴ Compound Interest
= ₹ (11109 – 8000) = ₹ 3109.

14. (1) Using Rule 1 and 2,
The rate of interest is compounded half yearly,
∴ *r* = 10% per half year

Let time = $\frac{T}{2}$ years = half years

According to the question,

$$\text{Amount} = P\left(1+\frac{R}{100}\right)^t$$

$$\Rightarrow 13310 = 10000\left(1+\frac{10}{100}\right)^T$$

$$\Rightarrow \frac{13310}{10000} = \left(\frac{11}{10}\right)^T$$

$$\Rightarrow \left(\frac{11}{10}\right)^T = \frac{1331}{1000} = \left(\frac{11}{10}\right)^3$$

$$\Rightarrow T = 3 \text{ half years} = 1\frac{1}{2} \text{ years}$$

15. (4) Let the principal be ₹ x. Now,

$$\text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$\Rightarrow 1261 = x\left[\left(1+\frac{5}{100}\right)^3 - 1\right]$$

$$\Rightarrow 1261 = x\left(\frac{9261}{8000} - 1\right)$$

$$\Rightarrow 1261 = x\left(\frac{9261-8000}{8000}\right)$$

$$= \frac{1261x}{8000}$$

$$\Rightarrow x = \frac{1261 \times 8000}{1261} = ₹\ 8000$$

16. (3) Using Rule 1,
Let the sum be P.
As, the interest is compounded half-yearly,
$\therefore$ R = 2%, T = 2 half years

$$\therefore A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow 7803 = P\left(1+\frac{2}{100}\right)^2$$

$$\Rightarrow 7803 = P\left(1+\frac{1}{50}\right)^2$$

$$\Rightarrow 7803 = P \times \frac{51}{50} \times \frac{51}{50}$$

$$\Rightarrow P = \frac{7803 \times 50 \times 50}{51 \times 51} = ₹\ 7500$$

17. (1) Using Rule 1,

$$5832 = P\left(1+\frac{8}{100}\right)^2$$

$$\Rightarrow 5832 = P\left(1+\frac{2}{25}\right)^2$$

$$\Rightarrow 5832 = P \times \frac{27}{25} \times \frac{27}{25}$$

$$\Rightarrow P = \frac{5832 \times 25 \times 25}{27 \times 27} = ₹\ 5000$$

18. (3) Amount

$$= 6000\left(1+\frac{10}{100}\right) \times \left(1+\frac{\frac{1}{2}\times 10}{100}\right)$$

$$= 6000 \times \frac{11}{10} \times \frac{21}{20} = ₹\ 6930$$

Aliter : Using Rule 4,
Here, t = nF

$$A = P\left(1+\frac{r}{100}\right)^n\left(1+\frac{rF}{100}\right)$$

$\therefore$ CI = ₹ (6930 – 6000) = ₹ 930

19. (2) Using Rule 1 and 2,
Interest is compounded half yearly.
$\therefore$ Rate of interest = 5%

Time $= \frac{n}{2}$ years (let)

or n half-years

$$A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow 9261 = 8000\left(1+\frac{5}{100}\right)^n$$

$$\Rightarrow \frac{9261}{8000} = \left(\frac{21}{20}\right)^n$$

$$\Rightarrow \left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^n$$

$\Rightarrow n = 3$ half years

$= \frac{3}{2}$ years $= 1\frac{1}{2}$ years

20. (1) Using Rule 1,

$$A = P\left(1+\frac{R}{100}\right)^T$$

Let rate be 'r'

$$\Rightarrow \frac{1102.50}{1000} = \left(1+\frac{r}{100}\right)^2$$

$$\Rightarrow \frac{11025}{10000} = \left(1+\frac{r}{100}\right)^2$$

$$\Rightarrow \left(\frac{105}{100}\right)^2 = \left(1+\frac{r}{100}\right)^2$$

$$\Rightarrow 1 + \frac{r}{100} = \frac{105}{100}$$

$$\Rightarrow \frac{r}{100} = \frac{5}{100}$$

$\Rightarrow r = 5\%$

21. (1) Using Rule 1 and 2,
Rate = 10% per annum = 5% half yearly

$$A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow 926.10 = 800\left(1+\frac{5}{100}\right)^T$$

$$\Rightarrow \frac{9261}{8000} = \left(\frac{21}{20}\right)^T$$

$$\Rightarrow \left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^T$$

$\therefore$ Time = 3 half years

$= 1\frac{1}{2}$ years

22. (4) Using Rule 1,

$$A = P\left(1+\frac{R}{100}\right)^T$$

$$= 6000\left(1+\frac{5}{100}\right)^2$$

$$= 6000 \times \frac{21}{20} \times \frac{21}{20} = ₹\ 6615$$

23. (1) Using Rule 1 and 2,
Let the required time be t years.
Interest is compounded half yearly.
$\therefore$ Time = $2t$ half years

and rate $= \frac{20}{2} = 10\%$

$$\therefore \quad 1000\left(1+\frac{10}{100}\right)^{2t} = 1331$$

$$\Rightarrow \left(\frac{11}{10}\right)^{2t} = \frac{1331}{1000}$$

$$\Rightarrow \left(\frac{11}{10}\right)^{2t} = \left(\frac{11}{10}\right)^3 \Rightarrow 2t = 3$$

$\therefore \quad t = \frac{3}{2}$ years or $1\frac{1}{2}$ years

24. (3) Using Rule 1,

$$A = P\left(1+\frac{R}{100}\right)^T$$

$\Rightarrow$ 30000 + 4347

$$= 30000\left(1+\frac{7}{100}\right)^T$$

$$\Rightarrow \frac{34347}{30000} = \left(\frac{107}{100}\right)^T$$

$$\Rightarrow \frac{11449}{10000} = \left(\frac{107}{100}\right)^2 = \left(\frac{107}{100}\right)^T$$

$\Rightarrow$ Time = 2 years

25. (4) Using Rule 1,
If the rate of C.I. be r% per annum, then

$$A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow 8820 = 8000\left(1+\frac{r}{100}\right)^2$$

$$\Rightarrow \frac{8820}{8000} = \left(1+\frac{r}{100}\right)^2$$

$$\Rightarrow \frac{441}{400} = \left(\frac{21}{20}\right)^2 = \left(1+\frac{r}{100}\right)^2$$

$$\Rightarrow 1 + \frac{r}{100} = \frac{21}{20}$$

$$\Rightarrow \frac{r}{100} = \frac{21}{20} - 1 = \frac{1}{20}$$

$$\Rightarrow r = \frac{1}{20} \times 100$$

$\therefore r = 5\%$ per annum

26. (2) Using Rule 3,

$$A = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)$$

$$= 10000\left(1+\frac{10}{100}\right)\left(1+\frac{12}{100}\right)$$

$$= 10000 \times \frac{11}{10} \times \frac{28}{25}$$

= ₹ 12320

27. (3) Using Rule 1,

$$CI = P\left[\left(1+\frac{R}{100}\right)^T - 1\right] - \frac{PR}{100}$$

$$\Rightarrow 420 = P\left[\left(1+\frac{5}{100}\right)^2 - 1\right] - \frac{P \times 5}{100}$$

$$\Rightarrow 420 = P\left[\left(\frac{21}{20}\right)^2 - 1\right] - \frac{5P}{100}$$

$$\Rightarrow 420 = \frac{41P}{400} - \frac{5P}{100} = \frac{21P}{400}$$

$$\Rightarrow P = \frac{420 \times 400}{21} = ₹\ 8000$$

28. (2) Using Rule 1,
Amount

$$= 2000\left(1+\frac{5}{100}\right)^2 + 2000\left(1+\frac{5}{100}\right)$$

$$= 2000 \times \left(\frac{21}{20}\right)^2 + 2000\left(\frac{21}{20}\right)$$

$$= 2000 \times \frac{21}{20} \times \frac{41}{20} = ₹\ 4305$$

$\therefore$ Required amount
= 4305 + 2000 = ₹ 6305

29. (1) Using Rule 1 and 2,
Time = t half year
and R = 5% per half year

$$\therefore A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow \frac{92610}{80000} = \left(1+\frac{5}{100}\right)^T$$

$$\Rightarrow \frac{9261}{8000} = \left(\frac{21}{20}\right)^T$$

$\Rightarrow$ T = 3 half years or $1\frac{1}{2}$ years

$$\Rightarrow \left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^T$$

30. (2) If each instalment be x, then
Present worth of first instalment

$$= \frac{x}{1+\frac{10}{100}} = \frac{10x}{11}$$

Present worth of second instalment

$$= \frac{x}{\left(1+\frac{10}{100}\right)^2} = \frac{100}{121}x$$

$$\therefore \frac{10}{11}x + \frac{100}{121}x = 21000$$

$$\Rightarrow \frac{110x + 100x}{121} = 21000$$

$$\Rightarrow 210x = 21000 \times 121$$

$$\Rightarrow x = \frac{21000 \times 121}{210}\ x = ₹\ 12100$$

Aliter : Using Rule 9,
Here, n = 2, p = ₹ 21000,
r = 10%
Each annual instalment

$$= \frac{P}{\left(\frac{100}{100+r}\right) + \left(\frac{100}{100+r}\right)^2}$$

$$= \frac{21000}{\frac{100}{110} + \left(\frac{100}{110}\right)^2}$$

$$= \frac{21000}{\frac{100}{110} + \frac{10000}{12100}}$$

$$= \frac{21000}{\frac{10}{11} + \frac{100}{121}}$$

$$= \frac{21000}{110+100} \times 121$$

$$= \frac{21000}{210} \times 121$$

= 12100

31. (2) Using Rule 1,

$$A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow 882 = 800\left(1+\frac{5}{100}\right)^T$$

$$\Rightarrow \frac{882}{800} = \left(\frac{21}{20}\right)^T$$

$$\Rightarrow \frac{441}{400} = \left(\frac{21}{20}\right)^2 = \left(\frac{21}{20}\right)^T$$

$\therefore$ T = 2 years

32. (2) Using Rule 1,

$$C.I. = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$= 5000\left[\left(1+\frac{10}{100}\right)^3 - 1\right]$$

$$= 5000\left[\left(\frac{11}{10}\right)^3 - 1\right]$$

$$C.I. = \frac{5000 \times 331}{1000} = ₹\ 1655$$

33. (1) Using Rule 1 and 2,

$$A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow \frac{3362}{3200} = \left(1+\frac{10}{400}\right)^{4t}$$

$$\Rightarrow \frac{1681}{1600} = \left(\frac{41}{40}\right)^{4t}$$

$\Rightarrow \left(\frac{41}{40}\right)^2 = \left(\frac{41}{40}\right)^{4t}$

$\Rightarrow 4t = 2 \Rightarrow t = \frac{1}{2}$ year

34. (3) Using Rule 1,
Let the principal be Rs. P

$\therefore$ C.I. = $P\left[\left(1+\frac{R}{100}\right)^2 - 1\right]$

$\Rightarrow 328 = P\left[\left(1+\frac{5}{100}\right)^2 - 1\right]$

$\Rightarrow 328 = P\left[\left(\frac{21}{20}\right)^2 - 1\right]$

$\Rightarrow 328 = P\left(\frac{441}{400} - 1\right)$

$\Rightarrow 328 = P\left(\frac{441-400}{400}\right)$

$\Rightarrow 328 = \frac{41P}{400}$

$\Rightarrow P = \frac{328 \times 400}{41}$ = ₹ 3200

35. (2) Present worth of bike

$= P\left(1-\frac{R}{100}\right)^T$

$= 62500\left(1-\frac{4}{100}\right)^2$

$= 62500\left(1-\frac{1}{25}\right)^2$

$= 62500\left(\frac{25-1}{25}\right)^2$

$= \frac{62500 \times 24 \times 24}{25 \times 25}$

= ₹ 57600

36. (2) C.I. – S.I.
= 615 – 600 = ₹ 15

S.I. for 1 year = $\frac{600}{2}$ = ₹ 300

$\therefore$ S.I. for 1 year on ₹ 300
= ₹ 15

$\therefore$ Rate = $\frac{15 \times 100}{300 \times 1}$ = 5%

$\therefore \frac{PRT}{100} = 600$

$\Rightarrow P \times \frac{5 \times 2}{100} = 600$

$\Rightarrow$ P = 600 × 10 = ₹ 6000

37. (4) Using Rule 1,

$A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 13230 = 12000\left(1+\frac{5}{100}\right)^n$

$\Rightarrow \frac{13230}{12000} = \left(1+\frac{1}{20}\right)^n$

$\Rightarrow \frac{441}{400} = \left(\frac{21}{20}\right)^n$

$\Rightarrow \left(\frac{21}{20}\right)^n = \left(\frac{21}{20}\right)^2$

$\Rightarrow n = 2$ years

38. (3) Using Rule 1,
Principal (P) = Rs. S
Rate (R) = 2r% per annum

$\therefore$ Amount = $P\left(1+\frac{R}{100}\right)^T$

$= S\left(1+\frac{2r}{100}\right)^3 = S\left(1+\frac{r}{50}\right)^3$

39. (1) Using Rule 1,

$A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 2420 = P\left(1+\frac{10}{100}\right)^2$

$\Rightarrow 2420 = P\left(1+\frac{1}{10}\right)^2 = P\left(\frac{11}{10}\right)^2$

$\Rightarrow P = \frac{2420 \times 10 \times 10}{11 \times 11}$ = Rs. 2000

40. (3) Using Rule 1,
Let principal be Rs. P.

Interest in 1 year = $\frac{PRT}{100}$

$= \frac{P \times 10}{100}$ = Rs. $\frac{P}{10}$

According to question,

$\therefore P\left[\left(1+\frac{R}{100}\right)^2 - 1\right] - \frac{P}{10}$

= 132

$\Rightarrow P\left[\left(1+\frac{10}{100}\right)^2 - 1\right] - \frac{P}{10}$

= 132

$\Rightarrow P\left[\left(\frac{11}{10}\right)^2 - 1\right] - \frac{P}{10} = 132$

$\Rightarrow P\left(\frac{121}{100} - 1\right) - \frac{P}{10} = 132$

$\Rightarrow \frac{21P}{100} - \frac{P}{10} = 132$

$\Rightarrow \frac{21P - 10P}{100} = 132$

$\Rightarrow \frac{11P}{100} = 132$

$\Rightarrow P = \frac{132 \times 100}{11}$ = Rs 1200

41. (3) Using Rule 1,
Let the principal be Rs. P.
According to the question,

$P\left(1+\frac{R}{100}\right)^2 - P\left(1+\frac{R}{100}\right) = 420$

$\Rightarrow P\left(1+\frac{R}{100}\right)\left(1+\frac{R}{100} - 1\right) = 420$

$\Rightarrow P\left(1+\frac{R}{100}\right) \times \frac{R}{100} = 420$

$\Rightarrow P\left(1+\frac{5}{100}\right) \times \frac{5}{100} = 420$

$\Rightarrow P\left(1+\frac{1}{20}\right) = 420 \times 20$

$\Rightarrow P \times \frac{21}{20} = 420 \times 20$

$\Rightarrow P = \frac{420 \times 20 \times 20}{21}$ = Rs. 8000

42. (4) Using Rule 1,
Time = T half–years

Rate = $\frac{5}{2}$% per half year

$A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 68921 = 64000\left(1+\frac{5}{200}\right)^T$

$\Rightarrow \frac{68921}{64000} = \left(1+\frac{1}{40}\right)^T$

$\Rightarrow \frac{68921}{64000} = \left(\frac{41}{40}\right)^T$

$\Rightarrow \left(\frac{41}{40}\right)^3 = \left(\frac{41}{40}\right)^T$

$\Rightarrow$ T = 3 half years

$= \frac{3}{2} = 1\frac{1}{2}$ years

43. (4) Using Rule 1,

$A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 12100 = P\left(1+\frac{10}{100}\right)^2$

$\Rightarrow 12100 = P\left(\frac{11}{10}\right)^2$

$\Rightarrow 12100 = P \times \frac{121}{100}$

$\Rightarrow P = \frac{12100 \times 100}{121}$ = Rs. 10000

44. (4) Using Rule 1,

$A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 1348.32 = 1200\left(1+\frac{R}{100}\right)^2$

$\Rightarrow \frac{1348.32}{1200} = \left(1+\frac{R}{100}\right)^2$

$\Rightarrow \frac{134832}{120000} = \left(1+\frac{R}{100}\right)^2$

$\Rightarrow \frac{11236}{10000} = \left(1+\frac{R}{100}\right)^2$

$\Rightarrow \left(\frac{106}{100}\right)^2 = \left(1+\frac{R}{100}\right)^2$

$\Rightarrow \frac{106}{100} = 1+\frac{R}{100}$

$\Rightarrow 1+\frac{6}{100} = 1+\frac{R}{100}$

$\Rightarrow$ R = 6% per annum.

45. (3) Using Rule 1,
Rate of interest

$= \frac{20}{4}$ = 5% per quarter

Time = 3 quarters

$\therefore$ C.I. $= P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= 12000\left[\left(1+\frac{5}{100}\right)^3 - 1\right]$

$= 12000\left[\left(1+\frac{1}{20}\right)^3 - 1\right]$

$= 12000\left[\left(\frac{21}{20}\right)^3 - 1\right]$

$= 12000\left(\frac{9261}{8000} - 1\right)$

$= \frac{12000 \times 1261}{8000}$ = Rs. 1891.5

46. (2) Amount
= Rs. (30000 + 4347)
= Rs. 34347

$A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 34347 = 30000\left(1+\frac{7}{100}\right)^n$

$\Rightarrow \frac{34347}{30000} = \left(\frac{107}{100}\right)^n$

$\Rightarrow \frac{11449}{10000} = \left(\frac{107}{100}\right)^n$

$\Rightarrow \left(\frac{107}{100}\right)^2 = \left(\frac{107}{100}\right)^n$

$\Rightarrow n = 2$ years

47. (2) Let the principal be Rs. P.

$\therefore A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 2420 = P\left(1+\frac{10}{100}\right)^2$

$\Rightarrow 2420 = P \times \left(1+\frac{10}{100}\right)^2$

$\Rightarrow 2420 = P\left(\frac{11}{10}\right)^2$

$\Rightarrow P = \frac{2420 \times 10 \times 10}{11 \times 11}$

= Rs. 2000

48. (3) Rate of interest $= \frac{8}{4}$ = 2% per quarter
Time = 3 quarters

C.I. $= P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= 5000\left[\left(1+\frac{2}{100}\right)^3 - 1\right]$

$= 5000\left[(1.02)^3 - 1\right]$

= 5000 (1.061208 –1)
= 5000 × 0.061208
= Rs. 306.04

49. (3) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 800 = P\left(1+\frac{R}{100}\right)^3$ ....(i)

and,

$840 = P\left(1+\frac{R}{100}\right)^4$ ....(ii)

On dividing equation (ii) by (i),

$\frac{840}{800} = 1+\frac{R}{100}$

$\Rightarrow \frac{21}{20} = 1+\frac{R}{100}$

$\Rightarrow \frac{R}{100} = \frac{21}{20} - 1 = \frac{1}{20}$

$\Rightarrow R = \frac{1}{20} \times 100$

= 5% per annum

50. (4) Rate = 10% Per annum
= 5% per half year
Time = T years = 2T half years

$\therefore A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 926.10 = 800\left(1+\frac{5}{100}\right)^{2T}$

$\Rightarrow \frac{926.1}{800} = \left(1+\frac{1}{20}\right)^{2T}$

$\Rightarrow \frac{9261}{8000} = \left(\frac{21}{20}\right)^{2T}$

$\Rightarrow \left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^{2T}$

$\Rightarrow 2T = 3 \Rightarrow T = \frac{3}{2}$ years

51. (2) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 4000 = 2000\left(1+\frac{R}{100}\right)^2$

$\Rightarrow 2 = \left(1+\frac{R}{100}\right)^2$

$\Rightarrow 1+\frac{R}{100} = \sqrt{2}$ .....(1)

$\therefore 8000 = 2000\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 4 = (\sqrt{2})^T$

$\Rightarrow (\sqrt{2})^4 = (\sqrt{2})^T$

$\Rightarrow$ T = 4 years

52. (3) $A = P\left(1+\frac{R}{100}\right)^T$

$= 64000\left(1+\frac{7.5}{100}\right)^3$

$= 64000\left(1+\frac{3}{40}\right)^3$

$= 64000\left(\frac{43}{40}\right)^3$

$= \frac{64000\times 43\times 43\times 43}{40\times 40\times 40}$

= Rs. 79507

$\therefore$ C.I. = Rs. (79507 – 64000)

= Rs. 15507

53. (3) Principal = Rs. 4096

Time = $\frac{3}{2}$ years = 3 half years

Rate = $\frac{25}{2}\%$ per annum

= $\frac{25}{4}\%$ per half year

$\therefore A = P\left(1+\frac{R}{100}\right)^T$

$= 4096\left(1+\frac{25}{400}\right)^3$

$= 4096\left(1+\frac{1}{16}\right)^3$

$= 4096 \times \frac{17}{16}\times\frac{17}{16}\times\frac{17}{16}$

= Rs. 4913

54. (3) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 11664 = 10000\left(1+\frac{R}{100}\right)^2$

$\Rightarrow \frac{11664}{10000} = \left(1+\frac{R}{100}\right)^2$

$\Rightarrow \left(\frac{108}{100}\right)^2 = \left(1+\frac{R}{100}\right)^2$

$\Rightarrow 1+\frac{R}{100} = \frac{108}{100}$

$\Rightarrow \frac{R}{100} = \frac{108}{100} - 1 = \frac{8}{100}$

$\therefore R = \frac{8}{100}\times 100$

= 8% per annum

55. (1) C.I. = $P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= 4000\left[\left(1+\frac{10}{100}\right)^4 - 1\right]$

$= 4000\left[\left(\frac{11}{10}\right)^4 - 1\right]$

= 4000 (1.4641 – 1)

= 4000 × 0.4641 = Rs. 1856.4

56. (2) $A = P\left(1+\frac{R}{100}\right)^T$

$\therefore 2420 = P\left(1+\frac{R}{100}\right)^2$ .... (i)

and, $2662 = P\left(1+\frac{R}{100}\right)^3$ .. (ii)

By equation (ii) ÷ (i)

$\frac{2662}{2420} = 1 + \frac{R}{100}$

$\Rightarrow \frac{R}{100} = \frac{2662}{2420} - 1$

$= \frac{2662-2420}{2420}$

$\Rightarrow \frac{R}{100} = \frac{242}{2420} = \frac{1}{10}$

$\Rightarrow$ R = 10% per annum.

From equation (i),

$2420 = P\left(1+\frac{10}{100}\right)^2$

$\Rightarrow 2420 = P\left(\frac{11}{10}\right)^2$

$\Rightarrow 2420 = P \times \frac{121}{100}$

$\Rightarrow P = \frac{2420\times 100}{121}$

= Rs. 2000

57. (1) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 6000 = 3000\left(1+\frac{R}{100}\right)^2$

$\Rightarrow 2 = \left(1+\frac{R}{100}\right)^2$

On squaring,

$4 = \left(1+\frac{R}{100}\right)^4$

i.e. Amount

= Rs. (4 × 3000)

= Rs. 12000

$\therefore$ C.I. = Rs. (12000 – 3000)

= Rs. 9000

58. (3) Rate of interest

= 12% per annum

= 6% per half-year

Time = 2 half years

$\therefore$ C.I. = $P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= 12500\left[\left(1+\frac{6}{100}\right)^2 - 1\right]$

$= 12500\left[\left(1+\frac{3}{50}\right)^2 - 1\right]$

$= 12500\left[\left(\frac{53}{50}\right)^2 - 1\right]$

$= 12500\left(\frac{2809}{2500} - 1\right)$

= Rs. $\left(\frac{12500\times 309}{2500}\right)$

= Rs. 1545

59. (1) Let the principal be Rs. P.

$A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 6655 = P\left(1+\frac{10}{100}\right)^3$

$\Rightarrow 6655 = P\left(1+\frac{1}{10}\right)^3$

$\Rightarrow 6655 = P\left(\frac{11}{10}\right)^3$

$\Rightarrow P = \frac{6655\times 10\times 10\times 10}{11\times 11\times 11}$

= Rs. 5000

60. (1) Let the time be T years.

$\therefore\ A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 9261 = 8000\left(1+\frac{5}{100}\right)^T$

$\Rightarrow \frac{9261}{8000} = \left(1+\frac{1}{20}\right)^T$

$\Rightarrow \left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^T$

$\Rightarrow$ T = 3 years

61. (2) C.I. = $P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= 1000\left[\left(1+\frac{10}{100}\right)^3 - 1\right]$

$= 1000\left[\left(1+\frac{1}{10}\right)^3 - 1\right]$

$= 1000\left[\left(\frac{11}{10}\right)^3 - 1\right]$

$= 1000\left(\frac{1331}{1000} - 1\right)$

$= \frac{1000\times 331}{1000}$ = Rs. 331

62. (2) C.I. = $P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= 25000\left[\left(1+\frac{5}{100}\right)^2 - 1\right]$

$= 25000\left[\left(1+\frac{1}{20}\right)^2 - 1\right]$

$= 25000\left(\frac{441}{400} - 1\right)$

$= 2500\left(\frac{441-400}{400}\right)$

$= \frac{25000\times 41}{400}$ = Rs. 2562.5

63. (1) Rate = 10% per annum
= 5% per half year

Time = $1\frac{1}{2}$ years = 3 half years

$\therefore$ C.I. = $P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= 24000\left[\left(1+\frac{5}{100}\right)^3 - 1\right]$

$= 24000\left[\left(1+\frac{1}{20}\right)^3 - 1\right]$

$= 24000\left[\left(\frac{21}{20}\right)^3 - 1\right]$

$= 24000\left(\frac{9261}{8000} - 1\right)$

$= \frac{24000\times 1261}{8000}$ = Rs. 3783

64. (1) C.I. = $P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$\Rightarrow 3225 = P\left[\left(1+\frac{15}{100}\right)^2 - 1\right]$

$\Rightarrow 3225 = P\left[\left(1+\frac{3}{20}\right)^2 - 1\right]$

$\Rightarrow 3225 = P\left[\left(\frac{23}{20}\right)^2 - 1\right]$

$\Rightarrow 3225 = P\left(\frac{529}{400} - 1\right)$

$\Rightarrow 3225 = P\left(\frac{529-400}{400}\right)$

$\Rightarrow 3225 = P \times \frac{129}{400}$

$\Rightarrow P = \frac{3225\times 400}{129}$

= Rs. 10000

65. (1) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 3993 = 3000\left(1+\frac{x}{100}\right)^3$

$\Rightarrow \frac{3993}{3000} = \left(1+\frac{x}{100}\right)^3$

$\Rightarrow \frac{1331}{1000} = \left(1+\frac{x}{100}\right)^3$

$\Rightarrow \left(\frac{11}{10}\right)^3 = \left(1+\frac{x}{100}\right)^3$

$\Rightarrow 1 + \frac{x}{100} = \frac{11}{10}$

$\Rightarrow \frac{x}{100} = \frac{11}{10} - 1 = \frac{1}{10}$

$\Rightarrow x = \frac{1}{10} \times 100$

= 10% per annum

66. (2) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 2P = P\left(1+\frac{19}{100}\right)^T$

$\Rightarrow 2 = \left(\frac{119}{100}\right)^T$

$\Rightarrow 2 = (1.19)^T$

If T = 4 years,

$(1.19)^4 > 2$

TYPE-II

1. (3) Let the sum be P.

$\therefore 101.50 = P\left[\left(1+\frac{3}{100}\right)^2 - 1\right]$

$\left[\because \text{C.I.} = P\left[\left(1+\frac{r}{100}\right)^n - 1\right]\right]$

$\Rightarrow 101.50 = P\left[\left(\frac{103}{100}\right)^2 - 1\right]$

$= P\left(\frac{10609-10000}{10000}\right)$

$\Rightarrow$ P = ₹ $\frac{101.50\times 10000}{609}$

= ₹ $\frac{1015000}{609}$

$\therefore$ S.I. = $\frac{1015000\times 2\times 3}{609\times 100}$ = ₹ 100

Aliter : Using Rule 10,
Here, C.I. = Rs 101.50
R = 3%, S.I. = ?

C.I. = S.I. $\left(1+\frac{R}{200}\right)$

101.50 = S.I. $\left(1+\frac{3}{200}\right)$

S.I. = $\frac{101.50\times 200}{203}$

S.I. = ₹ 100

2. (2) Using Rule 1,
Suppose principal be x

$\Rightarrow x\left\{\left(1+\frac{5}{100}\right)^3 - 1\right\} = 252.20$

$\Rightarrow x\left\{\left(\frac{21}{20}\right)^3 - 1\right\} = 252.20$

$\Rightarrow x\left\{\frac{21\times 21\times 21 - 20\times 20\times 20}{20\times 20\times 20}\right\} = 252.20$

$\Rightarrow x\frac{1261}{8000} = 252.20$

$\therefore x = \frac{252 \cdot 20 \times 8000}{1261} = 1600$

$\Rightarrow SI = \frac{1600 \times 5 \times 3}{100} = ₹\ 240$

3. (3) Using Rule 10,
If SI on a certain sum for two years is x and CI is y, then

$y = x\left(1+\frac{r}{200}\right)$

$\Rightarrow 282.15 = 270\left(1+\frac{r}{100}\right)$

$\Rightarrow 1+\frac{r}{200} = \frac{282.15}{270}$

$\Rightarrow \frac{r}{200} = \frac{282.15}{270} - 1$

$\Rightarrow \frac{r}{200} = \frac{12.15}{270}$

$\Rightarrow r = \frac{12.15 \times 200}{270} = 9\%$

4. (2) C.I. $= P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$\Rightarrow 510 = P\left[\left(1+\frac{25}{200}\right)^2 - 1\right]$

$\Rightarrow 510 = P\left(\frac{81}{64} - 1\right)$

$\Rightarrow P = \frac{510 \times 64}{17} = 1920$

$\therefore$ S.I. $= \frac{1920 \times 2 \times 25}{100 \times 2} = ₹\ 480$

Aliter : Using Rule 10,
Here, C.I. = ₹ 510

$R = 12\frac{1}{2}\%$, S.I. = ?

C.I. = S.I. $\left(1+\frac{R}{200}\right)$

510 = S.I. $\left(1+\frac{25}{400}\right)$

S.I. = $\frac{510 \times 400}{425}$

S.I. = ₹ 480

5. (3) Let the principal be P and rate of interest be r per cent per annum. Then,

C. I = $P\left[\left(1+\frac{r}{100}\right)^2 - 1\right]$

$\Rightarrow 40.80 = P\left[\left(1+\frac{r}{100}\right)^2 - 1\right]$ ....(i)

S.I. = $\frac{P.r.t}{100} \Rightarrow 40 = \frac{Pr \times 2}{100}$ ...(ii)

$\therefore \frac{40.80}{40} = \frac{P\left[\left(1+\frac{r}{100}\right)^2 - 1\right]}{\frac{2Pr}{100}}$

$\Rightarrow 1.02$

$= \frac{100}{2r}\left[1+\frac{r^2}{10000}+\frac{2r}{100}-1\right]$

$\Rightarrow 1.02 = \frac{r}{200} + 1$

$\Rightarrow \frac{r}{200} = 1.02 - 1$

$\Rightarrow r = 0.02 \times 200$

$\therefore r = 4\%$ per annum.

Aliter : Using Rule 10,
Here, C.I. = ₹ 40.80
S.I. = ₹ 40, R = ?

C.I.= S.I. $\left(1+\frac{R}{200}\right)$

40.80 = 40$\left(1+\frac{R}{200}\right)$

$\frac{4080}{4000} = 1+\frac{R}{200}$

$\frac{408}{400} = \frac{200+R}{200}$

408 = 400 + 2R
2R = 8
R = 4%

6. (1) Let the principal be P.

$\therefore$ C.I. = $P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$\Rightarrow 328 = P\left[\left(1+\frac{5}{100}\right)^2 - 1\right]$

$\Rightarrow 328 = P\left[\frac{441}{400} - 1\right]$

$\Rightarrow 328 = P\left[\frac{441-400}{400}\right]$

$\Rightarrow P = \frac{328 \times 400}{41} = ₹\ 3200$

$\therefore$ S.I.

$= \frac{PRT}{100} = \frac{3200 \times 5 \times 2}{100} = ₹\ 320$

Aliter : Using Rule 10,
Here, C.I. = ₹ 328,
R = 5%, S.I. = ?

C.I.= S.I. $\left(1+\frac{R}{200}\right)$

328 = S.I. $\left(1+\frac{5}{200}\right)$

328 = S.I. $\left(1+\frac{1}{40}\right)$

S.I. = $\frac{328 \times 40}{41}$

S.I. = 8 x 40 = ₹ 320

7. (2) C.I.= $P\left(1+\frac{r}{100}\right)^t - P$

$2448 = P\left[\left(1+\frac{r}{100}\right)^t - 1\right]$

or $2448 = P\left[\left(1+\frac{4}{100}\right)^2 - 1\right]$

$\Rightarrow 2448 = P\left[\frac{676}{625} - 1\right]$

$2448 = P\left[\frac{51}{625}\right]$

$\therefore P = \frac{2448 \times 625}{51}$

P = ₹ 30,000

$\therefore$ S.I. = $\frac{30000 \times 4 \times 2}{100} = ₹\ 2400$

Aliter : Using Rule 10,
Here, C.I. = ₹ 2448
R = 4%, S.I. = ?

C.I.= S.I. $\left(1+\frac{R}{200}\right)$

2448 = S.I. $\left(1+\frac{4}{200}\right)$

2448 = S.I. $\left(1+\frac{1}{50}\right)$

2448 = S.I. $\left(\frac{51}{50}\right)$

S.I. = $\frac{2448 \times 50}{51}$

S.I. = ₹ 2400

8. (3) Using Rule 1,
Let the principal be x and rate of interest be r% per annum.
Now,

S.I. = $\frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$$260 = \frac{x \times r}{100} \quad ....(i)$$

$$C.I. = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$540.80 = x\left[\left(1+\frac{r}{100}\right)^2 - 1\right]$$

$$\Rightarrow 540.80 = x\left[1+\frac{2r}{100}+\frac{r^2}{10000}-1\right]$$

$$\Rightarrow 540.80 = \frac{2xr}{100}+\frac{xr^2}{10000}$$

$$\Rightarrow 540.80 = 2 \times 260 + \frac{260.r}{100}$$

$$\Rightarrow 260r = 54080 - 52000$$

$$\Rightarrow 260r = 2080$$

$$\Rightarrow r = \frac{2080}{260} = 8\ \%$$

9. (4) $\text{Principal} = \frac{\text{S.I.} \times 100}{\text{Time} \times \text{Rate}}$

$$= \frac{80 \times 100}{2 \times 4} = ₹\ 1000$$

$$\therefore C.I. = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$= 1000\left[\left(1+\frac{4}{100}\right)^2 - 1\right]$$

$$= 1000\left[\left(\frac{26}{25}\right)^2 - 1\right]$$

$$= 1000\left(\frac{676}{625} - 1\right)$$

$$= 1000\left(\frac{676-625}{625}\right)$$

$$= \frac{1000 \times 51}{625} = ₹\ 81.60$$

Aliter : Using Rule 10,
Here, S.I. = ₹ 80
R = 4%, C.I. = ?

$$C.I. = S.I.\left(1+\frac{R}{200}\right)$$

$$C.I. = 80\left(1+\frac{4}{200}\right)$$

$$= 80\left(1+\frac{1}{50}\right)$$

$$= 80 \times \frac{51}{50} = ₹\ 81.60$$

10. (4) Using Rule 1,

$$C.I. = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$246 = P\left[\left(1+\frac{5}{100}\right)^2 - 1\right]$$

$$\Rightarrow 246 = P\left[\left(\frac{21}{20}\right)^2 - 1\right]$$

$$\Rightarrow 246 = P\left(\frac{441-400}{400}\right)$$

$$\Rightarrow 246 = \frac{41P}{400} \Rightarrow P = \frac{246 \times 400}{41}$$

$$= ₹\ 2400$$

$$\therefore SI = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

$$= \frac{2400 \times 3 \times 6}{100} = ₹\ 432$$

11. (4) Difference of CI and SI for two years
= ₹ (954 – 900) = ₹ 54
∴ Sum= Difference in CI and SI

$$\times \left(\frac{100}{\text{Rate}}\right)^2$$

$$\text{Rate} = \frac{2 \times \text{Difference} \times 100}{\text{Simple interest}}$$

$$= \frac{2 \times 5400}{900} = 12\%$$

$$\therefore \text{Sum} = 54 \times \left(\frac{100}{12}\right)^2$$

$$= 54 \times \frac{25}{3} \times \frac{25}{3} = ₹\ 3750$$

Aliter : Using Rule 10,
C.I. = Rs. 954, S.I.=Rs. 900, P=?

$$C.I. = S.I.\left(1+\frac{R}{200}\right)$$

$$954 = 900\left(1+\frac{R}{200}\right)$$

$$\frac{954}{900} = 1+\frac{R}{200}$$

$$\frac{954}{900} - 1 = \frac{R}{200}$$

$$\frac{954-900}{900} = \frac{R}{200}$$

$$\frac{54}{9} = \frac{R}{2}$$

$$R = 12\%$$

$$\text{Now S.I.} = \frac{P \times R \times T}{100}$$

$$900 = \frac{P \times 12 \times 2}{100}$$

$$P = \text{Rs. } 3750$$

12. (4) If the principal be P then

$$C.I. = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$\Rightarrow 420 = P\left[\left(1+\frac{10}{100}\right)^2 - 1\right]$$

$$\Rightarrow 420 = P\left(\frac{121-100}{100}\right)$$

$$\Rightarrow 420 = \frac{P \times 21}{100}$$

$$\Rightarrow P = \frac{420 \times 100}{21} = ₹\ 2000$$

$$\therefore S.I. = \frac{PRT}{100}$$

$$= \frac{2000 \times 10 \times 2}{100} = ₹\ 400$$

Aliter : Using Rule 10,
Here, C.I. = Rs. 420,
R = 10%, S.I. = ?

$$C.I. = S.I.\left(1+\frac{R}{200}\right)$$

$$420 = S.I.\left(1+\frac{10}{200}\right)$$

$$420 = S.I.\left(\frac{210}{200}\right)$$

$$S.I. = \frac{420 \times 200}{210}$$

$$S.I. = \text{Rs. } 400$$

13. (4) If the sum be P, then

$$C.I. = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$\Rightarrow 102 = P\left[\left(1+\frac{4}{100}\right)^2 - 1\right]$$

$\Rightarrow 102 = P\left[\left(\frac{26}{25}\right)^2 - 1\right]$

$\Rightarrow 102 = P\left(\frac{676}{625} - 1\right)$

$\Rightarrow 102 = P\left(\frac{676 - 625}{625}\right)$

$\Rightarrow 102 = P \times \frac{51}{625}$

$\Rightarrow P = \frac{102 \times 625}{51}$ = ₹ 1250

$\therefore$ S.I. $= \frac{1250 \times 2 \times 4}{100}$ = ₹ 100

14. (4) Using Rule 1,
Let S.I. = ₹ 100,
& Principal = ₹ 100

$\therefore$ Rate $= \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$

$= \frac{100 \times 100}{100 \times 8} = \frac{25}{2}\%$

$\therefore$ C.I. $= P\left[\left(1 + \frac{r}{100}\right)^T - 1\right]$

$= 8000\left[\left(1 + \frac{25}{200}\right)^2 - 1\right]$

$= 8000\left(\frac{81}{64} - 1\right) = \frac{8000 \times 17}{64}$

= ₹ 2125

15. (1) C.I. $= P\left[\left(1 + \frac{R}{100}\right)^T - 1\right]$

$\Rightarrow 2544 = P\left[\left(1 + \frac{12}{100}\right)^2 - 1\right]$

$\Rightarrow 2544 = P\left[\left(\frac{28}{25}\right)^2 - 1\right]$

$\Rightarrow 2544 = P\left(\frac{784}{625} - 1\right)$

$\Rightarrow 2544 = P\left(\frac{784 - 625}{625}\right)$

$2544 = \frac{P \times 159}{625}$

$\Rightarrow P = \frac{2544 \times 625}{159}$ = ₹ 10000

$\therefore$ S.I. $= \frac{P \times R \times T}{100}$

$= \frac{10000 \times 2 \times 12}{100}$ = ₹ 2400

Aliter : Using Rule 10,
Here, C.I. = Rs. 2544
R = 12%, S.I. = ?

C.I. $= \text{S.I.}\left(1 + \frac{R}{200}\right)$

$2544 = \text{S.I.}\left(1 + \frac{12}{200}\right)$

$2544 = \text{S.I.}\left(\frac{212}{200}\right)$

S.I. $= \frac{2544 \times 200}{212}$ = ₹ 2400

16. (2) Using Rule 1,

$A = P\left(1 + \frac{R}{100}\right)^T$

$\Rightarrow 2916 = x\left(1 + \frac{8}{100}\right)^2$

$\Rightarrow 2916 = x\left(\frac{27}{25}\right)^2$

$\Rightarrow x = \frac{2916 \times 25 \times 25}{27 \times 27}$

= ₹ 2500

$\therefore$ S.I. $= \frac{P \times R \times T}{100}$

$= \frac{2500 \times 9 \times 3}{100}$ = ₹ 675

17. (1) Using Rule 6,
S.I. for 3 years = ₹ 3000

S.I. for 2 years $= \frac{3000}{3} \times 2$

= ₹ 2000
C.I. – S.I.
= 2050 – 2000 = ₹ 50

S.I. $= \frac{PR \times 3}{100}$

$\Rightarrow PR = \frac{3000 \times 100}{3}$

= ₹ 100000

$\therefore$ Difference $= \frac{P \times R^2}{10000}$

$\Rightarrow 50 = \frac{P \times (100000)^2}{10000 \times P^2}$

$\Rightarrow P = \frac{1000000}{50}$ = ₹ 20000

18. (1) Compound interest

$= P\left[\left(1 + \frac{R}{100}\right)^T - 1\right]$

$\Rightarrow 410 = P\left[\left(1 + \frac{5}{100}\right)^2 - 1\right]$

$\Rightarrow 410 = P\left[\left(1 + \frac{1}{20}\right)^2 - 1\right]$

$\Rightarrow 410 = P\left[\left(\frac{21}{20}\right)^2 - 1\right]$

$\Rightarrow 410 = P\left(\frac{441}{400} - 1\right)$

$\Rightarrow 410 = P\left(\frac{41}{400}\right)$

$\Rightarrow P = \frac{410 \times 400}{41}$ = ₹ 4000

$\therefore$ S.I.

$= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$= \frac{4000 \times 2 \times 5}{100}$ = ₹ 400

Aliter : Using Rule 10,
Here, C.I. = Rs. 410
R = 5%, S.I. = ?

C.I. $= \text{S.I.}\left(1 + \frac{R}{200}\right)$

$410 = \text{S.I.}\left(1 + \frac{5}{200}\right)$

$410 = \text{S.I.}\left(\frac{205}{200}\right)$

S.I. $= \frac{410 \times 200}{205}$

S.I. = Rs.400

19. (4) Principal = ₹ P (let)

$\therefore$ C.I. $= P\left[\left(1 + \frac{R}{100}\right)^T - 1\right]$

$\Rightarrow 510 = P\left[\left(1 + \frac{25}{200}\right)^2 - 1\right]$

$\Rightarrow 510 = P\left[\left(1+\frac{1}{8}\right)^2 - 1\right]$

$\Rightarrow 510 = P\left[\left(\frac{9}{8}\right)^2 - 1\right]$

$\Rightarrow 510 = P\left(\frac{81}{64} - 1\right)$

$\Rightarrow 510 = P\left(\frac{81-64}{64}\right)$

$\Rightarrow 510 = \frac{17P}{64}$

$\Rightarrow P = \frac{510 \times 64}{17}$ = ₹ 1920

$\therefore$ S.I.

$= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$= \frac{1920 \times 2 \times 25}{100 \times 2}$ = ₹ 480

Aliter : Using Rule 10,

Here, C.I. = ₹ 510

$R = 12\frac{1}{2}\%$, S.I. = ?

$\text{C.I.} = \text{S.I.}\left(1+\frac{R}{200}\right)$

$510 = \text{S.I.}\left(1+\frac{25}{400}\right)$

$510 = \text{S.I.}\left(\frac{425}{400}\right)$

$\text{S.I.} = \frac{510 \times 400}{425}$

S.I. = ₹ 480

20. (2) Using Rule 1,

Sum borrowed = Rs. x

$\therefore$ Simple interest after 4 years

$= \frac{x \times 4 \times 5}{100}$ = Rs. $\frac{x}{5}$

Amount lent of on compound interest

= Rs. $\frac{x}{2}$

$\therefore \text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= \frac{x}{2}\left[\left(1+\frac{10}{100}\right)^4 - 1\right]$

$= \frac{x}{2}\left[(1.1)^4 - 1\right]$

$= \frac{x}{2}(1.4641 - 1)$

= Rs. $\frac{0.4641x}{2}$

$\therefore \frac{0.4641x}{2} - \frac{x}{5} = 3205$

$\Rightarrow \frac{2.3205x - 2x}{10} = 3205$

$\Rightarrow 0.3205x = 32050$

$\Rightarrow x = \frac{32050}{0.3205}$ = Rs. 100000

21. (3) S.I. for 2 years

$= \frac{2}{3} \times 540$ = Rs. 360

C.I. – S.I.

= 376.20 – 360 = Rs. 16.20

$\therefore$ Rate of interest

$= \frac{16.20}{180} \times 100$

= 9% per annum

$\therefore$ Principal = $\frac{\text{S.I.} \times 100}{\text{Time} \times \text{Rate}}$

$= \frac{180 \times 100}{1 \times 9}$ = Rs. 2000

22. (2) Principal = $\frac{\text{S.I.} \times 100}{\text{Time} \times \text{Rate}}$

$= \frac{350 \times 100}{2 \times 4}$ = Rs. 4375

Difference = $\frac{PR^2}{10000}$

$= \frac{4375 \times 4 \times 4}{10000}$

= Rs. 7

23. (3) $\because$ S.I. for 3 years

= Rs. 240

$\therefore$ S.I. for 2 years = $\frac{240}{3} \times 2$

= Rs. 160

$\therefore \frac{PR \times 2}{100} = 160$

$\Rightarrow PR = 160 \times 50 = 8000$...(i)

Again, C.I. – S.I.

= 170 – 160 = Rs. 10

$\Rightarrow \frac{PR^2}{10000} = 10$

$\Rightarrow \frac{8000 \times R}{10000} = 10$

$\Rightarrow R = \frac{100}{8} = \frac{25}{2} = 12\frac{1}{2}\%$

24. (2) Principal = $\frac{\text{S.I.} \times 100}{\text{Time} \times \text{Rate}}$

$= \frac{1600 \times 100}{5 \times 2}$ = Rs. 16000

$\text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= 16000\left[\left(1+\frac{5}{100}\right)^3 - 1\right]$

$= 16000\left[\left(\frac{21}{20}\right)^3 - 1\right]$

$= 16000\left(\frac{9261}{8000} - 1\right)$

$= \frac{16000 \times 1261}{8000}$ = Rs. 2522

25. (4) Let the principal be Rs. P.

For 4 years,

$\text{S.I.} = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$= \frac{P \times 4 \times 5}{100}$ = Rs. $\frac{P}{5}$

$\text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= P\left[\left(1+\frac{10}{100}\right)^4 - 1\right]$

$= P\left[\left(\frac{11}{10}\right)^4 - 1\right]$

$= P\left(\frac{14641}{10000} - 1\right)$

$= \frac{4641P}{10000}$

According to the question,

$\frac{4641P}{10000} - \frac{P}{5} = 26410$

$\Rightarrow \frac{4641P - 2000P}{10000} = 2641$

$\Rightarrow \frac{2641P}{10000} = 2641$

$\Rightarrow P$ = Rs. 10000

26. (2) Principal = $\frac{\text{S.I.}\times 100}{\text{Time}\times\text{Rate}}$

$= \frac{50\times 100}{2\times 5}$ = Rs. 500

$\therefore$ C.I. = $P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= 500\left[\left(1+\frac{5}{100}\right)^2 - 1\right]$

$= 500\left[\left(1+\frac{1}{20}\right)^2 - 1\right]$

$= 500\left[\left(\frac{21}{20}\right)^2 - 1\right]$

$= 500\left(\frac{441}{400} - 1\right)$

$= \frac{500\times 41}{400}$ = Rs. 51.25

27. (4) According to the question,
If principal
= Rs. 100 then interest
= Rs. 40.

$\therefore$ Rate = $\frac{\text{S.I.}\times 100}{\text{Principal}\times\text{Time}}$

$= \frac{40\times 100}{100\times 8}$ = 5% per annum

Case II.

$\therefore A = P\left(1+\frac{R}{100}\right)^T$

$= 30000\left(1+\frac{5}{100}\right)^2$

$= 30000\left(1+\frac{1}{20}\right)^2$

$= 30000\left(\frac{20+1}{20}\right)^2$

$= 30000 \times \frac{21}{20}\times\frac{21}{20}$

= Rs. 33075

$\therefore$ C. I. = Rs. (33075 – 30000)

= Rs. 3075

TYPE-III

1. (1) **TRICK**

As the interest was compounded half-yearly, we changed r to $\frac{r}{2}$ and t to 2t.

$\therefore$ T = 1 year & R 6%

Sum

$= \frac{36\times 100\times 100}{6\times 6}$

= ₹10000

2. (2) Compound Interest (when compounded yearly)

$= 5000\left(1+\frac{4}{100}\right)^{1.5} - 5000$

$= 5000\left(\frac{26}{25}\right)^{1.5} - 5000$

= 5302.9805 – 5000 = ₹ 302.9805

C.I. (When compounded half-yearly).

$= 5000\left(1+\frac{2}{100}\right)^3 - 50000$

= 5306.04 – 5000 = ₹ 306.04

Required difference

= ₹ (306.04 – 302.9805)

= ₹ 3.059 = ₹ 3.06

3. (3) Let the sum ₹ x. Then,

C.I. = $x\left(1+\frac{5}{100}\right)^2 - x$

$= \frac{441x}{400} - x = \frac{441x - 400x}{400}$

$= \frac{41}{400}x$

Now,

S.I. = $\frac{x\times 5\times 2}{100} = \frac{x}{10}$

$\therefore$ (C.I.) – (S.I.) = $\frac{41x}{400} - \frac{x}{10}$

$= \frac{41x - 40x}{400} = \frac{x}{400}$

$\therefore \frac{x}{400} = 15$

$\Rightarrow$ x = 15 × 400 = 6000

Hence, the sum is ₹ 6000

Aliter : Using Rule 6,

C.I. – S.I. = ₹ 15, R = 5%, T = 2 years, P =?

C.I. – S.I. = $P\left(\frac{R}{100}\right)^2$

$15 = P\left(\frac{5}{100}\right)^2$

P = 15 × 400

P = ₹ 6000

4. (4) **Tricky Approach**

Difference of SI and CI for 3 years

$= \frac{PR(300+R)}{100^3}$

$\because \frac{P\times 25\times 305}{100\times 100\times 100} = 36.60$

$\Rightarrow P = \frac{36.60\times 100\times 100\times 100}{25\times 305}$

= ₹ 4800

Aliter : Using Rule 6,

C.I.–S.I. = ₹ 36.60, R = 5%, P =?, T = 3yrs.

C.I. – S.I.= $P\left(\frac{R}{100}\right)^2\times\left(3+\frac{R}{100}\right)$

$36.60 = P\left(\frac{5}{100}\right)^2\times\left(3+\frac{5}{100}\right)$

$36.60 = P\times\frac{25}{100^2}\times\frac{305}{100}$

$P = \frac{36.60\times 100\times 100\times 100}{25\times 305}$

$P = \frac{36600000}{25\times 305}$ = ₹ 4800

5. (4) S.I. = ₹ $\frac{2500\times 2\times 4}{100}$ = ₹ 200

C.I. = ₹ $2500\left[\left(1+\frac{4}{100}\right)^2 - 1\right]$

= ₹ $2500\left[\left(\frac{26}{25}\right)^2 - 1\right]$

= ₹ $\frac{(676-625)}{625}\times 2500$

= ₹ $\frac{51}{625}\times 2500$ = ₹ 204

$\therefore$ The required difference

= C.I. – S.I. = ₹ (204 – 200) = ₹ 4

Aliter : Using Rule 6,

Here, C.I. – S.I.= ?, P = ₹ 2500

R = 4%, T = 2

C.I. – S.I.= $P\left(\frac{R}{100}\right)^2$

$= 2500\left(\frac{4}{100}\right)^2$

$= 2500 \times \frac{1}{25} \times \frac{1}{25}$

C.I.–S.I. = ₹ 4

6. (4) Let the sum be x. Then,

C.I. $= x\left(1+\frac{10}{100}\right)^2 - x = \frac{21x}{100}$

S.I. $= \frac{x \times 10 \times 2}{100} = \frac{x}{5}$

$\therefore$ C.I. – S.I. $= \frac{21x}{100} - \frac{x}{5} = \frac{x}{100}$

Given that, $\frac{x}{100} = 65$

$\therefore x = 6500$

Hence, the sum is ₹ 6500.

Aliter : Using Rule 6,

Here, C.I. – S.I. = ₹ 65,

R = 10%, T = 2 years, P = ?

C.I. – S.I. = $P\left(\frac{R}{100}\right)^2$

$65 = P\left(\frac{10}{100}\right)^2$

P = ₹ 6500

7. (3) When difference between the compound interest and simple interest on a certain sum of money for 2 years at r% rate is x, then

$x = \text{Sum}\left(\frac{r}{100}\right)^2$

$\Rightarrow 10 = 1000\left(\frac{r}{100}\right)^2$

$\Rightarrow \left(\frac{r}{100}\right)^2 = \frac{10}{1000}$

$\Rightarrow \frac{r}{100} = \sqrt{\frac{1}{100}} = \frac{1}{10}$

$\Rightarrow r = \frac{100}{10} = 10\%$

Aliter : Using Rule 6,

Here, C.I. – S.I. = Rs. 10

R = ?, T= 2 years, P = Rs. 1000

C.I. – S.I. = $P\left(\frac{R}{100}\right)^2$

$10 = 1000\left(\frac{R}{100}\right)^2$

$10 = 1000 \times \frac{R}{100} \times \frac{R}{100}$

$\Rightarrow R^2 = 100$

$\Rightarrow R = \sqrt{100} = 10\%$

8. (2) Using Rule 6,

When difference between the compound interest and simple interest on a certain sum of money for 2 years at r % rate is x, then the sum is given by

$x\left(\frac{100}{r}\right)^2$ Here x = ₹ 80,

r = 40%

$\therefore$ Required sum = $80\left(\frac{100}{4}\right)^2$

= 80 × 25 × 25 = ₹ 50000

9. (2) Using Rule 6,

When difference between the CI and SI on a certain sum of money for 2 years at r % rate is x, then

Sum = $x \times \left(\frac{100}{r}\right)^2$

$= 1 \times \left(\frac{100}{4}\right)^2$ = ₹ 625

10. (1) Using Rule 6,

Sum = Difference $\left(\frac{100}{r}\right)^2$

$= 4 \times \left(\frac{100}{4}\right)^2$ = ₹ 2500

11. (1) Using Rule 6,

Difference between C.I. and S.I for 3 years

$= \frac{PR^2}{(100)^2}\left(\frac{R}{100}+3\right)$

$\Rightarrow 15.25 = \frac{P \times 25}{10000}\left(\frac{5}{100}+3\right)$

$\Rightarrow 15.25 = \frac{P \times 305}{400 \times 100}$

$\Rightarrow P = \frac{15.25 \times 400 \times 100}{305}$

= ₹ 2000

12. (3) Using Rule 6,

Tricky Approach

Sum = (CI – SI) $\left(\frac{100}{r}\right)^2$

$= 768 \times \left(\frac{100}{8}\right)^2$ = ₹ 1,20,000

13. (3) Using Rule 6 and 1,

If the difference between compound interest and simple interest at the rate of r% per annum for 2 years be x, then

Principal = $x\left(\frac{100}{r}\right)^2$

$= 28\left(\frac{100}{10}\right)^2$ = ₹ 2800

If the interest is compounded half yearly, then

$r = \frac{10}{2} = 5\%$,

Time = 4 half years

Simple interest $= \frac{2800 \times 5 \times 4}{100}$

= ₹ 560

Compound interest

$= 2800\left[\left(1+\frac{5}{100}\right)^4 - 1\right]$

= 2800 [1.2155 – 1]

= 2800 × 0.2155 = 603.41

$\therefore$ Difference = ₹ (603.41–560)

= ₹ 43.41

14. (3) Using Rule 1,

C.I. after 3 years

$= 6000\left[\left(1+\frac{5}{100}\right)^3 - 1\right]$

$= 6000\left(\frac{9261-8000}{8000}\right)$

$= 6000 \times \frac{1261}{8000}$ = ₹ 945.75

CI after 2 years

$= 6000\left[\left(1+\frac{5}{100}\right)^2 - 1\right]$

$= 6000\left(\frac{441-400}{400}\right)$

$= 6000 \times \frac{41}{400}$ = ₹ 615

Required difference

= ₹ (945.75 – 615) = ₹ 330.75

15. (1) Let the principal be x.
Compound interest

$$= P\left[\left(1+\frac{R}{100}\right)^t - 1\right]$$

$$= x\left[\left(1+\frac{10}{100}\right)^2 - 1\right]$$

$= x[(1.1)^2 - 1]$
$= x(1.21 - 1) = 0.21x$

$$SI = \frac{x \times 2 \times 10}{100} = \frac{x}{5} = 0.2x$$

According to the question,
$0.21x - 0.2x = 40$
$\Rightarrow 0.01x = 40$

$$\Rightarrow x = \frac{40}{0.01} = ₹\ 4000$$

Aliter : Using Rule 6,
Here, C.I. – S.I. = ₹ 40
R = 10%, T = 2 years, P = ?

$$C.I. - S.I. = P\left(\frac{R}{100}\right)^2$$

$$40 = P\left(\frac{10}{100}\right)^2$$

P = ₹ 4000

16. (1) Using Rule 6,
Let the difference between CI and SI on a certain sum for 3 years at r% be x,
then the sum

$$= \frac{\text{Difference} \times (100)^3}{r^2(300+r)}$$

$$= \frac{122 \times 100^3}{25(300+5)}$$

$$= \frac{122000000}{25 \times 305} = ₹16000$$

17. (2) Using Rule 6,
Difference of two years

$$= P\left(\frac{r^2}{10000}\right)$$

$$\Rightarrow 48 = P\left(\frac{400}{10000}\right)$$

$$\Rightarrow 48 = \frac{P}{25}$$

$\Rightarrow$ P = 48 × 25 = ₹ 1200

18. (1) Using Rule 6,

$$\text{Difference} = \frac{PR^2}{10000}$$

$$\Rightarrow 25 = \frac{10000 \times R^2}{10000}$$

$\Rightarrow$ R = 5%

19. (2) Using Rule 6,

$$\text{Difference} = \frac{Pr^2}{10000}$$

$$\Rightarrow 6 = \frac{P \times 5 \times 5}{10000}$$

$\Rightarrow$ P = 6 × 400 = ₹ 2400

20. (3) Using Rule 6,
Rate of interest = 8% per half-year
Time = 2 half years

$$\text{Difference of interests} = \frac{PR^2}{100}$$

$$\Rightarrow 56 = \frac{P \times (8)^2}{(100)^2}$$

$$\Rightarrow P = \frac{56 \times 10000}{64} = ₹\ 8750$$

21. (4) Let the sum be x
r = 10%, n = 3 years

$$S.I. = \frac{x \times r \times n}{100}$$

$$S.I. = \frac{x \times 10 \times 3}{100} = \frac{3}{10}x$$

$$C.I. = \left[\left(1+\frac{r}{100}\right)^n - 1\right]x$$

$$= \left[\left(1+\frac{10}{100}\right)^3 - 1\right]x$$

$$= \left[\left(\frac{11}{10}\right)^3 - 1\right]x$$

$$= \left(\frac{1331}{1000} - 1\right)x = \frac{331}{1000}x$$

$$\frac{331}{1000}x - \frac{3}{10}x = 31$$

$$\text{or } \frac{(331-300)}{1000}x = 31$$

$$\text{or } \frac{31}{1000}x = 31$$

or x = 1000
∴ Sum = ₹ 1000

Aliter : Using Rule 6,
Here, C.I. – S.I. = ₹ 31
R = 10%, T = 3 years, P = ?
C.I. – S.I.

$$= P \times \left(\frac{R}{100}\right)^2 \times \left(3+\frac{R}{100}\right)$$

$$31 = P \times \left(\frac{10}{100}\right)^2 \left(3+\frac{10}{100}\right)$$

$$31 = P \times \frac{1}{100} \times \frac{31}{10}$$

P = ₹ 1000

22. (4) Using Rule 6,
Let the sum be x.
When difference between the compound interest and simple interest on a certain sum of money for 2 years at r% rate is x, then the sum is given by:

$$\text{Sum} = \text{Difference} \times \left(\frac{100}{\text{Rate}}\right)^2$$

$$= ₹\ 8 \times \left(\frac{100}{4}\right)^2$$

= ₹ 8 × 25 × 25 = ₹ 5000

23. (2) If the interest is compounded half yearly,

$$C.I. = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$= P\left[\left(1+\frac{5}{100}\right)^2 - 1\right]$$

$$= P\left[\left(\frac{21}{20}\right)^2 - 1\right] = \frac{41P}{400}$$

$$S.I. = \frac{P \times R \times T}{100} = \frac{P \times 10}{100} = \frac{P}{10}$$

$$\therefore \frac{41P}{400} - \frac{P}{10} = 180$$

$$\Rightarrow \frac{41P - 40P}{400} = 180$$

$$\Rightarrow \frac{P}{400} = 180$$

$\Rightarrow$ P = ₹ 72000

Aliter : Using Rule 6,
Here, C.I. – S.I. = ₹ 180
Interest is compounded half yearly

$$R = \frac{10}{5} = 5\%,$$

T = 2 years

$$C.I. - S.I. = P\left(\frac{R}{100}\right)^2$$

$\Rightarrow 180 = P\left(\frac{5}{100}\right)^2$

$\Rightarrow P = 180 \times 20 \times 20$

$P = ₹\ 72000$

24.(1) Using Rule 6,

$\text{Difference} = \frac{PR^2}{(100)^2}$

$\Rightarrow 1.50 = \frac{P \times 5 \times 5}{(100)^2}$

$\Rightarrow P = 400 \times 1.5 = ₹\ 600$

25. (3) Using Rule 6,

$\text{Time} = \frac{3}{2} \times 2 = 3$ half years

$\text{Rate} = \frac{10}{2} = 5\%$ per half year

[$\because$ when $r \to r/2$, then $t \to 2t$]

Difference

$= P\left(\frac{r^3}{1000000} + \frac{3r^2}{10000}\right)$

$\Rightarrow 244 = P\left(\frac{125}{1000000} + \frac{75}{10000}\right)$

$\Rightarrow 244 = P\left(\frac{7625}{1000000}\right)$

$\Rightarrow P = \frac{244 \times 1000000}{7625}$

$= ₹\ 32000$

26. (3) Using Rule 6,

The difference between compound interest and simple interest for two years

$= \frac{\text{Principal} \times (\text{Rate})^2}{100 \times 100}$

$\therefore \quad 1 = \frac{\text{Principal} \times (4)^2}{10000}$

$\Rightarrow \text{Principal} = \frac{10000}{16} = ₹\ 625$

27. (2) Using Rule 6,

Difference of 2 years

$= \frac{p \times r^2}{10000}$

$\Rightarrow 32 = \frac{5000 \times r^2}{10000}$

$\Rightarrow r^2 = \frac{32 \times 10000}{5000} = 64$

$\Rightarrow r = \sqrt{64} = 8\%$

28. (1) Using Rule 6,

$\text{Difference} = \frac{PR^2}{10000}$

$\Rightarrow 25 = \frac{P \times 5 \times 5}{10000}$

$\Rightarrow P = ₹\ 10000$

29. (3) Using Rule 6,

$\text{Difference} = \frac{PR^2}{10000}$

$\Rightarrow 300 = \frac{P \times 10 \times 10}{10000}$

$\Rightarrow P = 300 \times 100 = ₹\ 30000$

30. (1) Using Rule 1,

$\text{S.I.} = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$= \frac{32000 \times 4 \times 10}{100} = ₹\ 12800$

$\text{C.I.} = P\left[\left(1 + \frac{R}{100}\right)^4 - 1\right]$

$= 32000\left[\left(1 + \frac{10}{100}\right)^4 - 1\right]$

$= 32000\ [(1.1)^4 - 1]$

$= 32000\ (1.4641 - 1)$

$= 32000 \times 0.4641 = ₹\ 14851.2$

$\therefore$ Required difference

$= 14851.2 - 12800 = ₹\ 2051.2$

31. (3) Using Rule 6,

$\text{Difference} = \frac{PR^2}{10000}$

$\Rightarrow 63 = \frac{P \times 5 \times 5}{10000}$

$\Rightarrow P = 400 \times 63 = ₹\ 25200$

32. (4) Let the principal be Rs. P.

For 2 years

$\text{C.I.} - \text{S.I.} = \frac{PR^2}{10000}$

$\Rightarrow 1 = \frac{P \times 4 \times 4}{10000}$

$\Rightarrow P = \frac{10000}{4 \times 4} = \text{Rs. } 625$

33. (1) $\text{Difference} = \frac{PR^2}{10000}$

$\Rightarrow 4 = \frac{P \times 10 \times 10}{10000}$

$\Rightarrow P = \text{Rs. } 400$

34. (1) Difference between C.I. and S.I. for 3 years

$= \frac{Pr^2(r + 300)}{1000000}$

$\Rightarrow 93 = \frac{P \times 100(10 + 300)}{1000000}$

$\Rightarrow 93 = \frac{P \times 100 \times 310}{1000000}$

$\Rightarrow \frac{31P}{1000} = 93$

$\Rightarrow P = \frac{93000}{31} = \text{Rs. } 3000$

35. (3) Difference

$= \frac{PR^2}{10000}$

$\Rightarrow 41 = \frac{P \times 5 \times 5}{10000}$

$\Rightarrow 41 = \frac{P}{400}$

$\Rightarrow P = 41 \times 400 = \text{Rs. } 16400$

36. (4) For 3 years,

C.I. – S.I.

$= P\left(\frac{r}{100}\right)^2\left(\frac{r}{100} + 3\right)$

$\Rightarrow P\left(\frac{10}{100}\right)^2\left(\frac{10}{100} + 3\right) = 186$

$\Rightarrow P\left(\frac{1}{100}\right) \times \frac{31}{10} = 186$

$\Rightarrow P = \frac{186 \times 1000}{31} = \text{Rs. } 6000$

37. (2) Difference between C.I. and S.I. for 3 years

$= P\left(\frac{r}{100}\right)^2\left(\frac{r}{100} + 3\right)$

$= 40000\left(\frac{8}{100}\right)^2\left(\frac{8}{100} + 3\right)$

$= 40000 \times \frac{64}{10000} \left(\frac{8+300}{100}\right)$

$= 4 \times 64 \times \frac{308}{100} = \frac{78848}{100}$

= Rs. 788.48

38. (3) For 2 years,

C.I. – S.I. = $\frac{PR^2}{10000}$

$\Rightarrow 96 = \frac{15000 \times R^2}{10000}$

$\Rightarrow 15 R^2 = 960$

$\Rightarrow R^2 = \frac{960}{15} = 64$

$\Rightarrow R = \sqrt{64} = 8\%$ per annum

39. (4) For 2 years,

C.I. – S.I. = $\frac{PR^2}{10000}$

$= \frac{5000 \times 8 \times 8}{10000}$ = Rs. 32

40. (4) For 2 years,

C.I. – S.I. = $\frac{PR^2}{10000}$

$\Rightarrow 20 = \frac{P \times 5 \times 5}{10000}$

$\Rightarrow \frac{P}{400} = 20$

$\Rightarrow$ P = Rs. (20 × 400)

= Rs. 8000

TYPE-IV

1. (4) Suppose P = ₹ 100 and amount A = ₹ 225

$A = P\left(1+\frac{r}{100}\right)^t$

or $225 = 100\left(1+\frac{r}{100}\right)^2$

or $\frac{225}{100} = \left[1+\frac{r}{100}\right]^2$

or $1+\frac{r}{100} = \frac{15}{10}$

or $\frac{100+r}{100} = \frac{15}{10}$

or 100 + r = 150

or r = 50%

Aliter : Using Rule 8,

Here, n = 2.25, t = 2 years

$R\% = \left(n^{\frac{1}{t}} - 1\right) \times 100\%$

$R\% = \left[(2.25)^{\frac{1}{2}} - 1\right] \times 100\%$

$= [1.5 - 1] \times 100\%$

$= 0.5 \times 100\%$

= 50%

2. (2) A sum of ₹ x becomes ₹ 2x in 4 years.

Similarly, ₹ 2x will become 2 × 2x = ₹ 4x in next 4 years and ₹ 4x will become 2 × 4x = ₹ 8x in yet another 4 years. So, the total time = 4 + 4 + 4 = 12 years

Aliter : Using Rule 5,

Here, m = 2, t = 4

Time taken to become

2^3 = n × t years

= 3 × 4 = 12 years

Note : If a sum of money becomes n times in t years, it will become $t^1 = n^x$ times at the same rate of interest in t^1 years given by, $\boxed{t^1 = xt}$

3. (2) Let the sum be x which becomes 2x in 10 years. Hence, 4x in 20 years

Method 2 :

Unitary Method can also be used.

Aliter : Using Rule 5,

Here, m = 2, t = 10

Time taken to become 4 times = 2^2 times

= t × n = 10 × 2 = 20 years

4. (1) Let the principal be *x* and the rate of compound interest be *r*% per annum. Then,

$8x = x\left(1+\frac{r}{100}\right)^3$

$\Rightarrow 8 = \left(1+\frac{r}{100}\right)^3 \Rightarrow 2^3 = \left(1+\frac{r}{100}\right)^3$

$\Rightarrow 2 = 1+\frac{r}{100}$

$\Rightarrow \frac{r}{100} = 1 \Rightarrow r = 100\%$

Aliter : Using Rule 8,

Here, n = 8, t = 3 years.

$R\% = \left(n^{\frac{1}{t}} - 1\right) \times 100\%$

$= \left[(8)^{\frac{1}{3}} - 1\right] \times 100\%$

$= \left[(2^3)^{\frac{1}{3}} - 1\right] \times 100\%$

= 100%

5. (3) Let the sum be *x*.

Then,

$2x = x\left(1+\frac{r}{100}\right)^6$

$\Rightarrow 2 = \left(1+\frac{r}{100}\right)^6$

Cubing both sides,

$8 = \left\{\left(1+\frac{r}{100}\right)^6\right\}^3$

$\Rightarrow 8 = \left(1+\frac{r}{100}\right)^{18}$

$\Rightarrow 8x = x\left(1+\frac{r}{100}\right)^{18}$

∴ The sum will be 8 times in 18 years. i.e., Time = 18 years

Aliter : Using Rule 5,

Here, m = 2, t = 6 years

It will becomes 8 times of itself = 2^3 times of it self

in t × n years = 6 × 3 = 18 years

6. (2) Let the Principal be P and rate of interest be *r*%.

$\therefore 2P = P\left(1+\frac{r}{100}\right)^2$

$\Rightarrow 2 = \left(1+\frac{r}{100}\right)^5$ ...(i)

On cubing both sides,

$8 = \left(1+\frac{r}{100}\right)^{15}$

∴ Time = 15 years

Aliter : Using Rule 5,

Here, m = 2, t = 5 years

It becomes 8 times = 2^3 times

in t × n = 5 × 3 = 15 years

7. (1) $A = P\left(1+\frac{R}{100}\right)^T$

$2 = 1\left(1+\frac{R}{100}\right)^{15}$

Cubing on both sides, we have

$8 = 1\left(1+\frac{R}{100}\right)^{45}$

Required time = 45 years

Aliter : Using Rule 5,

Here, m = 2, t = 15 years

It becomes 8 times = 2^3 times

in t × n years= 15 × 3 = 45 years

8. (4) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 24000 = 12000\left(1+\frac{R}{100}\right)^5$

$\Rightarrow 2 = \left(1+\frac{R}{100}\right)^5$

$\Rightarrow 2^4 = \left(1+\frac{R}{100}\right)^{20}$

i.e. The sum amounts to ₹ 192000 after 20 years.

Aliter : Using Rule 11

Here, x = 2, n_1 = 5

y = ?, n_2 = 20

$x^{\frac{1}{n_1}} = y^{\frac{1}{n}}$

$2^{\frac{1}{5}} = y^{\frac{1}{20}}$

$\Rightarrow y = \left(2^{\frac{1}{5}}\right)^{20}$

$y = 2^4$

y = 16 times

∴ Sum = 16 × 12000

= ₹ 1,92,000

9. (1) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 4 = \left(1+\frac{R}{100}\right)^2$

$\Rightarrow 1 + \frac{R}{100} = 2$

$\Rightarrow \frac{R}{100} = 1$

$\Rightarrow$ R = 100%

Aliter : Using Rule 8,

Here, n = 4, t = 2 years

$R\% = \left(n^{\frac{1}{t}} - 1\right) \times 100\%$

$= \left[(4)^{\frac{1}{2}} - 1\right] \times 100\%$

= 100%

10. (2) $A = P\left(1+\frac{R}{100}\right)^T$

Let P. ₹, A = ₹ 2

$\Rightarrow 2 = 1\left(1+\frac{R}{100}\right)^3$

On squaring both sides.

$4 = 1\left(1+\frac{R}{100}\right)^6$

∴ Time = 6 years

Aliter : Using Rule 11,

Here, x = 2, n_1 = 3

y = 4, n_2 = ?

$x^{\frac{1}{n_1}} = y^{\frac{1}{n_2}}$

$2^{\frac{1}{3}} = 4^{\frac{1}{n_2}}$

$2^{\frac{1}{3}} = \left(2^2\right)^{\frac{1}{n_2}}$

$\Rightarrow 2^{\frac{1}{3}} = 2^{\frac{2}{n_2}}$

$\frac{1}{3} = \frac{2}{n_2}$

∴ n_2 = 6 Years

11. (2) Let the principal be ₹ 1.

$\therefore A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 8 = 1\left(1+\frac{R}{100}\right)^3$

$\Rightarrow 2^3 = \left(1+\frac{R}{100}\right)^3$

$\Rightarrow 2 = \left(1+\frac{R}{100}\right)^1$

$\Rightarrow 2^4 = \left(1+\frac{R}{100}\right)^4$

∴ Time = 4 years

Aliter : Using Rule 11,

Here, x = 8, n_1 = 3

y = 16, n_2 = ?

Using $x^{\frac{1}{n_1}} = y^{\frac{1}{n_2}}$

$(8)^{\frac{1}{3}} = (16)^{\frac{1}{n_2}}$

$\left(2^3\right)^{\frac{1}{3}} = \left(2^4\right)^{\frac{1}{n_2}}$

$2^1 = 2^{\frac{4}{n_2}}$

$\Rightarrow 1 = \frac{4}{n_2}$

n_2 = 4 years

12. (3) $A = P\left(1+\frac{R}{100}\right)^T$

Let P be ₹ 1, then A = ₹ 2

$\Rightarrow 2 = 1\left(1+\frac{R}{100}\right)^4$

$\Rightarrow 2^2 = \left(1+\frac{R}{100}\right)^8$

∴ Time = 8 years

Aliter : Using Rule 11,

Here, x = 2, n_1 = 4

y = 4, n_2 = ?

Using $x^{\frac{1}{n_1}} = y^{\frac{1}{n_2}}$

$(2)^{\frac{1}{4}} = (4)^{\frac{1}{n_2}}$

$2^{\frac{1}{4}} = \left(2^2\right)^{\frac{1}{n_2}}$

$2^{\frac{1}{4}} = 2^{\frac{1}{n_2}}$

$\Rightarrow \frac{1}{4} = \frac{2}{n_2}$

n_2 = 8 years

13. (3) $A = P\left(1+\frac{R}{100}\right)^T$

Let P = ₹ 1, then A = ₹ 3

$\Rightarrow 3 = 1\left(1+\frac{R}{100}\right)^3$

On squaring both sides,

$9 = 1\left(1+\frac{R}{100}\right)^6$

$\therefore$ Time = 6 years

Aliter : Using Rule 11,

Here, x = 3, n_1 = 3

y = 9, n_2 = ?

Using, $x^{\frac{1}{n_1}} = y^{\frac{1}{n_2}}$

$(3)^{\frac{1}{3}} = (9)^{\frac{1}{n_2}}$

$3^{\frac{1}{3}} = (3^2)^{\frac{1}{n_2}}$

$3^{\frac{1}{3}} = 3^{\frac{2}{n_2}}$

$\Rightarrow \frac{1}{3} = \frac{2}{n_2}$

$\Rightarrow n_2 = 6$ years

14. (3) If principal = ₹ 1000, amount = ₹ 1331

$\therefore A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow \frac{1331}{1000} = \left(1+\frac{R}{100}\right)^3$

$\Rightarrow \left(\frac{11}{10}\right)^3 = \left(1+\frac{R}{100}\right)^3$

$\Rightarrow 1+\frac{R}{100} = \frac{11}{10}$

$\Rightarrow \frac{R}{100} = \frac{1}{10}$

$\Rightarrow R = \frac{1}{10}\times 100 = 10\%$

Aliter : Using Rule 8,

Here, n = 1.331, t = 3 years

$R\% = \left(n^{\frac{1}{t}}-1\right)\times 100\%$

$= \left[(1.331)^{\frac{1}{3}}-1\right]\times 100\%$

= [1.1 – 1] × 100%

= 0.1 × 100%

= 10%

15. (4) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 1.44P = P\left(1+\frac{R}{100}\right)^2$

$\Rightarrow (1.2)^2 = \left(1+\frac{R}{100}\right)^2$

$\Rightarrow 1+\frac{R}{100} = 1.2$

$\Rightarrow R = 0.2 \times 100 = 20\%$

Aliter : Using Rule 8,

Here, n = 1.44, t = 2 years

$R\% = \left(n^{\frac{1}{6}}-1\right)\times 100\%$

$= \left[(1.44)^{\frac{1}{2}}-1\right]\times 100\%$

= [(1.2) – 1] × 100%

= 0.2 × 100%

= 20%

16. (2) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow \frac{27}{8}x = x\left(1+\frac{R}{100}\right)^3$

$\Rightarrow \left(\frac{3}{2}\right)^3 = \left(1+\frac{R}{100}\right)^3$

$\Rightarrow 1+\frac{R}{100} = \frac{3}{2}$

$\Rightarrow \frac{R}{100} = \frac{3}{2}-1 = \frac{1}{2}$

$\Rightarrow R = \frac{1}{2}\times 100$

$\therefore$ R = 50%

Aliter :

$n = \frac{27}{8}$, t = 3 years

$R\% = \left(n^{\frac{1}{n}}-1\right)\times 100\%$

$= \left[\left(\frac{27}{8}\right)^{\frac{1}{3}}-1\right]\times 100\%$

$= \left[\left(\frac{3}{2}\right)-1\right]\times 100\%$

= 50%

TYPE-V

1. (1) Let the rate of interest be r% per annum,

According to the question,

$4840 = P\left(1+\frac{r}{100}\right)^2$ ..... (i)

and $5324 = P\left(1+\frac{r}{100}\right)^3$ ....(ii)

On dividing equation (ii) by equation (i), we have,

$1+\frac{r}{100} = \frac{5324}{4840} = 1+\frac{484}{4840}$

$\Rightarrow \frac{r}{100} = \frac{484}{4840}$

$\Rightarrow r = 10\%$

Aliter : Using Rule 7 (i),

Here, b – a = 3 – 2 = 1

B = Rs 5,324, A = 4,840

$R\% = \left(\frac{B}{A}-1\right)\times 100\%$

$= \left(\frac{5324}{4840}-1\right)\times 100\%$

$= \left(\frac{5324-4840}{4840}\right)\times 100\%$

$= \frac{484}{4840}\times 100\% = 10\%$

2. (4) Let the rate of interest = R% per annum.

We know that

$A = P\left(1+\frac{R}{100}\right)^T$

$2420 = P\left(1+\frac{R}{100}\right)^2$ ....(i)

$2662 = P\left(1+\frac{R}{100}\right)^3$ ...(ii)

Dividing equation (ii) by (i),

$$1+\frac{R}{100}=\frac{2662}{2420}$$

$$\Rightarrow \frac{R}{100}=\frac{2662}{2420}-1$$

$$\Rightarrow \frac{R}{100}=\frac{2662-2420}{2420}=\frac{242}{2420}=\frac{1}{10}$$

$$\Rightarrow R=\frac{1}{10}\times 100=10\%$$

Aliter : Using Rule 7(i),
Here, b – a = 3 – 2 = 1
B = Rs. 2,662, A= Rs,2,420

$$R\% = \left(\frac{B}{A}-1\right)\times 100\%$$

$$= \left(\frac{2662}{2420}-1\right)\times 100\%$$

$$= \left[\frac{2662-2420}{2420}\right]\times 100\%$$

$$= \frac{242}{2420}\times 100\%$$

$$= 10\%$$

3. (1) $A = P\left(1+\frac{R}{100}\right)^T$

$$\therefore\ 3840 = P\left(1+\frac{R}{100}\right)^4 \quad ....(i)$$

$$3936 = P\left(1+\frac{R}{100}\right)^5 \quad ...(ii)$$

Dividing equation (ii) by equation (i),

$$\frac{3936}{3840}=1+\frac{R}{100}$$

$$\Rightarrow \frac{R}{100}=\frac{3936}{3840}-1$$

$$=\frac{3936-3840}{3840}=\frac{96}{3840}$$

$$\Rightarrow R=\frac{96}{3840}\times 100=2.5\%$$

Aliter : Using Rule 7(i),
Here, b – a = 5 – 4 = 1
B = Rs. 3,936, A = Rs. 3,840

$$R\%=\left(\frac{B}{A}-1\right)\times 100\%$$

$$=\left(\frac{3936}{3840}-1\right)\times 100\%$$

$$=\left(\frac{3936-3840}{3840}\right)\times 100\%$$

$$=\frac{96}{3840}\times 100\%$$

$$=\frac{10}{4}\% = 2.5\%$$

4. (4) If the principal be ₹ P, then

$$A = P\left(1+\frac{r}{100}\right)^T$$

$$\Rightarrow 1440 = P\left(1+\frac{r}{100}\right)^2 \quad ...(i)$$

$$\text{and } 1728 = P\left(1+\frac{r}{100}\right)^3 \quad ...(ii)$$

On dividing equation (ii) by (i),

$$\frac{1728}{1440} = 1 + \frac{r}{100}$$

$$\therefore\ \frac{r}{100}=\frac{1728}{1440}-1$$

$$=\frac{1728-1440}{1440}=\frac{288}{1440}$$

$$\Rightarrow r=\frac{288\times 100}{1440}$$

$\therefore r$ = 20% per annum

Aliter : Using Rule 7(i),
Here, b – a = 3 – 2 = 1
B = Rs 1728, A = Rs,1440

$$R\% = \left(\frac{B}{A}-1\right)\times 100\%$$

$$=\left(\frac{1728}{1440}-1\right)\times 100\%$$

$$=\left(\frac{1728-1440}{1440}\right)\times 100\%$$

$$=\left[\frac{288}{1440}\right]\times 100\% = 20\%$$

5. (4) Difference = 238.50 – 225
= ₹ 13.50
= S.I. on ₹ 225 for 1 year

$$\therefore \text{Rate} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$$

$$=\frac{13.50\times 100}{225\times 1} = 6\% \text{ per annum}$$

Aliter : Using Rule 7(i),
Here, b – a = 1
B = Rs 238.50, A = Rs,225

$$R\% = \left(\frac{B}{A}-1\right)\times 100\%$$

$$=\left(\frac{238.50}{225}-1\right)\times 100\%$$

$$=\left(\frac{238.50-225}{225}\right)\times 100\%$$

$$=\left[\frac{13.5}{225}\right]\times 100\% = 6\%$$

6. (2) $A = P\left(1+\frac{R}{100}\right)^T$

$$\Rightarrow 7000 = P\left(1+\frac{R}{100}\right)^4 \quad ....(i)$$

$$10000 = P\left(1+\frac{R}{100}\right)^8 \quad .....(ii)$$

Dividing equation (ii) by (i)

$$\frac{10000}{7000}=\left(1+\frac{R}{100}\right)^4$$

$$\Rightarrow \frac{10}{7}=\left(1+\frac{R}{100}\right)^4$$

From equation (i),

$$7000 = P\times\frac{10}{7}$$

$\Rightarrow$ P = ₹ 4900

Aliter : Using Rule 7(iii),
Here, b – a = 8 – 4 = 4
B = Rs 10,000, A = Rs,7000

$$R\% = \left[\left(\frac{B}{A}\right)^{\frac{1}{n}}-1\right]\times 100\%$$

$$R\% = \left[\left(\frac{10000}{7000}\right)^{\frac{1}{4}}-1\right]$$

$$= \left[\left(\frac{10}{7}\right)^{\frac{1}{4}}-1\right]$$

$$\Rightarrow 1+\frac{R}{100} = \left(\frac{10}{7}\right)^{\frac{1}{4}}$$

$$\left(1+\frac{R}{100}\right)^4 = \frac{10}{7}$$

$$7000 = P \times \frac{10}{7}$$

$$\because \text{ Amount} = P\left(1+\frac{R}{100}\right)^4$$

P = Rs. 4900

7. (3) Interest on ₹ 650 for 1 year = 676 – 650 = ₹ 26

So, $r = \frac{26}{650} \times 100$

$\Rightarrow$ r = 4% per annum

$$P = \frac{A}{\left[1+\frac{r}{100}\right]^t} = \frac{650}{\left[1+\frac{4}{100}\right]^1}$$

$$= \frac{650}{\frac{26}{25}} = 650 \times \frac{25}{26} = ₹\ 625$$

Aliter : Using Rule 7(i),
Here, b – a = 1
B = Rs 676, A = ₹ 650

$$R\% = \left(\frac{B}{A}-1\right)\times 100\%$$

$$= \left[\frac{676}{650}-1\right]\times 100\%$$

$$= \left[\frac{676-650}{650}\right]\times 100\%$$

$$= \frac{26}{650}\times 100\%$$

$$= \frac{100}{25} = 4\%$$

$$\text{Amount} = P\left(1+\frac{R}{100}\right)^1$$

$$650 = P\left(1+\frac{4}{100}\right)$$

$$\Rightarrow P = \frac{650\times 100}{104} = ₹\ 625$$

Note : A sum at a rate of interest compounded yearly becomes ₹ A, in n years and ₹ A_2 in (n + 1) years,

then $P = A_1\left(\frac{A_1}{A_2}\right)^n$

8. (1) S.I. on ₹ 2400 for 1 year = ₹ (2, 520 – 2, 400) = ₹ 120

$$\therefore \text{ Rate} = \frac{\text{S.I.}\times 100}{\text{Principal} \times \text{Time}}\%$$

$$= \frac{120\times 100}{2400\times 1} = 5\%$$

Aliter : Using Rule 7(i),
Here, b – a = 4 – 3 = 1
B = Rs 2520, A = ₹ 2400

$$R\% = \left(\frac{B}{A}-1\right)\times 100\%$$

$$= \left[\frac{2520}{2400}-1\right]\times 100\%$$

$$= \left[\frac{2520-2400}{2400}\right]\times 100\%$$

$$= \frac{120}{2400}\times 100\%$$

= 5%

9. (3) $P\left(1+\frac{r}{100}\right)^2 = 4500$ ...(i)

$P\left(1+\frac{r}{100}\right)^4 = 6750$ .....(ii)

On dividing equation (ii) by equation (i), we get

$$\left(1+\frac{r}{100}\right)^2 = \frac{6750}{4500}$$

From equation (i),

$$P \times \frac{6750}{4500} = 4500$$

$$\Rightarrow P = \frac{4500\times 4500}{6750} = ₹\ 3{,}000$$

Aliter : Using Rule 7(ii),
Here, b – a = 4 – 2 = 2
B = ₹ 6750, A = ₹ 4500

$$R\% = \left[\left(\frac{B}{A}\right)^{\frac{1}{2}}-1\right]\times 100\%$$

$$= \left[\left(\frac{6750}{4500}\right)^{\frac{1}{2}}-1\right]\times 100\%$$

$$= \left[\left(\frac{3}{2}\right)^{\frac{1}{2}}-1\right]\times 100\%$$

$$\Rightarrow \left(\frac{3}{2}\right)^{\frac{1}{2}} = 1+\frac{R}{100}$$

$$\Rightarrow \frac{3}{2} = \left(1+\frac{R}{100}\right)^2$$

$$A = P\left(1+\frac{R}{100}\right)^2$$

$$4500 = P \times \frac{3}{2}$$

P = ₹ 3000

10. (4) Principal = ₹ P (let)
Rate = R% per annum

$$\therefore A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow 650 = P\left(1+\frac{R}{100}\right)$$

$$\Rightarrow \frac{650}{P} = \left(1+\frac{R}{100}\right) \text{ ...(i)}$$

$$\text{Again, } 676 = P\left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow 676 = P\left(\frac{650}{P}\right)^2$$

$$= \frac{P\times 650\times 650}{P^2}$$

$$\Rightarrow P = \frac{650\times 650}{676} = ₹\ 625$$

11. (2) Principal = $\frac{\text{S.I.}\times 100}{\text{Time} \times \text{Rate}}$

$$= \frac{350\times 100}{2\times 4} = \text{Rs. } 4375$$

$$\text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^T-1\right]$$

$$= 4375\left[\left(1+\frac{4}{100}\right)^2-1\right]$$

$$= 4375\left[\left(1+\frac{1}{25}\right)^2-1\right]$$

$$= 4375\left[\left(\frac{26}{25}\right)^2-1\right]$$

$$= 4375\left(\frac{676}{625}-1\right)$$

$$= \frac{4375\times 51}{625}$$

= Rs. 357
Required difference
= Rs. (357 – 350) = Rs. 7

12. (1) Rate of interest = 12% p.a.
= 1% per month
Time = 12y months

$$\therefore A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow 64 = 1\left(1+\frac{1}{100}\right)^{12y}$$

$$\Rightarrow 64 = 1(1.01)^{12y}$$

13. (3) C.I. = $P\left[\left(1+\frac{R}{100}\right)^T-1\right]$

$\Rightarrow 525 = P\left[\left(1+\frac{10}{100}\right)^2-1\right]$

$\Rightarrow 525 = P\left(\frac{121}{100}-1\right)$

$\Rightarrow 525 = \frac{P\times 21}{100}$

$\Rightarrow P = \frac{525\times 100}{21}$ = Rs. 2500

Again, new rate = 5% per annum

$\therefore$ S.I. = $\frac{\text{Principal}\times\text{Time}\times\text{Rate}}{100}$

$= \frac{2500\times 5\times 4}{100}$ = Rs. 500

14. (2) Let the principal be Rs. *x*.
When the interest is compounded annually,

C.I. = $P\left[\left(1+\frac{R}{100}\right)^T-1\right]$

$= P\left[\left(1+\frac{20}{100}\right)^2-1\right]$

$= P\left[\left(\frac{6}{5}\right)^2-1\right]$

$= P\left(\frac{36}{25}-1\right)$ = Rs. $\frac{11P}{25}$

When the interest is compounded half–yearly,

C.I. = $P\left[\left(1+\frac{10}{100}\right)^4-1\right]$

$= P\left[\left(\frac{11}{10}\right)^4-1\right]$

$= P\left(\frac{14641}{10000}-1\right)$

= Rs. $\frac{4641P}{10000}$

$\therefore \frac{4641P}{10000}-\frac{11P}{25} = 723$

$\Rightarrow \frac{4641P-4400P}{10000} = 723$

$\Rightarrow \frac{241P}{10000} = 723$

$\Rightarrow P = \frac{723\times 10000}{241}$

= Rs. 30000

TYPE-VI

1. (1) A = ₹ 2550
R = 4% per annum
n = 2 years
Let each of the two equal instalments be x
Present worth

$= \frac{\text{Instalment}}{\left(1+\frac{r}{100}\right)^n}$

$P_1 = \frac{x}{\left(1+\frac{4}{100}\right)^1} = \frac{x}{1+\frac{1}{25}} = \frac{x}{\frac{26}{25}}$

or $P_1 = \frac{25}{26}x$

Similarly,

$P_2 = \left(\frac{25}{26}\right)^2 x = \frac{625}{676}x$

$P_1 + P_2 = A$

$\therefore \frac{25}{26}x+\frac{625}{676}x = 2550$

$\Rightarrow \frac{(650+625)x}{676} = 2550$

$\Rightarrow \frac{1275}{676}x = 2550$

$\Rightarrow x = 2550\times\frac{676}{1275}$

x = ₹ 1352

Aliter : Using Rule 9(i),
Here, P = ₹ 2550, n = 2, r = 4%
Each instalment

$= \frac{P}{\left(\frac{100}{100+r}\right)+\left(\frac{100}{100+r}\right)^2}$

$= \frac{2550}{\left(\frac{100}{100+4}\right)+\left(\frac{100}{100+4}\right)^2}$

$= \frac{2550}{\frac{100}{104}+\left(\frac{100}{104}\right)^2}$

$= \frac{2550}{\frac{100}{104}\left(1+\frac{100}{104}\right)}$

$= \frac{2550}{\frac{100}{104}\left(\frac{204}{104}\right)}$

$= \frac{2550\times 104\times 104}{20400}$ = ₹ 1352

2. (2) Using Rule 1,
Let principal (present worth) for first year be P_1 and that for two years be P_2.

$\therefore 16224 = P_1\left(1+\frac{4}{100}\right)$

$\Rightarrow 16224 = P_1\left(1+\frac{1}{25}\right) = \frac{26P_1}{25}$

$\Rightarrow P_1 = \frac{16224\times 25}{26}$ = ₹ 15600

Again,

$16224 = P_2\left(1+\frac{4}{100}\right)^2$

$\Rightarrow 16224 = P_2\left(\frac{26}{25}\right)^2 = \frac{676\,P_2}{625}$

$\Rightarrow P_2 = \frac{16224\times 625}{676}$ = ₹ 15000

$\therefore$ Cash value of the scooter
= ₹ (16224 + 15600 + 15000)
= ₹ 46824

3. (3) Let the annual instalment be *x*

$A = P\left(1+\frac{R}{T}\right)^T$

$x = P_1\left(1+\frac{25}{200}\right)$

$\Rightarrow x = P_1\times\frac{9}{8}$

$\Rightarrow P_1 = \frac{8}{9}x$

Similarly, $P_2 = \frac{64}{81}x$

$P_1 + P_2 = 6800$

$\Rightarrow \frac{8}{9}x+\frac{64}{81}x = 6800$

$\Rightarrow \frac{72x+64x}{81} = 6800$

$\Rightarrow \frac{136x}{81} = 6800$

$\Rightarrow x = \frac{6800\times 81}{136}$ = ₹ 4050

Aliter : Using Rule 9(i),

Here, P = ₹ 6800, R = $\frac{25}{2}$%

n = 2
Each instalment

$= \frac{P}{\left(\frac{100}{100+r}\right)+\left(\frac{100}{100+r}\right)^2}$

$$= \frac{6800}{\left(\frac{100}{100+\frac{25}{2}}\right)+\left(\frac{100}{100+\frac{25}{2}}\right)^2}$$

$$= \frac{6800}{\frac{200}{225}+\left(\frac{200}{225}\right)^2}$$

$$= \frac{6800}{\frac{200}{225}\left(1+\frac{200}{225}\right)}$$

$$= \frac{6800\times 225\times 225}{200\times 425} = ₹\ 4050$$

4. (2) Using Rule 9(i),
Let each instalment be x.

$$\therefore \frac{x}{\left(1+\frac{5}{100}\right)}+\frac{x}{\left(1+\frac{5}{100}\right)^2}=12300$$

$$\Rightarrow \frac{20x}{21}+\left(\frac{20}{21}\right)^2 x = 12300$$

$$\Rightarrow \frac{20x}{21}\left(1+\frac{20}{21}\right)=12300$$

$$\Rightarrow \frac{20x}{21}\times\frac{41}{21}\times x = 12300$$

$$\Rightarrow x = \frac{12300\times 21\times 21}{20\times 41}$$

$\therefore x = ₹\ 6615$

5. (2) Using Rule 9(i),
Let the value of each instalment be ₹ x

$\therefore$ Principal = Present worth of ₹ x due 1 year hence, present worth of Rs. x due 2 years hence

$$\Rightarrow 210 = \frac{x}{\left(1+\frac{R}{100}\right)} + \frac{x}{\left(1+\frac{R}{100}\right)^2}$$

$$\Rightarrow 210 = \frac{x}{\left(1+\frac{10}{100}\right)} + \frac{x}{\left(1+\frac{10}{100}\right)^2}$$

$$\Rightarrow 210 = \frac{x}{1+\frac{1}{10}} + \frac{x}{\left(1+\frac{1}{10}\right)^2}$$

$$\Rightarrow 210 = \frac{x}{\frac{11}{10}} + \frac{x}{\left(\frac{11}{10}\right)^2}$$

$$\Rightarrow 210 = \frac{10x}{11} + \frac{100x}{121}$$

$$\Rightarrow 210 = \frac{110x+100x}{121}$$

$$\Rightarrow 210\times 121 = 210\,x$$

$$\Rightarrow x = \frac{210\times 121}{210} = ₹\ 121$$

6. (3) Using Rule 1,
Share of elder brother
= Rs. x (let)

$\therefore$ Share of younger brother
= Rs. $(16820 - x)$

$$A = P\left(1+\frac{R}{100}\right)^T$$

According to the question,

$$x\left(1+\frac{5}{100}\right)^{13}$$

$$= (16820 - x)\left(1+\frac{5}{100}\right)^{15}$$

$$\Rightarrow x = (16820 - x)\left(1+\frac{1}{20}\right)^2$$

$$\Rightarrow x = (16820 - x)\left(\frac{21}{20}\right)^2$$

$$\Rightarrow \left(\frac{20}{21}\right)^2 x = 16820 - x$$

$$\Rightarrow \frac{400x}{441} + x = 16820$$

$$\Rightarrow \frac{400x+441x}{441} = 16820$$

$$\Rightarrow 841x = 16820\times 441$$

$$\Rightarrow x = \frac{16820\times 441}{841} = \text{Rs. } 8820$$

7. (1) Using Rule 9(i),
Sum borrowed = Present worth of Rs. 17640 due 1 year hence + Present worth of Rs. 17640 due 2 years hence

$$= \text{Rs. }\left(\frac{17640}{\left(1+\frac{5}{100}\right)}+\frac{17640}{\left(1+\frac{5}{100}\right)^2}\right)$$

$$= \text{Rs.}\left(17640\times\frac{20}{21}+17640\times\frac{20}{21}\times\frac{20}{21}\right)$$

= Rs. (16800 + 16000)
= Rs. 32800

8. (3) Using Rule 1,
Let the amount deposited in Post Office be Rs. x lakhs.

$\therefore$ Amount deposited in bank = Rs. $(3 - x)$ lakhs

According to the question,

$$\frac{x\times 10\times 1}{100\times 12}+\frac{(3-x)\times 6\times 1}{100\times 12}$$

$$= \frac{2000}{100000} = \frac{1}{50}$$

$$\Rightarrow 10x + 18 - 6x = \frac{1}{50}\times 1200$$

$= 24$

$\Rightarrow 4x = 24 - 18 = 6$

$$\Rightarrow x = \frac{6}{4} = \text{Rs. } \frac{3}{2} \text{ lakhs}$$

$\therefore$ Required difference = 0

9. (2) Using Rule 1,
Let the income of company in 2010 be Rs. P

According to the question,

$$A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow 2664000 = P\left(1+\frac{20}{100}\right)^2$$

$$\Rightarrow 2664000 = P\left(1+\frac{1}{5}\right)^2$$

$$\Rightarrow 2664000 = P\times\left(\frac{6}{5}\right)^2$$

$$\Rightarrow P = \frac{2664000\times 5\times 5}{6\times 6}$$

= Rs. 1850000

TYPE-VII

1. (2) Using Rule 1,

$$\text{S.I.} = \frac{6000\times 5\times 2}{100} = ₹\ 600$$

$$\text{C.I.} = 5000\left[\left(1+\frac{8}{100}\right)^2 - 1\right]$$

$$= 5000\left[\left(\frac{27}{25}\right)^2 - 1\right]$$

$$= 5000\left[\left(\frac{729-625}{625}\right)\right]$$

$$= 5000\times\frac{104}{625} = ₹\ 832$$

$\therefore$ Required difference
= ₹ (832–600) = ₹ 232

2. (3) Using Rule 1,
Let the borrowed amount be x
According to the question,

$$x\left[\left(1+\frac{3}{100}\right)^2-1\right]-\frac{x\times4\times1}{100}$$

= 104.50
[$\because$ Interest is compounded half yearly]
$\Rightarrow x\,[(1.03)^2 - 1] - 0.04x$
= 104.50
$\Rightarrow 0.0609x - 0.04x = 104.50$
$\Rightarrow 0.0209x = 104.5$

$$\Rightarrow x = \frac{104.5}{0.0209} = ₹\ 5000$$

3. (2) Using Rule 9(i),
Let each instalment be x.

$$\frac{x}{\left(1+\frac{35}{400}\right)^2}+\frac{x}{\left(1+\frac{35}{400}\right)}=13360$$

$$\Rightarrow \frac{x}{\left(1+\frac{7}{80}\right)^2}+\frac{x}{\left(1+\frac{7}{80}\right)}=13360$$

$$\Rightarrow \frac{6400\,x}{7569}+\frac{80\,x}{87}=13360$$

$$\Rightarrow \frac{6400\,x+6960\,x}{7569}=13360$$

$\Rightarrow 13360\,x = 13360 \times 7569$
$\Rightarrow x = ₹\ 7569$

4. (3) Using Rule 1,
Rate = 5%, Time
= 4 half years
P = ₹ 5000

$$\therefore\ \text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^T-1\right]$$

$$= 5000\left[\left(1+\frac{5}{100}\right)^4-1\right]$$

$$= 5000\left(\frac{194481}{160000}-1\right)$$

$$= \frac{5000\times34481}{160000} = ₹\ 1077.5$$

$$\text{S.I.} = \frac{5000\times10\times2}{100} = ₹\ 1000$$

Difference = 1077.5 – 1000
= ₹ 77.5

5. (2) Using Rule 3,

$$A = P\left(1+\frac{R_1}{100}\right)^{T_1}\left(1+\frac{R_2}{100}\right)^{T_2}$$

$$= 250\left(1+\frac{4}{100}\right)\left(1+\frac{8}{100}\right)$$

$$= 250\times\frac{104}{100}\times\frac{108}{100}$$

$\therefore$ A = ₹ 280.80

6. (1) Using Rule 1,
Amount given to sons

$$= 84100 \times \frac{1}{2} = ₹\ 42050$$

Amount given to B = ₹ x (let)
$\therefore$ Amount given to A
= ₹ $(42050 - x)$

$$A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow (42050 - x)\left(1+\frac{R}{100}\right)^3$$

$$= x\left(1+\frac{R}{100}\right)^5$$

$$\Rightarrow (42050 - x) = x\left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow (42050 - x) = x\left(1+\frac{5}{100}\right)^2$$

$$\Rightarrow (42050 - x) = x\left(1+\frac{1}{20}\right)^2$$

$$\Rightarrow 42050 - x = x\left(\frac{21}{20}\right)^2$$

$$\Rightarrow 42050 - x = \frac{441x}{400}$$

$$\Rightarrow 42050 = \frac{441x}{400} + x$$

$$\Rightarrow 42050 = \frac{441x+400x}{400}$$

$$= \frac{841x}{400}$$

$\Rightarrow 841\,x = 42050 \times 400$

$$\Rightarrow x = \frac{42050\times400}{841}$$

= ₹ 20,000

7. (2) Using Rule 1,

$$\text{Time} = \frac{3}{2}\ \text{years}$$

= 3 half years
Rate = 2R% per annum
= R% per half year
$\therefore$ Amount

$$= \text{Principal} - \left(1+\frac{\text{Rate}}{100}\right)^{\text{Time}}$$

$$\Rightarrow 2315.25 = 2000\left(1+\frac{R}{100}\right)^3$$

$$\Rightarrow \frac{231525}{200000} = \left(1+\frac{R}{100}\right)^3$$

$$\Rightarrow \frac{9261}{8000} = \left(1+\frac{R}{100}\right)^3$$

$$\Rightarrow \left(\frac{21}{20}\right)^3 = \left(1+\frac{R}{100}\right)^3$$

$$\Rightarrow \left(1+\frac{1}{20}\right)^3 = \left(1+\frac{R}{100}\right)^3$$

$$\Rightarrow 1+\frac{1}{20} = 1+\frac{R}{100}$$

$$\Rightarrow \frac{R}{100} = \frac{1}{20}$$

$$\Rightarrow R = \frac{100}{20}$$

= 5% per half year
$\therefore$ Required rate
= 10% per annum

8. (4) $A = P\left(1+\frac{R}{100}\right)^n$

$$\Rightarrow 2P = P\left(1+\frac{R}{100}\right)^5$$

On cubing both sides,

$$2^3 = \left(1+\frac{R}{100}\right)^{5\times3}$$

$$\Rightarrow 8 = 1\left(1+\frac{R}{100}\right)^{15}$$

$\therefore$ Required time = 15 years
Aliter : Using Rule 11,
$x = 2,\ n_1 = 5, y = 8,\ n_2 = ?$

Here, $x^{\frac{1}{n_1}} = y^{\frac{1}{n_2}}$

$$(2)^{\frac{1}{5}} = (8)^{\frac{1}{n_2}}$$

$$2^{\frac{1}{5}} = (2)^{\frac{3}{n_2}}$$

$$\Rightarrow \frac{1}{5} = \frac{3}{n_2}$$

$$\therefore n_2 = 15$$

9. (4) Using Rule 1,
When the interest is payable half yearly,
= 9% per half annum
Time = 4 half years
Let the principal be Rs. P.

$$\therefore \text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$= P\left[\left(1+\frac{9}{100}\right)^4 - 1\right]$$

$$= P\left[(1.09)^4 - 1\right]$$

= P [1.4116 – 1] = Rs. 0.4116 P
According to the question,

$$= P\left[\left(1+\frac{18}{100}\right)^2 - 1\right]$$

$$= P\left[(1.18)^2 - 1\right]$$

= P (1.3924 – 1) = Rs. 0.3924 P
According to the question,
0.4116P – 0.3924P = 960
$\Rightarrow$ 0.0192P = 960

$$\Rightarrow P = \frac{960}{0.0192}$$

$$= \frac{960 \times 10000}{192}$$

= Rs. 50000

10. (3) Using Rule 3,
Amount

$$= P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)$$

$$= 25000\left(1+\frac{4}{100}\right)\left(1+\frac{5}{100}\right)$$

$$= 25000 \times \frac{104}{100} \times \frac{105}{100}$$

= Rs. 27300

11. (3) $A = P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)$

$$= 10000\left(1+\frac{10}{100}\right)\left(1+\frac{12}{100}\right)$$

$$= 10000 \times \frac{110}{100} \times \frac{112}{100}$$

= Rs. 12320

12. (1) Let the principal be Rs. P and rate of interest be R% per annum.

$$\therefore \text{S.I.} = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

$$\Rightarrow 1400 = \frac{PR \times 2}{100}$$

$\Rightarrow$ PR = 1400 × 50
= 70000 ..... (i)
Again, for 2 years,

$$\text{C.I.} - \text{S.I.} = \frac{PR^2}{10000}$$

$$\Rightarrow 1449 - 1400 = \frac{PR^2}{10000}$$

$$\Rightarrow 49 = \frac{PR \times R}{10000}$$

$$\Rightarrow 49 = \frac{70000 \times R}{10000}$$

[From equation (i)]

$\Rightarrow$ 7R = 49

$$\Rightarrow R = \frac{49}{7} = 7\% \text{ per annum}$$

13. (3) $P = \frac{x_1}{1+\frac{R}{100}} + \frac{x_2}{\left(1+\frac{R}{100}\right)^2}$

$$= \text{Rs.}\left(\frac{3150}{1+\frac{5}{100}} + \frac{4410}{\left(1+\frac{5}{100}\right)^2}\right)$$

$$= \text{Rs.}\left(\frac{3150}{1+\frac{1}{20}} + \frac{4410}{\left(1+\frac{1}{20}\right)^2}\right)$$

$$= \text{Rs.}\left(\frac{3150}{\frac{21}{20}} + \frac{4410}{\left(\frac{21}{20}\right)^2}\right)$$

$$= \text{Rs.}\left(\frac{3150 \times 20}{21} + \frac{4410 \times 400}{441}\right)$$

= Rs. (3000 + 4000)
= Rs. 7000

14. (2) Let Ram's share be Rs. x.
$\therefore$ Shyam's share
= Rs. (260200 – x)

$$A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow x\left(1+\frac{R}{100}\right)^4$$

$$= (260200 - x)\left(1+\frac{R}{100}\right)^6$$

$$\Rightarrow x = (260200 - x)\left(1+\frac{4}{100}\right)^2$$

$$\Rightarrow x = (260200 - x)\left(1+\frac{1}{25}\right)^2$$

$$\Rightarrow x = (260200 - x)\left(\frac{26}{25}\right)^2$$

$$\Rightarrow x = (260200 - x)\frac{676}{625}$$

$$\Rightarrow \frac{625x}{676} + x = 260200$$

$$\Rightarrow \frac{625x + 676x}{676} = 260200$$

$$\Rightarrow \frac{1301x}{676} = 260200$$

$$\Rightarrow x = \frac{260200 \times 676}{1301}$$

= Rs. 135200

15. (3) Interest got by A

$$= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

$$= \frac{5000 \times 2 \times 6}{100} = \text{Rs. } 600$$

C.I. received by B

$$= P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$= 5000\left[\left(1+\frac{10}{100}\right)^2 - 1\right]$$

$$= 5000\left[\left(\frac{11}{10}\right)^2 - 1\right]$$

$$= 5000\left(\frac{121}{100} - 1\right)$$

$$= \frac{5000 \times 21}{100} = \text{Rs. } 1050$$

$\therefore$ B's profit
= Rs. (1050 – 600)
= Rs. 450

TEST YOURSELF

1. At what rate per annum will ₹ 32000 yield a compound interest of ₹ 5044 in 9 months interest being compounded quarterly ?
(1) 20% (2) 32%
(3) 50% (4) 80%

2. If the difference between simple and compound interest on some principal amount at 20% per annum for three years is ₹48, then the principal amount is:
(1) ₹450 (2) ₹375
(3) ₹390 (4) None of these

3. Find compound interest on ₹ 5000 for 2 years at 10% per annum, compounded half-yearly.
(1) ₹ 1077.5 (2) ₹ 1072.5
(3) ₹ 1000 (4) ₹ 1100

4. Find compound interest on ₹ 10,000 for $3\frac{1}{2}$ years at 10% per annum, compounded yearly.
(1) ₹ 3675.50 (2) ₹ 3775.50
(3) ₹ 3875. 50 (4) ₹ 3975.50

5. Find the present worth of ₹ 9261 due 3 years hence at 5% per annum compounded yearly.
(1) ₹ 8000 (2) ₹ 8200
(3) ₹ 8500 (4) ₹ 8700

6. Find the ratio of simple interest to compound interest for 2 years at 4% per annum, compounded yearly in case of compound interest.
(1) 50 : 53 (2) 50 : 51
(3) 49 : 50 (4) 48 : 53

7. In what time will ₹15625 amount to ₹17576 at 4% per annum, compounded yearly?
(1) 4 years (2) 2.5 years
(3) 3 years (4) 3.5 years

8. If SI on a certain sum of money at 4% per annum for 2 years be ₹ 125, what would be the interest if it was to be compounded annually at the same rate and for the same time period?
(1) ₹ 127.50 (2) ₹ 125.50
(3) ₹ 135.50 (4) ₹ 138

9. The compound interest on a sum of money at 5% per annum for 3 years is ₹ 2522. What would be the simple interest on this sum at the same rate and for the same period ?
(1) ₹ 2500 (2) ₹ 2400
(3) ₹ 2450 (4) ₹ 2350

10. The simple interest on a certain sum for 2 years is ₹ 50 and the compound interest is ₹ 55. Find the rate of interest per annum and the sum.
(1) 16% P.a. ; ₹ 200
(2) 15% P.a. ; ₹ 150
(3) 20% P.a. ; ₹ 125
(4) 18% P.a. ; ₹ 175

11. If the difference between CI and SI on a certain sum at *r*% per annum for 2 years is ₹ *x*, find the expression for principal sum. If the difference between CI and SI on a certain sum at 4% per annum for 2 years is ₹ 25, find the sum.
(1) ₹ 18625 (2) ₹ 16625
(3) ₹ 14625 (4) ₹ 15625

12. If the difference between *CI* and *SI* on a certain sum at *r*% per annum for 3 years is Rs *x*, find the expression for the principal sum. If the difference between *CI* and *SI* on a certain sum at 4% for 3 years is Rs. 608. Find the sum.
(1) ₹ 125000 (2) ₹ 120000
(3) ₹ 130000 (4) ₹ 122250

13. A sum amounts to ₹ 9680 in 2 years and to ₹ 10648 in 3 years compounded annually. Find the principal and the rate of interest per annum.
(1) 12% ; ₹ 7500
(2) 10% ; ₹ 8000
(3) 11% : ₹ 11000
(4) None of these

14. Divide ₹ 10230 into two parts such that the first part after 10 years is equal to the second part after 7 years, compound interest being 20% per annum compounded yearly.
(1) ₹ 4150 ; ₹ 6080
(2) ₹ 3950 ; ₹ 6280
(3) ₹ 3750 ; ₹ 6480
(4) ₹ 3550 ; ₹ 6680

15. A sum of ₹1682 is to be divided between *A* and *B* who are respectively 20 years and 22 years old. They invest their shares at 5% per annum, compounded annually. At the age of 25 years both receive equal amounts. Find the share of each.
(1) ₹ 730 ; ₹ 952
(2) ₹ 750 ; ₹ 932
(3) ₹ 700 ; ₹ 982
(4) ₹ 800 ; ₹ 882

16. A sum of money was lent at 10% per annum, compounded annually, for 2 years. If the interest was compounded half-yearly, he would have received ₹ 220.25 more. Find the sum.
(1) ₹ 40000 (2) ₹ 45000
(3) ₹ 48000 (4) ₹ 50000

17. Ram invests ₹ 5000 in a bond which gives interest at 4% per annum during the first year, 5% during the second year and 10% during the third year. How much does he get at the end of third year ?
(1) ₹ 7000 (2) ₹ 5006
(3) ₹ 6006 (4) ₹ 5506

SHORT ANSWERS

1. (1)	**2.** (2)	**3.** (1)	**4.** (4)
5. (1)	**6.** (2)	**7.** (3)	**8.** (1)
9. (2)	**10.** (3)	**11.** (4)	**12.** (1)
13. (2)	**14.** (3)	**15.** (4)	**16.** (1)
17. (3)			

EXPLANATIONS

1. (1) Using Rule 1,
Let the rate of CI be R per cent per annum.

$$\therefore \text{CI} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$\Rightarrow 5044$

$$= 32000\left[\left(1+\frac{R}{400}\right)^3 - 1\right]$$

[$\because$ Interest is compounded quarterly]

$$\Rightarrow \frac{5044}{32000} = \left(1+\frac{R}{400}\right)^3 - 1$$

$$\Rightarrow \left(1+\frac{R}{400}\right)^3 - 1 = \frac{1261}{8000}$$

$$\Rightarrow \left(1+\frac{R}{400}\right)^3 = 1+\frac{1261}{8000}$$

$$\Rightarrow \left(1+\frac{R}{400}\right)^3 = \frac{9261}{8000} = \left(\frac{21}{20}\right)^3$$

$$\Rightarrow 1+\frac{R}{400} = \frac{21}{20} \Rightarrow \frac{R}{400} = \frac{21}{20} - 1 = \frac{1}{20}$$

$$\Rightarrow R = \frac{400}{20} = 20\ \%\ \text{per annum}$$

2. (2) Using Rule 6,

$$P = \frac{D \times 100^3}{r^2(r+300)}$$

$$= \frac{48 \times 100^3}{400(20+300)} = \text{Rs. } 375$$

3. (1) Using Rule 1,

$$A = P\left(1+\frac{r}{200}\right)^{2t}$$

Here, P = ₹ 5000
r = 10% per annum
t = 2 years

$$\text{So, } A = 5000\left(1+\frac{10}{200}\right)^4$$

$$= 5000\left(1+\frac{5}{100}\right)^4$$

$$= 5000 \times \frac{194481}{160000} = \frac{194481}{32}$$

A = ₹ 6077.5
CI = ₹ (6077.5 – 5000)
= ₹ 1077.5.

4. (4) Using Rule 4,

$$A = P\left(1+\frac{r}{100}\right)^3\left(1+\frac{\frac{r}{2}}{100}\right)$$

$$= 10{,}000\left(1+\frac{10}{100}\right)^3\left(1+\frac{5}{100}\right)$$

$$= 10{,}000 \times \frac{1331}{1000} \times \frac{21}{20}$$

A = ₹ 13975.5
CI = ₹ (13975.5 – 10,000)
CI = ₹ 3975.5.

5. (1) Using Rule 1,

$$P = \frac{A}{\left(1+\frac{r}{100}\right)^t}$$

Here, A = ₹ 9261
r = 5% per annum
t = 3 years

$$P = \frac{9261}{\left(1+\frac{5}{100}\right)^3} = \frac{9261}{\frac{9261}{8000}}$$

P = ₹ 8000.

6. (2) $$\frac{SI}{CI} = \frac{rt}{100\left[\left(1+\frac{r}{100}\right)^t - 1\right]}$$

$$= \frac{4 \times 2}{100\left[\left(1+\frac{4}{100}\right)^2 - 1\right]}$$

$$= \frac{2}{25\left(\frac{676}{625} - 1\right)} = \frac{2 \times 625}{25 \times 51}$$

$$\frac{SI}{CI} = \frac{50}{51} = 50 : 51$$

7. (3) Using Rule 1,
A = ₹ 17576
P = ₹ 15625
r = 4% per annum

$$A = P\left(1+\frac{r}{100}\right)^t$$

$$\left(1+\frac{r}{100}\right)^t = \frac{A}{P}$$

$$\left(1+\frac{4}{100}\right)^t = \frac{17576}{15625}$$

$$\left(\frac{26}{25}\right)^t = \frac{17576}{15625} = \left(\frac{26}{25}\right)^3$$

$\therefore$ t = 3 years.

8. (1) $$\frac{CI}{SI} = \frac{100\left[\left(1+\frac{r}{100}\right)^t - 1\right]}{rt}$$

$$= \frac{100\left[\left(1+\frac{4}{100}\right)^2 - 1\right]}{4 \times 2}$$

$$= \frac{100 \times \left(\frac{676}{625} - 1\right)}{4 \times 2}$$

$$\frac{CI}{125} = \frac{100 \times 51}{4 \times 2 \times 625}$$

$$CI = \frac{100 \times 51 \times 125}{4 \times 2 \times 625}$$

CI = ₹ 127.5.

9. (2)

$$SI = CI \times \frac{rt}{100\left[\left(1+\frac{r}{100}\right)^t - 1\right]}$$

$$= \frac{2522 \times 5 \times 3}{100\left[\left(1+\frac{5}{100}\right)^3 - 1\right]}$$

$$SI = \frac{2522 \times 5 \times 3}{100\left[\frac{9261}{8000} - 1\right]}$$

$$= \frac{2522 \times 5 \times 3}{100 \times 1261} \times 8000$$

SI = ₹ 2400.

10. (3) The difference between CI and SI for 2 years period is because CI also includes interest for the second year on the first year's interest.
CI – SI = ₹ (55 – 50) = ₹ 5

$$\text{First year's SI} = \frac{50}{2} = ₹\ 25$$

So, ₹ 5 is the interest on ₹ 25 for 1 year.

$$r = \frac{100\,I}{pt}$$

Here, I = ₹ 5
P = ₹ 25
t = 1 year

$$\therefore r = \frac{100 \times 5}{25 \times 1}$$

r = 20% per annum.

$$\text{Now, } P = \frac{100\,I}{rt}$$

Here, I = ₹ 50
r = 20% per annum
t = 2 years.

$$P = \frac{100 \times 50}{20 \times 2}$$

P = ₹ 125.

Note : **Derivation** for 2 years problems :

$$\text{Rate} = \frac{2 \times (CI - SI)}{SI} \times 100$$

$$\text{Sum} = \frac{SI \times 100}{\text{Rate} \times 2}$$

11. (4) Let the sum be ₹ P

$$SI = \frac{Pr \times 2}{100} = \frac{2Pr}{100}$$

$$CI = P\left[\left(1+\frac{r}{100}\right)^2 - 1\right]$$

$$= P\left[1+\frac{r^2}{(100)^2}+\frac{2r}{100}-1\right]$$

$$CI = P\left[\frac{r^2}{100^2}+\frac{2r}{100}\right]$$

$$CI - SI = P\left[\frac{r^2}{100^2}+\frac{2r}{100}\right]-\frac{2Pr}{100}$$

Let, CI – SI = x

$$x = \frac{Pr^2}{100^2}P = x\left(\frac{100}{r}\right)^2$$

Here, x = ₹ 25

r = 4% per annum

$$P = 25\left(\frac{100}{4}\right)^2$$

P = 25× 625

P = ₹15625.

12. (1) Using Rule 6,

Let the sum be ₹ P

$$SI = \frac{Pr\times 3}{100} = \frac{3Pr}{100}$$

$$CI = P\left[\left(1+\frac{r}{100}\right)^3 - 1\right]$$

$$CI = P\left[1+\frac{r^3}{100^3}+\frac{3r^2}{100^2}+\frac{3r}{100}-1\right]$$

$$CI = P\left[\frac{r^3}{100^3}+\frac{3r^2}{100^2}+\frac{3r}{100}\right]$$

$\Rightarrow CI - SI\,(x) =$

$$= P\left[\frac{r^3}{100^3}+\frac{3r^2}{100^2}+\frac{3r}{100}\right]-\frac{3Pr}{100}$$

$$x = P\left[\frac{r^3}{100^3}+\frac{3r^2}{100^2}\right]$$

$$x = P\left(\frac{r^2}{100^3}\right)[r+300]$$

$$\boxed{P = \frac{x\,(100)^3}{r^2\,(r+300)}}$$

Here, x = ₹ 608 (given) and

r = 4% per annum

$$P = \frac{608\times 100\times 100\times 100}{4\times 4\times (4+300)}$$

P = Rs. 1,25,000.

13. (2) Using Rule 1,

Let P = x

r = r% p.a.

A_1 = ₹ 9680

t_1 = 2 years

A_2 = ₹ 10648

t_2 = 3 years

Interest on ₹ 9680 for 1 year

= 10648 – 9680 = ₹ 968

$$\therefore\ r = \frac{968\times 100}{9680} = 10\%$$

Using A = $P\left(1+\frac{r}{100}\right)^t$ we get

$$9680 = x\left(1+\frac{10}{100}\right)^2 = x\left(\frac{11}{10}\right)^2$$

$$\Rightarrow x = 9680\times\frac{10}{11}\times\frac{10}{11} = 8000$$

∴ Principal = ₹ 8000.

14. (3) Using Rule 1,

Let the first part be x and the second part y.

The first part after 10 years

$$= x\left[1+\frac{20}{100}\right]^{10}$$

The second part after 7 years

$$= y\left[1+\frac{20}{100}\right]^{7}$$

As given in the problem these two amounts are equal.

So,

$$y\left(1+\frac{20}{100}\right)^7 = x\left(1+\frac{20}{100}\right)^{10}$$

$$\text{or } \frac{y}{x} = \left(1+\frac{20}{100}\right)^3$$

$$\text{or } \frac{y}{x} = \frac{216}{125}$$

and we have $y + x$ = ₹ 10230

Using the ratio formula

$$y = \frac{216}{216+125}\times 10230 = ₹\ 6480$$

$$x = \frac{125}{216+125}\times 10230 = ₹\ 3750$$

15. (4) Using Rule 1,

For A, time = 5 years

For B, time = 3 years

r = 5% per annum

$$A\left(1+\frac{5}{100}\right)^5 = B\left(1+\frac{5}{100}\right)^3$$

$$\frac{B}{A} = \left(1+\frac{5}{100}\right)^2$$

$$\frac{B}{A} = \frac{441}{400}$$

As given, $A + B$ = ₹ 1682

$$\text{So, } A = \frac{400}{400+441}\times 1682$$

= ₹ 800

$$\text{and } B = \frac{441}{400+441}\times 1682$$

= ₹ 882

16. (1) Using Rule 1,

Let the sum be ₹ P.

When compounded yearly, amount

$$= P\left[1+\frac{10}{100}\right]^2 = \frac{121}{100}P$$

When compounded half-yearly, amount

$$= P\left[1+\frac{5}{100}\right]^4 = \frac{194481}{160000}P$$

$$\text{So, } \left[\frac{194481}{160000}-\frac{121}{100}\right]P = 220.25$$

(Given difference)

$$\text{or } \frac{194481-193600}{160000}P = 220.25$$

$$\text{or } \frac{881}{160000}P = 220.25$$

$$\text{or } P = \frac{160000}{881}\times 220.25$$

or P = ₹ 40,000.

17. (3) Using Rule 3,

$$A = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)\left(1+\frac{r_3}{100}\right)$$

Here, P = ₹ 5000

$r_1 7$ = 4%

r_2 = 5%

r_3 = 10%

$$A = 5000\left(1+\frac{4}{100}\right)\left(1+\frac{5}{100}\right)\left(1+\frac{10}{100}\right)$$

$$= 5000\times\frac{26}{25}\times\frac{21}{20}\times\frac{11}{10}$$

A = ₹ 6006.

12 TIME AND WORK

Importance : In all level competitive examinations questions on Time and Work have been asked. Due to limited number of types you can ensure your marks with minimum efforts.

Scope of questions : In these questions, time taken by one/two persons or groups in doing certain works. required number of persons for any work are commonly asked. Comparision of male, female, children works, time taken after distribution/change and questions based on efficiency (per cent of ratio) are also asked.

Way to success : Note that 'time and work' and 'number of labour and work', have direct ratio while 'time and number of labour' have inverse ratio to solve these questions use ratio method to be it is noted that practice will ensure your accuracy and fast speed.

RULE 1 : If M_1 men can finish W_1 work in D_1 days and M_2 men can finish W_2 work in D_2 days then, Relation is

$$\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2} \text{ and}$$

If M_1 men finish W_1 work in D_1 days, working T_1 time each day and M_2 men finish W_2 work in D_2 days, working T_2 time each day, then

$$\frac{M_1D_1T_1}{W_1} = \frac{M_2D_2T_2}{W_2}$$

RULE 2 : If A completes a piece of work in 'x' days, and B completes the same work in 'y' days, then,

Work done by A in 1 day = $\frac{1}{x}$, Work done by B in 1 day = $\frac{1}{y}$

$\therefore$ Work done by A and B in 1 day = $\frac{1}{x}+\frac{1}{y} = \frac{x+y}{xy}$

$\therefore$ Total time taken to complete the work by A and B both = $\left(\frac{xy}{x+y}\right)$

RULE 3 : If A can do a work in 'x' days, B can do the same work in 'y' days, C can do the same work in 'z' days then, total time taken by A, B and C to complete the work together = $\frac{1}{\frac{1}{x}+\frac{1}{y}+\frac{1}{z}} = \frac{xyz}{xy+yz+zx}$ and

If workers are more than 3 then total time taken by A, B, C ..... so on to complete the work together = $\frac{1}{\frac{1}{x}+\frac{1}{y}+\frac{1}{z}+\ldots\ldots\ldots}$

RULE 4 : If A alone can do a certain work in 'x' days and A and B together can do the same work in 'y' days, then B alone can do the same work in

$$\left(\frac{xy}{x-y}\right) \text{ days}$$

RULE 5 : If A and B can do a work in 'x' days, B and C can do the same work in 'y' days, C and A can do the same work in 'z' days. Then total time taken, when A, B and C work together = $\frac{2}{\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)}$ OR $\frac{2xyz}{xy+yz+zx}$ days

RULE 6 : Work of one day = $\frac{\text{Total work}}{\text{Total no. of working days}}$

Total work = (work of one day) × (total no. of working days)

Remaining work = 1 – (work done)

Work done by A = (Work done in 1 day by A) × (total no. of days worked by A,

B and C and so on) = $\frac{\frac{1}{x}}{\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}+\ldots\ldots\ldots\ldots\right)}$

where A can complete work in x days, B in y days, C in z days and so on....

RULE 7 : If A can finish $\frac{m}{n}$ part of the work in D days. Then,

Total time taken to finish the work by

A = $\frac{D}{\left(\frac{m}{n}\right)} = \frac{n}{m}\times D$ days

RULE 8 : (i) If A can do a work in 'x' days and B can do the same work in 'y' days and when they started working together, B left the work 'm' days before completion then total time taken to complete work is $\frac{(y+m)x}{x+y}$

(ii) A leaves the work 'm' days before its completion then total time taken to complete work is = $\frac{(x+m)y}{x+y}$

RULE 9 : If A and B together can finish a certain work in 'a' days. They worked together for 'b' days and then 'B' (or A) left the work. A (or B) finished the rest work in 'd' days, then

Total time taken by A (or B) alone to complete the work

$$= \frac{ad}{a-b} \text{ or } \frac{bd}{a-b} \text{ days}$$

RULE 10 : If food is available for 'a' days for 'A' men at a certain place and after 'b' days. 'B' men join, then the remaining food will serve total men for

Required time = $\frac{A(a-b)}{(A+B)}$ days

If food is available for 'a' days for 'A' men at a certain place, and after 'b' days 'B' men leave then the remaining food will serve remaining men for

$\therefore$ Required time = $\frac{A(a-b)}{(A-B)}$ days

RULE 11 : If A_1 men and B_1 boys can do a certain work in D_1 days, Again, A_2 men and B_2 boys can do the same work in D_2 days, then, A_3 men and B_3 boys can do the same work in

Required time

$$= \frac{D_1D_2[A_1B_2 - A_2B_1]}{D_1[A_1B_3 - A_3B_1] - D_2[A_2B_3 - A_3B_2]} \text{ days}$$

RULE 12 : If A men or B boys can do a certain work in 'a' days, then A_1 men and B_1 boys can do the same work in

$$\text{Time taken} = \frac{a}{\frac{A_1}{A} + \frac{B_1}{B}} = \frac{a(A.B)}{A_1B + B_1A} \text{ days}$$

RULE 13 : If A men or B boys or C women can do a certain work in 'a' days, then A_1 men, B_1 boys and C_1 women can do the same work in

$$\text{Time taken} = \frac{a}{\frac{A_1}{A} + \frac{B_1}{B} + \frac{C_1}{C}}$$

RULE 14 : If 'A' men can do a certain work in 'a' days and 'B' women can do the same work in 'b' days, then the total time taken when A_1 men and B_1 women work together is

$$\text{Time taken} = \frac{1}{\left(\frac{A_1}{A.a} + \frac{B_1}{B.b}\right)}$$

If A men do a certain work in 'a' days, B women do the same work in 'b' days and C boys do the same work in 'c' days then the total time taken when A_1 men, B_1 women and C_1 boys can work together is

$$\text{Total time taken} = \frac{1}{\left(\frac{A_1}{A.a} + \frac{B_1}{B.b} + \frac{C_1}{C.c}\right)}$$

RULE 15 : The comparison of rate of work done is called efficiency of doing work. Efficiency (E) $\propto \frac{1}{\text{No. of days}}$,

$E_1 : E_2 : E_3 = \frac{1}{D_1} : \frac{1}{D_2} : \frac{1}{D_3}$, $E = \frac{k}{D}$ or, $ED = k$ or, $E_1D_1 = E_2D_2$

RULE 16 : If the efficiency to work of A is twice the efficiency to work of B, then, A:B (efficiency) = 2x:x and A:B (time) = t:2t

RULE 17 : If A can do a work in 'x' days and B is R% more efficient than A, then 'B' alone will do the same work in $x \frac{100}{(100+R)}$ days

RULE 18 : A, B and C can do a certain work together within 'x' days. While, any two of them can do the same work separately in 'y' and 'z' days, then in how many days can 3rd do the same work?

$$\text{Required time} = \frac{xyz}{yz - x(y+z)} \text{ days}$$

RULE 19 : A and B can do a work in 'x' days, B and C can do the same work in 'y' days. C and A can do the same work in 'z' days. Then, all can do alone the work as following:

$$\text{A alone can do in} = \frac{2xyz}{xy + yz - zx} \text{ days}$$

$$\text{B alone can do in} = \frac{2xyz}{-xy + yz + zx} \text{ days}$$

$$\text{C alone can do in} = \frac{2xyz}{-yz + xy + zx} \text{ days}$$

RULE 20 : A can do a certain work in 'm' days and B can do the same work in 'n' days. They worked together for 'P' days and after this A left the work, then in how many days did B alone do the rest of work ?

$$\text{Required time} = \frac{mn - P(m+n)}{m} \text{ days}$$

when after 'P' days B left the work, then in how many days did A alone do the rest of work?

$$\text{Required time} = \frac{mn - P(m+n)}{n} \text{ days}$$

RULE 21 : If a man can do a certain work in 'd_1' days working 'h_1' hours in a days, while another man can do the same work in 'd_2' days working 'h_2' hours in a day. When they work together everyday 'h' hours, then in how many days work will complete?

$$\text{Required time} = \left[\frac{(h_1d_1) \times (h_2d_2)}{(h_1d_1 + h_2d_2)}\right]\frac{1}{h}$$

RULE 22 : The efficiency of A to work is 'n' times more than that of B, Both start to work together and finish it in 'D' days. Then, A and B will separately complete, the work in $\left(\frac{n+1}{n}\right)D$ and (n + 1) D days respectively.

RULE 23 : Some people finish a certain work in 'D' days. If there were 'a' less people, then the work would be completed in 'd'days more, what was the number of people initially?

$$\therefore \text{ Required number} = \frac{a(D-d)}{d} \text{ people}$$

RULE 24 : A can do a work in 'm' days and B can do the same work in 'n' days. If they work together and total wages is R, then.

$$\text{Part of A} = \frac{n}{(m+n)} \times R$$

$$\text{Part of B} = \frac{m}{(m+n)} \times R$$

RULE 25 : If A, B and C finish the work in m, n and p days respectively and they receive the total wages R, then the ratio of their wages is $\frac{1}{m} : \frac{1}{n} : \frac{1}{p}$

RULE 26 : A and B can do a piece of work in x and y days, respectively. Both begin together but after some days. A leaves the job and B completed the remaining work in a days. After how many days did A leave?

$$\text{Required time, } t = \frac{(y-a)}{x+y} \times x$$

RULE 27 : If A men and B boys can complete a work in x days, while A, men and B, boys will complete the same work in y days, then

$$\frac{\text{One day work of 1 man}}{\text{One day work of 1 boy}} = \frac{(yB_1 - xB)}{(xA - yA_1)}$$

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE-I

1. A and B can do a work in 12 days, B and C in 15 days and C and A in 20 days. If A, B and C work together, they will complete the work in :

(1) 5 days (2) $7\frac{5}{6}$ days

(3) 10 days (4) $15\frac{2}{3}$ days

(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC CPO S.I. Exam. 07.09.2003 & 03.09.2006) & (SSC CGL Prelim Exam. 19.06.2011) (Ist Sitting) & (SSC GL Tier-I Exam. 19.05.2013) (Ist Sitting)

2. A and B can do a piece of work in 72 days. B and C can do it in 120 days, A and C can do it in 90 days. In how many days all the three together can do the work ?

(1) 80 days (2) 100 days
(3) 60 days (4) 150 days

(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting) & (SSC MTS (Non-Technical) Exam. 27.02.2011)

3. A particular job can be completed by a team of 10 men in 12 days. The same job can be completed by a team of 10 women in 6 days. How many days are needed to complete the job if the two teams work together?

(1) 4 days (2) 6 days
(3) 9 days (4) 18 days

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

4. A can do a work in 6 days and B in 9 days. How many days will both take together to complete the work?

(1) 7.5 days (2) 5.4 days
(3) 3.6 days (4) 3 days

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

5. A and B can do a piece of work in 10 days, B and C in 15 days and C and A in 20 days. C alone can do the work in :

(1) 60 days (2) 120 days
(3) 80 days (4) 30 days

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

6. A can do a piece of work in 4 hours; B and C can do it in 3 hours. A and C can do it in 2 hours. How long will B alone take to do it ?

(1) 10 hours (2) 12 hours
(3) 8 hours (4) 24 hours

(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting)

7. A, B and C can complete a piece of work in 24, 6 and 12 days respectively. Working together, they will complete the same work in

(1) $\frac{1}{4}$ day (2) $\frac{7}{24}$ day

(3) $3\frac{3}{7}$ days (4) 4 days

(SSC CPO S.I. Exam. 12.01.2003)

8. A and B together can do a piece of work in 10 days. A alone can do it in 30 days. The time in which B alone can do it is

(1) 10 days (2) 12 days
(3) 15 days (4) 20 days

(SSC CPO S.I. Exam. 05.09.2004)

9. A and B together can complete a piece of work in 72 days, B and C together can complete it in 120 days, and A and C together in 90 days. In what time can A alone complete the work ?

(1) 80 days (2) 100 days
(3) 120 days (4) 150 days

(SSC CPO S.I. Exam. 26.05.2005)

10. A and B together can do a work in 8 days, B and C together in 6 days while C and A together in 10 days, if they all work together, the work will be completed in :

(1) $3\frac{3}{4}$ days (2) $3\frac{3}{7}$ days

(3) $5\frac{5}{47}$ days (4) $4\frac{4}{9}$ days

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

11. A and B can do a piece of work in 12 days, B and C in 8 days and C and A in 6 days. How long would B take to do the same work alone ?

(1) 24 days (2) 32 days
(3) 40 days (4) 48 days

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

12. *A* and *B* can complete a piece of work in 30 days, *B* and *C* in 20 days, while *C* and *A* in 15 days. If all of them work together, the time taken in completing the work will be

(1) 10 days (2) 12 days

(3) $12\frac{2}{3}$ days (4) $13\frac{1}{3}$ days

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

13. A and B together can complete a work in 8 days and B and C together in 12 days. All of the three together can complete the work in 6 days. In how much time will A and C together complete the work ?

(1) 8 days (2) 10 days
(3) 12 days (4) 20 days

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011) (Delhi)

14. A alone can complete a work in 12 days. A and B together can complete it in 8 days. How long will B alone take to complete the work ?

(1) 24 days (2) 18 days
(3) 16 days (4) 20 days

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

15. If A and B together can complete a work in 18 days, A and C together in 12 days and B and C together in 9 days, then B alone can do the work in

(1) 18 days (2) 24 days
(3) 30 days (4) 40 days

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (IInd Sitting)

16. While working 7 hours a day, A alone can complete a piece of work in 6 days and B alone in 8 days. In what time would they complete it together, working 8 hours a day ?

(1) 3 days (2) 4 days
(3) 2.5 days (4) 3.6 days

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

17. A and B can do a piece of work in 10 days. B and C can do it in 12 days. C and A in 15 days. In how many days will C finish it alone ?
(1) 24 days (2) 30 days
(3) 40 days (4) 60 days
(SSC CPO S.I. Exam. 06.09.2009)

18. If A and B together can complete a piece of work in 15 days and B alone in 20 days, in how many days can A alone complete the work ?
(1) 60 days (2) 45 days
(3) 40 days (4) 30 days
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

19. If A and B together can complete a work in 12 days, B and C together in 15 days and C and A together in 20 days, then B alone can complete the work in
(1) 30 days (2) 25 days
(3) 24 days (4) 20 days
(SSC (South Zone) Investigator Exam 12.09.2010)

20. A work can be completed by P and Q in 12 days, Q and R in 15 days, R and P in 20 days. In how many days P alone can finish the work?
(1) 10 days (2) 20 days
(3) 30 days (4) 60 days
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting) & (SSC GL Tier-I Exam. 19.05.2013)

21. A and B can complete a piece of work in 8 days, B and C can do it in 12 days, C and A can do it in 8 days. A, B and C together can complete it in
(1) 4 days (2) 5 days
(3) 6 days (4) 7 days
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

22. A and B together can do a work in 10 days. B and C together can do the same work in 6 days. A and C together can do the work in 12 days. Then A, B and C together can do the work in
(1) 28 days (2) 14 days
(3) $5\frac{5}{7}$ days (4) $8\frac{2}{7}$ days
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

23. A and B working together; can do a piece of work in $4\frac{1}{2}$ hours. B and C working together can do it in 3 hours. C and A working together can do it in $2\frac{1}{4}$ hours. All of them begin the work at the same time. Find how much time they will take to finish the piece of work.
(1) 3 hours (2) 2 hours
(3) 2·5 hours (4) 3·25 hours
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

24. A and B together can complete a piece of work in 18 days, B and C in 24 days and A and C in 36 days. In how many days, will all of them together complete the work ?
(1) 16 days (2) 15 days
(3) 12 days (4) 10 days
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

25. A and B together can do a piece of work in 5 days and A alone can do it in 8 days. B alone can do the same piece of work in
(1) $11\frac{1}{3}$ days (2) $12\frac{3}{5}$ days
(3) $13\frac{1}{3}$ days (4) $16\frac{4}{5}$ days
(SSC Data Entry Operator Exam. 31.08.2008)

26. A, B and C together can complete a piece of work in 30 minutes. A and B together can complete the same work in 50 minutes. C alone can complete the work in
(1) 60 minutes (2) 75 minutes
(3) 80 minutes (4) 150 minutes
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

27. A and B can do a piece of work in 8 days, B and C can do it in 24 days, while C and A can do it in $8\frac{4}{7}$ days. In how many days can C do it alone?
(1) 60 days (2) 40 days
(3) 30 days (4) 10 days
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

28. A and B can do a piece of work in 10 days. B and C can do it in 12 days. A and C can do it in 15 days. How long will A take to do it alone ?
(1) 24 days (2) 20 days
(3) 40 days (4) 30 days
(SSC CHSL DEO & LDC Exam. 04.12.2011(IInd Sitting (North Zone)

29. If A and B together can finish a piece of work in 20 days, B and C in 10 days and C and A in 12 days, then A, B, C jointly can finish the same work in
(1) $4\frac{2}{7}$ days (2) 30 days
(3) $8\frac{4}{7}$ days (4) $\frac{7}{60}$ days
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

30. A, B and C individually can do a work in 10 days, 12 days and 15 days respectively. If they start working together, then the number of days required to finish the work is
(1) 16 days (2) 8 days
(3) 4 days (4) 2 days
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

31. A and B together can do a piece of work in 12 days, while B alone can finish it in 30 days. A alone can finish the work in
(1) 20 days (2) 25 days
(3) 15 days (4) 18 days
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

32. A, B and C can complete a piece of work in 12, 24 and 36 days respectively. In how many days will they together complete the same work ?
(1) $5\frac{6}{11}$ days (2) 4 days
(3) $6\frac{6}{11}$ days (4) 6 days
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

33. A and B can separately do a piece of work in 6 days and 12 days respectively. How long will they together take to do the work ?
(1) 9 days (2) 18 days
(3) 6 days (4) 4 days
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

34. A and B can do a piece of work in 36 days, B and C can do it in 60 days, A and C can do it in 45 days. C alone can do it in
(1) 90 days (2) 180 days
(3) 120 days (4) 150 days
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

35. Ronald and Elan are working on an Assignment. Ronald takes 6 hours to type 32 pages on a computer, while Elan takes 5 hours to type 40 pages. How much time will they take working together on two different computers to type an assignment of 110 pages ?
(1) 7 hrs. 30 min.
(2) 8 hrs.
(3) 8 hrs. 15 min.
(4) 8 hrs. 25 min.
(SSC Graduate Level Tier-I Exam. 21.04.2013)

36. A can do a piece of work in 20 days and B can do the same piece of work in 30 days. Find in how many days both can do the work ?
(1) 16 days (2) 14 days
(3) 10 days (4) 12 days
(SSC Constable (GD) Exam. 12.05.2013) & (SSCCHSL DEO & LDC Exam. 20.10.2013)

37. A can do as much work as B and C together can do. A and B can together do a piece of work in 9 hours 36 minutes and C can do it in 48 hours. The time (in hours) that B needs to do the work alone, is :
(1) 18 hrs (2) 24 hrs
(3) 30 hrs (4) 12 hrs
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

38. A can do a piece of work in 12 days and B in 15 days. They work together for 5 days and then B left. The days taken by A to finish the remaining work is
(1) 3 (2) 5
(3) 10 (4) 12l
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

39. A and B together can dig a trench in 12 days, which A alone can dig in 28 days; B alone can dig it in
(1) 20 days (2) 21 days
(3) 22 days (4) 23 days
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

40. A can complete a work in 'm' days and B can complete it in 'n' days. How many days will it take to complete the work if both A and B work together ?
(1) $(m + n)$ days
(2) $\left(\frac{1}{m} \times \frac{1}{n}\right)$ days
(3) $\left(\frac{m+n}{mn}\right)$ days
(4) $\left(\frac{mn}{m+n}\right)$ days
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

41. Three men A. B and C working together can do a job in 6 hours less time than A alone, in 1 hour less time than B alone and in one half the time needed by C when working alone. Then A and B together can do the job in
(1) $\frac{2}{3}$ hour (2) $\frac{3}{4}$ hour
(3) $\frac{3}{2}$ hour (4) $\frac{4}{3}$ hour
(SSC CGL Tier-I Exam. 19.10.2014)

42. A takes three times as long as B and C together to do a job. B takes four times as long as A and C together to do the work. If all the three, working together can complete the job in 24 days, then the number of days, A alone will take to finish the job is
(1) 100 (2) 96
(3) 95 (4) 90
(SSC CGL Tier-I Exam. 19.10.2014)

43. A can do a piece of work in 4 days and B can do it in 12 days. In how many days will they finish the work, both working together ?
(1) 4 days (2) 6 days
(3) 2 days (4) 3 days
(SSC CGL Tier-I Exam. 26.10.2014)

44. A can do $\frac{1}{4}$ of a work in 10 days. B can do $\frac{1}{3}$ of the work in 20 days. In how many days can both A and B together do the work ?
(1) 30 days (2) 32 days
(3) 24 days (4) 25 days
(SSC CGL Tier-I Exam. 26.10.2014)

45. 15 men take 20 days to complete a job working 8 hours a day. The number of hours a day should 20 men take to complete the job in 12 days
(1) 5 hours (2) 10 hours
(3) 15 hours (4) 18 hours
(SSC CGL Tier-II Exam. 21.09.2014)

46. Raj and Ram working together do a piece of work in 10 days. Raj alone can do it in 12 days. Ram alone will do the work in
(1) 20 days (2) 40 days
(3) 50 days (4) 60 days
(SSC CGL Tier-II Exam. 21.09.2014)

47. A and B working separately can do a piece of work in 9 and 15 days respectively. If they work for a day alternately, with A beginning, then the work will be completed in
(1) 10 days (2) 11 days
(3) 9 days (4) 12 days
(SSC CHSL DEO & LDC Exam. 9.11.2014)

48. How many men need to be employed to complete a job in 5 days, if 15 men can complete $\frac{1}{3}$ of the job in 7 days ?
(1) 20 (2) 21
(3) 45 (4) 63
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

49. If x can finish a job in 4 hours and y can finish the same job in 8 hours independently, then they together will finish the job in
(1) 140 minutes
(2) 160 minutes
(3) 120 minutes
(4) 150 minutes
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

50. x can copy 80 pages in 20 hours, x and y together can copy 135 pages in 27 hours. Then y can copy 20 pages in
(1) 20 hours (2) 3 hours
(3) 24 hours (4) 12 hours
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

51. A and B can do a piece of work in 15 days. B and C can do a similar work in 12 days and C and A in 10 days. How many days will A take to do the work by himself ?

(1) 13 (2) 24

(3) 40 (4) 8

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

52. A can do a piece of work in 25 days and B can do the same work in 30 days. They work together for 5 days, how much of work is left ?

(1) $\frac{11}{30}$ (2) $\frac{15}{30}$

(3) $\frac{19}{30}$ (4) $\frac{12}{30}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

53. A and B together can do a piece of work in 6 days. If A can alone do the work in 18 days, then the number of days required for B to finish the work is

(1) 10 (2) 12

(3) 9 (4) 15

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

54. A's 2 days' work is equal to B's 3 days' work. If A can complete the work in 8 days then to complete the work B will take

(1) 14 days (2) 12 days

(3) 15 days (4) 16 days

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

55. 16 men are able to complete a piece of work in 12 days working 14 hours a day. How long will 28 men, working 12 hours a day, take to complete the work ?

(1) 10 days (2) 7 days

(3) 8 days (4) 6 days

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

56. A and B can do a given piece of work in 8 days, B and C can do the same work in 12 days and A, B, C complete it in 6 days. Number of days required to finish the work by A and C is

(1) 16 (2) 8

(3) 12 (4) 24

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

57. If 90 men can do a certain job in 16 days, working 12 hours per day, then the part of that work which can be completed by 70 men in 24 days, working 8 hours per day is

(1) $\frac{1}{3}$ (2) $\frac{2}{3}$

(3) $\frac{7}{9}$ (4) $\frac{5}{8}$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

58. A, B and C can do a work separately in 16, 32 and 48 days respectively. They started the work together but B left off 8 days and C six days before the completion of the work. In what time is the work finished?

(1) 10 days (2) 9 days

(3) 12 days (4) 14 days

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

59. A and B can do a piece of work in 15 days. B and C can do the same work in 10 days and A and C can do the same in 12 days. Time taken by A, B and C together to do the job is

(1) 4 days (2) 9 days

(3) 8 days (4) 5 days

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

60. A, B and C can complete a work in 10, 12 and 15 days respectively. A left the work 5 days before the work was completed and B left 2 days after A had left. Number of days required to complete the whole work is :

(1) $8\frac{2}{3}$ (2) $6\frac{2}{3}$

(3) 7 (4) 6

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

61. A, B and C can complete a piece of work in 24, 5 an 12 days respectively. Working together, they will complete the same work in :

(1) $\frac{7}{24}$ days (2) $3\frac{1}{13}$ days

(3) 4 days (4) $\frac{1}{24}$ days

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

62. If 20 women can lay a road of length 100m in 10 days. Then 10 women can lay the same road of length 50m in

(1) 20 days (2) 15 days

(3) 5 days (4) 10 days

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

63. A can do a piece of work in 9 days while B can do it in 12 days. A and B together can do the work in

(1) $5\frac{1}{7}$ days (2) $5\frac{2}{7}$ days

(3) $6\frac{1}{7}$ days (4) $6\frac{2}{7}$ days

(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

64. A man can do a piece of work in 30 hours. If he works with his son then the same piece of work is finished in 20 hours. If the son works alone he can do the work in

(1) 60 hours (2) 50 hours

(3) 25 hours (4) 10 hours

(SSC CGL Tier-II Online Exam.01.12.2016)

65. A can do a piece of work in 12 days and B in 20 days. If they together work on it for 5 days, and remaining work is completed by C in 3 days, then in how many days can C do the same work alone?

(1) 10 days (2) 9 days

(3) 12 days (4) 15 days

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

66. A can finish a work in 7 days. B can finish the same work in 9 days. The number days required to finish the same work by both of them together is

(1) $1\frac{15}{16}$ (2) $2\frac{15}{16}$

(3) $3\frac{15}{16}$ (4) $4\frac{15}{16}$

(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

67. A and B together can finish a job in 24 days, while A, B and C together can finish the same job in 8 days. C alone will finish the job in

(1) 12 days (2) 14 days
(3) 16 days (4) 24 days

(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

68. A can do a piece of work in 12 days and B in 24 days. If they work together, in how many days will they finish the work?

(1) 12 days (2) 20 days
(3) 15 days (4) 8 days

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

69. A, B and C working separately can do a piece of work in 11 days, 20 days and 55 days respectively. In how many days, the work will be completed if A is assisted by B and C on alternate days ?

(1) 2 (2) 6
(3) 4 (4) 8

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

70. A and B together can do a piece of work in 6 days and A alone can do it in 9 days. The number of days B will take to do it alone is

(1) 18 days (2) 24 days
(3) 9 days (4) 12 days

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

71. A can do a piece of work in 18 days. He worked at it for 12 days and B finished the remaining work in 8 days. B alone can do the whole work in

(1) 16 days (2) 24 days
(3) 28 days (4) 29 days

(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

72. A and B can do a work in 8 days, B and C can do the same work in 12 days. A, B and C together can finish it in 6 days. A and C together will do it in :

(1) 4 days (2) 6 days
(3) 8 days (4) 12 days

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

73. A and B together can do a piece of work in 9 days. If A does thrice the work of B in a given time, the time A alone will take to finish the work is

(1) 4 days (2) 6 days
(3) 8 days (4) 12 days

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

74. If 100 cats kill 100 mice in 100 days, then 4 cats would kill 4 mice in how many days?

(1) 4 days (2) 3 days
(3) 40 days (4) 100 days

(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

75. X can do a piece of work in 'p' days and Y can do the same work in 'q' days. Then the number of days in which X and Y can together do that work is

(1) $\frac{p+q}{2}$ (2) $\frac{1}{p}+\frac{1}{q}$

(3) $\frac{pq}{p+q}$ (4) pq

(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

76. A can do a piece of work in 8 days and B can do it in 10 days separately. How many days would it take for both A and B to finish the same work together ?

(1) $\frac{33}{8}$ (2) $\frac{40}{9}$

(3) $\frac{41}{10}$ (4) $\frac{42}{11}$

(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

77. A and B together can do a piece of work in 36 days, B and C together can do it in 24 days. A and C together can do it in 18 days. The three working together can finish the work in

(1) 8 days (2) 16 days
(3) 30 days (4) 32 days

(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

78. Koushik can do a piece of work in x days and Krishnu can do the same work in y days. If they work together, then they can do the work in

(1) $(x + y)$ days

(2) $\frac{1}{(x+y)}$ days

(3) $\frac{xy}{(x+y)}$ days

(4) $\frac{(x+y)}{xy}$ days

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

79. A canal of a village can be cleaned by 24 villagers in 12 days. The number of days in which 36 villagers can clean the canal is

(1) 18 (2) 8
(3) 72 (4) 16

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

80. A and B can do a piece of work in 18 days, B and C in 24 days, A and C in 36 days. Working together they can do the work in

(1) 12 days (2) 13 days
(3) 16 days (4) 26 days

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

81. A can do as much work in 4 days as B can do in 5 days, and B can do as much work in 6 days as C in 7 days. In what time will C do a piece of work which A can do in a week ?

(1) $10\frac{5}{24}$ days (2) $4\frac{4}{5}$ days

(3) $6\frac{8}{15}$ days (4) $12\frac{6}{19}$ days

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

82. If 42 persons consume 144 kg of wheat in 15 days, then in how many days will 30 persons consume 45 kg of wheat ?

(1) 8 days (2) 7 days
(3) 12 days (4) 6 days

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

83. A father can do a job as fast as his two sons working together. If one son does the job in 3 hours and the other in 6 hours, the number of hours taken by the father, to do the job alone is

(1) 1 (2) 2
(3) 3 (4) 4

(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (Ist Sitting)

84. A can do a piece of work in 10 days, B can do it in 12 days and C can do it in 15 days. In how many days will A, B and C finish it, working all together?

(1) 6 days (2) $5\frac{1}{4}$ days

(3) $4\frac{4}{11}$ days (4) 4 days

(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

85. If 5 persons together can make 5 mats in 5 hours, then 10 persons in 10 hours will make

(1) 20 mats (2) 10 mats
(3) 15 mats (4) 5 mats

(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

86. A and B together can do a piece of work in 12 days while A alone can do the same work in 30 days. B alone can do it in

(1) 18 days (2) 20 days
(3) 15 days (4) 22 days

(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

87. Ganesh, Ram and Sohan together can complete a work in 16 days. If Ganesh and Ram together can complete the same work in 24 days, the number of days Sohan alone takes, to finish the work is

(1) 40 (2) 48
(3) 32 (4) 30

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

88. A and B can do a piece of work in 72 days. B and C can do it in 120 days and A and C can do it in 90 days. A alone can do it in :

(1) 120 days (2) 130 days
(3) 150 days (4) 100 days

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

89. If 35 men can finish a piece of work in 8 days, then the number of men who can do the same work in 10 days is :

(1) 38 (2) 28
(3) 19 (4) 17

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

90. A can do a piece of work in 30 days while B can do it in 40 days. In how many days can A and B working together do it ?

(1) $42\frac{3}{4}$ days (2) $27\frac{1}{7}$ days

(3) $17\frac{1}{7}$ days (4) 70 days

(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE-II

1. A and B can do a work in 18 and 24 days respectively. They worked together for 8 days and then A left. The remaining work was finished by B in :

(1) 5 days (2) $5\frac{1}{3}$ days

(3) 8 days (4) 10 days

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A can do a piece of work in 12 days and B can do it in 18 days. They work together for 2 days and then A leaves. How long will B take to finish the remaining work ?

(1) 6 days (2) 8 days
(3) 10 days (4) 13 days

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. A and B can do a job in 6 and 12 days respectively. They began the work together but A leaves after 3 days. Then the total number of days needed for the completion of the work is :

(1) 4 days (2) 5 days
(3) 6 days (4) 9 days

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

4. A and B can do a piece of work in 30 days while B and C can do the same work in 24 days and C and A in 20 days. They all work together for 10 days when B and C leave. How many days more will A take to finish the work ?

(1) 18 days (2) 24 days
(3) 30 days (4) 36 days

(SSC CPO S.I. Exam. 12.01.2003)

5. A and B can together finish a work in 30 days. They worked together for 20 days and then B left. After another 20 days, A finished the remaining work. In how many days A alone can finish the job ?

(1) 50 days (2) 60 days
(3) 48 days (4) 54 days

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting) & (SSC DEO & LDC Exam. 10.11.2013)

6. 8 men can do a work in 12 days. After 6 days of work, 4 more men were engaged to finish the work. In how many days would the remaining work be completed?

(1) 2 (2) 3
(3) 4 (4) 5

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

7. A can finish a work in 24 days, B in 9 days and C in 12 days. B and C start the work but are forced to leave after 3 days. The remaining work was done by A in :

(1) 5 days (2) 6 days

(3) 10 days (4) $10\frac{1}{2}$ days

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. A certain number of persons can complete a piece of work in 55 days. If there were 6 persons more, the work could be finished in 11 days less. How many persons were originally there ?

(1) 17 (2) 24
(3) 30 (4) 22

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

9. A and B working separately can do a piece of work in 10 days and 15 days respectively. If they work on alternate days beginning with A, in how many days will the work be completed ?

(1) 18 days (2) 13 days
(3) 12 days (4) 6 days

(SSC CPO S.I. Exam. 07.09.2003)

10. A and B can do a piece of work in 28 and 35 days respectively. They began to work together but A leaves after sometime and B completed remaining work in 17 days. After how many days did A leave ?

(1) $14\frac{2}{5}$ days (2) 9 days

(3) 8 days (4) $7\frac{5}{9}$ days

(SSC CPO S.I. Exam. 07.09.2003)

11. A and B can complete a work in 15 days and 10 days respectively. They started doing the work together but after 2 days, B had to leave and A alone completed the remaining work. The whole work was completed in :

(1) 10 days (2) 8 days
(3) 12 days (4) 15 days

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

12. A and B can do a piece of work in 20 days and 12 days respectively. A started the work alone and then after 4 days B joined him till the completion of the work. How long did the work last ?

(1) 10 days (2) 20 days
(3) 15 days (4) 6 days

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

13. A and B can do a work in 45 days and 40 days respectively. They began the work together but A left after some time and B completed the remaining work in 23 days. After how many days of the start of the work did A leave ?

(1) 10 days (2) 9 days
(3) 8 days (4) 5 days

(SSC CPO S.I. Exam. 05.09.2004)

14. A man and a boy can complete a work together in 24 days. If for the last six days man alone does the work then it is completed in 26 days. How long the boy will take to complete the work alone ?

(1) 72 days (2) 20 days
(3) 24 days (4) 36 days

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

15. A and B together can complete a work in 8 days. B alone can complete that work in 12 days. B alone worked for four days. After that how long will A alone take to complete the work ?

(1) 15 days (2) 18 days
(3) 16 days (4) 20 days

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

16. A and B can complete a piece of work in 12 and 18 days respectively. A begins to do the work and they work alternatively one at a time for one day each. The whole work will be completed in

(1) $14\frac{1}{3}$ days (2) $15\frac{2}{3}$ days
(3) $16\frac{1}{3}$ days (4) $18\frac{2}{3}$ days

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

17. A, B and C can complete a work in 10, 12 and 15 days respectively. They started the work together. But A left the work before 5 days of its completion. B also left the work 2 days after A left. In how many days was the work completed?

(1) 4 days (2) 5 days
(3) 7 days (4) 8 days

(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC MTS Exam. 17.03.2013 (IInd Sitting)

18. A can complete a piece of work in 10 days, B in 15 days and C in 20 days. A and C worked together for two days and then A was replaced by B. In how many days, altogether, was the work completed ?

(1) 12 days (2) 10 days
(3) 6 days (4) 8 days

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

19. 40 men can complete a work in 40 days. They started the work together. But at the end of each 10th day, 5 men left the job. The work would have been completed in

(1) $56\frac{2}{3}$ days (2) $53\frac{1}{3}$ days
(3) 52 days (4) 50 days

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

20. A can do a piece of work in 18 days and B in 12 days. They began the work together, but B left the work 3 days before its completion. In how many days, in all, was the work completed?

(1) 12 days (2) 10 days
(3) 9.6 days (4) 9 days

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

21. A and B can separately complete a piece of work in 20 days and 30 days respectively. They worked together for some time, then B left the work. If A completed the rest of the work in 10 days, then B worked for

(1) 6 days (2) 8 days
(3) 12 days (4) 16 days

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

22. A and B alone can complete work in 9 days and18 days respectively. They worked together; however 3 days before the completion of the work A left. In how many days was the work completed ?

(1) 13 days (2) 8 days
(3) 6 days (4) 5 days

(SSC CPO S.I. Exam. 09.11.2008)

23. A can complete a piece of work in 18 days, B in 20 days and C in 30 days. B and C together start the work and are forced to leave after 2 days. The time taken by A alone to complete the remaining work is

(1) 10 days (2) 12 days
(3) 15 days (4) 16 days

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

24. A alone can complete a work in 18 days and B alone in 15 days. B alone worked at it for 10 days and then left the work. In how many more days, will A alone complete the remaining work ?

(1) 5 days (2) $5\frac{1}{2}$ days
(3) 6 days (4) 8 days

(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

25. A and B working separately can do a piece of work in 9 and 12 days respectively. If they work for a day alternately with A beginning, the work would be completed in

(1) $10\frac{2}{3}$ days (2) $10\frac{1}{2}$ days
(3) $10\frac{1}{4}$ days (4) $10\frac{1}{3}$ days

(SSC SAS Exam. 26.06.2010) & SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

26. A and B together can complete a work in 12 days. A alone can complete in 20 days. If B does the work only half a day daily, then in how many days A and B together will complete the work ?

(1) 10 days (2) 20 days
(3) 11 days (4) 15 days

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

27. A and B can do a piece of work in 12 days and 15 days respectively. They began to work together but A left after 4 days. In how many more days would B alone complete the remaining work ?

(1) $\frac{20}{3}$ days (2) $\frac{25}{3}$ days

(3) 6 days (4) 5 days

(SSC Data Entry Operator Exam. 02.08.2009)

28. X alone can complete a piece of work in 40 days. He worked for 8 days and left. Y alone completed the remaining work in 16 days. How long would X and Y together take to complete the work ?

(1) $13\frac{1}{3}$ days (2) 14 days

(3) 15 days (4) $16\frac{2}{3}$ days

(SSC CHSL DEO & LDC Exam. 27.11.2010)

29. A, B and C can do a piece of work in 30, 20 and 10 days respectively. A is assisted by B on one day and by C on the next day, alternately. How long would the work take to finish ?

(1) $9\frac{3}{8}$ days (2) $4\frac{8}{8}$ days

(3) $8\frac{4}{13}$ days (4) $3\frac{9}{13}$ days

(SSC Graduate Level Tier-II Exam.16.09.2012)

30. A can do a piece of work in 20 days which B can do in 12 days. B worked at it for 9 days. A can finish the remaining work in

(1) 5 days (2) 7 days

(3) 11 days (4) 3 days

(SSC CHSL DEO & LDC Exam. 04.11.2012 (Ist Sitting)

31. *A* can do a piece of work in 8 days which *B* can destroy in 3 days. A has worked for 6 days, during the last 2 of which *B* has been destroying; how many days must A now work alone to complete the work ?

(1) 7 days (2) $7\frac{1}{3}$ days

(3) $7\frac{2}{3}$ days (4) 8 days

(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

32. A can finish a work in 18 days and B can do the same work in 5 days. B worked for 10 days and left the job. In how many days, A alone can finish the remaining work?

(1) 6 days (2) $5\frac{1}{2}$ days

(3) 5 days (4) 8 days

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

33. A and B together can do a piece of work in 12 days which B and C together can do in 16 days. After A has been working at it for 5 days and B for 7 days, C finishes it in 13 days. In how many days B could finish the work ?

(1) 48 days (2) 24 days

(3) 16 days (4) 12 days

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

34. A, B and C can do a piece of work in 20, 30 and 60 days respectively. In how many days can A do the work if he is assisted by B and C on every third day ?

(1) 10 days (2) 12 days

(3) 15 days (4) 20 days

(SSC CPO S.I. Exam. 09.11.2008) & (SSC Graduate Level Tier-I Exam.19.05.2013 (Ist Sitting)

35. A and B together can complete a work in 3 days. They start together. But, after 2 days, B left the work. If the work is completed after 2 more days, B alone could do the work in

(1) 10 days (2) 4 days

(3) 6 days (4) 8 days

(SSC CGL Prelim Exam. 04.02.2007 (Ist Sitting) & (SSC Graduate Level Tier-I Exam.19.05.2013 (Ist Sitting)

36. A can do a piece of work in 20 days and B in 30 days. They work together for 7 days and then both leave the work. Then C alone finishes the remaining work in 10 days. In how many days will C finish the full work ?

(1) 25 days (2) 30 days

(3) 24 days (4) 20 days

(SSC Graduate Level Tier-II Exam. 29.09.2013)

37. 45 men can complete a work in 16 days. Four days after they started working, 36 more men joined them. How many days will they now take to complete the remaining work ?

(1) 6 days (2) 8 days

(3) $6\frac{2}{3}$ days (4) $7\frac{3}{4}$ days

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

38. A and B together can complete a job in 8 days. Both B and C, working alone can finish the same job in 12 days. A and B commence work on the job, and work for 4 days, where upon A leaves. B continues for 2 more days, and then he leaves too. C now starts working, and finishes the job. How many days did C require ?

(1) 5 (2) 8

(3) 3 (4) 4

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

39. A and B can together finish a work in 30 days. They worked at it for 20 days and then B left. The remaining work was done by A alone in 20 more days.A alone can finish the work in

(1) 60 days (2) 54 days

(3) 48 days (4) 50 days

(SSC CGL Tier-I Exam. 26.10.2014)

40. A, B and C can do a job in 6 days, 12 days and 15 days respectively. After $\frac{1}{8}$ of the work is completed, C leaves the job. Rest of the work is done by A and B together. Time taken to finish the work is

(1) $5\frac{5}{6}$ days (2) $5\frac{1}{4}$ days

(3) $3\frac{1}{2}$ days (4) $3\frac{3}{4}$ days

(SSC CGL Tier-II Exam. 21.09.2014)

41. 16 women take 12 days to complete a work which can be completed by 12 men in 8 days. 16 men started working and after 3 days 10 men left and 4 women joined them. How many days will it take them to complete the remaining work ?

(1) 4 (2) 6

(3) 8 (4) 10

(SSC CHSL GL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

42. 40 men can complete a work in 18 days. Eight days after they started working together, 10 more men joined them. How many days will they now take to complete the remaining work ?
(1) 6 (2) 8
(3) 10 (4) 12
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

43. If 12 men or 24 boys can do a work in 66 days, the number of days in which 15 men and 6 boys can do it is
(1) 44 (2) 33
(3) 55 (4) 66
(SSC CHSL DEO & LDC Exam. 16.11.2014)

44. A, B and C together can do a piece of work in 40 days. After working with B and C for 16 days, A leaves and then B and C complete the remaining work in 40 days more. A alone could do the work in
(1) 80 days (2) 90 days
(3) 100 days (4) 120 days
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

45. A certain number of men complete a piece of work in 60 days. If there were 8 men more, the work could be finished in 10 days less. The number of men originally was
(1) 30 (2) 40
(3) 32 (4) 36
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

46. Some staff promised to do a job in 18 days, but 6 of them went on leave. So the remaining men took 20 days to complete the job. How many men were there originally ?
(1) 55 (2) 62
(3) 56 (4) 60
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

47. A certain number of men can do a piece of work in 40 days. If there were 45 men more the work could have been finished in 25 days. Find the original number of men employed in the work.
(1) 70 (2) 85
(3) 65 (4) 75
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

48. A and B can do a piece of work in 45 and 40 days repectively. They began the work together but A left after some days and B finished the remaining work in 23 days. A left after
(1) 6 days (2) 9 days
(3) 12 days (4) 5 days
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

49. 20 men can do a piece of work in 18 days, They worked together for 3 days, then 5 men joined them. In how many more days is the work completed ?
(1) 15 (2) 12
(3) 14 (4) 13
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

50. A, B and C can do a piece of work in 24, 30 and 40 days respectively. They began the work together but C left 4 days before completion of the work. In how many days was the work done ?
(1) 13 (2) 12
(3) 14 (4) 11
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

51. Raja can do a piece of work in 20 days while Ramesh can finish it in 25 days. Ramesh started working and Raja joined him after 10 days. The whole work is completed in
(1) 18 days (2) $16\frac{2}{3}$ days
(3) 20 days (4) 15 days
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

52. A certain number of men can do a work in 40 days. If there were 8 men more, it could be finished in 10 days less. How many men were there initially?
(1) 20 (2) 24
(3) 30 (4) 16
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

53. X can do a piece of work in 24 days. When he had worked for 4 days, Y joined him. If complete work was finished in 16 days, Y can alone finish that work in:
(1) 18 days (2) 27 days
(3) 36 days (4) 42 days
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

54. 12 men can complete a work in 90 days. 30 days after they started work, 2 men left and 8 men joined. How many days will it take to complete the remaining work ?
(1) 90 days (2) 60 days
(3) 40 days (4) 50 days
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

55. A can do a job in 10 days and B can do the same job in 15 days. They start working together, but B leaves after 5 days. How many more days A want to finish the work ?
(1) 2 days (2) $1\frac{2}{3}$ days
(3) 3 days (4) $2\frac{2}{3}$ days
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

56. A and B together can finish a work in 30 days. They worked on it for 20 days and then B left the work. The remaining work was done by A alone in 20 days more. In how many days can A alone finish the work?
(1) 48 days (2) 50 days
(3) 54 days (4) 60 days
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

57. Ram and Hari can cut 12 kgs nuts in 2 days. After 5 days, Hari left the work. Ram took 8 more days to cut the rest of the nuts. If total of 58 kgs of nuts were cut, the time taken by Hari to cut 10 kgs of nuts is
(1) 1 days (2) 2 days
(3) 3 days (4) 4 days
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

58. Ramesh and Rahman can do a work in 20 and 25 days respectively. After doing collectively for 10 days at the work, they leave the work due to illness and Suresh completes rest of the work in 3 days. How many days Suresh alone can take to complete the whole work ?
(1) 32 days (2) 28 days
(3) 29 days (4) 30 days
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

59. A can do a piece of work in 10 days and B can do it in 12 days. They work together for 3 days. Then B leaves and A alone continues. 2 days after that C joins and the work is completed in 2 days more. In how many days can C do it, if he works alone ?
(1) 30 days (2) 50 days
(3) 40 days (4) 60 days
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

60. A certain number of men can do a piece of work in 60 days. If there were 6 men more, the work can be finished 20 days earlier. The number of men working is :
(1) 6 (2) 12
(3) 18 (4) 24
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

61. A can do a piece of work in 20 days and B in 15 days. With the help of C, they finish the work in 5 days. C can alone do the work in
(1) 5 days (2) 6 days
(3) 10 days (4) 12 days
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

62. 15 men can finish a piece of work in 40 days. The number of days after which 5 men should leave the work so that the work is finished in 45 days altogether is :
(1) 10 (2) 20
(3) 30 (4) 35
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

63. A and B together can complete a piece of work in 12 days. They worked together for 5 days and then A alone finished the rest of the work in 14 days. A alone can complete the work in
(1) 24 days (2) 22 days
(3) 20 days (4) 18 days
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE-III

1. If 6 men and 8 boys can do a piece of work in 10 days and 26 men and 48 boys can do the same in 2 days, then the time taken by 15 men and 20 boys to do the same type of work will be :
(1) 5 days (2) 4 days
(3) 6 days (4) 7 days
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. 5 men can do a piece of work in 6 days while 10 women can do it in 5 days. In how many days can 5 women and 3 men do it ?
(1) 4 days (2) 5 days
(3) 6 days (4) 8 days
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. If 3 men or 6 women can do a piece of work in 16 days, in how many days can 12 men and 8 women do the same piece of work?
(1) 4 days (2) 5 days
(3) 3 days (4) 2 days
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. A man, a woman and a boy can complete a job in 3, 4 and 12 days respectively. How many boys must assist 1 man and 1 woman to complete the job in $\frac{1}{4}$ of a day?
(1) 1 (2) 4
(3) 19 (4) 41
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

5. If 16 men or 20 women can do a piece of work in 25 days. In what time will 28 men and 15 women do it?
(1) $14\frac{2}{7}$ days (2) $33\frac{1}{3}$ days
(3) $18\frac{3}{4}$ days (4) 10 days
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

6. If 5 men or 8 women can do a piece of work in 12 days, how many days will be taken by 2 men and 4 women to do the same work?
(1) 15 days (2) $13\frac{1}{2}$ days
(3) $13\frac{1}{3}$ days (4) 10 days
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

7. If 3 men or 4 women can plough a field in 43 days, how long will 7 men and 5 women take to plough it ?
(1) 10 days (2) 11 days
(3) 9 days (4) 12 days
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. 6 men or 12 women can do a piece of work in 20 days. In how many days can 8 men and 16 women do twice as big as this work ?
(1) 2 days (2) 5 days
(3) 15 days (4) 10 days
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

9. A man, a woman and a boy can together complete a piece of work in 3 days. If a man alone can do it in 6 days and a boy alone in 18 days, how long will a woman alone take to complete the work?
(1) 9 days (2) 21 days
(3) 24 days (4) 27 days
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

10. 3 men or 5 women can do a work in 12 days. How long will 6 men and 5 women take to finish the work?
(1) 20 days (2) 10 days
(3) 4 days (4) 15 days
(SSC CPO S.I. Exam. 03.09.2006) & (SSC GL Tier-I Exam. 19.05.2013)

11. If 10 men or 20 boys can make 260 mats in 20 days, then how many mats will be made by 8 men and 4 boys in 20 days?
(1) 260 (2) 240
(3) 280 (4) 520
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

12. Three men can complete a piece of work in 6 days. Two days after they started the work, 3 more men joined them. How many days will they take to complete the remaining work ?
(1) 1 days (2) 2 days
(3) 3 days (4) 4 days
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

13. One man and one woman together can complete a piece of work in 8 days. A man alone can complete the work in 10 days. In how many days can one woman alone complete the work ?
(1) $\frac{140}{9}$ days (2) 30 days
(3) 40 days (4) 42 days
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

14. 4 men and 6 women can complete a work in 8 days, while 3 men and 7 women can complete it in 10 days. In how many days will 10 women complete it ?
(1) 50 days (2) 45 days
(3) 40 days (4) 35 days
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

15. A man, a woman and a boy can complete a work in 20 days, 30 days and 60 days respectively. How many boys must assist 2 men and 8 women so as to complete the work in 2 days ?
(1) 8 (2) 12
(3) 4 (4) 6
(SSC Data Entry Operator Exam. 02.08.2009)

16. If 1 man or 2 women or 3 boys can complete a piece of work in 88 days, then 1 man, 1 woman and 1 boy together will complete it in
(1) 36 days (2) 42 days
(3) 48 days (4) 54 days
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

17. 6 men and 8 women can do a work in 10 days, Then 3 men and 4 women can do the same work in
(1) 24 days (2) 20 days
(3) 12 days (4) 18 days
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

18. 3 men and 4 boys can complete a piece of work in 12 days. 4 men and 3 boys can do the same work in 10 days. Then 2 men and 3 boys can finish the work in
(1) $17\frac{1}{2}$ days (2) $5\frac{5}{11}$ days
(3) 8 days (4) 22 days
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

19. If 10 men or 20 women or 40 children can do a piece of work in 7 months, then 5 men, 5 women and 5 children together can do half of the work in :
(1) 6 months (2) 4 months
(3) 5 months (4) 8 months
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

20. If 8 men or 12 boys can do a piece of work in 16 days, the number of days required to complete the work by 20 men and 6 boys is
(1) $5\frac{1}{3}$ days (2) $6\frac{1}{3}$ days
(3) $8\frac{1}{3}$ days (4) $7\frac{1}{3}$ days
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

21. 2 men and 3 boys can do a piece of work in 10 days while 3 men and 2 boys can do the same work in 8 days. In how many days can 2 men and 1 boy do the work ?
(1) 8 days (2) 7 days
(3) $12\frac{1}{2}$ days (4) 2 days
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

22. 2 men and 3 women can do a piece of work in 10 days while 3 men and 2 women can do the same work in 8 days. Then, 2 men and 1 woman can do the same work in
(1) 12 days (2) $12\frac{1}{2}$ days.
(3) 13 days (4) $13\frac{1}{2}$ days
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

23. 3 men and 4 boys can complete a piece of work in 12 days. 4 men and 3 boys can do the same work in 10 days. Then 2 men and 3 boys can finish the work in number of days is
(1) $17\frac{1}{2}$ days (2) $5\frac{5}{11}$ days
(3) 8 days (4) 22 days
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

24. If 4 men or 6 women can do a piece of work in 12 days working 7 hours a day; how many days will it take to complete a work twice as large with 10 men and 3 women working together 8 hours a day?
(1) 6 days (2) 7 days
(3) 8 days (4) 10 days
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

25. A man, a woman and a boy together finish a piece of work in 6 days. If a man and a woman can do the work in 10 and 24 days respectively. The days taken by a boy to finish the work is
(1) 30 (2) 35
(3) 40 (4) 45
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

26. If 40 men or 60 women or 80 children can do a piece of work in 6 months, then 10 men, 10 women and 10 children together do half of the work in
(1) $5\frac{6}{13}$ months
(2) 6 months
(3) $5\frac{7}{13}$ months
(4) $11\frac{1}{13}$ months
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

27. A man is twice as fast as a woman and a woman is twice as fast as a boy in doing a work. If all of them, a man, a woman and a boy can finish the work in 7 days, in how many days a boy will do it alone ?
(1) 49 (2) 7
(3) 6 (4) 42
(SSC CGL Tier-II Exam. 21.09.2014)

28. One man or two women or three boys can do a piece of work in 88 days. One man, one woman and one boy will do it in
(1) 44 days (2) 24 days
(3) 48 days (4) 20 days
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

29. 3 men or 7 women can do a piece of work in 32 days. The number of days required by 7 men and 5 women to do a piece of work twice as large is
(1) 19 (2) 21
(3) 27 (4) 36
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

30. If 1 man or 2 women or 3 boys can do a piece of work in 44 days, then the same piece of work will be done by 1 man, 1 woman and 1 boy in
(1) 21 days (2) 24 days
(3) 26 days (4) 33 days
(SSC CGL Tier-I Re-Exam, 30.08.2015)

31. 8 children and 12 men complete a certain piece of work in 9 days. Each child takes twice the time taken by a man to finish the work. In how many days will 12 men finish the same work ?
(1) 9 days (2) 13 days
(3) 12 days (4) 15 days
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

32. 12 men and 16 boys can do a piece of work in 5 days; 13 men and 24 boys can do it in 4 days, then the ratio of the daily work done by a man to that of a boy is
(1) 2 : 1 (2) 3 : 1
(3) 1 : 3 (4) 5 : 4
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

33. Twenty women can do a work in sixteen days. Sixteen men can complete the same work in fifteen days. The ratio between the capacity of a man and a woman is
(1) 3 : 4 (2) 4 : 3
(3) 5 : 3 (4) 5 : 7
(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (Ist Sitting)

34. 18 men or 36 boys working 6 hours a day can plough a field in 24 days. In how many days will 24 men and 24 boys working 9 hours a day plough the same field ?
(1) 9 (2) 10
(3) 6 (4) 8
(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

35. 3 men and 5 women can do a work in 14 days while 5 men can do it in 14 days. 5 men and 5 women can complete the work in
(1) 13 days (2) 11 days
(3) 10 days (4) 12 days
(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE-IV

1. A can do a work in 15 days and B in 20 days.If they together work on it for 4 days, then the fraction of the work that is left is:
(1) $\frac{8}{15}$ (2) $\frac{7}{15}$
(3) $\frac{1}{4}$ (4) $\frac{1}{10}$
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. A can cultivate $\frac{2}{5}$th of a land in 6 days and B can cultivate $\frac{1}{3}$rd of the same land in 10 days. Working together A and B can cultivate $\frac{4}{5}$th of the land in:
(1) 4 days (2) 5 days
(3) 8 days (4) 10 days
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

3. A does $\frac{4}{5}$ of a piece of work in 20 days; He then calls in B and they finish the remaining work in 3 days. How long B alone will take to do whole work ?
(1) $37\frac{1}{2}$ days (2) 37 days
(3) 40 days (4) 23 days
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. A can finish a work in 18 days and B can do the same work in half the time taken by A. Then working together what part of the same work they can finish in a day ?
(1) $\frac{1}{6}$ (2) $\frac{2}{5}$
(3) $\frac{1}{9}$ (4) $\frac{2}{7}$
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. A does $\frac{7}{10}$ part of work in 15 days. After that he completes the remaining work in 4 days with the help of B. In how many days will A and B together do the same work ?
(1) $10\frac{1}{3}$ days (2) $12\frac{2}{3}$ days
(3) $13\frac{1}{3}$ days (4) $8\frac{1}{4}$ days
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

6. A can complete a work in 6 days while B can complete the same work in 12 days. If they work together and complete it, the portion of the work done by A is
(1) $\frac{1}{3}$ (2) $\frac{2}{3}$
(3) $\frac{1}{4}$ (4) $\frac{1}{2}$
(SSC CPO S.I. Exam. 07.09.2003)

7. A can do $\frac{1}{2}$ of a piece of work in 5 days, B can do $\frac{3}{5}$ of the same work in 9 days and C can do $\frac{2}{3}$ of that work in 8 days. In how many days can three of them together do the work ?
(1) 3 days (2) 5 days
(3) $4\frac{1}{2}$ days (4) 4 days
(SSC CPO S.I. Exam. 26.05.2005)

8. If 28 men complete $\frac{7}{8}$ of a piece of work in a week, then the number of men, who must be engaged to get the remaining work completed in another week, is
(1) 5 (2) 6
(3) 4 (4) 3
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

9. A can complete $\frac{1}{3}$ of a work in 5 days and B, $\frac{2}{5}$ of the work in 10 days. In how many days both A and B together can complete the work ?
(1) 10 days (2) $9\frac{3}{8}$ days
(3) $8\frac{4}{5}$ days (4) $7\frac{1}{2}$ days
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

10. A can complete $\frac{2}{3}$ of a work in 4 days and B can complete $\frac{3}{5}$ of the work in 6 days. In how many days can both A and B together complete the work ?
(1) 3 (2) 2
(3) $3\frac{3}{4}$ (4) $2\frac{7}{8}$
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

11. A contractor undertook to complete a project in 90 days and employed 60 men on it. After 60 days, he found that $\frac{3}{4}$ of the work has already been completed. How many men can he discharge so that the project may be completed exactly on time ?

(1) 40 (2) 20
(3) 30 (4) 15

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

12. P can complete $\frac{1}{4}$ of a work in 10 days, Q can complete 40% of the same work in 15 days, R, completes $\frac{1}{3}$ of the work in 13 days and S, $\frac{1}{6}$ of the work in 7 days. Who will be able to complete the work first ?

(1) P (2) Q
(3) R (4) S

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

13. A and B can do a piece of work in 72 days, B and C can do it in 120 days, and A and C can do it in 90 days. When A, B and C work together, how much work is finished by them in 3 days.

(1) $\frac{1}{40}$ (2) $\frac{1}{30}$
(3) $\frac{1}{20}$ (4) $\frac{1}{10}$

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

14. A can do $\frac{1}{6}$ of a work in 5 days and B can do $\frac{2}{5}$ of the work in 8 days. In how many days, can both A and B together do the work?

(1) 12 days (2) 13 days
(3) 15 days (4) 20 days

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

15. A can do a work in 20 days and B in 40 days. If they work on it together for 5 days, then the fraction of the work that is left is :

(1) $\frac{5}{8}$ (2) $\frac{8}{15}$
(3) $\frac{7}{15}$ (4) $\frac{1}{10}$

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

16. A alone can do a piece of work in 20 days and B alone in 30 days. They begin to work together. They will finish half of the work in :

(1) 8 days (2) 9 days
(3) 12 days (4) 6 days

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

17. A does half as much work as B in three- fourth of the time. If together they take 18 days to complete a work, how much time shall B take to do it alone?

(1) 30 days (2) 35 days
(3) 40 days (4) 45 days

(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

18. A does half as much work as B in one-third of the time taken by B. If together they take 10 days to complete a work, then the time taken by B alone to do it would have been

(1) 30 days (2) 25 days
(3) 6 days (4) 12 days

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

19. A can do one and a half as much of a work which B can do in one day. B alone can do a piece of work in 18 days. They together can finish that work in

(1) $10\frac{1}{5}$ days (2) $11\frac{1}{5}$ days
(3) $5\frac{1}{5}$ days (4) $7\frac{1}{5}$ days

(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

20. A can do $\frac{7}{8}$ of work in 28 days, B can do $\frac{5}{6}$ of the same work in 20 days. The number of days they will take to complete if they do it together is

(1) $15\frac{3}{7}$ days (2) $17\frac{3}{5}$ days
(3) $14\frac{5}{7}$ days (4) $13\frac{5}{7}$ days

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

21. Two workers A and B are engaged to do a piece of work. A working alone would take 8 hours more to complete the work than when work together. If B worked alone, would take $4\frac{1}{2}$ hours more than when work together. The time required to finish the work together is

(1) 5 hours (2) 4 hours
(3) 8 hours (4) 6 hours

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

22. A company employed 200 workers to complete a certain work in 150 days. If only one-fourth of the work has been done in 50 days, then in order to complete the whole work in time, the number of additional workers to be employed was

(1) 100 (2) 300
(3) 600 (4) 200

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

23. x does $\frac{1}{4}$ of a job in 6 days. y completes rest of the job in 12 days. Then x and y could complete the job together in

(1) 9 days (2) $9\frac{3}{5}$ days
(3) $8\frac{1}{8}$ days (4) $7\frac{1}{3}$ days

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

24. A does half as much work as B in three fourth of the time. If together they take 18 days to complete the work, how much time will B alone take to do it ?

(1) 40 days (2) 45 days
(3) 50 days (4) 30 days

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

25. A, B and C are employed to do a piece of work for Rs. 5,290. A and B together are supposed to do $\frac{19}{23}$ of the work and B and C together $\frac{8}{23}$ of the work. Then A should be paid

(1) Rs. 4,250 (2) Rs. 3,450
(3) Rs. 1,950 (4) Rs. 2,290

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

26. A can do a work in 10 days and B in 20 days. If they together work on it for 5 days, then the fraction of the work that is left is

(1) $\frac{3}{4}$ (2) $\frac{4}{3}$
(3) $\frac{3}{20}$ (4) $\frac{1}{4}$

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

27. 4 men and 6 women complete a work in 8 days. 2 men and 9 women also complete in 8 days in which. The number of days in which 18 women complete the work is :

(1) $4\frac{1}{3}$ days (2) $5\frac{1}{3}$ days
(3) $4\frac{2}{3}$ days (4) $5\frac{2}{3}$ days

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

28. A can do in one day three times the work done by B in one day. They together finish $\frac{2}{5}$ of the work in 9 days. The number of days by which B can do the work alone is :

(1) 90 days (2) 120 days
(3) 100 days (4) 30 days

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

29. If 12 men working 8 hours a day complete the work in 10 days, how long would 16 men working $7\frac{1}{2}$ hours a day take to complete the same work?

(1) 7 (2) 6
(3) 10 (4) 8

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

30. A contractor was engaged to construct a road in 16 days. After working for 12 days with 20 labours it was found that only $\frac{5}{8}$th of the road had been constructed. To complete the work in stipulated time the number of extra labours required is :

(1) 18 (2) 10
(3) 12 (4) 16

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

31. Janardan completes $\frac{2}{3}$ of his work in 10 days. Time he will take to complete $\frac{3}{5}$ of the same work, is

(1) 8 days (2) 6 days
(3) 9 days (4) 4 days

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

32. John does $\frac{1}{2}$ piece of work in 3 hours, Joe does $\frac{1}{4}$ of the remaining work in 1 hour and George finishes remaining work in 5 hours. How long would it have taken the three working together to do the work ?

(1) $2\frac{1}{7}$ hours (2) $3\frac{1}{7}$ hours
(3) $3\frac{8}{11}$ hours (4) $2\frac{8}{11}$ hours

(SSC CGL Tier-II Online Exam.01.12.2016)

33. A does $\frac{2}{5}$ of a work in 9 days. Then B joined him and they together completed the remaining work in 6 days. B alone can finish the whole work in

(1) $6\frac{12}{13}$ days (2) $8\frac{2}{11}$ days
(3) 10 days (4) 18 days

(SSC CGL Tier-II Online Exam.01.12.2016)

34. A and B work together to complete the rest of a job in 7 days. However, $\frac{37}{100}$ of the job was already done. Also, the work done by A in 5 days is equal to the work done by B in 4 days. How many days would be required by the fastest worker to complete the entire work?

(1) 20 (2) 25
(3) 30 (4) 10

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

35. Dhiru can dig $\frac{1}{a}$ of a field in 20 hours. What fraction of the same field can Kaku dig in 20 hours if the two of them can dig the field in 60 hours, working together at their respective rates ?

(1) $\frac{(a-3)}{a}$ (2) $\frac{1}{3a}$
(3) $\frac{3a}{(a-3)}$ (4) $\frac{(a-3)}{3a}$

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

36. A can do a certain job in 12 days. B is 60% more efficient than A. Then B can do the same piece of work in

(1) 8 days (2) $7\frac{1}{2}$ days
(3) $6\frac{1}{4}$ days (4) 6 days

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

37. A and B together can complete a work in 24 days. B alone does $\frac{1}{3}$rd part of this work in 12 days. How many days will A alone take to complete the remaining work?

(1) 24 days (2) 36 days
(3) 48 days (4) 72 days

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

38. A can do $\frac{1}{3}$rd of a work in 5 days and B can do $\frac{2}{5}$th of this work in 10 days. Both A and B, together can do the work in

(1) $7\frac{3}{8}$ days (2) $8\frac{4}{5}$ days
(3) $9\frac{3}{8}$ days (4) 10 days

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

39. A, B and C contract a work for Rs. 440. A and B together are to do $\frac{9}{11}$ of the work. The share of C should be :
(1) Rs. 75 (2) Rs. 90
(3) Rs. 100 (4) Rs. 80
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

40. P can do $\left(\frac{1}{4}\right)$th of work in 10 days, Q can do 40% of work in 40 days and R can do $\left(\frac{1}{3}\right)$rd of work in 13 days. Who will complete the work first?
(1) P (2) Q
(3) R (4) Both P and R
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE-V

1. A does half as much work as B in one sixth of the time. If together they take 10 days to complete a work, how much time shall B take to do it alone?
(1) 70 days (2) 30 days
(3) 40 days (4) 50 days
(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting)

2. Babu and Asha can do a job together in 7 days. Asha is $1\frac{3}{4}$ times as efficient as Babu. The same job can be done by Asha alone in
(1) $\frac{49}{4}$ days (2) $\frac{49}{3}$ days
(3) 11 days (4) $\frac{28}{3}$ days
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

3. Jyothi can do $\frac{3}{4}$ of a job in 12 days. Mala is twice as efficient as Jyothi. In how many days will Mala finish the job ?
(1) 6 days (2) 8 days
(3) 12 days (4) 16 days
(SSC CPO S.I. Exam. 06.09.2009)

4. A can do a piece of work in 70 days and B is 40% more efficient than A. The number of days taken by B to do the same work is
(1) 40 days (2) 60 days
(3) 50 days (4) 45 days
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

5. A 10 hectare field is reaped by 2 men, 3 women and 4 children together in 10 days. If working capabilities of a man, a woman and a child are in the ratio 5 : 4 : 2, then a 16 hectare field will be reaped by 6 men,4 women and 7 children in
(1) 5 days (2) 6 days
(3) 7 days (4) 8 days
(SSC CPO S.I. Exam. 09.11.2008)

6. To complete a work, A takes 50% more time than B. If together they take 18 days to complete the work, how much time shall B take to do it ?
(1) 30 days (2) 35 days
(3) 40 days (4) 45 days
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

7. A is twice as good a workman as B and B is twice as good a workman as C. If A and B can together finish a piece of work in 4 days, then C can do it by himself in
(1) 6 days (2) 8 days
(3) 24 days (4) 12 days
(SSC CPO S.I. Exam. 06.09.2009)

8. A and B together can complete a work in 15 days. A is 50% more efficient worker than B. How long will A take to complete the work alone ?
(1) 20 days (2) 21 days
(3) 21.4 days (4) 22.5 days
(SSC SAS Exam 26.06.2010 (Paper-1)

9. Tapas works twice as fast as Mihir. If both of them together complete a work in 12 days, Tapas alone can complete it in
(1) 15 days (2) 18 days
(3) 20 days (4) 24 days
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

10. A and B together can do a work in 12 days. B and C together do it in 15 days. If A's efficiency is twice that of C, then the days required for B alone to finish the work is
(1) 60 days (2) 30 days
(3) 20 days (4) 15 days
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

11. A is 50% as efficient as B. C does half of the work done by A and B together. If C alone does the work in 20 days, then A, B and C together can do the work in
(1) $5\frac{2}{3}$ days (2) $6\frac{2}{3}$ days
(3) 6 days (4) 7 days
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

12. A is thrice as good a workman as B and is, therefore, able to finish a piece of work in 60 days less than B. The time (in days) in which they can do it working together is
(1) 22 days (2) $22\frac{1}{2}$ days
(3) 23 days (4) $23\frac{1}{4}$ days
(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC CPO S.I. Exam. 26.05.2005) & (SSC CGL Tier-1 Exam. 19.06.2011 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 04.11.2012)

13. A does 20% less work than B. If A can complete a piece of work in $7\frac{1}{2}$ hours, then B can do it in
(1) $6\frac{1}{2}$ hours (2) 6 hours
(3) $5\frac{1}{2}$ hours (4) 5 hours
(SSC CPO S.I. Exam. 03.09.2006) & (SSC GL Tier-I Exam. 19.05.2013 (Ist Sitting)

14. Kamal can do a work in 15 days. Bimal is 50 per cent more efficient than Kamal in doing the work. In how many days will Bimal do that work?
(1) 14 days (2) 12 days
(3) 10 days (4) $10\frac{1}{2}$ days
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CPO S.I. Exam.03.09.2006)

15. A takes twice as much time as B and thrice as much as C to complete a piece of work. They together complete the work in1 day. In what time, will A alone complete the work.

(1) 9 days (2) 5 days
(3) 6 days (4) 4 days

(SSC Data Entry Operator Exam. 31.08.2008)

16. A is thrice as good a workman as B and therefore is able to finish a job in 40 days less than B. Working together, they can do it in

(1) 14 days (2) 13 days
(3) 20 days (4) 15 days

(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011) & (SSC CGL Tier-I Exam. 26.06.2011 (Ist Sitting)

17. A is twice as good a workman as B and together they finish a piece of work in 14 days. The number of days taken by A alone to finish the work is

(1) 11 days (2) 21 days
(3) 28 days (4) 42 days

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

18. A can do a work in 21 days. B is 40% more efficient than A. The number of days required for B to finish the same work alone is

(1) 10 days (2) 12 days
(3) 15 days (4) 18 days

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

19. A can do a work in 5 days less than the time taken by B to do it. If both of them together take $11\frac{1}{9}$ days, then the time taken by 'B' alone to do the same work (in days) is

(1) 15 (2) 20
(3) 25 (4) 30

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

20. A takes 10 days less than the time taken by B to finish a piece of work. If both A and B can do it in 12 days, then the time taken by B alone to finish the work is

(1) 30 days (2) 27 days
(3) 20 days (4) 25 days

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

21. A can do a work in 9 days, if B is 50% more efficient than A, then in how many days can B do the same work?

(1) 13.5 days (2) 4.5 days
(3) 6 days (4) 3 days

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

22. A is 30% more efficient than B, and can alone do a work in 23 days. The number of days, in which A and B, working together can finish the job is

(1) 11 days (2) 13 days
(3) 20 days (4) 21 days

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

23. 5 men and 2 women working together can do four times as much work per hour as a man and a woman together. The work done by a man and a woman should be in the ratio :

(1) 1 : 2 (2) 2 : 1
(3) 1 : 3 (4) 4 : 1

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

24. A can do a certain job in 12 days. B is 60% more efficient than A. To do the same job B alone would take :

(1) $7\frac{1}{2}$ days (2) 8 days
(3) 10 days (4) 7 days

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

25. A can do a certain work in 12 days. B is 60% more efficient than A. How many days will B and A together take to do the same job?

(1) $\frac{80}{13}$ days (2) $\frac{70}{13}$ days
(3) $\frac{75}{13}$ days (4) $\frac{60}{13}$ days

(SSC Graduate Level Tier-II Exam.16.09.2012)

26. A and B can do a job together in 12 days. A is 2 times as efficient as B. In how many days can B alone complete the work ?

(1) 18 days (2) 9 days
(3) 36 days (4) 12 days

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting) & (SSC CGL Prelim Exam. 27.02.2000 (IInd Sitting)

27. P is thrice as good a workman as Q and therefore able to finish a job in 48 days less than Q. Working together, they can do it in :

(1) 18 days (2) 24 days
(3) 30 days (4) 12 days

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

28. To do a certain work, B would take time thrice as long as A and C together and C twice as long as A and B together. The three men together complete the work in 10 days. The time taken by A to complete the work separately is

(1) 22 days (2) 24 days
(3) 30 days (4) 20 days

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

29. A can do a piece of work in 6 days. B is 25% more efficient than A. How long would B alone take to finish this work?

(1) $4\frac{4}{5}$ days (2) $3\frac{1}{3}$ days
(3) $5\frac{1}{4}$ days (4) $2\frac{2}{3}$ days

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

30. Two workers A and B working together completed a job in 5 days. If A worked twice as efficiently as he actually did and B worked $\frac{1}{3}$ as efficiently as he actually did, the work would have been completed in 3 days. To complete the job alone, A would require

(1) $5\frac{1}{5}$ days (2) $6\frac{1}{4}$ days
(3) $7\frac{1}{2}$ days (4) $8\frac{3}{4}$ days

(SSC Graduate Level Tier-II Exam. 29.09.2013

31. Sunil completes a work in 4 days, whereas Dinesh completes the work in 6 days. Ramesh works $1\frac{1}{2}$ times as fast as Sunil. The three together can complete the work in

(1) $1\frac{5}{12}$ days (2) $1\frac{5}{7}$ days
(3) $1\frac{3}{8}$ days (4) $1\frac{5}{19}$ days

(SSC Graduate Level Tier-II Exam. 29.09.2013

32. Pratibha is thrices as efficient as Sonia and is therefore able to finish a piece of work in 60 days less than Sonia. Pratibha and Sonia can individually complete the work respectively in
(1) 30 days, 60 days
(2) 60 days, 90 days
(3) 30 days, 90 days
(4) 40 days, 120 days
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

33. If A, B and C can complete a work in 6 days. If A can work twice faster than B and thrice faster than C, then the number of days C alone can complete the work is :
(1) 33 days (2) 44 days
(3) 22 days (4) 11 days
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

34. A is twice as good as B and together they finish a piece of work in 16 days. The number of days taken by A alone to finish the work is
(1) 20 days (2) 21 days
(3) 22 days (4) 24 days
(SSC CGL Tier-I (CBE) Exam.10.09.2016)

35. A man does double the work done by a boy in the same time. The number of days that 3 men and 4 boys will take to finish a work which can be done by 10 men in 8 days is
(1) 4 (2) 16
(3) $7\frac{3}{11}$ (4) $8\frac{4}{5}$
(SSC CGL Tier-II Online Exam. 01.12.2016)

36. A works twice as fast as B. If B can complete a piece of work independently in 12 days, then what will be the number of days taken by A and B together to finish the work?
(1) 4 (2) 6
(3) 8 (4) 18
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

37. If 10 people can do a job in 20 days, then 20 people with twice the efficiency can do the same job in
(1) 5 days (2) 10 days
(3) 20 days (4) 40 days
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

38. Shashi can do a piece of work in 20 days. Tanya is 25% more efficient than Shashi. The number of days taken by Tanya to do the same piece of work is :
(1) 15 (2) 16
(3) 18 (4) 25
(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

TYPE-VI

1. 39 persons can repair a road in 12 days working 5 hours a day. In how many days will 30 persons working 6 hours a day complete the work ?
(1) 10 days (2) 13 days
(3) 14 days (4) 15 days
(SSC CPO S.I. Exam. 12.01.2003)

2. If 72 men can build a wall of 280 m length in 21 days, how many men could take 18 days to build a similar type of wall of length 100 m?
(1) 30 (2) 10
(3) 18 (4) 28
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

3. A wall of 100 metres can be built by 7 men or 10 women in 10 days. How many days will 14 men and 20 women take to build a wall of 600 metres ?
(1) 15 (2) 20
(3) 25 (4) 30
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

4. 5 persons can prepare an admission list in 8 days working 7 hours a day. If 2 persons join them so as to complete the work in 4 days, they need to work per day for :
(1) 10 hours (2) 9 hours
(3) 12 hours (4) 8 hours
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

5. 4 mat-weavers can weave 4 mats in 4 days. At the same rate how many mats would be woven by 8 mat-weavers in 8 days ?
(1) 4 (2) 8
(3) 12 (4) 16
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

6. 10 men working 6 hours a day can complete a work in 18 days. How many hours a day must 15 men work to complete the same work in 12 days ?
(1) 6 days (2) 10 days
(3) 12 days (4) 15 days
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

7. Two persons can complete a piece of work in 9 days. How many more persons are needed to complete double the work in 12 days?
(1) 3 (2) 2
(3) 4 (4) 1
(SSC CPO S.I. Exam. 03.09.2006)

8. If p men working p hours per day for p days produce p units of work, then the units of work produced by n men working n hours a day for n days is
(1) $\frac{p^2}{n^2}$ (2) $\frac{p^3}{n^2}$
(3) $\frac{n^2}{p^2}$ (4) $\frac{n^3}{p^2}$
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

9. If 10 men can do a piece of work in 12 days, the time taken by 12 men to do the same piece of work will be
(1) 12 days (2) 10 days
(3) 9 days (4) 8 days
(SSC CPO S.I. Exam. 09.11.2008)

10. 7 men can complete a piece of work in 12 days. How many additional men will be required to complete double the work in 8 days ?
(1) 28 (2) 21
(3) 14 (4) 7
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

11. 'x' number of men can finish a piece of work in 30 days. If there were 6 men more, the work could be finished in 10 days less. The original number of men is
(1) 6 (2) 10
(3) 12 (4) 15
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

12. Some carpenters promised to do a job in 9 days but 5 of them were absent and remaining men did the job in 12 days. The original number of carpenters was
(1) 24 (2) 20
(3) 16 (4) 18
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

13. 2 men and 3 women together or 4 men together can complete a piece of work in 20 days.3 men and 3 women will complete the same work in :
(1) 12 days (2) 16 days
(3) 18 days (4) 19 days
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

14. Working 8 hours a day, Anu can copy a book in 18 days. How many hours a day should she work so as to finish the work in 12 days ?
(1) 12 hours (2) 10 hours
(3) 11 hours (4) 13 hours
(SSC CISF Constable (GD) Exam. 05.06.2011)

15. Some persons can do a piece of work in 12 days. Two times the number of such persons will do half of the work in
(1) 9 days (2) 6 days
(3) 5 days (4) 3 days
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

16. If the work done by $(x-1)$ men in $(x+1)$ days is to the work done by $(x+2)$ men in $(x-1)$ days are in the ratio 9 : 10, then the value of x is equal to :
(1) 5 (2) 6
(3) 7 (4) 8
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

17. If 80 persons can finish a work within 16 days by working 6 hours a day, the number of hours a day, should 64 persons work to finish that very job within 15 days is :
(1) 5 hrs. (2) 7 hrs.
(3) 8 hrs. (4) 6 hrs.
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

18. 18 boys can do a piece of work in 24 days. In how many days can 27 boys do the same work ?
(1) 16 days (2) 32 days
(3) 23 days (4) 48 days
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

19. One man, 3 women and 4 boys can do a piece of work in 96 hours, 2 men and 8 boys can do it in 80 hours, 2 men and 3 women can do it in 120 hours. 5 men and 12 boys can do it in
(1) $39\frac{1}{11}$ hours
(2) $42\frac{7}{11}$ hours
(3) $43\frac{7}{11}$ hours
(4) 44 hours
(SSC Graduate Level Tier-I Exam. 21.04.2013)

20. If x men can do a piece of work in x days, then the number of days in which y men can do the same work is
(1) xy days (2) $\frac{y^2}{x}$ days
(3) $\frac{x^2}{y}$ days (4) x^2y days
(SSC Graduate Level Tier-II Exam. 29.09.2013

21. 30 men can repair a road in 18 days. They are joined by 6 more workers. Now the road can be repaired in
(1) 14 days (2) 15 days
(3) 16 days (4) 17 days
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

22. 20 men or 24 women can complete a piece of work in 20 days. If 30 men and 12 women undertake to complete the work, the work will be completed in
(1) 10 days (2) 12 days
(3) 15 days (4) 16 days
(SSC (South Zone) Investigator Exam 12.09.2010)

23. Either 8 men or 17 women can paint a house in 33 days. The number of days required to paint three such houses by 12 men and 24 women working at the same rate is :
(1) 44 days (2) 43 days
(3) 34 days (4) 66 days
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

24. 3 men and 7 women can do a job in 5 days, while 4 men and 6 women can do it in 4 days. The number of days required for a group of 10 women working together, at the same rate as before, to finish the same job is :
(1) 30 days (2) 36 days
(3) 40 days (4) 20 days
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

25. A contractor undertook to finish a work in 92 days and employed 110 men. After 48 days, he found that he had already done $\frac{3}{5}$ part of the work, the number of men he can withdraw so that the work may still be finished in time is :
(1) 45 (2) 40
(3) 35 (4) 30
(SSC Multi-Tasking Staff Exam. 10.03.2013)

26. A man undertakes to do a certain work in 150 days. He employs 200 men. He finds that only a quarter of the work is done in 50 days. The number of additional men that should be appointed so that the whole work will be finished in time is :
(1) 75 (2) 100
(3) 125 (4) 50
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

27. A contractor undertook to finish a certain work in 124 days and employed 120 men. After 64 days, he found that he had already done $\frac{2}{3}$ of the work. How many men can be discharged now so that the work may finish in time ?
(1) 48 (2) 56
(3) 40 (4) 50
(SSC Graduate Level Tier-I Exam. 21.04.2013)

28. If 7 men working 7 hrs a day for each of 7 days produce 7 units of work, then the units of work produced by 5 men working 5 hrs a day for each of 5 days is
(1) $\frac{25}{343}$ (2) $\frac{125}{49}$
(3) $\frac{49}{125}$ (4) $\frac{343}{25}$
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

29. Seventy-five men are employed to lay down a railway line in 3 months. Due to certain emergency conditions, the work was to be finished in 18 days. How many more men should be employed to complete the work in the desired time ?

(1) 300 (2) 325
(3) 350 (4) 375

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

30. If 4 men or 8 women can do a piece of work in 15 days, in how many days can 6 men and 12 women do the same piece of work ?

(1) 20 days (2) 45 days
(3) 15 days (4) 30 days

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

31. 24 men can do a piece of work in 17 days. How many men will be able to do it in 51 days ?

(1) 8 (2) 10
(3) 12 (4) 6

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

TYPE : VII

1. Suman can do a work in 3 days. Sumati can do the same work in 2 days. Both of them finish the work together and get ₹ 150. What is the share of Suman ?

(1) ₹ 30 (2) ₹ 60
(3) ₹ 70 (4) ₹ 75

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. The average wage of 500 workers was found to be ₹ 200. Later on, it was discovered that the wages of two workers were misread as 180 and 20 instead of 80 and 220. The correct average wage is :

(1) ₹ 200.10 (2) ₹ 200.20
(3) ₹ 200.50 (4) ₹ 201.00

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. A and B undertook to do a piece of work for ₹ 4500. A alone could do it in 8 days and B alone in 12 days. With the assistance of C they finished the work in 4 days. Then C's share of the money is

(1) ₹ 2250 (2) ₹ 1500
(3) ₹ 750 (4) ₹ 375

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

4. If 6 persons working 8 hours a day earn ₹ 8400 per week, then 9 persons working 6 hours a day will earn per week

(1) ₹ 8400 (2) ₹ 16800
(3) ₹ 9450 (4) ₹ 16200

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

5. A alone can do a piece of work in 6 days and B alone in 8 days. A and B undertook to do it for ₹ 3200. With the help of C they completed the work in 3 days. How much is to be paid to C ?

(1) ₹ 375 (2) ₹ 400
(3) ₹ 600 (4) ₹ 800

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

6. A and B can complete a piece of work in 15 days and 10 days respectively. They contracted to complete the work for ₹ 30,000. The share of A in the contracted money will be :

(1) ₹ 18,000 (2) ₹ 16,500
(3) ₹ 12,500 (4) ₹ 12,000

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

7. A man and a boy received ₹ 800 as wages for 5 days for the work they did together. The man's efficiency in the work was three times that of the boy. What are the daily wages of the boy ?

(1) ₹ 76 (2) ₹ 56
(3) ₹ 44 (4) ₹ 40

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

8. A daily-wage labourer was engaged for a certain number of days for ₹ 5,750; but being absent on some of those days he was paid only ₹ 5,000. What was his maximum possible daily wage?

(1) ₹ 125 (2) ₹ 250
(3) ₹ 375 (4) ₹ 500

(SSC CPO S.I. Exam. 03.09.2006)

9. A, B and C completed a work costing ₹ 1,800. A worked for 6 days, B for 4 days and C for 9 days. If their daily wages are in the ratio of 5 : 6 : 4, how much amount will be received by A?

(1) ₹ 800 (2) ₹ 600
(3) ₹ 900 (4) ₹750

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

10. A labourer was appointed by a contractor on the condition that he would be paid ₹ 75 for each day of his work but would be fined at the rate of ₹ 15 per day for his absence, apart from losing his wages, After 20 days, the contractor paid the labourer ₹ 1140. The number of days the labourer abstained from work was

(1) 3 (2) 5
(3) 4 (4) 2

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

11. Two men undertook to do a job for ₹ 1400. One of them can do it alone in 7 days, and the other in 8 days. With the assistance of a boy they together completed the work in 3 days. How much money will the boy get ?

(1) ₹ 300 (2) ₹ 325
(3) ₹ 275 (4) ₹ 250

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

12. If 5 men or 7 women can earn ₹ 5,250 per day, how much would 7 men and 13 women earn per day ?

(1) ₹ 11,600 (2) ₹ 11,700
(3) ₹ 16,100 (4) ₹ 17,100

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

13. 2 men and 1 woman together can complete a piece of work in 14 days, while 4 women and 2 men together can do it in 8 days. If a man gets ₹ 600 per day, how much should a woman get per day?

(1) ₹ 400 (2) ₹ 450
(3) ₹ 480 (4) ₹ 360

(SSC Data Entry Operator Exam. 31.08.2008)

14. Two men undertake a job for ₹ 960. They can complete it in 16 days and 24 days respectively. They work along with a third man and take 8 days to complete it. Then the share of the third man should be

(1) ₹ 155 (2) ₹ 165
(3) ₹ 160 (4) ₹ 150

(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

15. If there is a reduction in the number of workers in a factory in the ratio 15 : 11 and an increment in their wages in the ratio 22 : 25, then the ratio by which the total wages of the workers should be decreased is
(1) 6 : 5 (2) 5 : 6
(3) 3 : 7 (4) 3 :5
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

16. Stanie and Paul take a piece of work for ₹ 28,800. One alone could do it in 36 days, the other in 48 days. With the assistance of an expert, they finish it in 12 days. How much remuneration the expert should get ?
(1) ₹ 10000 (2) ₹ 18000
(3) ₹ 16000 (4) ₹ 12000
(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

17. A and B were assigned to do a job for an amount of ₹ 1,200. A alone can do it in 15 days, while B can do it in 12 days. With the help of C, they can finish in 5 days. The share of amount that C earns is
(1) ₹ 300 (2) ₹ 400
(3) ₹ 500 (4) ₹ 600
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

18. A sum of money is sufficient to pay A' s wages for 21 days and B's wages for 28 days. The same money is sufficient to pay the wages of both for :
(1) $12\frac{1}{4}$ days (2) 14 days
(3) $24\frac{1}{2}$ days (4) 12 days
(SSC Graduate Level Tier-I Exam. 21.04.2013)

19. A can do a piece of work in 12 days while B alone can do it in 15 days. With the help of C they can finish it in 5 days. If they are paid ₹ 960 for the whole work how much money A gets ?
(1) ₹ 480 (2) ₹ 240
(3) ₹ 320 (4) ₹ 400
(SSC Graduate Level Tier-I Exam. 21.04.2013)

20. A, B and C together earn ₹ 150 per day while A and C together earn ₹ 94 and B and C together earn ₹ 76. The daily earning of 'C' is
(1) ₹ 56 (2) ₹ 20
(3) ₹ 34 (4) ₹ 75
(SSC Constable (GD) Exam. 12.05.2013)

21. Three persons undertake to complete a piece of work for ₹ 1,200. The first person can complete the work in 8 days, second person in 12 days and third person in 16 days. They complete the work with the help of a fourth person in 3 days. What does the fourth person get?
(1) ₹ 180 (2) ₹ 200
(3) ₹ 225 (4) ₹ 250
(SSC Graduate Level Tier-II Exam. 29.09.2013)

22. A can do a piece of work in 16 days and B in 24 days. They take the help of C and three together finish the work in 6 days. If the total remuneration for the work is ₹ 400. The amount (in rupees) each will receive, in proportion, to do the work is
(1) A : 150, B : 100, C : 150
(2) A : 100, B : 150, C : 150
(3) A : 150, B : 150, C : 100
(4) A : 100, B : 150, C : 100
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

23. A skilled, a half skilled and an unskilled labourer work for 7, 8 and 10 days respectively and they together get ₹ 369 for their work. If the ratio of their each day's work is $\frac{1}{3} : \frac{1}{4} : \frac{1}{6}$, then how much does the trained labourer get (in rupees) ?
(1) 164 (2) 102.50
(3) 201.50 (4) 143.50
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

24. A, B and C are employed to do a piece of work for ₹ 575. A and C are supposed to finish $\frac{19}{23}$ of the work together. Amount shall be paid to B is
(1) ₹ 210 (2) ₹ 100
(3) ₹ 200 (4) ₹ 475
(SSC CGL Tier-II Exam. 21.09.2014)

25. If a man earns ₹ 2000 for his first 50 hours of work in a week and is then paid one and a half times his regular hourly rate for any additional hours, then the hours must he work to make ₹ 2300 in a week is
(1) 6 hours (2) 4 hours
(3) 7 hours (4) 5 hours
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

26. 2 men and 1 woman can complete a piece of work in 14 days while 4 women and 2 men can do the same work in 8 days. If a man gets Rs. 180 per day, then a woman will get per day
(1) Rs. 150 (2) Rs. 140
(3) Rs. 120 (4) Rs. 160
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

27. The daily wages of A and B respectively are Rs.3.50 and Rs. 2.50. When A finishes a certain work, he gets a total wage of Rs. 63. When B does the same work, he gets a total wage of Rs.75. If both of them do it together what is the cost of the work ?
(1) Rs. 67.50 (2) Rs. 27.50
(3) Rs. 60.50 (4) Rs. 70.50
(SSC CGL Tier-II Online Exam.01.12.2016)

28. A can do a work in 12 days while B can do it in 15 days. They undertake to complete it together for Rs. 450. what will be the share of A in this amount of money ?
(1) Rs. 200 (2) Rs. 240
(3) Rs. 250 (4) Rs. 300
(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

29. A, B and C can work together for Rs. 550. A and B together are to do $\frac{7}{11}$ of the work. The share of C should be
(1) Rs. 200 (2) Rs. 300
(3) Rs. 400 (4) Rs. 450
(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

30. A and B undertake a piece of work for Rs. 250. A alone can do that work in 5 days and B alone can do that work in 15 days. With the help of C, they finish the work in 3 days. If every one gets paid in proportion to work done by them, the amount C will get is :
(1) Rs. 50 (2) Rs. 100
(3) Rs. 150 (4) Rs. 200
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

37. A certain factory employed 600 men and 400 women and the average wage was ₹ 2.55 per day. If a women got 50 paise less than a man, the daily wages of a man and a woman were
(1) Man ₹ 2.75, Woman ₹ 2.25
(2) Man ₹ 5.30, Woman ₹ 2.50
(3) Man ₹ 2.50, Woman ₹ 2.00
(4) Man ₹ 3.25, Woman ₹ 2.75
(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE-VIII

1. A certain number of men can complete a job in 30 days. If there were 5 men more, it could be completed in 10 days less. How many men were in the beginning?
(1) 10 (2) 15
(3) 20 (4) 25
(SSC CGL Prelim Exam. 27.02.2000 (IInd Sitting)

2. If the expenditure of gas on burning 6 burners for 6 hours a day for 8 days is ₹ 450, then how many burners can be used for 10 days at 5 hours a day for ₹ 625 ?
(1) 12 (2) 16
(3) 4 (4) 8
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

3. A can do a piece of work in 60 days. He works for 15 days and then B alone finishes the remaining work in 30 days. The two together can finish the work in
(1) 24 days (2) 25 days
(3) 30 days (4) 32 days
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

4. A can do a certain work in the same time in which B and C together can do it. If A and B together could do it in 10 days and C alone in 50 days, then B alone could do the work in
(1) 15 days (2) 20 days
(3) 25 days (4) 30 days
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

5. A man can do a piece of work in 5 days, but with the help of his son, he can do it in 3 days. In what time can the son do it alone ?
(1) 7 days (2) 8 days
(3) $7\frac{1}{2}$ days (4) $6\frac{1}{2}$ days
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

6. A certain number of men can do a work in 60 days. If there were eight more men, it could be completed in 10 days less. How many men were there in the beginning?
(1) 70 (2) 55
(3) 45 (4) 40
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

7. 12 persons can do a piece of work in 4 days. How many persons are required to complete 8 times the work in half the time ?
(1) 192 (2) 190
(3) 180 (4) 144
(SSC CPO S.I. Exam. 05.09.2004)

8. A work could be completed in 100 days by some workers. However, due to the absence of 10 workers, it was completed in 110 days. The original number of workers was :
(1) 100 (2) 110
(3) 55 (4) 50
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

9. A job can be completed by 12 men in 12 days. How many extra days will be needed to complete the job if 6 men leave after working for 6 days ?
(1) 3 days (2) 6 days
(3) 12 days (4) 24 days
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

10. 60 men could complete a work in 250 days. They worked together for 200 days. After that the work had to be stopped for 10 days due to bad weather. How many more men should be engaged to complete the work in time ?
(1) 10 (2) 15
(3) 18 (4) 20
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

11. Working 5 hours a day, A can complete a work in 8 days and working 6 hours a day, B can complete the same work in 10 days. Working 8 hours a day, they can jointly complete the work in
(1) 3 days (2) 4 days
(3) 4.5 days (4) 5.4 days
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

12. If two persons, with equal abilities, can do two jobs in two days, then 100 persons with equal abilities can do 100 similar jobs in
(1) 100 days (2) 10 days
(3) 5 days (4) 2 days
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

13. Ganga and Saraswati, working separately can mow a field in 8 and 12 hours respectively. If they work in stretches of one hour alternately, Ganga beginning at 9 a.m., when will the moving be completed ?
(1) 6 p.m. (2) 6.30 p.m.
(3) 5 p.m. (4) 5.30 p.m.
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

14. A road of 5 km length will be constructed in 100 days. So 280 workers were employed. But after 80 days it was found that only $3\frac{1}{2}$ km road was completed. Now how many more people were needed to finish the work in the specified time ?
(1) 480 (2) 80
(3) 200 (4) 100
(SSC CPO S.I. Exam. 06.09.2009)

15. A can do a work in 12 days. When he had worked for 3 days, B joined him. If they complete the work in 3 more days, in how many days can B alone finish the work?
(1) 6 days (2) 12 days
(3) 4 days (4) 8 days
(SSC CGL Tier-I Exam 26.06.2011 (First Sitting)

16. Working efficiencies of P and Q for completing a piece of work are in the ratio 3 : 4. The number of days to be taken by them to complete the work will be in the ratio
(1) 3 : 2 (2) 2 : 3
(3) 3 : 4 (4) 4 : 3
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

17. A contractor undertakes to make a road in 40 days and employs 25 men. After 24 days, he finds that only one-third of the road is made. How many extra men should he employ so that he is able to complete the work 4 days earlier?
(1) 100 (2) 60
(3) 75 (4) None of these
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

18. Twenty women together can complete a work in 16 days. 16 men together can complete the same work in 15 days. The ratio of the working capacity of a man to that of a woman is :
(1) 3 : 4 (2) 4 : 3
(3) 5 : 3 (4) 4 : 5
(SSC CHSL DEO & LDC Exam. 27.11.2010)

19. A man and a woman working together can do a certain work in 18 days. Their skills in doing the work are in the ratio 3 : 2. How many days will the woman take to finish the work alone?
(1) 45 days (2) 36 days
(3) 27 days (4) 30 days
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

20. Two men can do a piece of work in x days. But y women can do that in 3 days. Then the ratio of the work done by 1 man and 1 woman is
(1) $3y : 2x$ (2) $2x : 3y$
(3) $x : y$ (4) $2y : 3x$
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

21. A farmer can plough a field working 6 hours per day in 18 days. The worker has to work how many hours per day to finish the same work in 12 days ?
(1) 7 hrs (2) 9 hrs
(3) 11 hrs (4) 13 hrs
(SSC Graduate Level Tier-II Exam. 29.09.2013

22. If 12 carpenters working 6 hours a day can make 460 chairs in 240 days, then the number of chairs made by 18 carpenters in 36 days each working 8 hours a day is
(1) 92 (2) 132
(3) 138 (4) 126
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

23. 8 workers can build a wall 18 m long, 2 m broad and 12 m high in 10 days, working 9 hours a day. Find how many workers will be able to build a wall 32 m long, 3 m broad and 9 m high in 8 days working 6 hours a day ?
(1) 16 (2) 20
(3) 30 (4) 10
(SSC CGL Tier-I Re-Exam, 30.08.2015)

24. P and Q together can do a job in 6 days. Q and R can finish the same job in $\frac{60}{7}$ days. P started the work and worked for 3 days. Q and R continued for 6 days. Then the difference of days in which R and P can complete the job is
(1) 15 (2) 10
(3) 8 (4) 12
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

25. 150 workers were engaged to finish a piece of work in a certain number of days. Four workers dropped on the second day, four more workers dropped on third day and so on. It takes 8 more days to finish the work now. Find the number of days in which the work was completed?
(1) 28 (2) 24
(3) 25 (4) 30
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

26. Work done by $(x + 4)$ men in $(x + 5)$ days is equal to the work done by $(x - 5)$ men in $(x + 20)$ days. Then the value of x is
(1) 20 (2) 25
(3) 30 (4) 15
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

27. A group of workers can complete a piece of work in 50 days, when they are working individually. On the first day one person works, on the second day another person joins him, on the third day one more person joins them and this process continues till the work is completed. How many approximate days are needed to complete the work?
(1) 8 days (2) 9 days
(3) 10 days (4) 11 days
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

28. 20 men working 8 hours per day can complete a piece of work in 21 days. How many hours per day must 48 men work to complete the same job in 7 days?
(1) 12 (2) 20
(3) 10 (4) 15
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

29. The four walls and ceiling of a room of length 25 m, breadth 12 m and height 10 m are to be painted. Painter A can paint 200 m^2 in 5 days, Painter B can paint 250 m^2 in 2 days. If A and B work together, they will finish the job in
(1) 6 days (2) $6\frac{10}{33}$ days
(3) $7\frac{10}{33}$ days (4) 8 days
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

30. 36 men together can build a wall 140 m long in 21 days. The number of men working at the same rate required to build the same wall in 14 days is
(1) 54 (2) 48
(3) 36 (4) 18
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

31. A canteen requires 56 kgs of rice for seven days . The quantity of rice required for the months of April and May together is :
(1) 468 kg. (2) 488 kg.
(3) 498 kg. (4) 508 kg.
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

32. A school has 8 periods of 45 minutes each, everyday. How long will each period be if the school has to have 9 periods everyday, assuming the working hours to be the same?
(1) 40 minutes (2) 35 minutes
(3) 30 minutes (4) 45 minutes
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

33. If 7 spiders make 7 webs in 7 days, then 1 spider will make 1 web in how many days ?
(1) 1 (2) $\frac{7}{2}$
(3) 7 (4) 49
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

34. Sister can bake 50 cakes in 25 hours, Sister and Mummy together can bake 75 cakes in 15 hours. How many cakes Mummy can bake in 15 hours ?

(1) 25 (2) 45
(3) 20 (4) 10

(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

SHORT ANSWERS

TYPE-I

1. (3)	**2.** (3)	**3.** (1)	**4.** (3)
5. (2)	**6.** (2)	**7.** (3)	**8.** (3)
9. (3)	**10.** (3)	**11.** (4)	**12.** (4)
13. (1)	**14.** (1)	**15.** (2)	**16.** (1)
17. (3)	**18.** (1)	**19.** (4)	**20.** (3)
21. (3)	**22.** (3)	**23.** (2)	**24.** (1)
25. (3)	**26.** (2)	**27.** (1)	**28.** (1)
29. (3)	**30.** (3)	**31.** (1)	**32.** (3)
33. (4)	**34.** (2)	**35.** (3)	**36.** (4)
37. (2)	**38.** (1)	**39.** (2)	**40.** (4)
41. (4)	**42.** (2)	**43.** (4)	**44.** (3)
45. (2)	**46.** (4)	**47.** (2)	**48.** (4)
49. (2)	**50.** (1)	**51.** (2)	**52.** (3)
53. (3)	**54.** (2)	**55.** (3)	**56.** (2)
57. (3)	**58.** (3)	**59.** (3)	**60.** (3)
61. (*)	**62.** (4)	**63.** (1)	**64.** (1)
65. (2)	**66.** (3)	**67.** (1)	**68.** (4)
69. (4)	**70.** (1)	**71.** (2)	**72.** (3)
73. (4)	**74.** (4)	**75.** (3)	**76.** (2)
77. (2)	**78.** (3)	**79.** (2)	**80.** (3)
81. (1)	**82.** (2)	**83.** (2)	**84.** (4)
85. (1)	**86.** (2)	**87.** (2)	**88.** (1)
89. (2)	**90.** (3)		

TYPE-II

1. (2)	**2.** (4)	**3.** (3)	**4.** (1)
5. (2)	**6.** (3)	**7.** (3)	**8.** (2)
9. (3)	**10.** (3)	**11.** (3)	**12.** (1)
13. (2)	**14.** (1)	**15.** (3)	**16.** (1)
17. (3)	**18.** (4)	**19.** (1)	**20.** (4)
21. (1)	**22.** (2)	**23.** (3)	**24.** (3)
25. (3)	**26.** (4)	**27.** (3)	**28.** (1)
29. (1)	**30.** (1)	**31.** (2)	**32.** (1)
33. (1)	**34.** (3)	**35.** (3)	**36.** (3)
37. (3)	**38.** (4)	**39.** (1)	**40.** (3)
41. (2)	**42.** (2)	**43.** (1)	**44.** (3)
45. (2)	**46.** (4)	**47.** (4)	**48.** (2)
49. (2)	**50.** (4)	**51.** (2)	**52.** (2)
53. (3)	**54.** (3)	**55.** (2)	**56.** (4)
57. (4)	**58.** (4)	**59.** (3)	**60.** (2)
61. (4)	**62.** (3)	**63.** (1)	

TYPE-III

1. (2)	**2.** (2)	**3.** (3)	**4.** (4)
5. (4)	**6.** (3)	**7.** (4)	**8.** (3)
9. (1)	**10.** (3)	**11.** (1)	**12.** (2)
13. (3)	**14.** (3)	**15.** (1)	**16.** (3)
17. (2)	**18.** (1)	**19.** (4)	**20.** (1)
21. (3)	**22.** (2)	**23.** (1)	**24.** (2)
25. (3)	**26.** (3)	**27.** (1)	**28.** (3)
29. (2)	**30.** (2)	**31.** (3)	**32.** (1)
33. (2)	**34.** (4)	**35.** (3)	

TYPE-IV

1. (1)	**2.** (3)	**3.** (1)	**4.** (1)
5. (3)	**6.** (2)	**7.** (4)	**8.** (3)
9. (2)	**10.** (3)	**11.** (2)	**12.** (2)
13. (3)	**14.** (1)	**15.** (1)	**16.** (4)
17. (1)	**18.** (2)	**19.** (4)	**20.** (4)
21. (4)	**22.** (1)	**23.** (2)	**24.** (4)
25. (2)	**26.** (4)	**27.** (2)	**28.** (1)
29. (4)	**30.** (4)	**31.** (3)	**32.** (4)
33. (4)	**34.** (1)	**35.** (4)	**36.** (2)
37. (3)	**38.** (3)	**39.** (4)	**40.** (3)

TYPE-V

1. (3)	**2.** (3)	**3.** (2)	**4.** (3)
5. (4)	**6.** (1)	**7.** (3)	**8.** (*)
9. (2)	**10.** (3)	**11.** (2)	**12.** (2)
13. (2)	**14.** (3)	**15.** (3)	**16.** (4)
17. (2)	**18.** (3)	**19.** (3)	**20.** (1)
21. (3)	**22.** (2)	**23.** (2)	**24.** (1)
25. (4)	**26.** (3)	**27.** (1)	**28.** (2)
29. (1)	**30.** (2)	**31.** (4)	**32.** (3)
33. (1)	**34.** (4)	**35.** (2)	**36.** (1)
37. (1)	**38.** (2)		

TYPE-VI

1. (2)	**2.** (1)	**3.** (1)	**4.** (1)
5. (4)	**6.** (1)	**7.** (1)	**8.** (4)
9. (2)	**10.** (3)	**11.** (3)	**12.** (2)
13. (2)	**14.** (1)	**15.** (4)	**16.** (4)
17. (3)	**18.** (1)	**19.** (3)	**20.** (3)
21. (2)	**22.** (1)	**23.** (3)	**24.** (4)
25. (4)	**26.** (2)	**27.** (2)	**28.** (2)
29. (1)	**30.** (*)	**31.** (1)	

TYPE-VII

1. (2)	**2.** (2)	**3.** (3)	**4.** (3)
5. (2)	**6.** (4)	**7.** (4)	**8.** (2)
9. (2)	**10.** (3)	**11.** (3)	**12.** (4)
13. (1)	**14.** (3)	**15.** (1)	**16.** (4)
17. (1)	**18.** (4)	**19.** (4)	**20.** (2)
21. (3)	**22.** (1)	**23.** (4)	**24.** (2)
25. (4)	**26.** (3)	**27.** (1)	**28.** (3)
29. (1)	**30.** (1)	**31.** (1)	

TYPE-VIII

1. (1)	**2.** (4)	**3.** (1)	**4.** (3)
5. (3)	**6.** (4)	**7.** (1)	**8.** (2)
9. (3)	**10.** (2)	**11.** (1)	**12.** (4)
13. (2)	**14.** (3)	**15.** (1)	**16.** (4)
17. (3)	**18.** (2)	**19.** (1)	**20.** (1)
21. (2)	**22.** (3)	**23.** (3)	**24.** (2)
25. (3)	**26.** (1)	**27.** (3)	**28.** (3)
29. (2)	**30.** (1)	**31.** (2)	**32.** (1)
33. (3)	**34.** (2)		

EXPLANATIONS

TYPE-I

1. (3) According to question,
A and B can do a work in 12 days

$\therefore$ (A + B)'s one day's work $= \frac{1}{12}$

Similarly,

(B + C)'s one day's work $= \frac{1}{15}$

and (C + A)'s one day's work $= \frac{1}{20}$

On adding all three,
$\therefore$ 2 (A + B + C)'s one days's work

$= \frac{1}{12} + \frac{1}{15} + \frac{1}{20} = \frac{10+8+6}{120} = \frac{1}{5}$

$\Rightarrow$ (A + B + C)'s one days's work

$= \frac{1}{10}$

$\therefore$ A, B and C together can finish the whole work in 10 days.

Aliter : Using Rule 5,
Time taken

$= \frac{2 \times 12 \times 15 \times 20}{12 \times 15 + 15 \times 20 + 20 \times 12}$

$= \frac{24 \times 300}{180 + 300 + 240}$

$= \frac{7200}{720}$ = 10 days.

2. (3) (A+B)'s 1 day's work

$= \frac{1}{72}$,

(B+C)'s 1 day's work = $\frac{1}{120}$,

(C+A)'s 1 day's work = $\frac{1}{90}$

On adding all three
2 (A + B + C)'s 1 days work =

$= \frac{1}{72} + \frac{1}{120} + \frac{1}{90}$

$= \frac{5+3+4}{360} = \frac{1}{30}$

$\therefore$ (A+B+C)'s 1 day's work = $\frac{1}{60}$

$\therefore$ (A+B+C) will do the work in 60 days.

Aliter : Using Rule 5,
Time taken

$= \frac{2 \times 72 \times 120 \times 90}{72 \times 120 + 120 \times 90 + 72 \times 90}$

$= \frac{1555200}{8640 + 10800 + 6480}$

$= \frac{1555200}{25920}$ = 60 days

3. (1) According to question,

10 men's one day's work $= \frac{1}{12}$

$\therefore$ 1 man one day's work

$= \frac{1}{12 \times 10} = \frac{1}{120}$

Similarly,
1 woman one day's work

$= \frac{1}{6 \times 10} = \frac{1}{60}$

$\therefore$ (1 man + 1 woman)'s one day's work $= \frac{1}{120} + \frac{1}{60}$

$= \frac{1+2}{120} = \frac{3}{120} = \frac{1}{40}$

$\therefore$ (10 men + 10 women)'s one day's work $= \frac{10}{40} = \frac{1}{4}$

Therefore, both the teams can finish the whole work in 4 days.

4. (3) According to question,
A can finish the whole work in 6 days.

$\therefore$ A's one day's work $= \frac{1}{6}$

Similarly,

B's one day's work $= \frac{1}{9}$

(A + B)'s one day's work

$= \left(\frac{1}{6} + \frac{1}{9}\right) = \left(\frac{3+2}{18}\right) = \frac{5}{18}$

Therefore, (A + B)'s can finish the whole work in $\frac{18}{5}$ days i.e., 3.6 days.

Aliter : Using Rule 2,

Time taken $= \frac{6 \times 9}{9+6} = \frac{54}{15}$

= 3.6 days

5. (2) According to the question
Work done by A and B together

in one day $= \frac{1}{10}$ part

Work done by B and C together

in one day $= \frac{1}{15}$ part

Work done by C and A together

in one day $= \frac{1}{20}$ part

So,

A + B $= \frac{1}{10}$ ....(I)

B + C $= \frac{1}{15}$ ...(II)

C + A $= \frac{1}{20}$ ....(III)

Adding I, II, III, we get

2 (A + B + C) $= \frac{1}{10} + \frac{1}{15} + \frac{1}{20}$

2 (A + B + C) $= \frac{6+4+3}{60} = \frac{13}{60}$

A + B + C $= \frac{13}{120}$ ....(IV)

Putting the value of eqn. (I) in eqn. (IV)

$\frac{1}{10} + C = \frac{13}{120}$

$C = \frac{13}{120} - \frac{1}{10} = \frac{13-12}{120} = \frac{1}{120}$

$\therefore$ Work done in 1 day by C is

$\frac{1}{120}$ part

Hence, C will finish the whole work in 120 days

Aliter : Using Rule 19,

Time Taken by C= $\frac{2xyz}{xy - yz + zx}$

$= \frac{2 \times 10 \times 15 \times 20}{10 \times 15 - 15 \times 20 + 20 \times 10}$

$= \frac{6000}{150 - 300 + 200}$

$= \frac{6000}{50}$ = 120 days

6. (2) A's 1 hour's work $= \frac{1}{4}$

(B + C)'s 1 hour's work $= \frac{1}{3}$

(A + C)'s 1 hour's work $= \frac{1}{2}$

$\therefore$ C's 1 hour's work

$= \frac{1}{2} - \frac{1}{4} = \frac{2-1}{4} = \frac{1}{4}$

and B's 1 hour's work

$= \frac{1}{3} - \frac{1}{4} = \frac{4-3}{12} = \frac{1}{12}$

Hence, B alone can do the work in 12 hours.

7. (3) A's 1 day's work $= \frac{1}{24}$

B's 1 day's work $= \frac{1}{6}$

C's 1 day's work $= \frac{1}{12}$

(A + B + C)'s 1 day's work

$= \frac{1}{24} + \frac{1}{6} + \frac{1}{12} = \frac{1+4+2}{24} = \frac{7}{24}$

$\therefore$ The work will be completed by them in $\frac{24}{7}$ i.e., $3\frac{3}{7}$ days

Aliter : Using Rule 3,

Time taken

$= \frac{24 \times 6 \times 12}{24 \times 6 + 6 \times 12 + 24 \times 12}$

$= \frac{1728}{144 + 72 + 288}$

$= \frac{1728}{504} = \frac{24}{7} = 3\frac{3}{7}$ days

8. (3) (A + B)'s 1 day's work $= \frac{1}{10}$

A's 1 day's work $= \frac{1}{30}$

$\therefore$ B's 1 day's work $= \frac{1}{10} - \frac{1}{30}$

$= \frac{3-1}{30} = \frac{2}{30} = \frac{1}{15}$

Hence, B, alone can complete the work in 15 days.

Aliter : Using Rule 4,

Time taken by B $= \frac{30 \times 10}{30 - 10}$

$= 15$ days

9. (3) (A + B)'s 1 day's work

$= \frac{1}{72}$

(B + C)'s 1 day's work $= \frac{1}{120}$

(C + A)'s 1 day's work $= \frac{1}{90}$

Adding all three,

2(A + B + C)'s 1 day's work

$= \frac{1}{72} + \frac{1}{120} + \frac{1}{90}$

$= \frac{5+3+4}{360} = \frac{12}{360} = \frac{1}{30}$

$\therefore$ (A + B + C)'s 1 day's work

$= \frac{1}{60}$

Now, A's 1 day's work = (A + B + C)'s 1 day's work – (B + C)'s 1 day's work

$= \frac{1}{60} - \frac{1}{120} = \frac{2-1}{120} = \frac{1}{120}$

$\therefore$ A alone can complete the work in 120 days.

Aliter : Using Rule 19,

A alone can do in

$= \frac{2 \times 72 \times 120 \times 90}{72 \times 120 + 120 \times 90} - 72 \times 90$

$= \frac{2 \times 72 \times 120 \times 90}{8640 + 10800} - 6480$

$= \frac{144 \times 10800}{12960} = 120$ days

10. (3) (A + B)'s 1 day's work

$= \frac{1}{8}$ ...(i)

(B + C)'s 1 day's work

$= \frac{1}{6}$ ...(ii)

(C + A)'s 1 day's work

$= \frac{1}{10}$ ...(iii)

On adding,

2(A + B + C)'s 1 day's work

$= \frac{1}{8} + \frac{1}{6} + \frac{1}{10}$

$= \frac{15+20+12}{120} = \frac{47}{120}$

$\Rightarrow$ (A + B + C)'s 1 day's work

$= \frac{47}{240}$

$\therefore$ (A + B + C) together will complete the work in

$\frac{240}{47} = 5\frac{5}{47}$ days.

Aliter : Using Rule 5,

Time taken

$= \frac{2 \times 8 \times 6 \times 10}{8 \times 6 + 6 \times 10 + 10 \times 8}$

$= \frac{960}{48 + 60 + 80} = \frac{960}{188}$

$= \frac{240}{47} = 5\frac{5}{47}$ days

11. (4) (A + B)'s 1 day's work

$= \frac{1}{12}$ ...(i)

(B + C)'s 1 day's work

$= \frac{1}{8}$ ...(ii)

(C + A)'s 1 day's work

$= \frac{1}{6}$ ...(iii)

On adding,

2(A + B + C)'s 1 day's work

$= \frac{1}{12} + \frac{1}{8} + \frac{1}{6}$

$= \frac{2+3+4}{24} = \frac{9}{24}$

$\therefore$ (A+ B + C)'s 1 day's work

$= \frac{9}{24 \times 2} = \frac{9}{48}$ ...(iv)

On, subtracting (iii) from (iv),

B's 1 day's work $= \frac{9}{48} - \frac{1}{6}$

$= \frac{9-8}{48} = \frac{1}{48}$

$\therefore$ B can complete the work in 48 days.

Aliter : Using Rule 19,

B alone can do in

$= \frac{2 \times 12 \times 8 \times 6}{12 \times 8 + 8 \times 6 + 6 \times 12}$

$= \frac{24 \times 48}{96 + 48 + 72}$

$= \frac{24 \times 48}{-96+120}$

$= \frac{24 \times 48}{24} = 48$ days

12. (4) Work done by (A + B) in 1 day

$= \frac{1}{30}$

Work done by (B + C) in 1 day = $\frac{1}{20}$

Work done by (C + A) in 1 day = $\frac{1}{15}$

On adding,

Work done by 2 (A +B + C) in 1 day = $\frac{1}{30} + \frac{1}{20} + \frac{1}{15}$

$= \frac{2+3+4}{60}$

$= \frac{9}{60} = \frac{3}{20}$

∴ Work done by (A + B + C) in 1 day = $\frac{3}{40}$

∴ (A + B + C) will do the work in $\frac{40}{3} = 13\frac{1}{3}$ days

Aliter : Using Rule 5,

Time taken

$= \frac{2 \times 30 \times 20 \times 15}{30 \times 20 + 20 \times 15 + 15 \times 30}$

$= \frac{18000}{600+300+450}$

$= \frac{18000}{1350} = 13\frac{1}{3}$ days

13. (1) Let A and C complete the work in x days

(A + B)'s 1 day's work = $\frac{1}{8}$

(B + C)'s 1 day's work = $\frac{1}{12}$

(C + A)'s 1 day's work = $\frac{1}{x}$

Then (A + B + B + C + C + A)'s 1 day's work = $\frac{1}{8} + \frac{1}{12} + \frac{1}{x}$

2(A + B + C)'s 1 day's work

$= \frac{3x + 2x + 24}{24x}$

(A + B + C)'s 1 day's work

$= \frac{5x + 24}{24x \times 2}$

According to the question,

(A + B + C)'s 1 day's work = $\frac{1}{6}$

$\frac{1}{6} = \frac{5x + 24}{48x}$

$\Rightarrow 30x + 144 = 48x$

$\therefore x = \frac{144}{18} = 8$ days.

Aliter : Using Rule 5,

Let the time taken by A and C bc x days

⇒ Total time taken

$= \frac{2 \times 8 \times 12 \times x}{8 \times 12 + 12 \times x + 8 \times x}$

$6 = \frac{192x}{96 + 20x}$

576 + 120x = 192x

72x = 576

x = 8

⇒ Time taken by A and C is 8 days.

14. (1) A's 1 day's work $= \frac{1}{12}$

(A+B)'s 1 day's work $= \frac{1}{8}$

∴ B's 1 day's work

$= \frac{1}{8} - \frac{1}{12} = \frac{3-2}{24} = \frac{1}{24}$

∴ B alone can do the work in 24 days.

Aliter : Using Rule 4,

Time taken by B $= \frac{12 \times 8}{12 - 8}$

= 24 days

15. (2) (A + B)'s 1 day's work = $\frac{1}{18}$

(B + C)'s 1 day's work = $\frac{1}{9}$

(A + C)'s 1 day's work = $\frac{1}{12}$

Adding all the above three,

2 (A + B + C)'s 1 day's work

$= \frac{1}{18} + \frac{1}{9} + \frac{1}{12}$

$= \frac{2+4+3}{36} = \frac{9}{36} = \frac{1}{4}$

∴ (A + B + C)'s 1 day's work = $\frac{1}{8}$

∴ B's 1 day's work = (A + B + C)'s 1 day's work – (A + C)'s 1 day's work

$= \frac{1}{8} - \frac{1}{12} = \frac{3-2}{24} = \frac{1}{24}$

Hence, B alone can do the work in 24 days.

Aliter : Using Rule 19,

B alone can do in

$= \frac{2 \times 18 \times 9 \times 12}{-18 \times 9 + 12 \times 9 + 12 \times 18}$

$= \frac{36 \times 108}{-162 + 108 + 216}$

$= \frac{36 \times 108}{162} = 24$ days

16. (1) A alone can complete the work in 42 days working 1 hour daily. Similarly, B will take 56 days working 1 hour daily.

A 's 1 day's work = $\frac{1}{42}$

B 's 1 day's work = $\frac{1}{56}$

(A + B) 's 1 day's work

$= \frac{1}{42} + \frac{1}{56} = \frac{4+3}{168} = \frac{7}{168}$

∴ Time taken by (A + B) working 8 hours daily = $\frac{168}{7 \times 8} = 3$ days

Aliter : Using Rule 21,

Here, h_1 = 6 hours, h_2= 6 hours

d_1 = 6 days, d_2 = 8 days,

h = 8 hours

Required Time

$= \left[\frac{(6 \times 6) \times (6 \times 8)}{6 \times 6 + 6 \times 8}\right] \times \frac{1}{8}$

$= \frac{36 \times 64}{100} \times \frac{1}{8}$

$= \frac{36 \times 8}{100} = 2.88 \approx 3$ days

17. (3) (A + B)'s 1 day's work

$= \frac{1}{10}$ ..... (i)

(B + C)'s 1 day's work

$= \frac{1}{12}$ ..... (ii)

(C + A)'s 1 day's work

$= \frac{1}{15}$ ..... (iii)

On adding all these,
2(A + B + C)'s 1 day's work

$= \frac{1}{10} + \frac{1}{12} + \frac{1}{15}$

$= \frac{6+5+4}{60} = \frac{1}{4}$

∴ (A + B + C)'s 1 day's work

$= \frac{1}{8}$ ..... (iv)

∴ C's 1 day's work

$= \frac{1}{8} - \frac{1}{10} = \frac{5-4}{40} = \frac{1}{40}$

∴ C will finish the work in 40 days.

Aliter : Using Rule 19,
C alone can do in

$= \frac{2 \times 10 \times 12 \times 15}{10 \times 12 - 12 \times 15 + 10 \times 15}$

$= \frac{240 \times 15}{120 - 180 + 150}$

$= \frac{240 \times 15}{90} = 40$ days

18. (1) (A + B)'s 1 day's work = $\frac{1}{15}$

B's 1 day's work = $\frac{1}{20}$

∴ A's 1 day's work

$= \frac{1}{15} - \frac{1}{20} = \frac{4-3}{60} = \frac{1}{60}$

∴ A alone will do the work in 60 days.

Aliter : Using Rule 4,

A alone do in = $\frac{15 \times 20}{20 - 15}$

$= \frac{15 \times 20}{5} = 60$ days

19. (4) (A + B)'s 1 day's work = $\frac{1}{12}$

(B + C)'s 1 day's work = $\frac{1}{15}$

(C + A)'s 1 day's work = $\frac{1}{20}$

On adding,
2 (A + B + C)'s 1 day's work

$= \frac{1}{12} + \frac{1}{15} + \frac{1}{20}$

$= \frac{5+4+3}{60} = \frac{1}{5}$

∴ (A+B+C)'s 1 day's work = $\frac{1}{10}$

∴ B's 1 day's work

$= \frac{1}{10} - \frac{1}{20} = \frac{2-1}{20} = \frac{1}{20}$

∴ B alone can do the work in 20 days.

Aliter : Using Rule 19,
B alone can do in

$= \frac{2 \times 12 \times 15 \times 20}{-12 \times 15 + 15 \times 20 + 20 \times 12}$

$= \frac{24 \times 300}{-180 + 300 + 240}$

$= \frac{24 \times 300}{360} = 20$ days

20. (3) (P + Q)'s 1 day's work

$= \frac{1}{12}$ ...(i)

(Q + R)'s 1 day's work = $\frac{1}{15}$ ...(ii)

(R + P)'s 1 day's work = $\frac{1}{20}$ ...(iii)

Adding all three equations,
2 (P + Q + R)'s 1 day's work

$= \frac{1}{12} + \frac{1}{15} + \frac{1}{20} = \frac{5+4+3}{60}$

$= \frac{12}{60} = \frac{1}{5}$

∴ (P + Q + R)'s 1 day's work

$= \frac{1}{10}$ ...(iv)

∴ P's 1 day's work

$= \frac{1}{10} - \frac{1}{15} = \frac{3-2}{30} = \frac{1}{30}$

∴ P alone will complete the work in 30 days.

21. (3) (A + B)'s 1 day's work = $\frac{1}{8}$

(B + C)'s 1 day's work = $\frac{1}{12}$

(C + A)'s 1 day's work = $\frac{1}{8}$

On adding,
2 (A + B + C)'s 1 day's work

$= \frac{1}{8} + \frac{1}{12} + \frac{1}{8} = \frac{3+2+3}{24}$

$= \frac{8}{24} = \frac{1}{3}$

∴ (A + B + C)'s 1 day's work = $\frac{1}{6}$

Hence, the work will be completed in 6 days.

Method 2 :

Quicker Approach

Time = $\frac{2xyz}{xy + yz + zx}$

(Here, $x = 8$, $y = 12$; $z = 8$)

$= \frac{2 \times 8 \times 12 \times 8}{96 + 96 + 64} = \frac{2 \times 8 \times 12 \times 8}{256}$

= 6 days.

Aliter : Using Rule 5,
Time taken

$= \frac{2 \times 8 \times 12 \times 8}{8 \times 12 + 12 \times 8 + 8 \times 8}$

$= \frac{16 \times 96}{96 + 96 + 64}$

$= \frac{16 \times 96}{256} = 6$ days

22. (3) (A + B)'s 1 day's work = $\frac{1}{10}$

(B + C)'s 1 day's work = $\frac{1}{6}$

(C + A)'s 1 day's work = $\frac{1}{12}$

Adding all three
2 (A + B + C)'s 1 day's work

$= \frac{1}{10} + \frac{1}{6} + \frac{1}{12} = \frac{6+10+5}{60}$

$= \frac{21}{60} = \frac{7}{20}$

∴ (A + B + C)'s 1 day's work = $\frac{7}{40}$

∴ All three together will complete the work in $\frac{40}{7} = 5\frac{5}{7}$ days

Aliter : Using Rule 5,

Time taken

$$= \frac{2\times10\times6\times12}{10\times6+6\times12+12\times10}$$

$$= \frac{1440}{60+72+120}$$

$$= \frac{1440}{252} = \frac{40}{7}$$

$$= 5\frac{5}{7} \text{ days}$$

23. (2) (A + B)'s 1 hour's work

$$= \frac{2}{9} \quad .....(i)$$

(B + C)'s 1 hour's work = $\frac{1}{3}$ .....(ii)

(C + A)'s 1 hour's work

$$= \frac{4}{9} \quad .....(iii)$$

Adding all three equations,
2 (A + B + C)'s 1 hour's work

$$= \frac{2}{9}+\frac{1}{3}+\frac{4}{9} = \frac{2+3+4}{9} = 1$$

∴ A, B and C together will complete the work in 2 hours.

Aliter : Using Rule 5,
Time taken

$$= \frac{2\times\frac{9}{2}\times3\times\frac{9}{4}}{\frac{9}{2}\times3+3\times\frac{9}{4}+\frac{9}{2}\times\frac{9}{4}}$$

$$= \frac{\frac{18\times27}{8}}{\frac{27}{2}+\frac{27}{4}+\frac{81}{8}}$$

$$= \frac{18\times27}{8}\times\frac{8}{(108+54+81)}$$

$$= \frac{18\times27}{243} = 2 \text{ hours}$$

24. (1) (A + B)'s 1 day's work = $\frac{1}{18}$

(B + C)'s 1 day's work = $\frac{1}{24}$

(A + C)'s 1 day's work = $\frac{1}{36}$

Adding all three,
2 (A + B + C)'s 1 day's work

$$= \frac{1}{18}+\frac{1}{24}+\frac{1}{36}$$

$$= \frac{4+3+2}{72} = \frac{1}{8}$$

∴ (A + B + C)' 1 day's work = $\frac{1}{16}$

∴ A, B and C together will complete the work in 16 days.

Aliter : Using Rule 5,
Total time taken

$$= \frac{2\times18\times24\times36}{18\times24+24\times36+36\times18}$$

$$= \frac{36\times24\times36}{432+864+648}$$

$$= \frac{31104}{1944} = 16 \text{ days}$$

25. (3) (A + B)'s 1 day's work = $\frac{1}{5}$

A's 1 day's work = $\frac{1}{8}$

∴ B's 1 day's work = $\frac{1}{5}-\frac{1}{8}$

$$= \frac{8-5}{40} = \frac{3}{40}$$

∴ B alone will complete the work in $\frac{40}{3} = 13\frac{1}{3}$ days.

Aliter : Using Rule 4,

Time taken by B = $\frac{5\times8}{8-5}$

$$= \frac{40}{3} = 13\frac{1}{3} \text{ days}$$

26. (2) Work done by (A + B + C) in 1 minute = $\frac{1}{30}$

Work done by (A + B) in 1 minute

$$= \frac{1}{50}$$

∴ Work done by C alone in 1 minute

$$= \frac{1}{30}-\frac{1}{50}$$

$$= \frac{5-3}{150} = \frac{2}{150} = \frac{1}{75}$$

∴ C alone will complete the work in 75 minutes.

Aliter : Using Rule 4,

C alone can do in = $\frac{xy}{x-y}$

$$= \frac{50\times30}{50-30} = 75 \text{ minutes}$$

27. (1) (A + B)'s 1 day's work = $\frac{1}{8}$

(B + C)'s 1 day's work = $\frac{1}{24}$

(C + A)'s 1 day's work = $\frac{7}{60}$

On adding all three,
2 (A + B + C)'s 1 day's work

$$= \frac{1}{8}+\frac{1}{24}+\frac{7}{60}$$

$$= \frac{15+5+14}{120} = \frac{34}{120}$$

∴ (A + B + C)'s 1 day's work

$$= \frac{17}{120}$$

∴ C's 1 day's work

$$= \frac{17}{120}-\frac{1}{8} = \frac{17-15}{120} = \frac{1}{60}$$

∴ C alone will complete the work in 60 days.

Aliter : Using Rule 19,

C alone can do in= $\frac{2xyz}{xy-yz+zx}$

$$= \frac{2\times8\times24\times\frac{60}{7}}{8\times24-24\times\frac{60}{7}+\frac{60}{7}\times8}$$

$$= \frac{\frac{23040}{7}}{192-\frac{1440}{7}+\frac{480}{7}}$$

$$= \frac{\frac{23040}{7}}{\frac{1344-1440+480}{7}}$$

$$= \frac{23040}{7}\times\frac{7}{384} = 60 \text{ days}$$

28. (1) (A+B)'s 1 day's work = $\frac{1}{10}$

(B + C)'s 1 day's work = $\frac{1}{12}$

(C + A)'s 1 day's work $= \frac{1}{15}$

On adding all three,
2(A + B + C)'s 1 day's work

$= \frac{1}{10} + \frac{1}{12} + \frac{1}{15}$

$= \frac{6+5+4}{60} = \frac{15}{60} = \frac{1}{4}$

$\therefore$ (A + B + C)'s 1 day's work $= \frac{1}{8}$

$\therefore$ A's 1 day's work = $= \frac{1}{8} - \frac{1}{12}$

$= \frac{3-2}{24} = \frac{1}{24}$

$\therefore$ A will complete the work in 24 days.

Aliter : Using Rule 19,
A alone can do in

$= \frac{2 \times x \times y \times z}{xy + yz - zx}$

$= \frac{2 \times 10 \times 12 \times 15}{10 \times 12 + 12 \times 15 - 15 \times 10}$

$= \frac{3600}{120 + 180 - 150}$

$= \frac{3600}{150}$ = 24 days

29. (3) (A + B)'s 1 day's work = $\frac{1}{20}$

(B + C)'s 1 day's work = $\frac{1}{10}$

(C + A)'s 1 day's work = $\frac{1}{12}$

On adding all three,
2 (A + B + C)'s 1 day's work

$= \frac{1}{20} + \frac{1}{10} + \frac{1}{12}$

$= \frac{3+6+5}{60} = \frac{14}{60} = \frac{7}{30}$

$\therefore$ (A + B + C)'s 1 day's work

$= \frac{7}{60}$

$\therefore$ Hence, the work will be completed in $\frac{60}{7} = 8\frac{4}{7}$ days.

Aliter : Using Rule 5,

Time taken = $\frac{2xyz}{xy + yz + zx}$

$= \frac{2 \times 20 \times 10 \times 12}{20 \times 10 + 10 \times 12 + 12 \times 20}$

$= \frac{4800}{200 + 120 + 240}$

$= \frac{4800}{560} = \frac{60}{7} = 8\frac{4}{7}$ days

30. (3) Work done by A, B and C in 1 day

$= \frac{1}{10} + \frac{1}{12} + \frac{1}{15} = \frac{6+5+4}{60}$

$= \frac{15}{60} = \frac{1}{4}$

$\therefore$ Required time = 4 days

Aliter : Using Rule 3,

Time Taken = $\frac{xyz}{xy + yz + zx}$

$= \frac{10 \times 12 \times 15}{10 \times 12 + 12 \times 15 + 15 \times 10}$

$= \frac{1800}{120 + 180 + 150}$

$= \frac{1800}{450}$ = 4 days

31. (1) A's 1 day's work

$= \frac{1}{12} - \frac{1}{30} = \frac{5-2}{60} = \frac{3}{60} = \frac{1}{20}$

Hence, A alone will complete the work in 20 days.

Aliter : Using Rule 4,

Time taken By A = $\frac{xy}{x - y}$

$= \frac{12 \times 30}{30 - 12}$

$= \frac{12 \times 30}{18}$ = 20 days

32. (3) (A + B + C)'s 1 day's work

$= \frac{1}{12} + \frac{1}{24} + \frac{1}{36}$

$= \frac{6+3+2}{72} = \frac{11}{72}$

$\therefore$ (A + B + C) together will complete the work in $\frac{72}{11}$ days

$= 6\frac{6}{11}$ days.

Aliter : Using Rule 3,

Time taken = $\frac{x \times y \times z}{xy + yz + zx}$

$= \frac{12 \times 24 \times 36}{12 \times 24 + 24 \times 36 + 12 \times 36}$

$= \frac{24 \times 36}{24 + 72 + 36} = \frac{24 \times 36}{132}$

$= \frac{72}{11}$ days $= 6\frac{6}{11}$ days

33. (4) (A + B)'s 1 day's work

$= \frac{1}{6} + \frac{1}{12} = \frac{2+1}{12} = \frac{1}{4}$

$\therefore$ A and B together will complete the work in 4 days.

Aliter : Using Rule 2,

Time taken $= \frac{xy}{x+y}$

$= \frac{6 \times 12}{6 + 12}$

$= \frac{72}{18}$ = 4 days

34. (2) (A + B)'s 1 day's work = $\frac{1}{36}$

(B + C)'s 1 day's work = $\frac{1}{60}$

(C + A)'s 1 day's work = $\frac{1}{45}$

Adding all three,
2(A + B + C)'s 1 day's work

$= \frac{1}{36} + \frac{1}{60} + \frac{1}{45} = \frac{5+3+4}{180} = \frac{1}{15}$

$\therefore$ (A + B + C)'s 1 day's work

$= \frac{1}{30}$

$\therefore$ C's 1 day's work = $\frac{1}{30} - \frac{1}{36}$

$= \frac{6-5}{180} = \frac{1}{180}$

Hence, C alone will finish the work in 180 days.

Aliter : Using Rule 19,
C alone can do in

$= \frac{2xyz}{xy - yz + zx}$ days

$= \frac{2\times36\times60\times45}{36\times60-60\times45+45\times36}$

$= \frac{2\times36\times60\times3}{144-180+108}$

$= \frac{72\times180}{252-180}$ = 180 days

35. (3) Ronald's 1 hour's work

$= \frac{32}{6} = \frac{16}{3}$ pages

[Pages typed in 6 hrs. = 32

$\therefore$ pages typed in 1 hr = $\frac{32}{6}$]

Elan's 1 hour's work = 8 pages

1 hour's work of the both

$= \frac{16}{3} + 8 = \frac{40}{3}$ pages

$\therefore$ Required time

$= \frac{110\times3}{40} = \frac{33}{4}$ hours

= 8 hours 15 minutes

36. (4) A 's 1day's work = $\frac{1}{20}$

B 's 1day's work = $\frac{1}{30}$

$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{20} + \frac{1}{30} = \frac{3+2}{60} = \frac{1}{12}$

Hence, the work will be completed in 12 days. When worked together.

Aliter : Using Rule 2,

Time taken = $\frac{xy}{x+y}$ days

$= \frac{20\times30}{20+30}$ days

$= \frac{600}{50}$ = 12 days

37. (2) 9 hours 36 minutes

$= 9 + \frac{36}{60} = 9\frac{3}{5}$ hours

$= \frac{48}{5}$ hours

(A + B)'s 1 hour's work = $\frac{5}{48}$

C's 1 hour's work = $\frac{1}{48}$

(A + B + C)'s 1 hour's work

$= \frac{5}{48} + \frac{1}{48} = \frac{1}{8}$ .....(i)

A's 1 hours work = (B + C)'s 1 hour's work .....(ii)

From equations (i) and (ii),

2 × (A's 1 hour's work) = $\frac{1}{8}$

A's 1 hour's work = $\frac{1}{16}$

$\therefore$ B's 1 hour's work = $\frac{5}{48} - \frac{1}{16}$

$= \frac{5-3}{48} = \frac{1}{24}$

$\therefore$ B alone will finish the work in 24 hours

38. (1) Work done by A and B in 5 days

$= 5\left(\frac{1}{12} + \frac{1}{15}\right) = 5\left(\frac{5+4}{60}\right)$

$= 5\times\frac{9}{60} = \frac{9}{12} = \frac{3}{4}$

Remaining work = $1 - \frac{3}{4} = \frac{1}{4}$

$\therefore$ Time taken by A

$= \frac{1}{4}\times12 = 3$ days

Aliter : Using Rule 20,

Here, m = 12, n = 15, p = 5

Time taken by A

$= \frac{mn - p(m+n)}{n}$ days

$= \frac{12\times15 - 5(12+15)}{15}$

$= \frac{180-135}{15}$ = 3 days

39. (2) B's 1 day's work = (A + B)'s 1 day's work – A's 1 day's work

$= \frac{1}{12} - \frac{1}{28} = \frac{7-3}{84}$

$= \frac{4}{84} = \frac{1}{21}$

$\therefore$ Required time = 21 days

Aliter : Using Rule 4,

Time taken by B= $\frac{xy}{x-y}$ days

$= \frac{12\times28}{28-12}$

$= \frac{12\times28}{16}$ = 21 days

40. (4) A's 1 day's work = $\frac{1}{m}$

B's 1 day's work = $\frac{1}{n}$

$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{m} + \frac{1}{n}$

$= \frac{n+m}{mn} = \frac{m+n}{mn}$

$\therefore$ Required time = $\frac{mn}{m+n}$

41. (4) Let A, B and C together do the work in x hours.

$\therefore$ Time taken by A

= $(x + 6)$ hours

Time taken by B = $(x + 1)$ hours

Time taken by C = $2x$ hours

$\therefore \frac{1}{x+6} + \frac{1}{x+1} + \frac{1}{2x} = \frac{1}{x}$

$\Rightarrow \frac{1}{x+6} + \frac{1}{x+1} = \frac{1}{x} - \frac{1}{2x}$

$= \frac{1}{2x}$

$\Rightarrow \frac{1}{x+6} = \frac{1}{2x} - \frac{1}{x+1}$

$= \frac{x+1-2x}{2x(x+1)}$

$\Rightarrow \frac{1}{x+6} = \frac{1-x}{2x^2+2x}$

$\Rightarrow 2x^2 + 2x = x + 6 - x^2 - 6x$

$\Rightarrow 3x^2 + 7x - 6 = 0$

$\Rightarrow 3x^2 + 9x - 2x - 6 = 0$

$\Rightarrow 3x(x + 3) - 2(x + 3) = 0$

$\Rightarrow (3x - 2)(x + 3) = 0$

$\Rightarrow 3x - 2 = 0$ as $x + 3 \neq 0$

$\Rightarrow x = \frac{2}{3}$

$\therefore$ Time taken by A = $6 + \frac{2}{3}$

$= \frac{18+2}{3} = \frac{20}{3}$ hours

Time taken by B = $1 + \frac{2}{3}$

$= \frac{5}{3}$ hours

∴ (A +B)'s 1 hour's work

$= \frac{3}{20} + \frac{3}{5} = \frac{3+12}{20}$

$= \frac{15}{20} = \frac{3}{4}$

∴ Required time = $\frac{4}{3}$ hours

42. (2) Time taken by B and C = x days (let)

∴ Time taken by A = $3x$ days

∴ Part of work done by A, B and C in 1 day

$= \frac{1}{x} + \frac{1}{3x} = \frac{3+1}{3x} = \frac{4}{3x}$

$\therefore \frac{4}{3x} = \frac{1}{24} \Rightarrow 3x = 4 \times 24$

$\Rightarrow x = \frac{4 \times 24}{3} = 32$ days

∴ Time taken by A = 32 × 3 = 96 days

43. (4) A's 1 day's work = $\frac{1}{4}$

B's 1 day's work = $\frac{1}{12}$

(A + B)'s 1 day's work

$= \frac{1}{4} + \frac{1}{12}$

$= \frac{3+1}{12} = \frac{4}{12} = \frac{1}{3}$

∴ Required time = 3 days

Aliter : Using Rule 2,

Time taken = $\frac{xy}{x+y}$ days

$= \frac{4 \times 12}{4+12}$

$\frac{48}{16} = 3$ days

44. (3) A does $\frac{1}{4}$ work in 10 days

∴ A will do 1 work in 10 × 4 = 40 days

Similarly, B will do the same work in 20 × 3 = 60 days

∴ (A + B)'s 1 day's work

$= \frac{1}{40} + \frac{1}{60}$

$= \frac{3+2}{120} = \frac{5}{120} = \frac{1}{24}$

∴ Required time = 24 days

Aliter : Using Rule 2,

Time taken by A to finish the work = 40 days

Time taken by B to finish the work = 60 days

Total time taken

$= \frac{x \times y}{x+y}$ days

$= \frac{40 \times 60}{40+60}$

$= \frac{40 \times 60}{100} = 24$ days

45. (2) Using Rule 1,

$M_1 D_1 T_1 = M_2 D_2 T_2$

$\Rightarrow 15 \times 20 \times 8 = 20 \times 12 \times T_2$

$\Rightarrow T_2 = \frac{15 \times 20 \times 8}{20 \times 12} = 10$ hours

46. (4) (Raj + Ram)'s 1 day's work

$= \frac{1}{10}$

Raj's 1 day's work = $\frac{1}{12}$

∴ Ram's 1 day's work

$= \frac{1}{10} - \frac{1}{12} = \frac{6-5}{60} = \frac{1}{60}$

∴ Required time = 60 days

Aliter : Using Rule 4,

Time taken = $\frac{10 \times 12}{12-10}$

= 60 days

47. (2) A's 1 day's work = $\frac{1}{9}$

B's 1 day's work = $\frac{1}{15}$

Work done in first 2 days = A's 1 day's work + B's 1 day's work

$= \frac{1}{9} + \frac{1}{15} = \frac{5+3}{45} = \frac{8}{45}$

∴ Work done in first 10 days

$= \frac{8 \times 5}{45} = \frac{8}{9}$

Remaining work = $1 - \frac{8}{9} = \frac{1}{9}$

Now, it is turn of 'A' for the eleventh day.

∴ Time taken by 'A' in doing $\frac{1}{9}$ work = $\frac{1}{9} \times 9 = 1$ day

∴ Required time = 10 + 1 = 11 days

48. (4) Using Rule 1,

15 men complete $\frac{1}{3}$ work in 7 days.

∴ Time taken in doing 1 work = 3 × 7 = 21 days

$\therefore M_1D_1 = M_2D_2$

$\Rightarrow 15 \times 21 = M_2 \times 5$

$\Rightarrow M_2 = \frac{15 \times 21}{5} = 63$ days

49. (2) (x and y)'s 1 hour work

$= \frac{1}{4} + \frac{1}{8} = \frac{2+1}{8} = \frac{3}{8}$

∴ Required time = $\frac{8}{3}$ hours

$= \left(\frac{8}{3} \times 60\right)$ minutes

= 160 minutes

Aliter : Using Rule 2,

Time taken = $\frac{xy}{x+y}$ hours

$= \frac{4 \times 8}{4+8} = 160$ minutes

50. (1) Number of pages copied by x in hour = $\frac{80}{20} = 4$

Number of pages copied by x and y in 1 hour = $\frac{135}{27} = 5$

∴ Number of pages copied by y in 1 hour = 5 – 4 = 1

∴ Required time = 20 hours.

51. (2) (A + B)'s 1 day's work

$= \frac{1}{15}$ ....(i)

(B + C)'s 1 day's work

$= \frac{1}{12}$ .... (ii)

(C + A)'s 1 day's work

$= \frac{1}{10}$ .... (iii)

On adding all three equations,

2 (A + B + C)'s 1 day's work

$= \frac{1}{15} + \frac{1}{12} + \frac{1}{10}$

$= \frac{4+5+6}{60} = \frac{15}{60} = \frac{1}{4}$

∴ (A + B + C)'s 1 day's work

$= \frac{1}{8}$ ....(iv)

By equation (iv) – (ii),

A's 1 day's work

$= \frac{1}{8} - \frac{1}{12}$

$= \frac{3-2}{24} = \frac{1}{24}$

∴ Required time = 24 days

Aliter : Using Rule 19,

A alone can do in $= \frac{2xyz}{xy+yz-zx}$

$= \frac{2\times15\times12\times10}{15\times12+12\times10-15\times10}$

$= \frac{2\times3\times12\times10}{36+24-30}$

$= \frac{720}{60-30} = 24$ days

52. (3) (A + B)'s 1 day's work

$= \frac{1}{25} + \frac{1}{30} = \frac{6+5}{150} = \frac{11}{150}$

∴ (A + B)'s 5 days' work

$= \frac{5\times11}{150} = \frac{11}{30}$

∴ Remaining work

$= 1 - \frac{11}{30} = \frac{30-11}{30} = \frac{19}{30}$

53. (3) (A + B)'s 1 day's work $= \frac{1}{6}$

A's 1 day's work $= \frac{1}{18}$

∴ B's 1 day's work $= \frac{1}{6} - \frac{1}{18}$

$= \frac{3-1}{18} = \frac{2}{18} = \frac{1}{9}$

∴ Required time = 9 days

Aliter : Using Rule 4,

Time taken by B $= \frac{xy}{x-y}$ days

$= \frac{6\times18}{18-6}$

= 9 days

54. (2) A's 2 days' work = B's 3 days' work

∴ Time taken by A = 8 days

∴ Time taken by B $= \frac{8}{2} \times 3$

= 12 days

55. (3) Using Rule 1,

Men	Working hours	Days
16 ↑	14 ↑	12 ↓
28	12	x

$\therefore \left.\begin{matrix}28:16\\12:14\end{matrix}\right\} :: 12 : x$

$\Rightarrow 28\times12\times x = 16\times14\times12$

$\Rightarrow x = \frac{16\times14\times12}{28\times12} = 8$ days

56. (2) (A + B)'s 1 day's work $= \frac{1}{8}$

(B + C)'s 1 day's work $= \frac{1}{12}$

(A + B + C)'s 1 day's work $= \frac{1}{6}$

∴ C's 1 day's work $= \frac{1}{6} - \frac{1}{8}$

$= \frac{4-3}{24} = \frac{1}{24}$

A's 1 day's work

$= \frac{1}{6} - \frac{1}{12} = \frac{2-1}{12} = \frac{1}{12}$

∴ (A + C)'s 1 day's work

$= \frac{1}{12} + \frac{1}{24} = \frac{2+1}{24} = \frac{1}{8}$

∴ Required time = 8 days

Aliter : Using Rule 5,

Let the time taken by A and C is x days

$\Rightarrow 6 = \frac{2\times x\times8\times12}{8x+96+12x}$

$6 = \frac{x\times192}{20x+96}$

120x + 576 = 192x

72x = 576

x = 8 days

57. (3) Using Rule 1,

$\frac{M_1D_1T_1}{W_1} = \frac{M_2D_2T_2}{W_2}$

$\Rightarrow \frac{90\times16\times12}{1} = \frac{70\times24\times8}{W_2}$

$\Rightarrow W_2 = \frac{70\times24\times8}{90\times16\times12} = \frac{7}{9}$ parts

58. (3) Let the work be completed in x days.

According to the question,

$\frac{x}{16} + \frac{x-8}{32} + \frac{x-6}{48} = 1$

$\Rightarrow \frac{6x+3x-24+2x-12}{96} = 1$

$\Rightarrow 11x - 36 = 96$

$\Rightarrow 11x = 96 + 36 = 132$

$\Rightarrow x = \frac{132}{11} = 12$ days

59. (3) (A+B)'s 1 day's work $= \frac{1}{15}$

(B+C)'s 1 day's work $= \frac{1}{10}$

(A+C)'s 1 day's work $= \frac{1}{12}$

On adding all three,

2(A+B+C)'s 1 day's work

$= \frac{1}{15} + \frac{1}{10} + \frac{1}{12} = \frac{4+6+5}{60}$

$= \frac{15}{60} = \frac{1}{4}$

∴ (A + B + C)'s 1 day's work $= \frac{1}{8}$

$\therefore$ Required time = 8 days

Aliter : Using Rule 5,

Time taken = $\dfrac{2xyz}{xy+yz+zx}$

$= \dfrac{2\times15\times10\times12}{15\times10+10\times12+12\times15}$

$= \dfrac{3600}{150+120+180}$

$= \dfrac{3600}{450} = 8$ days

60. (3) Let the whole work be completed in x days

A's 1 day's work = $\dfrac{1}{10}$

B's 1 day's work = $\dfrac{1}{12}$

C's 1 day's work = $\dfrac{1}{15}$

According to the question,

A's $(x-5)$ days' work + B's $(x-3)$ days' work + C's x days' work = 1

$\Rightarrow \dfrac{x-5}{10} + \dfrac{x-3}{12} + \dfrac{x}{15} = 1$

$\Rightarrow \dfrac{6(x-5)+5(x-3)+4x}{60} = 1$

$\Rightarrow 6x - 30 + 5x - 15 + 4x = 60$

$\Rightarrow 15x - 45 = 60$

$\Rightarrow 15x = 60 + 45 = 105$

$\Rightarrow x = \dfrac{105}{15} = 7$ days

61. (*) A's 1 day's work = $\dfrac{1}{24}$

B's 1 day's work = $\dfrac{1}{5}$

C's 1 day's work = $\dfrac{1}{12}$

$\therefore$ (A + B + C)'s 1 day's work

$= \dfrac{1}{24}+\dfrac{1}{5}+\dfrac{1}{12}$

$= \dfrac{5+24+10}{120}$

$= \dfrac{39}{120} = \dfrac{13}{40}$

$\therefore$ Required time

$= \dfrac{40}{13} = 3\dfrac{1}{13}$ days

Aliter : Using Rule 3,

Time taken = $\dfrac{xyz}{xy+yz+zx}$

$= \dfrac{24\times5\times12}{24\times5+5\times12+24\times12}$

$= \dfrac{1440}{120+60+288}$

$= \dfrac{1440}{468} = \dfrac{40}{13} = 3\dfrac{1}{13}$ days

62. (4) Using Rule 1,

Women	Length	Days
20 ↑	100 ↓	10 ↓
10	50	x

$\therefore \left.\begin{matrix}10:20\\100:50\end{matrix}\right\} :: 10 : x$

$\Rightarrow 10 \times 100 \times x = 20 \times 50 \times 10$

$\Rightarrow x = \dfrac{20\times50\times10}{1000} = 10$ days

63. (1) A's 1 day's work = $\dfrac{1}{9}$

B's 1 day's work = $\dfrac{1}{12}$

$\therefore$ (A + B)'s 1 day's work

$= \dfrac{1}{9}+\dfrac{1}{12}$

$= \dfrac{4+3}{36} = \dfrac{7}{36}$

$\therefore$ Required time

$= \dfrac{36}{7} = 5\dfrac{1}{7}$ days

64. (1) Let time taken by son be x hours.

$\therefore$ Father's and son's 1 day's work = $\dfrac{1}{30}+\dfrac{1}{x}$

$\therefore \dfrac{1}{30}+\dfrac{1}{x} = \dfrac{1}{20}$

$\Rightarrow \dfrac{1}{x} = \dfrac{1}{20} - \dfrac{1}{30}$

$= \dfrac{3-2}{60} = \dfrac{1}{60}$

$\therefore x = 60$ hours

65. (2) Work done by (A + B) in 5 days

$= 5\left(\dfrac{1}{12}+\dfrac{1}{20}\right) = 5\left(\dfrac{5+3}{60}\right)$

$= \dfrac{40}{60} = \dfrac{2}{3}$

Remaining work = $1 - \dfrac{2}{3} = \dfrac{1}{3}$

$\because$ Time taken by C in doing $\dfrac{1}{3}$ work = 3 days

$\therefore$ Required time = 3 × 3 = 9 days

66. (3) A's 1 day's work = $\dfrac{1}{7}$

B's 1 day's work = $\dfrac{1}{9}$

$\therefore$ (A + B)'s 1 day's work

$= \dfrac{1}{7}+\dfrac{1}{9}$

$= \dfrac{9+7}{63} = \dfrac{16}{63}$

$\therefore$ Required time = $\dfrac{63}{16}$ days

$= 3\dfrac{15}{16}$ days

67. (1) (A + B)'s 1 day's work = $\dfrac{1}{24}$

(A + B + C)'s 1 day's work = $\dfrac{1}{8}$

$\therefore$ C's 1 day's work = $\dfrac{1}{8} - \dfrac{1}{24}$

$= \dfrac{3-1}{24} = \dfrac{2}{24} = \dfrac{1}{12}$

$\therefore$ Required time = 12 days

68. (4) (A + B)'s 1 day's work

$= \dfrac{1}{12}+\dfrac{1}{24}$

$= \dfrac{2+1}{24} = \dfrac{3}{24} = \dfrac{1}{8}$

$\therefore$ Required time = 8 days

69. (4) (A + B)'s 1 day's work

$= \dfrac{1}{11}+\dfrac{1}{20}$

$= \dfrac{20+11}{220} = \dfrac{31}{220}$

(A + C)'s 1 day's work

$= \frac{1}{11} + \frac{1}{55}$

$= \frac{5+1}{55} = \frac{6}{55}$

Work done in first two days

$= \frac{31}{220} + \frac{6}{55}$

$= \frac{31+24}{220} = \frac{55}{220} = \frac{1}{4}$

$\therefore$ Required time = 2 × 4
= 8 days

70. (1) (A + B)'s 1 day's work = $\frac{1}{6}$

A's 1 day's work = $\frac{1}{9}$

$\therefore$ B's 1 day's work = $\frac{1}{6} - \frac{1}{9}$

$= \frac{3-2}{18} = \frac{1}{18}$

$\therefore$ Required time = 18 days

71. (2) $\because$ A's 1 day's work = $\frac{1}{18}$

$\therefore$ A's 12 days' work = $\frac{12}{18} = \frac{2}{3}$

$\therefore$ Remaining work

$= 1 - \frac{2}{3} = \frac{1}{3}$

$\because$ Time taken by B in doing $\frac{1}{3}$ work = 8 days

$\therefore$ Time taken by B in doing whole work
= 3 × 8 = 24 days

72. (3) (A + B)'s 1 day's work

$= \frac{1}{8}$ .... (i)

(B + C)'s 1 day's work

$= \frac{1}{12}$ .... (ii)

(A + B + C)'s 1 day's work

$= \frac{1}{6}$ .... (iii)

By equations (i) + (ii) – (iii),
B's 1 day's work

$= \frac{1}{8} + \frac{1}{12} - \frac{1}{6}$

$= \frac{3+2-4}{24} = \frac{1}{24}$ .... (iv)

By equations (iii) – (iv),
(A + C)'s 1 day's work

$= \frac{1}{6} - \frac{1}{24}$

$= \frac{4-1}{24} = \frac{3}{24} = \frac{1}{8}$

$\therefore$ Required time = 8 days

73. (4) Let time taken by A be x days.
$\therefore$ Time taken by B = $3x$ days
According to the question,

$\frac{1}{x} + \frac{1}{3x} = \frac{1}{9}$

$\Rightarrow \frac{3+1}{3x} = \frac{1}{9}$

$\Rightarrow 3x = 4 \times 9$

$\Rightarrow x = \frac{4 \times 9}{3} = 12$ days

74. (4)

Cats	Rats	Days
100 ↑	100 ↓	100 ↓
4	4	x

$\therefore \left.\begin{matrix} 4:100 \\ 100:4 \end{matrix}\right\} :: 100 : x$

$\Rightarrow 4 \times 100 \times x = 100 \times 100 \times 4$

$\Rightarrow x = \frac{100 \times 100 \times 4}{4 \times 100}$

= 100 days

75. (3) X's 1 day's work = $\frac{1}{p}$

Y's 1 day's work = $\frac{1}{q}$

(X + Y)'s 1 day's work

$= \frac{1}{p} + \frac{1}{q} = \frac{q+p}{pq}$

$\therefore$ Required time = $\frac{pq}{p+q}$

76. (2) A's 1 day's work = $\frac{1}{8}$

B's 1 day's work = $\frac{1}{10}$

(A + B)'s 1 day's work

$= \frac{1}{8} + \frac{1}{10} = \frac{5+4}{40} = \frac{9}{40}$

$\therefore$ Required time = $\frac{40}{9}$ days

77. (2) (A + B)'s 1 day's work = $\frac{1}{36}$

(B + C)'s 1 day's work = $\frac{1}{24}$

(A + C)'s 1 day's work = $\frac{1}{18}$

On adding all three,
2 (A + B + C)'s 1 day's work

$= \frac{1}{36} + \frac{1}{24} + \frac{1}{18}$

$= \frac{2+3+4}{72}$

$= \frac{9}{72} = \frac{1}{8}$

$\therefore$ (A + B + C)'s 1 day's work

$= \frac{1}{16}$

$\therefore$ Required time = 16 days

78. (3) Koushik's 1 day's work

$= \frac{1}{x}$

Krishnu's 1 day's work = $\frac{1}{y}$

$\therefore$ One day's work of both

$= \frac{1}{x} + \frac{1}{y} = \frac{x+y}{xy}$

$\therefore$ Required time = $\frac{xy}{x+y}$ days

79. (2) $M_1D_1 = M_2D_2$
$\Rightarrow 24 \times 12 = 36 \times D_2$

$\Rightarrow D_2 = \frac{24 \times 12}{36} = 8$ days

80. (3) (A + B)'s 1 day's work = $\frac{1}{18}$

(B + C)'s 1 day's work = $\frac{1}{24}$

(C + A)'s 1 day's work = $\frac{1}{36}$

On adding all three,
2 (A + B + C)'s 1 day's work

$= \frac{1}{18} + \frac{1}{24} + \frac{1}{36} = \frac{4+3+2}{72}$

$= \frac{9}{72} = \frac{1}{8}$

$\therefore$ (A + B + C)'s 1 day's work

$= \frac{1}{16}$

$\therefore$ Required time = 16 days

81. (1) A's 4 days' work = B's 5 days' work

$\Rightarrow$ A : B = 4 : 5

Again, B : C = 6 : 7

$\therefore$ A : B : C = 4 × 6 : 5 × 6 : 5 × 7

= 24 : 30 : 35

$\because$ Time taken by A = 7 days

$\therefore$ Time taken by C = $\frac{35}{24} \times 7$

$= \frac{245}{24} = 10\frac{5}{24}$ days

82. (2)

Men	Quantity of wheat	Days
42 ↑	144 ↓	15 ↓
30	48	x

$\therefore \left.\begin{matrix} 30 : 42 \\ 144 : 48 \end{matrix}\right\} :: 15 : x$

$\Rightarrow 30 \times 144 \times x = 42 \times 48 \times 15$

$\Rightarrow x = \frac{42 \times 48 \times 15}{30 \times 144} = 7$ days

83. (2) Work done by two sons in an hour

$= \frac{1}{3} + \frac{1}{6} = \frac{2+1}{6} = \frac{1}{2}$

$\therefore$ Work done by father in an hour = $\frac{1}{2}$

$\therefore$ Required time = 2 hours

84. (4) A's 1 day's work = $\frac{1}{10}$

B's 1 day's work = $\frac{1}{12}$

C's 1 day's work = $\frac{1}{15}$

$\therefore$ (A + B + C)'s 1 day's work

$= \frac{1}{10} + \frac{1}{12} + \frac{1}{15}$

$= \frac{6+5+4}{60} = \frac{15}{60} = \frac{1}{4}$

$\therefore$ Required time = 4 days.

85. (1)

Men	Time	Mats
5 ↓	5 ↓	5 ↓
10	10	x

$\therefore \left.\begin{matrix} 5 : 10 \\ 5 : 10 \end{matrix}\right\} :: 5 : x$

$\Rightarrow 5 \times 5 \times x = 10 \times 10 \times 5$

$\Rightarrow x = \frac{10 \times 10 \times 5}{5 \times 5}$

= 20 mats

86. (2) (A + B)'s 1 day's work = $\frac{1}{12}$

A's 1 day's work = $\frac{1}{30}$

$\therefore$ B's 1 day's work = $\frac{1}{12} - \frac{1}{30}$

$= \frac{5-2}{60} = \frac{1}{20}$

$\therefore$ Required time = 20 days

87. (2) (Ganesh + Ram + Sohan)'s 1 day's work = $\frac{1}{16}$

(Ganesh + Ram)'s 1 day's work

$= \frac{1}{24}$

$\therefore$ Sohan's 1 day's work

$= \frac{1}{16} - \frac{1}{24} = \frac{3-2}{48} = \frac{1}{48}$

$\therefore$ Required time = 48 days

88. (1) (A + B)'s 1 day's work

$= \frac{1}{72}$ ..... (i)

(B + C)'s 1 day's work

$= \frac{1}{120}$ ..... (ii)

(C + A)'s 1 day's work

$= \frac{1}{90}$ ..... (iii)

On adding all three,

2 (A + B + C)'s 1 day's work

$= \frac{1}{72} + \frac{1}{120} + \frac{1}{90}$

$= \frac{5+3+4}{360} = \frac{12}{360} = \frac{1}{30}$

$\therefore$ (A + B + C)'s 1 day's work

$= \frac{1}{60}$ ..... (iv)

$\therefore$ A's 1 day's work

= Equation (iv) – (ii),

$= \frac{1}{60} - \frac{1}{120} = \frac{2-1}{120} = \frac{1}{120}$

$\therefore$ Required time = 120 days

89. (2) $M_1D_1 = M_2D_2$

$\Rightarrow 35 \times 8 = M_2 \times 10$

$\Rightarrow M_2 = \frac{35 \times 8}{10}$ = 28 men

90. (3) A's 1 day's work = $\frac{1}{30}$

B's 1 day's work = $\frac{1}{40}$

$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{30} + \frac{1}{40}$

$= \frac{4+3}{120} = \frac{7}{120}$

$\therefore$ Required time = $\frac{120}{7}$

$= 17\frac{1}{7}$ days

TYPE-II

1. (2) $\because$ A can finish the work in 18 days.

$\therefore$ A's one day's' work $= \frac{1}{18}$

Similarly, B's one day's work

$= \frac{1}{24}$

$\therefore$ (A + B)'s 8 days' work

$= \left(\frac{1}{18} + \frac{1}{24}\right) \times 8 = \frac{7}{72} \times 8 = \frac{7}{9}$

$\therefore$ Remaining work $= 1 - \frac{7}{9} = \frac{2}{9}$

$\therefore$ Time taken to finish the remaining work by B is $\frac{2}{9} \times 24$

$= \frac{16}{3} = 5\frac{1}{3}$ days

Aliter : Using Rule 20,

Here, m = 18, n= 24 and p = 8

$\Rightarrow$ Required Time

$= \frac{18 \times 24 - 8(18+24)}{18}$

$= \frac{432-336}{18} = \frac{96}{18}$

$= \frac{16}{3} = 5\frac{1}{3}$ days

2. (4) (A+B)'s 2 days' work

$= 2\left(\frac{1}{12} + \frac{1}{18}\right) = \frac{10}{36}$

Remaining work

$= 1 - \frac{10}{36} = \frac{26}{36}$

Time taken by B to complete $\frac{26}{36}$ part of work

$= \frac{26}{36} \times 18$ = 13 days

Aliter : Using Rule 20,
Here, m = 12, n = 18, p = 2
Time taken by B

$= \frac{mn - p(m+n)}{m}$

$= \frac{12 \times 18 - 2(12+18)}{12}$

$= \frac{216 - 60}{12}$ = 13 days

3. (3) A's one day's work $= \frac{1}{6}$

B's one day's work $= \frac{1}{12}$

(A + B)'s one day's work

$= \frac{1}{6} + \frac{1}{12} = \frac{2+1}{12} = \frac{1}{4}$

(A + B)'s three day's work $= \frac{3}{4}$

Remaining work $= 1 - \frac{3}{4} = \frac{1}{4}$

∴ Total required number of days

$= \frac{1}{4} \times \frac{12}{1} + 3$ = 3 + 3 = 6 days

Aliter : Using Rule 20,
Here, m = 6, n= 12, and p = 3
Time taken by B

$= \frac{mn - (m+n)p}{m}$

$= \frac{6 \times 12 - (6+12) \times 3}{6}$

$= \frac{72 - 54}{6}$ = 3 days

∴ Total number of days taken to finish the works = 6 days

4. (1) (A + B)'s day's work $= \frac{1}{30}$

(B + C)'s 1 day's work $= \frac{1}{24}$

(C + A)'s 1 day's work $= \frac{1}{20}$

∴ 2 (A + B + C)'s 1 day's work

$= \frac{1}{30} + \frac{1}{24} + \frac{1}{20}$

$= \frac{4+5+6}{120} = \frac{15}{120} = \frac{1}{8}$

∴ (A + B + C)'s 1 day's work

$= \frac{1}{16}$

∴ (A + B + C)'s 10 days' work

$= \frac{10}{16} = \frac{5}{8}$

∴ Remaining work $= 1 - \frac{5}{8} = \frac{3}{8}$

This part of work is done by A alone.

Now A's 1 day's work $= \frac{1}{16} - \frac{1}{24}$

$= \frac{3-2}{48} = \frac{1}{48}$

∴ The required no. of days

$= \frac{3}{8} \times 48 = 18$ days

5. (2) (A+B)'s 1 day's work $= \frac{1}{30}$

(A + B)'s 20 day's work $= \frac{20}{30} = \frac{2}{3}$

Remaining work $= 1 - \frac{2}{3} = \frac{1}{3}$

Now, $\frac{1}{3}$ part of work is done by A in 20 days.

∴ Whole work will be done by A alone in 20 × 3 = 60 days.

6. (3) Using Rule 1,
Work done by 8 men in 6 days

$= \frac{6}{12} = \frac{1}{2}$

Remaining work $= 1 - \frac{1}{2} = \frac{1}{2}$

4 more men are engaged.
∴ Total number of men
= 8 + 4 = 12
By work and time formula

$\frac{W_1}{M_1 D_1} = \frac{W_2}{M_2 D_2}$, we have

$\frac{1}{8 \times 12} = \frac{\frac{1}{2}}{12 \times D_2}$

$\Rightarrow D_2 = \frac{1}{2} \times \frac{8 \times 12}{12}$ = 4 days.

7. (3) Work done by (B + C) in 3 days. $= 3 \times \left(\frac{1}{9} + \frac{1}{12}\right)$

$= \frac{1}{3} + \frac{1}{4} = \frac{4+3}{12} = \frac{7}{12}$

Remaining work $= 1 - \frac{7}{12} = \frac{5}{12}$

This part of work is done by *A* alone.

Now, $\frac{1}{24}$ part of work is done by A in 1 day.

∴ $\frac{5}{12}$ part of work will be done by

A in $= 24 \times \frac{5}{12}$ = 10 days.

8. (2) Originally, let there be *x* men
Now, more men, less days
$(x + 6) : x :: 55 : 44$

So, $\frac{x+6}{x} = \frac{55}{44} = \frac{5}{4}$

or $5x = 4x + 24$
or $x = 24$

Aliter : Using Rule 23,
Here, D = 55. a = 6, d = 11

No of people initially $= \frac{a(D-d)}{d}$

$= \frac{6(55-11)}{11}$ = 24

9. (3) Work done by 2 (A + B) in one day

$= \frac{1}{10} + \frac{1}{15} = \frac{3+2}{30} = \frac{5}{30} = \frac{1}{6}$

∴ Work done by (A + B) in one day $= \frac{1}{12}$

∴ (A + B) can complete the work in 12 days

10. (3) Let A worked for *x* days.
According to question

$\frac{x}{28} + \frac{(x+17)}{35} = 1$

$\Rightarrow \frac{5x + 4(x+17)}{140} = 1$

⇒ 5x + 4x + 68 = 140
⇒ 9x = 140 – 68 = 72
⇒ x = 8
∴ A worked for 8 days

11. (3) Work done by (A + B) in 1 day

$= \frac{1}{15} + \frac{1}{10} = \frac{2+3}{30} = \frac{5}{30} = \frac{1}{6}$

$\therefore$ (A + B)'s 2 days' work = $\frac{2}{6} = \frac{1}{3}$

Remaining work

$= 1 - \frac{1}{3} = \frac{2}{3}$

This part is done by A alone.

$\because$ one work is done by A in 15 days.

$\therefore$ $\frac{2}{3}$ work is done in $15 \times \frac{2}{3}$

= 10 days.

$\therefore$ Total number of days

= 10 + 2 = 12 days

Aliter : Using Rule 20,

Here, m = 15, n = 10, p =2

A alone completed the work in

$= \frac{mn - p(m+n)}{n}$ days

$= \frac{15 \times 10 - 2(15+10)}{10}$

$= \frac{150-50}{10}$ = 10 days

Total time taken= 10 + 2 = 12 days

12. (1) A's 1 day's work = $\frac{1}{20}$

A's 4 days' work = $\frac{4}{20} = \frac{1}{5}$

Remaining work = $1 - \frac{1}{5} = \frac{4}{5}$

This part is completed by A and B together.

Now, (A + B)'s 1 day's work

$= \frac{1}{20} + \frac{1}{12}$

$= \frac{3+5}{60} = \frac{8}{60} = \frac{2}{15}$

Now, $\frac{2}{15}$ work is done by (A + B) in 1 day.

$\therefore$ $\frac{4}{5}$ work is done in

$= \frac{15}{2} \times \frac{4}{5}$ = 6 days.

Hence, the work lasted for 4 + 6 = 10 days.

13. (2) (A + B)'s 1 day's work

$= \left(\frac{1}{45} + \frac{1}{40}\right) = \frac{8+9}{360} = \frac{17}{360}$

Work done by B in 23 days

$= \frac{1}{40} \times 23 = \frac{23}{40}$

Remaining work = $1 - \frac{23}{40} = \frac{17}{40}$

Now, $\frac{17}{360}$ work was done by (A + B) in 1 day

$\therefore$ $\frac{17}{40}$ work was done by (A + B) in $1 \times \frac{360}{17} \times \frac{17}{40}$ = 9 days.

Hence, A left after 9 days.

Aliter : Using Rule 26,

Here, x = 45, y = 40, a = 23

$\Rightarrow$ Required time t= $\frac{(y-a)}{(x+y)} \times x$

$t = \frac{(40-23) \times 45}{45+40}$

$= \frac{17 \times 45}{85}$

t = 9 days

14. (1) Suppose a man can complete the work in x days and that boys in y days.

According to question

$\frac{24}{x} + \frac{24}{y} = 1$ ...(i) × 13

$\frac{26}{x} + \frac{20}{y} = 1$ ... (ii) × 12

$\frac{312}{x} + \frac{312}{y} = 13$

$\frac{312}{x} + \frac{240}{y} = 12$

$- \quad - \quad -$

$\Rightarrow \frac{72}{y} = 1 \Rightarrow y = 72$ days

$\therefore$ Boys alone can complete the work in 72 days

Aliter : Using Rule 9,

Here, a = 24, b = 24 – 6 = 18

d = 26 days

Total time taken by B alone to complete the work

$= \frac{bd}{a-b} - 6$

($\because$ man has work d or 6 days)

$= \frac{18 \times 26}{24-18} - 6$

= 78 – 6 = 72 days

15. (3) Time taken by A

$= \frac{8 \times 12}{128} = \frac{8 \times 12}{4} = 24$ days

Work done of by B $= \frac{4}{12} = \frac{1}{3}$

Remaining work

$= 1 - \frac{1}{3} = \frac{2}{3}$

$\because$ A can complete a work in 24 days

$\therefore$ A can complete $\frac{2}{3}$ part of work in $24 \times \frac{2}{3}$ = 16 days

16. (1) A's 1 day's work $= \frac{1}{12}$

B's 1 day's work $= \frac{1}{18}$

Part of work done by A and B in first two days

$= \frac{1}{12} + \frac{1}{18} = \frac{3+2}{36} = \frac{5}{36}$

Part of work done by A and B in 14 days $= \frac{35}{36}$

[14 days to be taken randomly]

Remaining work $= 1 - \frac{35}{36} = \frac{1}{36}$

Now A will work for 15th day.

A will do the $\frac{1}{36}$ work in $\frac{1}{36} \times 12$

$= \frac{1}{3}$ day.

$\therefore$ Total Work will be done in $14\frac{1}{3}$ days.

17. (3) Let the work be completed in x days.

According to the question,

$\frac{x-5}{10} + \frac{x-3}{12} + \frac{x}{15} = 1$

$\Rightarrow \frac{6x - 30 + 5x - 15 + 4x}{60} = 1$

$\Rightarrow 15x - 45 = 60$

$\Rightarrow 15x = 105 \Rightarrow x = \frac{105}{15} = 7$

Hence, the work will be completed in 7 days.

18. (4) Work done by (A + C) in 2 days

$= 2\left(\frac{1}{10} + \frac{1}{20}\right)$

$= 2\left(\frac{2+1}{20}\right) = \frac{6}{20} = \frac{3}{10}$

Remaining work $= 1 - \frac{3}{10} = \frac{7}{10}$

(B + C)'s 1 day's work

$= \frac{1}{15} + \frac{1}{20} = \frac{4+3}{60} = \frac{7}{60}$

$\therefore$ Time taken by (B + C) to finish $\frac{7}{10}$ part of the work

$= \frac{60}{7} \times \frac{7}{10} = 6$ days

$\therefore$ Total time = 2 + 6 = 8 days

19. (1) For the first 10 days 40 men worked.

Now, 40 men can complete the work in 40 days

$\therefore$ 1 man will complete the same work in 1600 days

$\therefore$ 1 man's 1 day's work $= \frac{1}{1600}$

$\therefore$ Part of work done in first 10 days $= \frac{1}{4}$

For the next 10 days 35 men worked.

Part of the work done

$= \frac{1 \times 35 \times 10}{1600} = \frac{7}{32}$

For the next 10 days, 30 men worked

Part of the work done

$= \frac{30 \times 10}{1600} = \frac{3}{16}$

For the next 10 days, 25 men worked. Part of the workdone

$= \frac{25 \times 10}{1600} = \frac{5}{32}$

Similarly, part of the work done by 20 men in next 10 days

$= \frac{20 \times 10}{1600} = \frac{1}{8}$

Work done in 50 days

$= \frac{1}{4} + \frac{7}{32} + \frac{3}{16} + \frac{5}{32} + \frac{1}{8}$

$= \frac{8+7+6+5+4}{32} = \frac{30}{32} = \frac{15}{16}$

$\therefore$ Remaining work

$= 1 - \frac{15}{16} = \frac{1}{16}$

Now 15 men remain to work

15 men's 1 day's work$= \frac{15}{1600}$

$\therefore$ Time taken to complete $\frac{1}{16}$ part of work

$= \frac{1600}{15} \times \frac{1}{16} = \frac{20}{3} = 6\frac{2}{3}$ days

$\therefore$ Total time $= 50 + 6\frac{2}{3}$

$= 56\frac{2}{3}$ days

20. (4) Let the work be finished in x days.

According to the question,

A worked for x days while B worked for $(x - 3)$ days

$\therefore \frac{x}{18} + \frac{x-3}{12} = 1$

$\Rightarrow \frac{2x + 3x - 9}{36} = 1$

$\Rightarrow 5x - 9 = 36$

$\Rightarrow 5x = 45$

$\Rightarrow x = \frac{45}{5} = 9$

Hence, the work was completed in 9 days.

Aliter : Using Rule 8,

Here, x = 18, y = 12, m = 3

Total time taken $= \left(\frac{y+m}{x+y}\right)x$

$= \left(\frac{12+3}{18+12}\right) \times 18 = 9$ days

21. (1) Let A and B worked together for x days

According to the question,

Part of work done by A for $(x + 10)$ days + part of work done by B for x days = 1

$\Rightarrow \frac{x+10}{20} + \frac{x}{30} = 1$

$\Rightarrow \frac{3x + 30 + 2x}{60} = 1$

$\Rightarrow 5x + 30 = 60$

$\Rightarrow 5x = 30$

$\Rightarrow x = \frac{30}{5} = 6$ days

Aliter : Using Rule 20,

Here, m =20, n= 30, p = x and time taken by A alone = 10

$\Rightarrow 10 = \frac{mn - p(m+n)}{n}$

$10 = \frac{30 \times 20 - x(30+20)}{30}$

300 = 600 – x 50

50x = 300 x = 6

$\Rightarrow$ B worked for 6 days

22. (2) Let the work be completed in x days.

According to the question,

A worked for $(x-3)$ days, while B worked for x days.

$\therefore \frac{x-3}{9} + \frac{x}{18} = 1$

$\Rightarrow \frac{2x - 6 + x}{18} = 1 \Rightarrow 3x - 6 = 18$

$\Rightarrow 3x = 18 + 6 = 24$

$\because x = \frac{24}{3} = 8$ days

Aliter : Using Rule 8,

Here, x = 9, y = 18, m = 3

Total time taken

$= \frac{(x+m)y}{x+y}$

$= \frac{(9+3) \times 18}{9+18}$

$= \frac{12 \times 18}{27} = 8$ days

23. (3) (B + C)'s 2 days' work

$= 2\left(\frac{1}{20} + \frac{1}{30}\right) = 2\left(\frac{3+2}{60}\right)$

$= \frac{1}{6}$ part

Remaining work

$= 1 - \frac{1}{6} = \frac{5}{6}$ part

$\therefore$ Time taken by A to complete this part of work

$= \frac{5}{6} \times 18 = 15$ days

24. (3) Part of work done by B in 10 days $= 10 \times \frac{1}{15} = \frac{2}{3}$

Remaining work $= 1 - \frac{2}{3} = \frac{1}{3}$

$\therefore$ Time taken by A $= \frac{1}{3} \times 18$

$= 6$ days

25. (3) Part of work done by A and B in first two days

$= \frac{1}{9} + \frac{1}{12} = \frac{4+3}{36} = \frac{7}{36}$

Part of work done in first 10 days

$= \frac{35}{36}$

Remaining work $= 1 - \frac{35}{36} = \frac{1}{36}$

Now it is the turn of A.

$\therefore$ Time taken by A

$= \frac{1}{36} \times 9 = \frac{1}{4}$ day

$\therefore$ Total time $= 10 + \frac{1}{4} = 10\frac{1}{4}$ days

26. (4) B's 1 day's work

$= \frac{1}{12} - \frac{1}{20} = \frac{5-3}{60} = \frac{1}{30}$

$\therefore$ B's $\frac{1}{2}$ day's work $= \frac{1}{60}$

$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{20} + \frac{1}{60} = \frac{3+1}{60} = \frac{1}{15}$

[$\because$ B works for half day daily]

Hence, the work will be completed in 15 days.

27. (3) Part of the work done by A and B in 4 days

$= 4\left(\frac{1}{12} + \frac{1}{15}\right) = 4\left(\frac{5+4}{60}\right)$

$= 4 \times \frac{9}{60} = \frac{3}{5}$

Remaining work $= 1 - \frac{3}{5} = \frac{2}{5}$

$\therefore$ Time taken by B to complete the remaining work

$= \frac{2}{5} \times 15 = 6$ days

Aliter : Using Rule 20,

Here, m = 12, n = 15, p = 4

B alone do the works in

$= \frac{mn - p(m+n)}{m}$

$= \frac{12 \times 15 - 4(12+15)}{12}$

$= \frac{180 - 108}{12} = \frac{72}{12} = 6$ days

28. (1) Part of the work done by X in 8 days.

$= \frac{8}{40} = \frac{1}{5}$

$\left[\because \text{work done in 1 day} = \frac{1}{40}\right]$

$\therefore$ Remaining work $= 1 - \frac{1}{5} = \frac{4}{5}$

This part of work is done by Y in 16 days.

$\therefore$ Time taken by Y in doing 1 work

$= \frac{16 \times 5}{4} = 20$ days

$\therefore$ Work done by X and Y in 1 day

$= \frac{1}{40} + \frac{1}{20} = \frac{1+2}{40} = \frac{3}{40}$

$\therefore$ Hence, both together will complete the work in $\frac{40}{3}$

i.e. $13\frac{1}{3}$ days.

29. (1) Work done in first two days

$= \frac{2}{30} + \frac{1}{20} + \frac{1}{10} = \frac{1}{15} + \frac{1}{20} + \frac{1}{10}$

$= \frac{4+3+6}{60} = \frac{13}{60}$

Work done in first 8 days $= \frac{52}{60}$

Remaining work

$= 1 - \frac{52}{60} = \frac{8}{60} = \frac{2}{15}$

(A + B)'s 1 day's work

$= \frac{1}{30} + \frac{1}{20} = \frac{2+3}{60} = \frac{1}{12}$

$\therefore$ Remaining work $= \frac{2}{15} - \frac{1}{12}$

$= \frac{8-5}{60} = \frac{3}{60} = \frac{1}{20}$

(A + C)'s 1 day's work

$= \frac{1}{30} + \frac{1}{10} = \frac{1+3}{30} = \frac{2}{15}$

$\therefore$ Time taken $= \frac{1}{20} \times \frac{15}{2}$

$= \frac{3}{8}$ day

Total time $= 9 + \frac{3}{8} = 9\frac{3}{8}$ days

30. (1) Work done by B in 9 days

$= \frac{9}{12} = \frac{3}{4}$ part

Remaining work

$= 1 - \frac{3}{4} = \frac{1}{4}$ which is done by A

$\therefore$ Time taken by A $= \frac{1}{4} \times 20$

$= 5$ days

31. (2) Work done by A in 6 days

$= \frac{6}{8} = \frac{3}{4}$ part

Work destroyed by B in 2 days

$= \frac{2}{3}$ part

Remaining work after destruction

$= \frac{3}{4} - \frac{2}{3} = \frac{9-8}{12} = \frac{1}{12}$

Now, time taken by A in doing $\frac{11}{12}$ parts

$= \frac{11}{12} \times 8 = \frac{22}{3} = 7\frac{1}{3}$ days

32. (1) Work done by B in 10 days

$= \frac{10}{15} = \frac{2}{3}$

Remaining work $= 1 - \frac{2}{3} = \frac{1}{3}$

$\therefore$ Time taken by A to complete the work $= \frac{1}{3} \times 18 = 6$ days

33. (1) Let the work done by each one of A, B and C per day be x, y, and z respectively.

$\therefore x + y = \frac{1}{12}$

$\Rightarrow x = \frac{1}{12} - y$ .....(i)

$y + z = \frac{1}{16} \Rightarrow z = \frac{1}{16} - y$ ...(ii)

Again, $5x + 7y + 13z = 1$

$\Rightarrow 5\left(\frac{1}{12} - y\right) + 7y + 13\left(\frac{1}{16} - y\right) = 1$

$\Rightarrow \frac{5}{12} - 5y + 7y + \frac{13}{16} - 13y = 1$

$\Rightarrow 11y = \frac{5}{12} + \frac{13}{16} - 1$

$= \frac{20 + 39 - 48}{48} = \frac{11}{48}$

$\Rightarrow y = \frac{1}{48}$

$\therefore$ B alone will complete the work in 48 days.

34. (3) (A + B + C)'s 1 day's work

$= \frac{1}{20} + \frac{1}{30} + \frac{1}{60} = \frac{3+2+1}{60}$

$= \frac{1}{10}$

A's 2 days' work $= \frac{2}{20} = \frac{1}{10}$

Work done in first three days

$= \frac{1}{10} + \frac{1}{10} = \frac{2}{10} = \frac{1}{5}$

[A's work for 2 days + (A + B + C) work on 3rd day]

Hence, the work will be finished in 15 days.

35. (3) (A + B)'s 2 days' work $= \frac{2}{3}$

Remaining work $= 1 - \frac{2}{3} = \frac{1}{3}$

Time taken by A in doing $\frac{1}{3}$ work

= 2 days

$\therefore$ Time taken by A in completing the work = 6 days

$\therefore$ B's 1 day's work $= \frac{1}{3} - \frac{1}{6}$

$= \frac{2-1}{6} = \frac{1}{6}$

$\therefore$ B alone will complete the work in 6 days.

36. (3) Work done by A and B in 7 days

$= \frac{7}{20} + \frac{7}{30} = \frac{21+14}{60} = \frac{35}{60} = \frac{7}{12}$

So, Remaining work

$= 1 - \frac{7}{12} = \frac{5}{12}$

$\therefore$ Time taken by C

$= \frac{12}{5} \times 10 = 24$ days

37. (3) 45 men's 4 days' work $= \frac{1}{4}$

Remaining work

$= 1 - \frac{1}{4} = \frac{3}{4}$

$\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{45 \times 16}{1} = \frac{81 \times D_2}{\frac{3}{4}}$

$\Rightarrow D_2 = \frac{45 \times 16}{27 \times 4} = 6\frac{2}{3}$ days

Aliter : Using Rule 10,

Here, A = 45, a = 16

b = 4, B = 36

Required days

$= \frac{A(a-b)}{(A+B)}$ days

$= \frac{45(16-4)}{(45+36)}$

$= \frac{45 \times 12}{81} = \frac{5 \times 12}{9}$

$= \frac{20}{3} = 6\frac{2}{3}$ days

38. (4) Work done by A and B in first 6 days

= (A + B)'s 4 days' work + B's 2 days' work

$= 4 \times \frac{1}{8} + \frac{2}{12}$

$= \frac{1}{2} + \frac{1}{6} = \frac{3+1}{6} = \frac{4}{6} = \frac{2}{3}$

Remaining work

$= 1 - \frac{2}{3} = \frac{1}{3}$

$\therefore$ Time taken by C

$= \frac{1}{3} \times 12 = 4$ days

39. (1) (A + B) together do the work in 30 days.

$\therefore$ (A + B)'s 1 day's work $= \frac{1}{30}$

$\therefore$ (A + B)'s 20 days' work

$= \frac{20}{30} = \frac{2}{3}$

Remaining work $= 1 - \frac{2}{3} = \frac{1}{3}$

$\because$ Time taken by A in doing $\frac{1}{3}$ work = 20 days

$\therefore$ Time taken in doing 1 work

= 20 × 3 = 60 days.

Aliter : Using Rule 9,

Here, a = 30, b = 20, d = 20

A alone can finish the work in

$= \frac{ad}{a-b}$ days

$= \frac{30 \times 20}{30 - 20} = 60$ days

40. (3) Remaining work

$= 1 - \frac{1}{8} = \frac{7}{8}$

(A + B)'s 1 day's work

$= \frac{1}{6} + \frac{1}{12} = \frac{2+1}{12} = \frac{3}{12} = \frac{1}{4}$

$\therefore$ Time taken in doing $\frac{7}{8}$ part of work $= \frac{7}{8} \times 4 = \frac{7}{2}$

$= 3\frac{1}{2}$ days

41. (2) Work done by 12 men in 8 days ≡ Work done by 16 women in 12 days.

$\Rightarrow$ 12 × 8 men ≡ 16 × 12 women

$\Rightarrow$ 1 man ≡ 2 women

Now, work done by 12 men in 1 day $= \frac{1}{8}$

1 man's 1 day's work

$= \frac{1}{12 \times 8} = \frac{1}{96}$

$\therefore$ 16 men's 3 day's work

$= \frac{16 \times 3}{96} = \frac{1}{2}$

Remaining work $= 1 - \frac{1}{2} = \frac{1}{2}$

Now, $\frac{1}{2}$ work is done by 6 men and 4 women.

$\therefore$ 6 men + 4 women

= (6 + 2) men = 8 men

$\therefore \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{12 \times 8}{1} = \frac{8 \times D_2}{\frac{1}{2}}$

$\Rightarrow D_2 = \frac{12 \times 8}{2 \times 8} = 6$ days

42. (2) 40 men complete the work in 18 days.

$\therefore$ Their 1 day's work $= \frac{1}{18}$

$\therefore$ Their 8 days' work $= \frac{8}{18} = \frac{4}{9}$

Remaining work $= 1 - \frac{4}{9} = \frac{5}{9}$

New number of men = 40 + 10 = 50

$\therefore \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{40 \times 18}{1} = \frac{50 \times D_2}{\frac{5}{9}}$

$\Rightarrow 40 \times 18 = 90 \times D_2$

$\Rightarrow D_2 = \frac{40 \times 18}{90} = 8$ days

Aliter : Using Rule 10,

Here, A = 40, a = 18

b = 8, B = 10

Required Days $= \frac{A(a-b)}{A+B}$

$= \frac{40(18-8)}{40+10}$

$= \frac{40 \times 10}{50}$

= 8 days

43. (1) $\because$ 12 men $\equiv$ 24 boys

$\therefore$ 1 man $\equiv$ 2 boys

$\therefore$ 15 men + 6 boys

= 30 boys + 6 boys = 36 boys

$\therefore M_1D_1 = M_2D_2$

$\Rightarrow 24 \times 66 = 36 \times D_2$

$\Rightarrow D_2 = \frac{24 \times 66}{36} = 44$ days

Aliter : Using Rule 12,

Here, A = 12, B = 24

a = 66, A_1 = 15, B_1 = 6

$\therefore$ Time taken $= \frac{a(A \times B)}{A_1B + B_1A}$

$= \frac{66(12 \times 24)}{15 \times 24 + 6 \times 12}$

$= \frac{66 \times 288}{360 + 72}$

$= \frac{66 \times 288}{432}$

= 44 days

44. (3) A, B and C together complete the work in 40 days.

$\therefore$ (A + B + C)'s 1 day's work

$= \frac{1}{40}$

$\therefore$ (A + B + C)'s 16 days work

$= \frac{16}{40} = \frac{2}{5}$

Remaining work $= 1 - \frac{2}{5} = \frac{3}{5}$

This part of work is done by B and C in 40 days.

$\therefore$ Time taken in doing $\frac{3}{5}$ work

= 40 days.

$\therefore$ Time taken in doing in 1 work

$= \frac{40 \times 5}{3} = \frac{200}{3}$ days

$\therefore$ A's day's work = (A + B + C)'s 1 day's work – (B + C)'s 1 day's work

$= \frac{1}{40} - \frac{3}{200} = \frac{5-3}{200} = \frac{2}{200}$

$= \frac{1}{100}$

$\therefore$ Required time = 100 days.

45. (2) Number of men originally = x (let)

$\therefore M_1 D_1 = M_2 D_2$

$\Rightarrow x \times 60 = (x + 8) \times 50$

$\Rightarrow 6x = 5x + 40$

$\Rightarrow 6x - 5x = 40$

$\Rightarrow x = 40$ men

Aliter : Using Rule 23,

Here, D= 60, a = 8, d =10

$\therefore$ Required number $= \frac{a(D-d)}{d}$

$= \frac{8(60-10)}{10} = 40$

46. (4) Using Rule 1,

Number of men originally = x (let)

$\therefore M_1D_1 = M_2D_2$

$\Rightarrow x \times 18 = (x - 6) \times 20$

$\Rightarrow x \times 9 = (x - 6) \times 10$

$= 10x - 60$

$\Rightarrow 10x - 9x = 60$

$\Rightarrow x = 60$ men

47. (4) Original number of men = x (let)

$\therefore M_1D_1 = M_2D_2$

$\Rightarrow x \times 40 = (x + 45) \times 25$

$\Rightarrow 8x = (x + 45) \times 5$

$\Rightarrow 8x = 5x + 225$

$\Rightarrow 8x - 5x = 225$

$\Rightarrow 3x = 225$

$\Rightarrow x = \frac{225}{3} = 75$ men

Aliter : Using Rule 23,

Here, D = 40, a = 45,

d = (40 – 25) = 15

$\therefore$ Required number $= \frac{a(D-d)}{d}$

$= \frac{45(40-15)}{15}$

$= \frac{45 \times 25}{15}$

$= 15 \times 5 = 75$

48. (2) Let A left the work after x days.

According to the question,

Work done by A in x days + work done by B in $(23 + x)$ days = 1

$\Rightarrow \frac{x}{45} + \frac{23 + x}{40} = 1$

$\Rightarrow \frac{8x+207+9x}{360} = 1$

$\Rightarrow 17x + 207 = 360$

$\Rightarrow 17x = 360 - 207 = 153$

$\Rightarrow x = \frac{153}{17} = 9$ days

Aliter : Using Rule 26,
Here, x = 45, y = 40, a = 23

A left after $= \frac{(y-a)}{x+y} \times x$

$= \frac{(40-23)}{45+40} \times 45$

$= \frac{17 \times 45}{85} = 9$ days

49. (2) Work done by 20 men in 3 days

$= \frac{3}{18} = \frac{1}{6}$ part

Remaining work

$= 1 - \frac{1}{6} = \frac{5}{6}$ part

$\therefore \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{20 \times 18}{1} = \frac{25 \times D_2}{\frac{5}{6}}$

$\Rightarrow 6 \times 25 \times D_2 = 5 \times 20 \times 18$

$\Rightarrow D_2 = \frac{5 \times 20 \times 18}{6 \times 25} = 12$ days

Aliter : Using Rule 10,
Here, A = 20, a = 18
b = 3. B = 5
Required number of days

$= \frac{A(a-b)}{A+B} = \frac{20(18-3)}{20+5}$

$= \frac{20 \times 15}{25} = 12$ days

50. (4) Let the work be completed in x days.
According to the question,
C worked for $(x - 4)$ days.

$\therefore \frac{x}{24} + \frac{x}{30} + \frac{x-4}{40} = 1$

$\Rightarrow \frac{5x + 4x + 3(x-4)}{120} = 1$

$\Rightarrow \frac{12x - 12}{120} = 1$

$\Rightarrow \frac{12(x-1)}{120} = 1$

$\Rightarrow \frac{x-1}{10} = 1 \Rightarrow x - 1 = 10$

$\Rightarrow x = 10 + 1 = 11$ days

51. (2) Work done by Raja and Ramesh in 1 day

$= \frac{1}{20} + \frac{1}{25} = \frac{5+4}{100} = \frac{9}{100}$

Work done by Ramesh in 10 days

$= \frac{10}{25} = \frac{2}{5}$

Remaining work $= 1 - \frac{2}{5} = \frac{3}{5}$

$\therefore$ This part is done by Raja and Ramesh.

$\therefore$ Time taken

$= \frac{3}{5} \times \frac{100}{9} = \frac{20}{3} = 6\frac{2}{3}$ days

$\therefore$ Required time

$= 10 + 6\frac{2}{3} = 16\frac{2}{3}$ days

52. (2) Number of men initially $= x$ (let)

$\therefore M_1D_1 = M_2D_2$

$\Rightarrow x \times 40 = (x + 8) \times 30$

$\Rightarrow 4x = 3x + 24$

$\Rightarrow 4x - 3x = 24$

$\Rightarrow x = 24$ men

Aliter : Using Rule 23,
Here, D = 40, a = 8, d = 10
Required number

$= \frac{a(D-d)}{d}$ men

$= \frac{8(40-10)}{10} = 24$ men

53. (3) Let Y alone complete the work in x days.
According to the question,
X's 16 days' work + Y's 12 days' work = 1

$\Rightarrow \frac{16}{24} + \frac{12}{x} = 1$

$\Rightarrow \frac{2}{3} + \frac{12}{x} = 1$

$\Rightarrow \frac{12}{x} = 1 - \frac{2}{3} = \frac{1}{3}$

$\Rightarrow x = 12 \times 3 = 36$ days

54. (3) Work done in 30 days $= W_2$

$\therefore \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{12 \times 90}{1} = \frac{12 \times 30}{W_2}$

$\Rightarrow W_2 = \frac{12 \times 30}{12 \times 90} = \frac{1}{3}$

Remaining work $= 1 - \frac{1}{3} = \frac{2}{3}$

New number of men = 18

$\therefore \frac{M_1D_1}{1} = \frac{M_2D_2}{W}$

$\Rightarrow \frac{12 \times 90}{1} = \frac{18 \times D_2}{\frac{2}{3}}$

$\Rightarrow 18 \times D_2 = 12 \times 90 \times \frac{2}{3}$

$= 12 \times 60$

$\Rightarrow D_2 = \frac{12 \times 60}{18} = 40$ days

55. (2) Work done by A and B in 5 days

$= 5\left(\frac{1}{10} + \frac{1}{15}\right) = 5\left(\frac{3+2}{30}\right)$

$= 5 \times \frac{5}{30} = \frac{5}{6}$

Remaining work $= 1 - \frac{5}{6} = \frac{1}{6}$

$\therefore$ Time taken by A

$= \frac{1}{6} \times 10 = \frac{5}{3}$ days $= 1\frac{2}{3}$ days

56. (4) (A + B)'s 1 day's work $= \frac{1}{30}$

$\therefore$ (A + B)'s 20 days' work

$= \frac{20}{30} = \frac{2}{3}$

Remaining work $= 1 - \frac{2}{3} = \frac{1}{3}$

Time taken by A in doing $\frac{1}{3}$ of work = 20 days

$\therefore$ Time taken by A in doing whole work = 3 × 20 = 60 days

57. (4) Nuts cut by Ram and Hari in 1 day = $\frac{12}{2}$ kg. = 6 kg. ....(i)
Nuts cut by them in 5 days = 30 kg.
Amount of nuts cut by Ram alone = 58 – 30 = 28 kg.
Time = 8 days
∴ Nuts cut by Ram in 1 day
$= \frac{28}{8} = 3.5$ kg.
∴ From equation (i),
Nuts cut by Hari in 1 day = (6 – 3.5) kg. = 2.5 kg.
∴ Time taken by Hari in cutting 10 kg. of nuts
$= \frac{10}{2.5} = 4$ days

58. (4) Ramesh's 1 day's work = $\frac{1}{20}$
Rahman's 1 day's work = $\frac{1}{25}$
∴ (Ramesh + Rahman)'s 1 days' work = $\frac{1}{20} + \frac{1}{25}$
$= \frac{5+4}{100} = \frac{9}{100}$
∴ Their 10 day's work
$= \frac{90}{100} = \frac{9}{10}$
∴ Remaining work
$= 1 - \frac{9}{10} = \frac{1}{10}$
∵ Suresh does $\frac{1}{10}$ work in 3 days.
∴ Time taken by Suresh in doing 1 work = 3 × 10 = 30 days

59. (3) Let C alone complete the work in x days.
According to the question,
A's 7 days' work + B's 3 days' work + C's 2 days' work = 1
$\Rightarrow \frac{7}{10} + \frac{3}{12} + \frac{2}{x} = 1$
$\Rightarrow \frac{2}{x} = 1 - \frac{7}{10} - \frac{1}{4}$
$= \frac{20-14-5}{20} = \frac{1}{20}$
$\Rightarrow x = 2 \times 20 = 40$ days

60. (2) Let the number of working men be x.
∴ $M_1D_1 = M_2D_2$
$\Rightarrow x \times 60 = (x + 6) \times 40$
$\Rightarrow 3x = 2x + 12$
$\Rightarrow 3x - 2x = 12$
$\Rightarrow x = 12$

61. (4) A's 1 day's work = $\frac{1}{20}$
B's 1 day's work = $\frac{1}{15}$
(A + B + C)'s 1 day's work = $\frac{1}{5}$
∴ C's 1 day's work
$= \frac{1}{5} - \frac{1}{20} - \frac{1}{15}$
$= \frac{12-3-4}{60} = \frac{5}{60} = \frac{1}{12}$
∴ Required time = 12 days

62. (3) Let 5 men leave the work after x days.
∵ $M_1D_1 = M_2D_2 + M_3D_3$
∴ $15 \times 40 = 15 \times x + 10 \times (45 - x)$
$\Rightarrow 600 = 15x + 450 - 10x$
$\Rightarrow 600 - 450 = 5x$
$\Rightarrow 5x = 150$
$\Rightarrow x = \frac{150}{5} = 30$ days

63. (1) ∵ (A + B)'s 1 day's work
$= \frac{1}{12}$
∴ (A + B)'s 5 days' work = $\frac{5}{12}$
Remaining work = $1 - \frac{5}{12} = \frac{7}{12}$
∵ A does $\frac{7}{12}$ work in 14 days
∴ A will do 1 work in
$= \frac{14 \times 12}{7} = 24$ days

TYPE-III

1. (2) According to question,
(6M + 8B) × 10 = (26M + 48B) × 2
∴ 60M + 80B = 52M + 96B
or, 1M = 2B
∴ 15M + 20B = (30 + 20)B
= 50 boys and 6M + 8B
= (12 + 8) boys = 20 boys
∵ 20 boys can finish the work in 10 days
∴ 50 boys can finish the work in
$\frac{20 \times 10}{50}$ days
= 4 days
Aliter : Using Rule 11,
$A_1 = 6, B_1 = 8, D_1 = 10$
$A_2 = 26, B_2 = 48, D_2 = 2$
$A_3 = 15, B_3 = 20$
Required time
$= \frac{D_1D_2(A_1B_2 - B_1A_2)}{D_1(A_1B_3 - A_3B_1) - D_2(A_2B_3 - A_3B_2)}$ day
$= \frac{10 \times 2(6 \times 48 - 8 \times 26)}{10(6 \times 20 - 15 \times 8) - 2(26 \times 20 - 15 \times 48)}$ days
$= \frac{20(288 - 208)}{10(120 - 120) - 2(520 - 720)}$
$= \frac{20 \times 80}{400} = 4$ days

2. (2) 5 × 6 men = 10 × 5 women
⇒ 3 men = 5 women
∴ 5 women + 3 men = 6 men
∵ 5 men complete the work in 6 days
∴ 6 men will complete the work in
$\frac{5 \times 6}{6} = 5$ days
Aliter : Using Rule 14,
Here, A = 5, a = 6
B = 10, b = 5
$A_1 = 3, B_1 = 5$
Time taken = $\frac{1}{\frac{A_1}{A \times a} + \frac{B_1}{B \times b}}$
$= \frac{1}{\frac{3}{5 \times 6} + \frac{5}{10 \times 5}}$
$= \frac{1}{\frac{1}{10} + \frac{1}{10}} = 5$ days

3. (3) 3m = 6w
∴ 1m = 2w
12m + 8w = (12 × 2w) + 8w
= 32w
∴ 6 women can do the work in 16 days.
∴ 32 women can do the work in
$\frac{16 \times 6}{32} = 3$ days
Aliter : Using Rule 12,
Here, A = 3, B = 6, a = 16
$A_1 = 12, B_1 = 8$
Time taken = $\frac{a(A \times B)}{A_1B + B_1A}$
$= \frac{16(3 \times 6)}{12 \times 6 + 8 \times 3}$
$= \frac{16 \times 18}{96} = 3$ days

4. (4) 1 man's 1 day's work = $\frac{1}{3}$

1 woman's 1 day's work = $\frac{1}{4}$

1 boy's 1 day's work = $\frac{1}{12}$

(1 man + 1 woman)'s $\frac{1}{4}$ day's work = $\frac{1}{4}\left(\frac{1}{3}+\frac{1}{4}\right) = \frac{7}{48}$

Remaining work

$= 1-\frac{7}{48} = \frac{41}{48}$

Now,

1 boy's $\frac{1}{4}$ day's work $= \frac{1}{4}\times\frac{1}{12}$

$= \frac{1}{48}$

$\therefore$ $\frac{41}{48}$ work will be done by

$\frac{41}{48} \times 48 = 41$ boys.

5. (4) 16 men = 20 women

4 men = 5 women.

Now, according to question,

16 men complete the work in 25 days.

$\therefore$ 1 man one day's work

$= \frac{1}{25\times16}$

$\therefore$ 4 men one day's work

$= \frac{4}{25\times16} = \frac{1}{100}$

Similarly,

1 woman one day's work

$= \frac{1}{25\times20}$

$\therefore$ 5 women one day's work

$= \frac{5}{25\times20} = \frac{1}{100}$

$\therefore$ 28 men

$= \frac{28}{4}\times5 = 35$ women

[28 men + 15 women]

$\therefore$ 50 women one day's work

$= \frac{50}{25\times20} = \frac{1}{10}$

Therefore, 28 men and 15 women can complete the whole work in 10 days.

Aliter : Using Rule 12,

A = 16, B = 20, a = 25

A_1 = 28, B_1 = 15

Time taken $= \frac{a(A\times B)}{A_1B+B_1A}$

$= \frac{25(16\times20)}{28\times20+15\times16}$

$= \frac{25\times320}{560+240}$

$= \frac{25\times320}{800}$

= 10 days

6. (3) According to the question

5 men = 8 women

$\therefore$ 2 men $= \frac{8}{5}\times2 = \frac{16}{5}$ women

$\therefore$ Total women $= \frac{16}{5}+4$

$= \frac{36}{5}$ women

$\therefore$ No. of days to do the same work

$= \frac{8\times12}{\frac{36}{5}} = \frac{8\times12\times5}{36}$

$= \frac{40}{3} = 13\frac{1}{3}$ days

Aliter : Using Rule 12,

Here, A = 5, B = 8, a = 12

A_1 = 2 and B_1 = 4

Time taken $= \frac{a(A\times B)}{A_1B+B_1A}$

$= \frac{12(5\times8)}{2\times8+4\times5}$

$= \frac{12\times40}{36}$

$= 33\frac{1}{3}$ days

7. (4) $\because$ 3 men = 4 women

$\therefore$ 1 man = $\frac{4}{3}$ women

$\therefore$ 7 men $= \frac{7\times4}{3} = \frac{28}{3}$ women

$\therefore$ 7 men + 5 women $= \frac{28}{3}+5$

$= \frac{28+15}{3} = \frac{43}{3}$ Women

Now, $M_1D_1 = M_2\ D_2$

$\Rightarrow$ 4 × 43 $= \frac{43}{3}\times D_2$,

where D_2 = number of days

$\Rightarrow D_2 = \frac{4\times3\times43}{43}$ = 12 days.

Aliter : Using Rule 12,

Here, A = 3, B = 4, a = 43

A_1 = 7 and B_1 = 5

Time taken $= \frac{a(A\times B)}{A_1B+B_1A}$

$= \frac{43(3\times4)}{7\times4+5\times3}$

$= \frac{43\times12}{43}$

= 12 days

8. (3) 6 men = 12 women

$\therefore$ 1 man = 2 women

Now, 8 men + 16 women

= (8 × 2 + 16) women

= 32 women

$\because$ 12 women can do a work in 20 days.

$\therefore$ 1 woman can do the work in 20 × 12 days.

$\therefore$ 32 women can do the twice work in

$= \frac{20\times12\times2}{32}$ = 15 days.

Aliter : Using Rule 12,

Here, A = 6, B= 12, a = 20

A_1 = 8, B_1 = 16

Time taken

$= \frac{a(A\times B)}{A_1B+B_1A}$

$= \frac{20(6\times12)}{8\times12+16\times6}$

$= \frac{20\times72}{192} = \frac{15}{2}$

They will do the twice as big work in $2\times\frac{15}{2}$ days = 15 days

9. (1) Work done by 1 woman in 1 day $= \frac{1}{3} - \frac{1}{6} - \frac{1}{18}$

$= \frac{6-3-1}{18} = \frac{1}{9}$

$\therefore$ Woman will do the work in 9 days.

Aliter : Using Rule 18,

Here, x = 3, y = 6 and z = 18

$\therefore$ Required time

$= \frac{xyz}{yz - x(y+z)}$ days

$= \frac{3 \times 6 \times 18}{6 \times 18 - 3(6+18)}$

$= \frac{324}{108 - 3 \times 24}$

$= \frac{324}{108 - 3 \times 24} = \frac{324}{36} = 9$

10. (3) 3 men's work = 5 women's work

1 man's work $= \frac{5}{3}$ women's work

$\therefore$ 6 men's work $= \frac{5}{3} \times 6$

=10 women's work

$\therefore$ 6 men + 5 women

= 15 women

$\therefore$ 5 women can do work in 12 days.

Hence, 15 women can do it in

$\frac{5 \times 12}{15} = 4$ days

Aliter : Using Rule 12,

Here, A = 3, B = 5, a = 12

$A_1 = 6$ and $B_1 = 5$

Required time $= \frac{a(A \times B)}{A_1B + B_1A}$

$= \frac{12(3 \times 5)}{6 \times 5 + 5 \times 3}$

$= \frac{12 \times 15}{45}$

= 4 days

11. (1) 10 men $\equiv$ 20 boys

$\therefore$ 1 man $\equiv$ 2 boys

$\therefore$ 8 men + 4 boys

= (16 + 4) boys = 20 boys

Hence, 8 men and 4 boys will make 260 mats in 20 days.

12. (2) Work done in two days $= \frac{1}{6} \times 2$

$= \frac{1}{3}$, remaining work $= \frac{2}{3}$

$\Rightarrow \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{3 \times 2}{\frac{1}{3}} = \frac{6 \times D_2}{\frac{2}{3}}$

$\Rightarrow D_2 = \frac{3 \times 2 \times 2}{6} = 2$ days

Aliter : Using Rule 10,

Here, A = 3, a = 6

b = 2, B = 3

Required time $= \frac{A(a-b)}{(A+B)}$

$= \frac{3(6-2)}{3+3}$

$= \frac{3 \times 4}{6} = 2$ days

13. (3) Work done by 1 woman in 1 day

$= \frac{1}{8} - \frac{1}{10} = \frac{5-4}{40} = \frac{1}{40}$

$\therefore$ One woman will complete the work in 40 days.

Aliter : Using Rule 4,

Here, x = 10 and y = 8

Woman can do work in

$= \left(\frac{xy}{x-y}\right)$ days

$= \left(\frac{10 \times 8}{10-8}\right) = 40$ days

14. (3) Let 1 man's 1 day's work = x and

1 woman's 1 day's work = y

Then, $4x + 6y = \frac{1}{8}$ and

$3x + 7y = \frac{1}{10}$

From both equations,

we get $y = \frac{1}{400}$

$\therefore$ 10 women's 1 day's work

$= \frac{10}{400} = \frac{1}{40}$

$\therefore$ 10 women will finish the work in 40 days.

Aliter : Using Rule 11,

$A_1 = 4$, $B_1 = 6$, $D_1 = 8$

$A_2 = 3$, $B_2 = 7$, $D_2 = 10$

$A_3 = 0$, $B_3 = 10$

Required time =

$\frac{D_1D_2(A_1B_2 - A_2B_1)}{D_1(A_1B_3 - A_3B_1) - D_2(A_2B_3 - A_3B_2)}$

$= \frac{8 \times 10(4 \times 7 - 3 \times 6)}{8(4 \times 10 - 0 \times 6) - 10(3 \times 10 - 0 \times 7)}$

$= \frac{80 \times 10}{20} = 40$ days

15. (1) Part of work done by 2 men and 2 women in 2 days.

$= 2\left(\frac{2}{20} + \frac{8}{30}\right)$

$= 2\left(\frac{1}{10} + \frac{8}{30}\right) = 2\left(\frac{3+8}{30}\right)$

$= \frac{22}{30} = \frac{11}{15}$

Remaining work $= 1 - \frac{11}{15} = \frac{4}{15}$

Work done by 1 boy in 2 days

$= \frac{2}{60} = \frac{1}{30}$

$\therefore$ Number of boys required to assist $= \frac{4}{15} \times 30 = 8$

Aliter : Using Rule 14,

Here, A = 1, B = 1, C = 1

a = 20, b = 30, c = 60

$A_1 = 2$, $B_1 = 8$,

Required time

$= \frac{1}{\frac{A_1}{A \times a} + \frac{B_1}{B \times b} + \frac{C_1}{C \times c}}$

$2 = \frac{1}{\frac{2}{1 \times 20} + \frac{8}{1 \times 30} + \frac{x}{1 \times 60}}$

$2 = \frac{10}{\frac{2}{2} + \frac{8}{3} + \frac{x}{6}}$

$2 = \frac{10}{\frac{6+16+x}{6}}$

$22 + x = 30$ $\boxed{x = 8}$

$\therefore$ Number of boys = 8

16. (3) 1 man = 2 women ≡ 3 boys
1 man + 1 woman + 1 boy

$= \left(3+\frac{3}{2}+1\right)$ boys $= \frac{11}{2}$ boys

$\therefore M_1D_1 = M_2D_2$

$\Rightarrow 3 \times 88 = \frac{11}{2} \times D_2$

$\Rightarrow D_2 = \frac{2 \times 3 \times 88}{11} = 48$ days

Aliter : Using Rule 13,
Here, A = 1, B= 2, C = 3, a = 88
$A_1 = 1, B_1 = 1, C_1 = 1$

$$\text{Time taken} = \frac{a}{\frac{A_1}{A}+\frac{B_1}{B}+\frac{C_1}{C}}$$

$$= \frac{88}{\frac{1}{1}+\frac{1}{2}+\frac{1}{3}}$$

$$= \frac{88 \times 6}{6+3+2}$$

= 48 days

17. (2) $6m + 8w \equiv 10$ days
$\Rightarrow 2(3m + 4w) \equiv 10$ days
$\Rightarrow 3m + 4w \equiv 20$ days
[Since the workforce has become half of the original force, so number of days must be double].
Aliter : Using Rule 14,
Let us assume efficiency of 6 men = efficiency of 8 men.
A = 6, a = 20
B = 8, b = 20
$A_1 = 3, B_1 = 4$
$\therefore$ Required time

$$= \frac{1}{\frac{A_1}{A \times a}+\frac{B_1}{B \times b}}$$

$$= \frac{1}{\frac{3}{6 \times 20}+\frac{4}{8 \times 20}}$$

$$= \frac{1}{\frac{1}{40}+\frac{1}{40}} = \frac{40}{2} = 20 \text{ days}$$

18. (1) 12 (3 men + 4 boys)
≡ 10 (4 men + 3 boys)
$\Rightarrow$ 36 men + 48 boys
= 40 men + 30 boys
$\Rightarrow$ 4 men = 18 boys
$\Rightarrow$ 2 men = 9 boys
$\therefore$ 4 men + 3 boys
= 21 boys, who do the work in 10 days and
2 men + 3 boys = 12 boys
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 21 \times 10 = 12 \times D_2$

$\Rightarrow D_2 = \frac{21 \times 10}{12} = \frac{35}{2} = 17\frac{1}{2}$ days

Aliter : Using Rule 11,
Here, $A_1 = 3, B_1 = 4, D_1 = 12$
$A_2 = 4, B_2 = 3, D_2 = 10$
$A_3 = 2, B_3 = 3$
Required time =

$$\frac{D_1D_2(A_1B_2 - A_2B_1)}{D_1(A_1B_3 - A_3B_1) - D_2(A_2B_3 - A_3B_2)} \text{ days}$$

$$= \frac{12 \times 10(3 \times 3 - 4 \times 4)}{12(3 \times 3 - 2 \times 4) - 10(4 \times 3 - 2 \times 3)}$$

$$= \frac{120 \times -7}{12(9-8) - 10 \times 6}$$

$$= \frac{-840}{-48} = 17\frac{1}{2} \text{ days}$$

19. (4) 10 men ≡ 20 women
1 man = 2 women = 5 children
1 woman = 2 children
$\therefore$ 5 men + 5 women + 5 children
= 20 + 10 + 5 = 35 children
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 40 \times 7 = 35 \times D_2$

$\Rightarrow D_2 = \frac{40 \times 7}{35} = 8$ months

$\therefore$ 5 men, 5 women and 5 children can do half of the work in 8 months
Required time = 4 months.
Aliter : Using Rule 13,
Here, A = 10, B= 20, C = 40, a = 7
$A_1 = 5, B_1 = 5, C_1 = 5$
Time taken to do same work

$$= \frac{a}{\frac{A_1}{A}+\frac{B_1}{B}+\frac{C_1}{C}}$$

$$= \frac{7}{\frac{5}{10}+\frac{5}{20}+\frac{5}{40}}$$

$$= \frac{7}{\frac{1}{2}+\frac{1}{4}+\frac{1}{8}}$$

$$= \frac{7}{\frac{4+2+1}{8}} = 8 \text{ months}$$

Half of the work they do in 4 months.

20. (1) $\because$ 8 men ≡ 12 boys
$\therefore$ 4 men ≡ 6 boys
$\Rightarrow$ 20 men ≡ 30 boys
$\Rightarrow$ 20 men + 6 boys = 36 boys
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 12 \times 16 = 36 \times D_2$

$\Rightarrow D_2 = \frac{12 \times 16}{36} = \frac{16}{3} = 5\frac{1}{3}$ days

Aliter : Using Rule 12,
Here, A = 8, B = 12, a = 16
$A_1 = 20, B_1 = 6,$
Required number of days

$$= \frac{a}{\frac{A_1}{A}+\frac{B_1}{B}} = \frac{16}{\frac{20}{8}+\frac{6}{12}}$$

$$= \frac{16}{\frac{5}{2}+\frac{1}{2}} = \frac{16 \times 2}{6} = 5\frac{1}{3} \text{ days}$$

21. (3) According to the question,
20 men + 30 boys = 24 men + 16 boys
$\therefore$ 4 men = 14 boys
$\Rightarrow$ 2 men = 7 boys
$\Rightarrow$ 2 men + 1 boy = 8 boys
$\Rightarrow$ 2 men + 3 boys = 10 boys
By $M_1 D_1 = M_2 D_2$
$\Rightarrow 10 \times 10 = 8 \times D_2$

$\Rightarrow D_2 = \frac{10 \times 10}{8} = \frac{25}{2}$

$= 12\frac{1}{2}$ days

Aliter : Using Rule 11,
Here, $A_1 = 2, B_1 = 3, D_1 = 10$
$A_2 = 3, B_2 = 2, D_2 = 8$
$A_3 = 2, B_3 = 1$
Required time =

$$\frac{D_1D_2(A_1B_2 - A_2B_1)}{D_1(A_1B_3 - A_3B_1) - D_2(A_2B_3 - A_3B_2)} \text{ days}$$

$$= \frac{10 \times 8(2 \times 2 - 3 \times 3)}{10(2 \times 1 - 2 \times 3) - 8(3 \times 1 - 2 \times 2)}$$

$$= \frac{80 \times -5}{-40+8} = 12\frac{1}{2} \text{ days}$$

22. (2) 2 × 10 men + 3 × 10 women
= 3 × 8 men + 2 × 8 women
$\Rightarrow$ 20 men + 30 women
= 24 men + 16 women
$\Rightarrow$ 4 men = 14 women
or 2 men = 7 women

$\therefore$ 2 men + 3 women = 10 women
$\therefore$ 2 men + 1 woman = 8 women
$\therefore$ $M_1D_1 = M_2D_2$
$\Rightarrow$ $10 \times 10 = 8 \times D_2$

$\Rightarrow D_2 = \frac{25}{2} = 12\frac{1}{2}$ days

Aliter : 22 (Using Rule 11),
Here, $A_1 = 2, B_1 = 3, D_1 = 10$
$A_2 = 3, B_2 = 2, D_2 = 8$
$A_3 = 2, B_3 = 1$
Required time

$$= \frac{D_1D_2(A_1B_2 - A_2B_1)}{D_1(A_1B_3 - A_3B_1) - D_2(A_2B_3 - A_3B_2)} \text{ days.}$$

$$= \frac{10 \times 8(2 \times 2 - 3 \times 3)}{10(2 \times 1 - 2 \times 3) - 8(3 \times 1 - 2 \times 2)}$$

$$= \frac{80(4-9)}{10(2-6) - 8(3-4)}$$

$$= \frac{-400}{-40+8}$$

$$= \frac{-400}{-32} = \frac{25}{2}$$

$$= 12\frac{1}{2} \text{ days}$$

23. (1) 12 (3 men + 4 boys)
= 10 (4 men + 3 boys)
$\Rightarrow$ 36 men + 48 boys
= 40 men + 30 boys
$\Rightarrow$ 4 men = 18 boys
or 2 men = 9 boys
$\therefore$ 4 men + 3 boys
= 21 boys who do the work in 10 days
and, 2 men + 3 boys = 12 boys
$\therefore$ $M_1D_1 = M_2D_2$
$\Rightarrow$ $21 \times 10 = 12 \times D_2$
$\Rightarrow$ D_2

$$= \frac{21 \times 10}{12} = \frac{35}{2} = 17\frac{1}{2} \text{ days}$$

Aliter : Using Rule 11,
Here, $A_1 = 3, B_1 = 4, D_1 = 12$
$A_2 = 4, B_2 = 3, D_2 = 10$
$A_3 = 2, B_3 = 3$
Required time

$$= \frac{D_1D_2(A_1B_2 - A_2B_1)}{D_1(A_1B_3 - A_3B_1) - D_2(A_2B_3 - A_3B_2)} \text{ days}$$

$$= \frac{12 \times 10(3 \times 3 - 4 \times 4)}{12(3 \times 3 - 2 \times 4) - 10(4 \times 3 - 2 \times 3)}$$

$$= \frac{-120 \times 7}{12 - 60} = \frac{-840}{-48} = \frac{70}{4}$$

$$= \frac{35}{2} = 17\frac{1}{2} \text{ days}$$

24. (2) Using Rule 1,
4 men $\equiv$ 6 women

$$1 \text{ men} \equiv \frac{6}{4} = \frac{3}{2} \text{ women}$$

10 men + 3 women

$$= 10 \times \frac{3}{2} + 3 = 18 \text{ women}$$

$$\therefore \frac{M_1D_1T_1}{W_1} = \frac{M_2D_2T_2}{W_2}$$

$$\Rightarrow \frac{6 \times 12 \times 7}{1} = \frac{18 \times D_2 \times 8}{W_2}$$

$$\Rightarrow D_2 = \frac{6 \times 12 \times 7 \times 2}{18 \times 8} = 7 \text{ days}$$

25. (3) Time taken by boy = x days

$$\therefore \frac{1}{10} + \frac{1}{24} + \frac{1}{x} = \frac{1}{6}$$

$$\Rightarrow \frac{1}{x} = \frac{1}{6} - \frac{1}{10} - \frac{1}{24}$$

$$= \frac{20 - 12 - 5}{120} = \frac{3}{120} = \frac{1}{40}$$

$\Rightarrow x = 40$ days
Aliter : Using Rule 18,
Here , x = 6, y = 10, z = 24
Number of days

$$= \frac{xyz}{yz - x(y+z)} \text{ days}$$

$$= \frac{6 \times 10 \times 24}{10 \times 24 - 6(10+24)}$$

$$= \frac{1440}{240 - 204}$$

$$= \frac{1440}{36} = 40 \text{ days}$$

26. (3) 40 men $\equiv$ 60 women $\equiv$ 80 children

$$\therefore 10 \text{ men} \equiv \frac{80}{40} \times 10$$

= 20 children

$$\therefore 10 \text{ women} \equiv \frac{80}{60} \times 10$$

$$= \frac{40}{3} \text{ children}$$

$\therefore$ 10 men + 10 women + 10 children

$$= \left(20 + \frac{40}{3} + 10\right) \text{ children}$$

$$= \left(\frac{60 + 40 + 30}{3}\right) \text{ children}$$

$$= \frac{130}{3} \text{ children}$$

$$\therefore \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$$

$$D_2 = \frac{80 \times 6 \times 13}{130} = \frac{144}{13} \text{ months}$$

$\therefore$ Half of the work can do

$$= \frac{144}{13} \times \frac{1}{2} = \frac{72}{13} = 5\frac{7}{13} \text{ months}$$

Aliter : Using Rule 13,
Here, A = 40, B= 60, C = 80, a = 6
$A_1 = 10, B_1 = 10, C_1 = 10$

$$\text{Time taken} = \frac{a}{\frac{A_1}{A} + \frac{B_1}{B} + \frac{C_1}{C}}$$

$$= \frac{6}{\frac{10}{40} + \frac{10}{60} + \frac{10}{80}}$$

$$= \frac{6}{\frac{1}{4} + \frac{1}{6} + \frac{1}{8}}$$

$$= \frac{6}{\frac{6+4+3}{24}} = \frac{144}{13}$$

Half of the work they do in

$$= \frac{1}{2} \times \frac{144}{13} \text{ months}$$

$$= \frac{72}{13} = 5\frac{7}{13} \text{ months}$$

27. (1) Using Rule 11,
According to the question,
1 man $\equiv$ 2 women $\equiv$ 4 boys
$\therefore$ 1 man + 1 woman + 1 boy
= (4 + 2 +1) boys = 7 boys
$\therefore$ $M_1 D_1 = M_2 D_2$
$\Rightarrow 7 \times 7 = 1 \times D_2$
$\Rightarrow D_2 = 49$ days

28. (3) 1 man $\equiv$ 2 women $\equiv$ 3 boys
$\therefore$ 1 man + 1 woman + 1 boy

$$= \left(3 + \frac{3}{2} + 1\right) \text{ boys}$$

$$= \left(\frac{6+3+2}{2}\right) \text{ boys}$$

$= \frac{11}{2}$ boys

$\therefore M_1D_1 = M_2D_2$

$\Rightarrow 3 \times 88 = \frac{11}{2} \times D_2$

$\Rightarrow D_2 = \frac{3 \times 2 \times 88}{11} = 48$ days

Aliter : Using Rule 13,
Here, A = 1, B = 2, C = 3, a= 88
$A_1 = 1, B_1 = 1, C_1 = 1$

Required time $= \frac{a}{\frac{A_1}{A}+\frac{B_1}{B}+\frac{C_1}{C}}$

$= \frac{88}{\frac{1}{1}+\frac{1}{2}+\frac{1}{3}}$

$= \frac{88}{\frac{6+3+2}{6}}$

= 48 days

29. (2) $\because$ 3 men $\equiv$ 7 women

$\therefore$ 7 men $\equiv \frac{7 \times 7}{3}$

$= \frac{49}{3}$ women

$\therefore$ 7 men + 5 women

$= \left(\frac{49}{3}+5\right)$ women

$= \left(\frac{49+15}{3}\right)$ women

$= \frac{64}{3}$ women

$\therefore \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{7 \times 32}{1} = \frac{64 \times D_2}{3 \times 2}$

$\Rightarrow D_2 = \frac{7 \times 32 \times 3 \times 2}{64}$

= 21 days

Aliter : Using Rule 12,
Here, A = 3, B = 7, a = 32
$A_1 = 7, B_1 = 5$

Required time $= \frac{a}{\frac{A_1}{A}+\frac{B_1}{B}}$

$= \frac{32}{\frac{7}{3}+\frac{5}{7}}$

$= \frac{32}{64} \times 21 = \frac{21}{2}$

They do the twice work in

$\frac{21}{2} \times 2 = 21$ days

30. (2) 1 man $\equiv$ 2 women $\equiv$ 3 boys

$\therefore$ 1 man + 1 woman + 1 boy

$\equiv$ 3 boys + $\frac{3}{2}$ boys + 1 boy

$\equiv \left(3+\frac{3}{2}+1\right)$ boys $\equiv \frac{11}{2}$ boys

$\therefore$ By $M_1 D_1 = M_2 D_2$,

$3 \times 44 = \frac{11}{2} \times D_2$

$\Rightarrow D_2 = \frac{2 \times 3 \times 44}{11} = 24$ days

Aliter : Using Rule 13,
Here, A = 1, B= 2, C = 3, a = 44
$A_1 = 1, B_1 = 1, C_1 = 1$
Required time

$= \frac{a}{\frac{A_1}{A}+\frac{B_1}{B}+\frac{C_1}{C}}$ days

$= \frac{44}{\frac{1}{1}+\frac{1}{2}+\frac{1}{3}}$

$= \frac{44 \times 6}{11} = 24$ days

31. (3) Using Rule 1,
2 children $\equiv$ 1 man

$\therefore$ 8 children + 12 men $\equiv$ 16 men

$\therefore M_1D_1 = M_2D_2$

$\Rightarrow 16 \times 9 = 12 \times D_2$

$\Rightarrow D_2 = \frac{16 \times 9}{12} = 12$ days.

32. (1) Work done by 12 men + 16 boys in 5 days

$\equiv$ Work done 13 men + 24 boys in 4 days

$\Rightarrow$ (60 men + 80 boys)'s 1 day's work $\equiv$ (52 men + 96 boys)'s 1 day's work

$\Rightarrow$ (60 – 52) men $\equiv$ (96 – 80) boys

$\Rightarrow$ 8 men $\equiv$ 16 boys

$\Rightarrow$ 1 man $\equiv$ 2 boys

$\therefore$ Required ratio = 2 : 1

33. (2) 20 women complete 1 work in 16 days.
16 men complete same work in 15 days

$\therefore$ 16 × 15 men $\equiv$ 20 × 16 women

$\Rightarrow$ 3 men $\equiv$ 4 women

$\therefore$ Required ratio = 4 : 3

34. (4) 18 men $\equiv$ 36 boys

$\Rightarrow$ 1 man $\equiv$ 2 boys

$\therefore$ 24 men + 24 boys

$\equiv$ (24 + 12) men

$\equiv$ 36 men

$M_1D_1T_1 = M_2D_2T_2$

$\Rightarrow 18 \times 24 \times 6 = 36 \times D_2 \times 9$

$\Rightarrow D_2 = \frac{18 \times 24 \times 6}{36 \times 9} = 8$ days

35. (3) $\because$ 5 men can do 1 work in 14 days.

$\therefore$ 3 men will do $\frac{3}{5}$ work in 14 days.

Remaining work $= 1 - \frac{3}{5} = \frac{2}{5}$

$\therefore$ 5 women do $\frac{2}{5}$ work in 14 days.

$\therefore$ Time taken by 5 women in doing 1 work

$= \frac{14 \times 5}{2} = 35$ days

$\therefore$ (5 men + 5 women)'s 1 day's work

$= \frac{1}{14}+\frac{1}{35} = \frac{5+2}{70} = \frac{7}{70} = \frac{1}{10}$

$\therefore$ Required time = 10 days.

TYPE-IV

1. (1) Using basics of Rule 2,

A's work per day $= \frac{1}{15}$

B's work per day $= \frac{1}{20}$

(A+ B)'s work per day

$= \frac{1}{15}+\frac{1}{20} = \frac{4+3}{60} = \frac{7}{60}$

$\therefore$ (A + B)'s work in 4 days

$= 4 \times \frac{7}{60} = \frac{7}{15}$

Left work $= 1 - \frac{7}{15} = \frac{15-7}{15} = \frac{8}{15}$

2. (3) Using basics of Rule 2,
The part of field cultivated by A in 1 day

$= \frac{2}{5 \times 6} = \frac{1}{15}$

The part of field cultivated by B in 1 day

$= \frac{1}{3 \times 10} = \frac{1}{30}$

$\therefore$ The part of field cultivated by A and B together

$= \frac{1}{15} + \frac{1}{30} = \frac{3}{30} = \frac{1}{10}$

$\therefore \frac{4}{5}$ part of field cultivated by A and B together in

$= \frac{\frac{4}{5}}{\frac{1}{10}}$ days $= \frac{4 \times 10}{5} = 8$ days

3. (1) Using basics of Rule 2,
A can do the whole work in $\frac{20 \times 5}{4} = 25$ days

Remaining work $= 1 - \frac{4}{5} = \frac{1}{5}$

$\therefore$ (A + B)'s 1 day's work $= \frac{1}{15}$

and A's 1 day's work $= \frac{1}{25}$

$\therefore$ B's 1 day's work

$= \frac{1}{15} - \frac{1}{25} \qquad = \frac{5-3}{75} = \frac{2}{75}$

$\therefore$ B can finish the work in $\frac{75}{2}$ days i.e., $37\frac{1}{2}$ days

4. (1) Using basics of Rule 2,

A's 1 day's work $= \frac{1}{18}$

B's 1 day's work $= \frac{1}{9}$

$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{18} + \frac{1}{9} = \frac{1+2}{18} = \frac{3}{18} = \frac{1}{6}$

5. (3) Using basics of Rule 2,
Remaining work

$= 1 - \frac{7}{10} = \frac{3}{10}$

$\because$ (A + B) take 4 days to do $\frac{3}{10}$ work

$\therefore$ (A + B) will do the work in

$4 \times \frac{10}{3}$ days

$= \frac{40}{3} = 13\frac{1}{3}$ days

6. (2) Using basics of Rule 2,
Time taken by A and B

$= \frac{6 \times 12}{6+12} = \frac{6 \times 12}{18} = 4$

$\therefore$ Work done by A in 4 days

$= \frac{4}{6} = \frac{2}{3}$

7. (4) Using basics of Rule 3,

A can do $\frac{1}{2}$ work in 5 days.

$\therefore$ A can do 1 work in 10 days
Similarly,

B can do 1 work in $\frac{5}{3} \times 9$

= 15 days.

C can do 1 work in $8 \times \frac{3}{2}$

= 12 days.
Now,

A's 1 day's work $= \frac{1}{10}$

B's 1 day's work $= \frac{1}{15}$

C's 1 day's work $= \frac{1}{12}$

$\therefore$ (A + B + C)'s 1 day's work

$= \frac{1}{10} + \frac{1}{15} + \frac{1}{12}$

$= \frac{6+4+5}{60} = \frac{15}{60} = \frac{1}{4}$

Hence, (A + B + C) together can complete the work in 4 days.

8. (3) Using basics of Rule 1,

Work	Days	Men
$\frac{7}{8}$ ↓	7 ↓	28 ↓
$\frac{1}{8}$	7	x

$\therefore \frac{7}{8} : \frac{1}{8} :: 28 : x$

where x is no. of men

$\Rightarrow \frac{7}{8} \times x = \frac{1}{8} \times 28$

$\Rightarrow x = \frac{28 \times 8}{7 \times 8} = 4$

9. (2) Using basics of Rule 2,
Time taken by A alone in doing the work = 15 days
Time taken by B alone in doing the work $= \frac{10 \times 5}{2} = 25$ days

$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{15} + \frac{1}{25} = \frac{5+3}{75} = \frac{8}{75}$

$\therefore$ Hence, the work will be completed in $\frac{75}{8} = 9\frac{3}{8}$ days.

10. (3) Using basics of Rule 2,
Time taken by A to complete the work $= \frac{4 \times 3}{2} = 6$ days

Time taken by B to complete the work $= \frac{6 \times 5}{3} = 10$ days

$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{6} + \frac{1}{10} = \frac{5+3}{30} = \frac{8}{30} = \frac{4}{15}$

$\therefore$ A and B together will complete the work in $\frac{15}{4} = 3\frac{3}{4}$ days.

11. (2) Using basics of Rule 1,

Days	Work	Men
60 ↑	$\frac{3}{4}$ ↓	60 ↓
30	$\frac{1}{4}$	x

$\therefore \left.\begin{matrix} 30 : 60 \\ \frac{3}{4} : \frac{1}{4} \end{matrix}\right\} :: 60 : x$

$\Rightarrow 30 \times \frac{3}{4} \times x = 60 \times \frac{1}{4} \times 60$

$\Rightarrow x = \frac{60 \times 60}{30 \times 3} = 40$

$\therefore$ 20 men should be discharged.

12. (2) Time taken by P in completing 1 work = 10 × 4 = 40 days
Time taken by Q in completing 1 work $= \frac{15 \times 5}{2} = \frac{75}{2}$ days

Time taken by R in completing 1 work = 13 × 3 = 39 days
Time taken by S in completing 1 work = 7 × 6 = 42 days

Clearly, Q took the least time i.e. $\frac{75}{2}$ or $37\frac{1}{2}$ days.

13. (3) Using basics of Rule 5,

(A + B)'s 1 day's work $= \frac{1}{72}$

(B + C)'s 1 day's work $= \frac{1}{120}$

(C + A)'s 1 day's work $= \frac{1}{90}$

On adding all three,
2 (A + B + C)'s 1 day's work

$= \frac{1}{72} + \frac{1}{120} + \frac{1}{90} = \frac{5+3+4}{360} = \frac{1}{30}$

∴ (A + B + C)'s 1 day's work

$= \frac{1}{60}$

∴ (A + B + C)'s 3 days' work

$= \frac{3}{60} = \frac{1}{20}$

14. (1) Using basics of Rule 2,
Time taken by A to finish the work
= 5 × 6 = 30 days
Time taken by B to complete the

work $= \frac{8 \times 5}{2} = 20$ days

∴ (A + B)'s 1 day's work

$= \frac{1}{30} + \frac{1}{20} = \frac{2+3}{60} = \frac{1}{12}$

∴ Required time = 12 days

15. (1) Using basics of Rule 2,
(A + B)'s 5 days' work

$= 5\left(\frac{1}{20} + \frac{1}{40}\right)$

$= 5\left(\frac{2+1}{40}\right) = \frac{15}{40} = \frac{3}{8}$

∴ Remaining work $= 1 - \frac{3}{8} = \frac{5}{8}$

16. (4) (A+B)'s 1 day's work

$= \frac{1}{20} + \frac{1}{30} = \frac{3+2}{60} = \frac{1}{12}$

∴ Work done in 6 days

$= \frac{6}{12} = \frac{1}{2}$

Aliter : Using basics of Rule 2,
Here, x = 20, y = 30

They do the work in

$= \frac{xy}{x+y}$ days

$= \frac{20 \times 30}{20+30} = 12$ days

Half of the work they do in 6 days

17. (1) Using basics of Rule 2,
Let B completes the work in x days.

∴ Work done by A in $\frac{3x}{4}$ days

$= \frac{1}{2}$

⇒ Time taken by A in completing the work $= 2 \times \frac{3x}{4} = \frac{3x}{2}$ days

∴ (A + B)'s 1 day's work

$= \frac{1}{x} + \frac{2}{3x} = \frac{3+2}{3x} = \frac{5}{3x}$

∴ $\frac{5}{3x} = \frac{1}{18} \Rightarrow 3x = 90$

⇒ $x = 30$

Hence, time taken by B in completing the work = 30 days

18. (2) Using basics of Rule 2,
If B completes a work in x days, A will complete the same in

$\frac{2x}{3}$ days.

∴ $\frac{1}{x} + \frac{3}{2x} = \frac{1}{10}$

⇒ $\frac{2+3}{2x} = \frac{1}{10} \Rightarrow 2x = 50$

⇒ $x = 25$ days

19. (4) Using basics of Rule 2,
Ratio of efficiency of A and B
= 3 : 2
Ratio of time taken = 2 : 3
∴ Time taken by A

$= \frac{2}{3} \times 18 = 12$ days

∴ (A + B)'s 1 day's work

$= \frac{1}{12} + \frac{1}{18} = \frac{3+2}{36} = \frac{5}{36}$

∴ Required time

$= \frac{36}{5} = 7\frac{1}{5}$ days

20. (4) Using basics of Rule 2,

A does $\frac{7}{8}$ work in 28 days.

∴ A will complete the work in

$28 \times \frac{8}{7} = 32$ days.

B does $\frac{5}{6}$ work in 20 days.

∴ B will complete the work in $\frac{20 \times 6}{5} = 24$ days

∴ (A + B)'s 1 day's work

$= \frac{1}{32} + \frac{1}{24} = \frac{3+4}{96} = \frac{7}{96}$

∴ Required time

$= \frac{96}{7} = 13\frac{5}{7}$ days

21. (4) Time taken by A and B = x hours (let).
∴ According to the question,
Time taken by A alone
= (x + 8) hours.
Time taken by B alone

$= \left(x + \frac{9}{2}\right)$ hours.

∴ $\frac{1}{x+8} + \frac{1}{x+\frac{9}{2}} = \frac{1}{x}$

⇒ $\frac{1}{x+8} + \frac{2}{2x+9} = \frac{1}{x}$

⇒ $\frac{2x+9+2x+16}{(x+8)(2x+9)} = \frac{1}{x}$

⇒ $\frac{4x+25}{2x^2+16x+9x+72} = \frac{1}{x}$

⇒ $4x^2 + 25x = 2x^2 + 25x + 72$

⇒ $2x^2 = 72 \Rightarrow x^2 = \frac{72}{2} = 36$

⇒ $x = \sqrt{36} = 6$ hours

22. (1) Using Rule 1,

200 workers do $\frac{1}{4}$ work in 50 days.

How many workers will do $\frac{3}{4}$ work in 100 days ?
Number of additional workers
= x (let)

∴ $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \dfrac{200 \times 50}{\frac{1}{4}}$

$= \dfrac{(200 + x) \times 100}{\frac{3}{4}}$

$\Rightarrow (200 + x)\ 100$
$= 3 \times 200 \times 50$
$\Rightarrow 200 + x = 300$
$\Rightarrow x = 300 - 200 = 100$

23. (2) Using basics of Rule 2,

x does $\frac{1}{4}$ work in 6 days

$\therefore$ x does 1 work in 24 days
Similarly,

y does $\frac{3}{4}$ work in12 days

$\therefore$ y does 1 work in $\dfrac{12 \times 4}{3}$

= 16 days
$(x + y)$'s 1 day's work

$= \dfrac{1}{24} + \dfrac{1}{16} = \dfrac{2+3}{48} = \dfrac{5}{48}$

$\therefore$ Required time $= \dfrac{48}{5}$

$= 9\dfrac{3}{5}$ days

24. (4) Let the time taken by B in doing the work alone $= x$ days
According to the question,
Time taken by A

$= 2 \times \dfrac{3x}{4} = \dfrac{3x}{2}$ days

$\therefore \dfrac{1}{x} + \dfrac{1}{\frac{3x}{2}} = \dfrac{1}{18}$

$\Rightarrow \dfrac{1}{x} + \dfrac{2}{3x} = \dfrac{1}{18}$

$\Rightarrow \dfrac{3+2}{3x} = \dfrac{1}{18}$

$\Rightarrow 3x = 18 \times 5$

$\Rightarrow x = \dfrac{18 \times 5}{3} = 30$ days

25. (2) Part of work done by A and

$B = \dfrac{19}{23}$

$\therefore$ Part of work done by C

$= 1 - \dfrac{19}{23} = \dfrac{4}{23}$

Part of work done by B and C

$= \dfrac{8}{23}$

$\therefore$ Part of work done by B

$= \dfrac{8}{23} - \dfrac{4}{23} = \dfrac{4}{23}$

$\therefore$ Part of work done by A

$= \dfrac{19}{23} - \dfrac{4}{23} = \dfrac{15}{23}$

$\therefore$ Ratio of the shares of wages of A, B and C

$= \dfrac{15}{23} : \dfrac{4}{23} : \dfrac{4}{23} = 15 : 4 : 4$

$\therefore$ A's share

$= \dfrac{15}{23} \times 5290 =$ Rs. 3450

26. (4) Using basics of Rule 2
Work done by A and B in 1 day

$= \dfrac{1}{10} + \dfrac{1}{20} = \dfrac{2+1}{20} = \dfrac{3}{20}$

$\therefore$ (A + B)'s 5 days' work

$= \dfrac{5 \times 3}{20} = \dfrac{3}{4}$

$\therefore$ Remaining work

$= 1 - \dfrac{3}{4} = \dfrac{1}{4}$

27. (2) According to the question,
(4×8) men + (6×8) women $\equiv$ (2×8) men + (9×8) women
$\Rightarrow$ 4 men + 6 women $\equiv$ 2 men + 9 women
$\Rightarrow (4 - 2)$ men $\equiv (9 - 6)$ women
$\Rightarrow$ 2 men $\equiv$ 3 women
$\therefore$ 4 men + 6 women $\equiv$ 12 women
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 12 \times 8 = 18 \times D_2$

$\Rightarrow D_2 = \dfrac{12 \times 8}{18} = \dfrac{16}{3} = 5\dfrac{1}{3}$ days

Aliter : Using Rule 1,
Here, $A_1 = 4$, $B_1 = 6$, $D_1 = 8$
$A_2 = 2$, $B_2 = 9$, $D_2 = 8$
$A_3 = 0$, $B_3 = 18$

Required time

$= \dfrac{D_1D_2(A_1B_2 - A_2B_1)}{D_1(A_1B_3 - A_3B_1) - D_2(A_2B_3 - A_3B_1)}$ days

$= \dfrac{8 \times 8(4 \times 9 - 2 \times 6)}{8(4 \times 18 - 0 \times 6) - 8(2 \times 18 - 0 \times 6)}$

$= \dfrac{64 \times 24}{8 \times 72 - 36 \times 8} = \dfrac{192}{36}$

$= \dfrac{16}{3} = 5\dfrac{1}{3}$ days

28. (1) Let time taken by A alone in doing work be x days.
$\therefore$ Time taken by B alone
$= 3x$ days

$\because$ A and B together finish $\frac{2}{5}$ work in 9 days.
$\therefore$ TIme taken by A and B in doing whole work

$= \dfrac{9 \times 5}{2} = \dfrac{45}{2}$ days

$\therefore \dfrac{1}{x} + \dfrac{1}{3x} = \dfrac{2}{45}$

$\Rightarrow \dfrac{3+1}{3x} = \dfrac{2}{45}$

$\Rightarrow \dfrac{4}{3x} = \dfrac{2}{45} \Rightarrow 2 \times 3x = 4 \times 45$

$\Rightarrow x = \dfrac{4 \times 45}{2 \times 3} = 30$ days

$\therefore$ Time taken by B $= 3x$ days
$= 3 \times 30 = 90$ days
Aliter : Using Rule 22,
Here, n = 3 and D

$= \dfrac{9 \times 5}{2} = \dfrac{45}{2}$ days

(Time taken to finish whole work)
Time taken by B = (n + 1)D

$= (3 + 1) \times \dfrac{45}{2}$

= 90 days

29. (4) Using Rule 1,

Men	Working hours	Days
12 ↑	8	10 ↓
16	$7\frac{1}{2}$ ↑	x

$$\therefore \left.\begin{matrix} 16 : 12 \\ \frac{15}{2} : 8 \end{matrix}\right\} :: 10 : x$$

$\Rightarrow 16 \times \frac{15}{2} \times x = 12 \times 8 \times 10$

$\Rightarrow 8 \times 15 \times x = 12 \times 8 \times 10$

$\Rightarrow x = \frac{12 \times 8 \times 10}{8 \times 15} = 8$ days

30. (4) Using Rule 1,

Remaining work

$= 1 - \frac{5}{8} = \frac{3}{8}$;

Remaining time = 4 days

$\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{20 \times 12}{\frac{5}{8}} = \frac{M_2 \times 4}{\frac{3}{8}}$

$\Rightarrow \frac{20 \times 12}{5} = \frac{M_2 \times 4}{3}$

$\Rightarrow 4 \times 12 = \frac{M_2 \times 4}{3}$

$\Rightarrow M_2 = 12 \times 3 = 36$

$\therefore$ Number of additional workers

$= 36 - 20 = 16$

31. (3) Using Rule 1,

$\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{10}{\frac{2}{3}} = \frac{D_2}{\frac{3}{5}}$

$\Rightarrow \frac{30}{2} = \frac{5D_2}{3}$

$\Rightarrow D_2 = \frac{30}{2} \times \frac{3}{5} = 9$ days

32. (4) According to the question,

John does $\frac{1}{2}$ work in 3 hours.

$\therefore$ Time taken by John in doing whole work = 6 hours

Joe does $\frac{1}{8}$ work in 1 hour.

$\therefore$ Time taken by Joe in doing whole work = 8 hours

Remaining work $= \frac{1}{2} - \frac{1}{8}$

$= \frac{4-1}{8} = \frac{3}{8}$ parts

$\therefore$ Time taken by George

$= \frac{8 \times 5}{3} = \frac{40}{3}$ hours

Work done by all three in 1 hour

$= \frac{1}{6} + \frac{1}{8} + \frac{3}{40}$

$= \frac{20+15+9}{120} = \frac{44}{120}$

$= \frac{11}{30}$

$\therefore$ Required time $= \frac{30}{11}$

$= 2\frac{8}{11}$ hours

33. (4) Remaining work $= 1 - \frac{2}{5}$

$= \frac{3}{5}$ parts

$\because$ (A + B) together do $\frac{3}{5}$th part of work in 6 days.

$\therefore$ Time taken by A and B in doing whole work $= \frac{6 \times 5}{3}$

= 10 days

A does $\frac{2}{5}$th part of work in 9 days.

$\therefore$ Time taken by A in doing whole work $= \frac{9 \times 5}{2} = \frac{45}{2}$ days

$\therefore$ B's 1 day's work $= \frac{1}{10} - \frac{2}{45}$

$= \frac{9-4}{90} = \frac{5}{90} = \frac{1}{18}$

$\therefore$ Required time = 18 days

34. (1) Remaining work

$= 1 - \frac{37}{100}$

$= \frac{100-37}{100} = \frac{63}{100}$

$\therefore$ Time taken by (A + B) in doing $\frac{63}{100}$ part of work

= 7 days

$\therefore$ Time taken by them in doing whole work $= \frac{100}{63} \times 7$

$= \frac{100}{9}$ days

Respective ratio of time taken by A and B in doing the work

= 5 : 4

$\therefore \frac{1}{4x} + \frac{1}{5x} = \frac{9}{100}$

$\Rightarrow \frac{5+4}{20x} = \frac{9}{100}$

$\Rightarrow 20x = 100 \Rightarrow x = 5$

$\therefore$ Required time

$= 4 \times 5 = 20$ days

35. (4) $\because$ Dhiru digs $\frac{1}{a}$ part of field in 20 hours.

$\therefore$ Dhiru digs 1 part of field in 20a hours.

$= \frac{1}{60} - \frac{1}{20a} = \frac{a-3}{60a}$

$\therefore$ Part of field dug by Kaku in 1 hour

$= \frac{20(a-3)}{60a} = \frac{a-3}{3a}$

36. (2) A can do a work in 12 days.

B is 60% more efficient than A.

$\therefore$ Time taken by B

$= \left(\frac{100}{160} \times 12\right)$ days

$= \frac{15}{2} = 7\frac{1}{2}$ days

37. (3) $\because$ B completes $\frac{1}{3}$ work in 12 days.

$\therefore$ B will complete 1 work in 12 × 3 = 36 days.

$\therefore$ B's 1 day's work $= \frac{1}{36}$

(A + B)'s 1 day's work $= \frac{1}{24}$

$\therefore$ A's 1 day's work $= \frac{1}{24} - \frac{1}{36}$

$= \frac{3-2}{72} = \frac{1}{72}$

$\therefore$ Time taken by A in doing 1

work = 72 days

Remaining work = $1 - \frac{1}{3} = \frac{2}{3}$

$\therefore$ Time taken by A in doing $\frac{2}{3}$ work = $\frac{2}{3} \times 72 = 48$ days

38. (3) $\because$ A does $\frac{1}{3}$rd part of work in 5 days.
$\therefore$ A will do 1 work in 5×3 = 15 days.
$\because$ B does $\frac{2}{5}$th of work in 10 days.
$\therefore$ B will do 1 work in $\frac{10 \times 5}{2}$ = 25 days.
$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{15} + \frac{1}{25}$

$= \frac{5+3}{75} = \frac{8}{75}$

$\therefore$ Required time = $\frac{75}{8}$

$= 9\frac{3}{8}$ days

39. (4) Work done by A and B together

$= \frac{9}{11}$ parts

$\therefore$ Work done by C

$= 1 - \frac{9}{11} = \frac{2}{11}$ parts

Total amount = Rs. 440

$\therefore$ C's share = Rs. $\left(\frac{2}{11} \times 440\right)$

= Rs. 80

40. (3) $\because$ P does $\frac{1}{4}$th work in 10 days.
$\therefore$ P will do 1 work in 10×4 = 40 days
$\because$ Q, does 40% part of work in 40 days
$\therefore$ Q will do 100% work in $\frac{40 \times 100}{40}$ = 100 days
$\because$ R, does $\frac{1}{3}$rd work in 13 days.
$\therefore$ R will do 1 work in 13×3 = 39 days

TYPE-V

1. (3) Let B does the whole work in x days

$\therefore$ Work done by B in 1 day $= \frac{1}{x}$

According to question

A does the $\frac{1}{2}$ work in $\frac{x}{6}$ days

$\therefore$ A does the whole work in $\frac{2x}{6}$

or $= \frac{x}{3}$ days

$\therefore$ Work done by A in one day $= \frac{3}{x}$

$\therefore$ Work done by A and B together in one day

$= \frac{1}{x} + \frac{3}{x} = \frac{4}{x}$

$\therefore$ Time taken to complete the whole work by A and B together

$= \frac{1}{\frac{4}{x}} = \frac{x}{4}$ days

Again, given that

$\frac{x}{4} = 10$

$\therefore$ x = 40 days

Aliter : Using Rule 22,
Here, n = 3, d = 10
$\because$ A is 3 times more efficient than B.
Time taken by B = (n + 1) × D
= (3 + 1) × 10
= 40 days

2. (3) Ratio of efficiency of Babu and Asha = $1 : \frac{7}{4} = 4 : 7$.

As the time taken is inversely proportional to efficiency, therefore, if Babu takes $7x$ days to complete work, Asha will take $4x$ days.

$\therefore \frac{1}{7x} + \frac{1}{4x} = \frac{1}{7} \Rightarrow \frac{4+7}{28x} = \frac{1}{7}$

$\Rightarrow 28x = 11 \times 7$

$\Rightarrow x = \frac{11 \times 7}{28} = \frac{11}{4}$

$\therefore$ Asha will complete the work in $4x = 4 \times \frac{11}{4} = 11$ days.

Aliter : Using Rule 22,

Here, $n = \frac{7}{4}$, D = 7

$\therefore$ Time taken by Asha

$= \left(\frac{n+1}{n}\right) \times D$ days

$= \left(\frac{\frac{7}{4}+1}{\frac{7}{4}}\right) \times 7$

$= \frac{11}{7} \times 7 = 11$ days

3. (2) Using Rule 1,

$\because$ Jyothi can do $\frac{3}{4}$th of a job in 12 days.
$\therefore$ Jyothi can do 1 job in $\frac{12 \times 4}{3} = 16$ days.

As Mala is twice as efficient as Jyothi,
$\therefore$ Mala will finish the job in 8 days.

4. (3) $A : B = D_2 : D_1$
$\Rightarrow 100 : 140 = D_2 : 70$
$\Rightarrow 100 \times 70 = 140 \times D_2$

$\Rightarrow D_2 = \frac{100 \times 70}{140} = 50$ days.

Aliter : Using Rule 17,
Here, x = 70, r = 40%
Time taken by B

$= x \times \frac{100}{100+R}$

$= \frac{70 \times 100}{100+40} = 50$ days

5. (4) Using Rule 1,
Ratio of the working capabilities of a man, a woman and a child = 5 : 4 : 2
$\therefore$ Ratio of man, woman and child equivalence = $\frac{1}{5} : \frac{1}{4} : \frac{1}{2}$

$= \frac{1}{5} \times 20 : \frac{1}{4} \times 20 : \frac{1}{2} \times 20$

= 4 : 5 : 10

or 4 men ≡ 5 women ≡ 10 children

4 men = 10 children

$\therefore$ 2 men ≡ 5 children and 6 men ≡ 15 children

5 women = 10 children

$\therefore$ 3 women ≡ 6 children

4 women ≡ 8 children

$\therefore$ 2 men + 3 women + 4 Children = 15 children

6 men + 4 women + 7 children = 30 children

Children	Field	Days
15 ↑	10 ↓	10 ↓
30	16	x

$\Rightarrow \left.\begin{matrix}30:15\\10:16\end{matrix}\right\} :: 10 : x$

where, x is no. of days

$\Rightarrow 30 \times 10 \times x = 15 \times 16 \times 10$

$\Rightarrow x = \frac{15 \times 16 \times 10}{30 \times 10} = 8$ days

6. (1) Using basics of Rule 2,
Let B alone can do the work in x days.

$\therefore$ A can do the work in $\frac{3x}{2}$ days.

According to the question,

$\frac{1}{x} + \frac{2}{3x} = \frac{1}{18} \Rightarrow \frac{3+2}{3x} = \frac{1}{18}$

$\Rightarrow \frac{5}{3x} = \frac{1}{18} \Rightarrow 3x = 18 \times 5$

$\Rightarrow x = \frac{18 \times 5}{3} = 30$ days

7. (3) Using basics of Rule 2,
According to the question,
If A takes x days to complete the work, B will take $2x$ days and C will take $4x$ days,
Now, (A + B)'s 1 day's work

$= \frac{1}{4}$

$\Rightarrow \frac{1}{x} + \frac{1}{2x} = \frac{1}{4} \Rightarrow \frac{2+1}{2x} = \frac{1}{4}$

$\Rightarrow 2x = 12 \Rightarrow x = 6$

$\therefore$ C will complete the work in $4x$ i.e. 24 days.

8. (*) Ratio of the work of A and B done in 1 day = 3 : 2
[$\because$ B's work doen = x (let), then

A's work done = $\frac{x+50}{100}x = \frac{3}{2}x$

So, (A : B)'s work done = $\frac{3}{2}x : x$

or 3 : 2]

$\because$ Work done by A and B together in 1 day = $\frac{1}{15}$

$\therefore$ A's 1 day's work = $\frac{1}{15} \times \frac{3}{5}$

$= \frac{1}{25}$

Hence, A alone will finish the work in 25 days.

Aliter : Using Rule 22,

Here, n = $\frac{3}{2}$ because A is 50% more efficient than B.

D = 15

Time taken by A

$= \left(\frac{n+1}{n}\right) \times D$ days

$= \left(\frac{\frac{3}{2}+1}{\frac{3}{2}}\right) \times 15$

= 25 days

9. (2) Using Rule 2,
If Tapas alone takes x days to complete the work, then

$\frac{1}{x} + \frac{1}{2x} = \frac{1}{12}$

$\Rightarrow \frac{2+1}{2x} = \frac{1}{12}$

$\Rightarrow 2x = 36$

$\Rightarrow x = 18$ days

10. (3) (A + B)'s 1 day's work

$= \frac{1}{12}$ ..... (i)

(B + C)'s 1 day's work

$= \frac{1}{15}$ ..... (ii)

$\therefore$ Difference between A and C's 1 day's work

$= \frac{1}{12} - \frac{1}{15} = \frac{5-4}{60} = \frac{1}{60}$

If A alone completes the work in x days, C will do the same in $2x$ days.

$\therefore \frac{1}{x} - \frac{1}{2x} = \frac{1}{60}$

$\Rightarrow \frac{2-1}{2x} = \frac{1}{60} \Rightarrow \frac{1}{2x} = \frac{1}{60}$

$\Rightarrow x = 30$

$\therefore$ B's 1 day's work

$= \frac{1}{12} - \frac{1}{30}$ [From equation (i)]

$= \frac{5-2}{60} = \frac{3}{60} = \frac{1}{20}$

Hence, B alone will complete the work in 20 days.

11. (2) If B alone completes the work in x days, A will do the same in $2x$ days.

$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{x} + \frac{1}{2x} = \frac{2+1}{2x} = \frac{3}{2x}$

and C's 1 day's work = $\frac{3}{4x}$

$\therefore \frac{3}{4x} = \frac{1}{20}$

$\Rightarrow 4x = 3 \times 20$

$\Rightarrow x = \frac{3 \times 20}{4} = 15$

$\therefore$ (A + B + C)'s 1day's work

$= \frac{1}{2x} + \frac{1}{x} + \frac{3}{4x} = \frac{1}{30} + \frac{1}{15} + \frac{1}{20}$

$= \frac{2+4+3}{60} = \frac{9}{60} = \frac{3}{20}$

Hence, all three together will complete the work in

$\frac{20}{3}$ or $6\frac{2}{3}$ days.

12. (2) Using Rule 2,
If A completes the work in x days, B will do the same in $3x$ days.

$\therefore 3x - x = 60$

$\Rightarrow 2x = 60$

$\Rightarrow x = 30$ and $3x = 90$

$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{30} + \frac{1}{90} = \frac{3+1}{90}$

$= \frac{4}{90} = \frac{2}{45}$

$\therefore$ A and B together will do the work in $\frac{45}{2}$ or $22\frac{1}{2}$ days.

13. (2) A does 20% less work than B.

$\therefore$ Ratio of time taken = 5 : 4

A completes a work in $\frac{15}{2}$ hours

$\therefore$ Time taken by B to do the same work

$= \frac{15}{2} \times \frac{4}{5} = 6$ hours.

14. (3) Using Rule 15,
Efficiency and time taken are inversely proportional Bimal : Kamal = 150 : 100 (work)
$\Rightarrow$ 100 : 150 (Time) = 2 : 3
$\because$ 3 units $\Rightarrow$ 15 days
$\therefore$ 2 units $\Rightarrow \frac{15}{3} \times 2 = 10$
Hence, Bimal complete the work in 10 days

15. (3) Let time taken by C to complete the work = x days
$\therefore$ Time taken by A to complete the work = $3x$ days
and time taken by B to complete the work = $\frac{3x}{2}$ days
According to the question,

$$\frac{1}{3x} + \frac{1}{\frac{3x}{2}} + \frac{1}{x} = 1$$

$$\Rightarrow \frac{1}{3x} + \frac{2}{3x} + \frac{1}{x} = 1$$

$$\Rightarrow \frac{1+2+3}{3x} = 1$$

$$\Rightarrow \frac{6}{3x} = 1 \Rightarrow \frac{2}{x} = 1$$

$\Rightarrow x = 2$
$\therefore$ Time taken by A
$= 3x = 3 \times 2 = 6$ days

16. (4) Using Rule 2,
Time taken by A to complete the work = x days
$\therefore$ Time taken by B to complete the work = $3x$ days
So, $3x - x = 2x = 40$
$\Rightarrow x = 20$ and $3x = 60$
$\therefore$ (A + B)'s 1 day's work

$$= \frac{1}{20} + \frac{1}{60} = \frac{3+1}{60}$$

$$= \frac{4}{60} = \frac{1}{15}$$

$\therefore$ A and B together will complete the work in 15 days.

17. (2) Using Rule 2,
If A completes the work in x days, B will take $2x$ days.

$$\therefore \frac{1}{x} + \frac{1}{2x} = \frac{1}{14} \Rightarrow \frac{2+1}{2x} = \frac{1}{14}$$

$\Rightarrow 2x = 42 \Rightarrow x = 21$ days

18. (3) Time taken by B

$$= \frac{21 \times 100}{140} = 15 \text{ days}$$

Aliter : Using Rule 17,
Here, x = 21, R = 40%
Time taken By B

$$= x \times \frac{100}{100+R} \text{ days}$$

$$= 21 \times \frac{100}{140} \text{ days}$$

= 15 days

19. (3) Using Rule 2,
If the time taken by B to complete the work be x days, then time taken by A
$= (x - 5)$ days

$$\therefore \frac{1}{x} + \frac{1}{x-5} = \frac{9}{100}$$

$$\Rightarrow \frac{x-5+x}{x(x-5)} = \frac{9}{100}$$

$\Rightarrow 9x^2 - 45x = 200x - 500$
$\Rightarrow 9x^2 - 245x + 500 = 0$
$\Rightarrow 9x^2 - 225x - 20x + 500 = 0$
$\Rightarrow 9x(x - 25) - 20(x - 25) = 0$
$\Rightarrow (x - 25)(9x - 20) = 0$

$\Rightarrow x = 25$ because $x \neq \frac{20}{9}$

20. (1) Using Rule 2,
Let time taken by B in completing the work = x days
$\therefore$ Time taken by A = $(x - 10)$ days

$$\therefore \frac{1}{x} + \frac{1}{x-10} = \frac{1}{12}$$

$$\Rightarrow \frac{x-10+x}{x(x-10)} = \frac{1}{12}$$

$\Rightarrow 24x - 120 = x^2 - 10x$
$\Rightarrow x^2 - 34x + 120 = 0$
$\Rightarrow x^2 - 30x - 4x + 120 = 0$
$\Rightarrow x(x - 30) - 4(x - 30) = 0$
$\Rightarrow (x - 4)(x - 30) = 0$
$\Rightarrow x = 30$ because $x \neq 4$

21. (3) Time taken by

$$B = 9 \times \frac{100}{150} = 6 \text{ days}$$

Aliter : Using Rule 17,
Here, x = 9, R = 50%
Time taken by B

$$= x \times \frac{100}{100+R} \text{ days}$$

$$= 9 \times \frac{100}{150} = 6 \text{ days}$$

22. (2) Using Rule 2,
Time taken by B

$$= \frac{130}{100} \times 23 = \frac{299}{10} \text{ days}$$

(A + B)'s 1 day's work

$$= \frac{1}{23} + \frac{10}{299}$$

$$= \frac{13+10}{299} = \frac{23}{299} = \frac{1}{13}$$

$\therefore$ Time taken by (A + B) = 13 days

23. (2) $5m + 2w = 4m + 4w$
$\Rightarrow m = 2w$
$\therefore$ Required ratio = 2 : 1

24. (1) Time taken by B

$$= 12 \times \frac{100}{160} = \frac{15}{2} = 7\frac{1}{2} \text{ days}$$

Aliter : Using Rule 17,
Here, x = 12, R = 60%
Time taken by B

$$= x \times \frac{100}{100+R} \text{ days}$$

$$= 12 \times \frac{100}{160} \text{ days}$$

$$= \frac{15}{2} \text{ days} = 7\frac{1}{2} \text{ days}$$

25. (4) Time taken by B in completing the work

$$= 12 \times \frac{100}{160} = \frac{15}{2} \text{ days}$$

$\therefore$ (A+B)'s 1 day's work

$$= \frac{1}{12} + \frac{2}{15} = \frac{5+8}{60} = \frac{13}{60}$$

Hence, the work will be completed in $\frac{60}{13}$ days

Aliter : Using Rule 17,
Here, x = 12, R = 60%
Time taken by B

$= x \times \frac{100}{100+R}$ days

$= 12 \times \frac{100}{160}$ days

$= \frac{15}{2}$ days

Now using Rule 2,
Time taken by A and B

$= \frac{xy}{x+y}$

$= \frac{12 \times \frac{15}{2}}{12 + \frac{15}{2}}$

$= \frac{12 \times 15}{39} = \frac{60}{13}$ days

26. (3) Using Rule 2,
If A alone completes the work in x days, B will complete the same in $2x$ days.

$\therefore \frac{1}{x} + \frac{1}{2x} = \frac{1}{12}$

$\Rightarrow \frac{2+1}{2x} = \frac{1}{12}$

$\Rightarrow 2x = 36$

$\therefore$ B alone will complete the work in 36 days (i.e. $2x$).

27. (1) Using Rule 2,
Let time taken by P = x days
Then, time taken by Q = $3x$ days
$\therefore 3x - x = 48 \Rightarrow x = 24$
$\therefore$ (P + Q)'s 1 day's work

$= \frac{1}{24} + \frac{1}{72} = \frac{3+1}{72} = \frac{1}{18}$

$\therefore$ Required time = 18 days

28. (2) Using Rule 2 and 3,
If B does the work in $3x$ days, (A + C) will do the same work in x days.
If C does that work in $2y$ days.
(A + B) will do it in y days.

$\therefore \frac{1}{x} + \frac{1}{3x} = \frac{1}{10}$

$\Rightarrow \frac{4}{3x} = \frac{1}{10}$

$\Rightarrow 3x = 40$

$\Rightarrow x = \frac{40}{3}$

Again, $\frac{1}{y} + \frac{1}{2y} = \frac{1}{10}$

$\Rightarrow \frac{3}{2y} = \frac{1}{10} \Rightarrow y = 15$

$\therefore$ (A + B + C)'s 1 day's work $= \frac{1}{10}$

$\Rightarrow \frac{1}{A} + \frac{1}{40} + \frac{1}{30} = \frac{1}{10}$

$\Rightarrow \frac{1}{A} = \frac{1}{10} - \frac{1}{40} - \frac{1}{30}$

$= \frac{12-3-4}{120} = \frac{5}{120} = \frac{1}{24}$

$\therefore$ A alone will complete the work in 24 days.

29. (1) Ratio of A's and B's efficiency = 4 : 5
Ratio of time taken = 5 : 4

$\therefore$ Time taken by B $= \frac{6 \times 4}{5}$

$= \frac{24}{5} = 4\frac{4}{5}$ days

Aliter : Using Rule 17,
Here, x = 6, R = 25%
Time taken by B

$= x \times \frac{100}{100+R}$ days

$= 6 \times \frac{100}{125} = 6 \times \frac{4}{5}$

$= \frac{24}{5} = 4\frac{4}{5}$ days

30. (2) Using Rule 2,
If A alone does the work in x days and B alone does the work in y days, then

$\frac{1}{x} + \frac{1}{y} = \frac{1}{5}$ .....(i)

Again, $\frac{2}{x} + \frac{1}{3y} = \frac{1}{3}$ ....(ii)

By equation (ii) × 3 – (i),

$\frac{6}{x} + \frac{1}{y} - \frac{1}{x} - \frac{1}{y} = 1 - \frac{1}{5}$

$\Rightarrow \frac{6}{x} - \frac{1}{x} = \frac{4}{5}$

$\Rightarrow \frac{6-1}{x} = \frac{4}{5}$

$\Rightarrow x = \frac{25}{4} = 6\frac{1}{4}$ days

31. (4) Using Rule 3,
Time taken by Ramesh

$= 4 \times \frac{2}{3} = \frac{8}{3}$ days

Work done by all three in 1 day

$= \frac{1}{4} + \frac{1}{6} + \frac{3}{8} = \frac{6+4+9}{24} = \frac{19}{24}$

$\therefore$ Required time

$= \frac{24}{19} = 1\frac{5}{19}$ days

32. (3) Time taken by Sonia
= $3x$ days (let)
$\therefore$ Time taken by Pratibha
= x days
$\therefore 3x - x = 60 \Rightarrow 2x = 60$
$\Rightarrow x = 30$ days
$\therefore$ Time taken by Sonia
= $3x$ days = 3 × 30 = 90 days.

33. (1) Using Rule 3,
Let time taken by A = x days
$\therefore$ Time taken by B = $2x$ days
Time taken by C = $3x$ days
According to the question,

$\frac{1}{x} + \frac{1}{2x} + \frac{1}{3x} = \frac{1}{6}$

$\Rightarrow \frac{6+3+2}{6x} = \frac{1}{6}$

$\Rightarrow \frac{11}{6x} = \frac{1}{6}$

$\Rightarrow 6x = 6 \times 11$

$\Rightarrow x = \frac{6 \times 11}{6} = 11$

$\therefore$ Time taken by C alone = $3x$
= 3 × 11 = 33 days

34. (4) A is twice as good as B.
$\therefore$ Time taken by A = x days
Time taken by B = $2x$ days
According to the question,

$\frac{1}{x} + \frac{1}{2x} = \frac{1}{16}$

$\Rightarrow \frac{2+1}{2x} = \frac{1}{16}$

$\Rightarrow \frac{3}{x} = \frac{1}{8}$

$\Rightarrow x = 3 \times 8 = 24$ days

35. (2) According to the question,
1 man ≡ 2 boys
∴ 3 men + 4 boys
≡ (3 + 2) men ≡ 5 men
∴ $M_1D_1 = M_2D_2$
$\Rightarrow 5 \times D_1 = 10 \times 8$

$\Rightarrow D_1 = \frac{10 \times 8}{5} = 16$ days

36. (1) A is twice efficient than B.
∴ Time taken by B = 12 days
⇒ Time taken by A = 6 days
∴ (A + B)'s 1 day's work

$= \frac{1}{6} + \frac{1}{12} = \frac{2+1}{12} = \frac{1}{4}$

∴ Required time = 4 days

37. (1) In second case, the efficiency of a man is twice to that in the first case.
∴ $M_1D_1 = 2\ M_2D_2$
$\Rightarrow 10 \times 20 = 2 \times 20 \times D_2$

$\Rightarrow D_2 = \frac{10 \times 20}{2 \times 20} = 5$ days.

38. (2) Time taken by Shashi in doing 1 work = 20 days
Tanya is 25% more efficient than Shashi.
∴ Time taken by Tanya

$= \frac{100}{125} \times 20 = 16$ days

TYPE-VI

1. (2) Less persons, more days (Indirect)
More working hours/day, less days (Indirect)
Let required no. of days be x.

Persons	Working hours/day	Days
39 ↑	5 ↑	12 ↓
30	6	x

$\therefore \left.\begin{matrix} 30 : 39 \\ 6 : 5 \end{matrix}\right\} :: 12 : x$

$\Rightarrow 30 \times 6 \times x = 39 \times 5 \times 12$

$\Rightarrow x = \frac{39 \times 5 \times 12}{30 \times 6} = 13$ days

Aliter : Using Rule 1,
Here, $M_1 = 39$, $D_1 = 12$, $T_1 = 5$
$M_2 = 30$, $D_2 = ?$, $T_2 = 6$
$M_1D_1T_1 = M_2D_2T_2$
$39 \times 12 \times 5 = 30 \times D_2 \times 6$

$D_2 = \frac{39 \times 12 \times 5}{30 \times 6}$

$D_2 = 13$ days

2. (1) Using Rule 1,
We know that

$\frac{W_1}{M_1D_1} = \frac{W_2}{M_2D_2}$

$\Rightarrow \frac{280}{72 \times 21} = \frac{100}{x \times 18}$,

Where x = number of men
$\Rightarrow x \times 18 \times 280 = 100 \times 72 \times 21$

$\Rightarrow x = \frac{100 \times 72 \times 21}{18 \times 280} = 30$

3. (1) Using Rule 1,
7 men ≡ 10 women

or 1 man $= \frac{10}{7}$ women

14 men + 20 women

$= \left(\frac{10 \times 14}{7} + 20\right)$ women

= 40 women
Now, more work, more days
More women, less days

$\left.\begin{matrix} \text{Work} & 1 : 6 \\ \text{Women} & 40 : 10 \end{matrix}\right\} :: 10 : x$

Where x = number of days
$\Rightarrow 1 \times 40 \times x = 6 \times 10 \times 10$

or $x = \frac{600}{40} = 15$

4. (1) Using Rule 1,
More persons, less working hours/day
Less days, more working hours/day

$\left.\begin{matrix} \text{Persons} & 7 : 5 \\ \text{Days} & 4 : 8 \end{matrix}\right\} :: 7 : x$

where, x is hours/days
$\therefore 7 \times 4 \times x = 5 \times 8 \times 7$

$\therefore x = \frac{5 \times 8 \times 7}{7 \times 4} = 10$ hours

5. (4) Using Rule 1,

Weaver	Days	Mats
4 ↓	4 ↓	4 ↓
8	8	x

$\left.\begin{matrix} 4 : 8 \\ 4 : 8 \end{matrix}\right\} :: 4 : x$

where, x is no. of mats
$\Rightarrow 4 \times 4 \times x = 8 \times 8 \times 4$

$\therefore x = \frac{8 \times 8 \times 4}{4 \times 4} = 16$

6. (1) Using Rule 1,

Men	Days	Working hours
10 ↑	18 ↑	6 ↓
15	12	x

where, x is working hrs/days

$\therefore \left.\begin{matrix} 15 : 10 \\ 12 : 18 \end{matrix}\right\} :: 6 : x$

$\Rightarrow 15 \times 12 \times x$
$= 10 \times 18 \times 6$

$\Rightarrow x = \frac{10 \times 18 \times 6}{15 \times 12} = 6$ hours

7. (1)

Work	Days	Persons
1 ↓	9 ↑	2 ↓
2	12	x

where x = number of persons

$\left.\begin{matrix} 1 : 2 \\ 12 : 9 \end{matrix}\right\} :: 2 : x$

$\Rightarrow 1 \times 12 \times x = 2 \times 9 \times 2$

$\Rightarrow x = \frac{2 \times 9 \times 2}{12} = 3$

Aliter : Using Rule 1,
Here, $M_1 = 2$, $W_1 = 1$, $D_1 = 9$
$M_2 = ?$, $W_2 = 2$, $D_2 = 12$
$M_1D_1W_2 = M_2D_2W_1$
$2 \times 9 \times 2 = M_2 \times 12 \times 1$

$M_2 = \frac{36}{12}$ $M_2 = 3$

8. (4) ∵ P men working P hours/day for P days produce P units of work.
∴ 1 man working 1 hour/day for 1 day produce

$\frac{P}{P^3} = \frac{1}{P^2}$ units of work

∴ n men working n hours a da

for n day's produce $\frac{n^3}{P^2}$ units of work

Aliter : Using Rule 1,
Here, $M_1 = p$, $D_1 = p$, $T_1 = p$, $W_1 = p$
$M_2 = n$, $D_2 = n$, $T_2 = n$, $W_2 = ?$
$M_1D_1T_1W_2 = M_2D_2T_2W_1$
$p \times p \times p \times w_2 = n \times n \times n \times p$

$$w_2 = \frac{n^3}{p^2}$$

9 (2)

Men	Days
10 ↑	12 ↓
12	x

Where x = number of days

$\Rightarrow 12 : 10 :: 12 : x$

$\Rightarrow 12 \times x = 10 \times 12$

$\Rightarrow x = \frac{10 \times 12}{12} = 10$ days

Aliter : Using Rule 1,

Here, $M_1 = 10$, $D_1 = 12$

$M_2 = 12$, $D_2 = ?$

$M_1D_1 = M_2D_2$

$10 \times 12 = 12 \times D_2$

$D_2 = 10$ days

10. (3)

Work	Days	Men
1 ↓	12 ↑	7 ↓
2	8	x

$\therefore \left.\begin{matrix} 1 : 2 \\ 8 : 12 \end{matrix}\right\} :: 7 : x$

where, x is no. of men

$\Rightarrow 1 \times 8 \times x = 2 \times 12 \times 7$

$\Rightarrow x = \frac{2 \times 12 \times 7}{8} = 21$

$\therefore$ Number of additional men

$= 21 - 7 = 14$

Metod 2 :

Using Rule 1,

$M_1D_1W_2 = M_2D_2W_1$

$\Rightarrow 7 \times 12 \times 2 = M_2 \times 8 \times 1$

$\Rightarrow M_2 = \frac{7 \times 12 \times 2}{8} = 21$

$\therefore$ No. of additional men

$= 21 - 7 = 14$

11. (3)

Men	Days
x ↑	30 ↓
$x + 6$	20

$x + 6 : x :: 30 : 20$

$\Rightarrow \frac{x+6}{x} = \frac{30}{20} = \frac{3}{2}$

$\Rightarrow 2x + 12 = 3x$

$\Rightarrow 3x - 2x = 12$

$\Rightarrow x = 12$

Aliter : Using Rule 1,

Here, $M_1 = x$, $D_1 = 30$

$M_2 = x + 6$, $D_2 = 20$

$M_1D_1 = M_2D_2$

$x \times 30 = (x + 6) \times 20$

$3x = 2x + 12$

$x = 12$

12. (2) Using Rule 1,

Let the original number of carpenters be x.

$M_1D_1 = M_2D_2$

$\Rightarrow x \times 9 = (x - 5) \times 12$

$\Rightarrow 9x = 12x - 60$

$\Rightarrow 3x = 60 \Rightarrow x = 20$

13. (2) Using Rule 1,

2 men + 3 women ≡ 4 men

$\Rightarrow$ 2 men ≡ 3 women

$\therefore$ 3 men + 3 women ≡ 5 men

$\therefore M_1D_1 = M_2D_2$

$\Rightarrow 4 \times 20 = 5 \times D_2$

$\Rightarrow D_2 = \frac{4 \times 20}{5} = 16$ days

14. (1)

Days	working hours/day
18 ↑	8 ↓
12	x

$\Rightarrow \frac{12}{18} = \frac{8}{x}$

where x is hours/days

$\Rightarrow 12x = 18 \times 8$

$\Rightarrow x = \frac{18 \times 8}{12} = 12$ hours

Aliter : Using Rule 1,

Here, $M_1 = 1$, $D_1 = 18$, $T_1 = 8$

$M_2 = 1$, $D_2 = 12$, $T_2 = ?$

$M_1D_1T_1 = M_2D_2T_2$

$1 \times 18 \times 8 = 1 \times 12 \times T_2$

$T_2 = \frac{18 \times 8}{12}$

$T_2 = 12$ hours

15. (4) Using Rule 1,

$\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{M \times 12}{W} = \frac{2M \times D_2}{\frac{W}{2}}$

$\Rightarrow \frac{M \times 12}{W} = \frac{4MD_2}{W}$

$\Rightarrow D_2 = 3$ days

16. (4) Using Rule 1,

$\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\therefore \frac{W_1}{W_2} = \frac{M_1D_1}{M_2D_2}$

$\therefore \frac{9}{10} = \frac{(x-1)(x+1)}{(x+2)(x-1)} = \frac{x+1}{x+2}$

$\Rightarrow 10x + 10 = 9x + 18$

$\Rightarrow x = 18 - 10 = 8$

17. (3) Using Rule 1,

$M_1D_1T_1 = M_2D_2T_2$

$\Rightarrow 80 \times 16 \times 6 = 64 \times 15 \times T_2$

$\Rightarrow T_2 = \frac{80 \times 16 \times 6}{64 \times 15} = 8$ hours

18. (1) Using Rule 1,

$M_1D_1 = M_2D_2$

$\Rightarrow 18 \times 24 = 27 \times D_2$

$\Rightarrow D_2 = \frac{18 \times 24}{27} = 16$ days

19. (3) Using Rule 1,

1 hour's work of 1 man and 4 boys $= \frac{1}{160}$

[$\because$ 2 men and 8 boys can do the work in 80 hrs.]

1 hour's work of 1 man 3 women and 4 boys $= \frac{1}{96}$

1 hour's work of 3 women

$= \frac{1}{96} - \frac{1}{160} = \frac{10-6}{960} = \frac{1}{240}$

1 hour's work of 2 men

$= \frac{1}{120} - \frac{1}{240} = \frac{1}{240}$

1 hour's work of 4 boys

$= \frac{1}{160} - \frac{1}{480}$

$= \frac{3-1}{480} = \frac{1}{240}$

$\therefore$ 2 men = 3 women = 4 boys

$\therefore$ 2 men + 8 boys = 12 boys

5 men + 12 boys = 22 boys

$\therefore$ By $M_1D_1 = M_2D_2$

$\Rightarrow 12 \times 80 = 22 \times D_2$

$\Rightarrow D_2 = \frac{12 \times 80}{22}$

$= \frac{480}{11} = 43\frac{7}{11}$ hours

20. (3) Using Rule 1,

$M_1D_1 = M_2D_2$

$\Rightarrow x \cdot x = y \cdot D_2$

$\Rightarrow D_2 = \frac{x^2}{y}$ days

21. (2) Using Rule 1,
$M_1D_1 = M_2D_2$
$\Rightarrow 30 \times 18 = 36 \times D_2$

$\Rightarrow D_2 = \frac{30 \times 18}{36} = 15$ days

22. (1) 20 men ≡ 24 women
$\Rightarrow$ 5 men ≡ 6 women
$\therefore$ 30 men + 12 women
= 40 men
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 20 \times 20 = 40 \times D_2$

$\Rightarrow D_2 = \frac{20 \times 20}{40} = 10$ days

Aliter : Using Rule 12,
Here, A = 20, B = 24, a = 20
$A_1 = 30, B_1 = 12$

Required time = $\frac{a(A \times B)}{A_1B + B_1A}$

$= \frac{20(20 \times 24)}{30 \times 24 + 12 \times 20}$

$= \frac{9600}{720 + 240}$

$= \frac{9600}{960} = 10$ days

23. (3) 8 men ≡ 17 women

$\Rightarrow$ 12 men ≡ $\frac{17}{8} \times 12$

$= \frac{51}{2}$ women

$\therefore$ 12 men + 24 women

$= \frac{51}{2} + 24 = \frac{99}{2}$ women

By $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\frac{17 \times 33}{1} = \frac{99 \times D_2}{2 \times 3}$

$\Rightarrow D_2 = \frac{17 \times 33 \times 6}{99} = 34$ days

Aliter : Using Rule 12,
Here, A = 8, B = 17, a = 33
$A_1 = 12, B_1 = 24$

Number of days= $\frac{a(A \times B)}{A_1B + B_1A}$

$= \frac{33 \times (8 \times 17)}{12 \times 17 + 24 \times 8}$

$= \frac{4488}{204 + 192} = \frac{4488}{396}$

No. of days to paint 3 houses

$= \frac{4488}{396} \times 3 = 34$ days

24. (4) 3 × 5 men + 7 × 5 women
= 4 × 4 men + 6 × 4 women
$\Rightarrow$ 16 men – 15 men = 35 women – 24 women
$\therefore$ 1 man = 11 women
$\Rightarrow$ 3 men + 7 women = 40 women
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 40 \times 5 = 10 \times D_2$
$\Rightarrow D_2 = 20$ days
Aliter : Using Rule 11,
Here, $A_1 = 3, B_1 = 7, D_1 = 5$
$A_2 = 4, B_2 = 6, D_2 = 4$
$A_3 = 0, B_3 = 10$
Required days

$= \frac{D_1D_2(A_1B_2 - A_2B_1)}{D_1(A_1B_3 - A_3B_1) - D_2(A_2B_3 - A_3B_1)}$ days

$= \frac{5 \times 4(3 \times 6 - 4 \times 7)}{5 \times (3 \times 10 - 0) - 4(4 \times 10 - 0)}$

$= \frac{20 \times (-10)}{150 - 160} = 20$ days

25. (4) Using Rule 1,

$\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{110 \times 48}{\frac{3}{5}} = \frac{M_2 \times 44}{\frac{2}{5}}$

$\Rightarrow M_2 \times 44 \times 3 = 110 \times 48 \times 2$

$\Rightarrow M_2 = \frac{110 \times 48 \times 2}{44 \times 3} = 80$

$\therefore$ Number of men can be withdrawn
= 110 – 80 = 30

26. (2) Using Rule 1,

200 men do $\frac{1}{4}$ work in 50 days.

$\therefore \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{200 \times 50}{\frac{1}{4}} = \frac{M_2 \times 100}{\frac{3}{4}}$

$\Rightarrow M_2 \times 100$
$= 200 \times 50 \times 3$
$\Rightarrow M_2 = 300$
$\therefore$ Additional men = 100

27. (2) Using Rule 1,

Remaining work $= 1 - \frac{2}{3} = \frac{1}{3}$;

Remaining days = 124–64= 60

$\therefore \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{120 \times 64}{\frac{2}{3}} = \frac{M_2 \times 60}{\frac{1}{3}}$

$\Rightarrow M_2 = \frac{120 \times 64}{2 \times 60} = 64$

$\therefore$ No. of men can be discharged
= 120 – 64 = 56 men

28. (2) Using Rule 1,

$\frac{M_1D_1T_1}{W_1} = \frac{M_2D_2T_2}{W_2}$

$\Rightarrow \frac{7 \times 7 \times 7}{7} = \frac{5 \times 5 \times 5}{W_2}$

$\Rightarrow 49 \times W_2 = 125$

$\Rightarrow W_2 = \frac{125}{49}$

29. (1) Using Rule 1,
$M_1D_1 = M_2D_2$
$\Rightarrow 75 \times 90 = M_2 \times 18$

$\Rightarrow M_2 = \frac{75 \times 90}{18} = 375$

$\therefore$ Number of additional men
= 375 – 75 = 300

30. (*) 4 men ≡ 8 women
$\Rightarrow$ 1 man ≡ 2 women
$\therefore$ 6 men + 12 women
≡ 12 women + 12 women
≡ 24 women
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 8 \times 15 = 24 \times D_2$

$\Rightarrow D_2 = \frac{8 \times 15}{24} = 5$ days

Aliter : Using Rule 12,
Here, A = 4, B = 8, a = 15
$A_1 = 6$, $B_1 = 12$
Required number of days

$= \frac{a(A \times B)}{A_1B + B_1A}$

$= \frac{15(4 \times 8)}{6 \times 8 + 12 \times 4}$

$= \frac{15 \times 32}{96} = 5$ days

31. (1) $M_1D_1 = M_2D_2$
$\Rightarrow 24 \times 17 = M_2 \times 51$

$\Rightarrow M_2 = \frac{24 \times 17}{51} = 8$ men

TYPE-VII

1. (2) Ratio of Suman's and Sumati's 1 day's work $= \frac{1}{3} : \frac{1}{2} = 2 : 3$
Sum of the ratios = 2 + 3 = 5

Suman's share $= \frac{2}{5} \times 150 =$ ₹ 60

Aliter : Using Rule 24,
Here, m = 3, n = 2, R = 150

Share of suman $= \frac{n}{m+n} \times R$

$= \frac{2}{3+2} \times 150$

$= \frac{2}{5} \times 150 = 60$

2. (2) Total wages of 500 workers = 500 × 200 = ₹ 100000
Now, according to question,
Correct Average

$= \frac{(100000 - 180 - 20 + 80 + 220)}{500}$

$= \frac{100100}{500} =$ ₹ 200.20

3. (3) Using Rule 25,
C's 1 day's work

$= \frac{1}{4} - \left(\frac{1}{8} + \frac{1}{12}\right) = \frac{1}{4} - \left(\frac{3+2}{24}\right)$

$= \frac{1}{4} - \frac{5}{24} = \frac{6-5}{24} = \frac{1}{24}$

A : B : C $= \frac{1}{8} : \frac{1}{12} : \frac{1}{24} = 3 : 2 : 1$

C's share $=$ ₹ $\left(\frac{1}{6} \times 4500\right) =$ ₹ 750

4. (3)

More persons, more earning
Less working hours, less earning } Direct proportion

$\left.\begin{matrix} 6 & : & 9 \\ 8 & : & 6 \end{matrix}\right\} :: 8400 : x,$

where x = required earning
Therefore,
$\therefore 6 \times 8 \times x = 9 \times 6 \times 8400$

or $x = \frac{9 \times 6 \times 8400}{6 \times 8} =$ ₹ 9450

Aliter : Using Rule 1,
Here, $M_1 = 6$, $T_1 = 8$, wages = x
$M_2 = 9$, $T_2 = 6$, wages = 8400
6 × 8 × x = 9 × 6 × 8400

x $= \frac{9 \times 6 \times 8400}{6 \times 8}$ = Rs. 9450

5. (2) Using Rule 25,

A's 1 day's work $= \frac{1}{6}$

B's 1 day's work $= \frac{1}{8}$

(A + B + C)'s 1 day's work $= \frac{1}{3}$

$\therefore$ C's 1day's work

$= \frac{1}{3} - \frac{1}{6} - \frac{1}{8} = \frac{8-4-3}{24} = \frac{1}{24}$

$\therefore$ Ratio of their one day's work respectively

$= \frac{1}{6} : \frac{1}{8} : \frac{1}{24} = 4 : 3 : 1$

Sum of the ratios = 4 + 3 + 1 = 8
$\therefore$ C's share

= ₹ $\frac{1}{8}$ × 3200 = ₹ 400

6. (4) A's 1 day's work $= \frac{1}{15}$

B's 1 day's work $= \frac{1}{10}$

Ratio $= \frac{1}{15} : \frac{1}{10} = 2 : 3$

Sum of the ratios = 2 + 3 = 5
$\therefore$ A's share

= ₹ $\frac{2}{5} \times 30000 =$ ₹ 12000

Aliter : Using Rule 24,
Here, m = 15, n = 10, R = 30,000

Share of A $= \frac{n}{m+n} \times R$

$= \frac{10}{15+10} \times 30{,}000$

$= \frac{10}{25} \times 30{,}000$

= ₹ 12,000

7. (4) Man : boy = 3 : 1

$\therefore$ Boy's share $= \frac{1}{4} \times 800 =$ ₹ 200

$\therefore$ The daily wages of boy

= ₹ $\left(\frac{200}{5}\right) =$ ₹ 40

Aliter : Using Rule 16,
A:B = 3x:x and A:B = t:3t

Share of boy $= \frac{t}{t+3t} \times 800$

= 200

Daily wages of boy

$= \frac{200}{5} =$ ₹ 40

8. (2) It is required to find the highest common factor of 5750 and 5000, because his daily wage is their common factor.

```
5000) 5750 (1
      5000
       750) 5000 (6
            4500
             500) 750 (1
                  500
                  250) 500 (2
                       500
                         ×
```

Hence, the daily wage is ₹ 250.

9. (2) Using Rule 25,
Ratio of wages of A, B and C respectively
= 5 × 6 : 6 × 4 : 4 × 9
= 30 : 24 : 36 = 5 : 4 : 6
$\therefore$ Amount received by A

$= \frac{5}{5+4+6} \times 1800$

$= \frac{5}{15} \times 1800$ = ₹ 600

10. (3) Total salary for 20 days
= ₹ (75 × 20) = ₹ 1500
Actual salary received = ₹ 1140
Difference = ₹ (1500 – 1140)
= ₹ 360
Money deducted for 1 day's absence from work
= ₹ (15 + 75) = ₹ 90
∴ Number of days he was absent $= \frac{360}{90} = 4$ days

11. (3) Using Rule 25,

First man's 1 day's work $= \frac{1}{7}$

Second man's 1 day's work $= \frac{1}{8}$

Let, Boy's 1 day's work $= \frac{1}{x}$

$\therefore \frac{1}{7} + \frac{1}{8} + \frac{1}{x} = \frac{1}{3}$

$\Rightarrow \frac{1}{x} = \frac{1}{3} - \frac{1}{7} - \frac{1}{8}$

$= \frac{56-24-21}{168} = \frac{11}{168}$

∴ Ratio of their one day's work

$= \frac{1}{7} : \frac{1}{8} : \frac{11}{168}$ = 24 : 21 : 11

Sum of the ratios
= 24 + 21 + 11= 56
∴ Boy's share in wages

$= \frac{11}{56} \times 1400$ = ₹ 275

12. (4) 5 men ≡ 7 women
[Both earn same amount in 1 day]

∴ 7 men ≡ $\frac{7}{5} \times 7 = \frac{49}{5}$ women

∴ 7 men + 13 women

$= \frac{49}{5} + 13 = \frac{114}{5}$ women

Now,
∵ 7 women ≡ ₹ 5250

∴ $\frac{114}{5}$ women

$\equiv \frac{5250}{7} \times \frac{114}{5}$ = ₹ 17100

13. (1) According to the question,
(2 × 14) men + 14 women
= 16 men + 32 women
⇒ (28 – 16) men
=(32–14) women
⇒ 12 men = 18 women
⇒ 2 men = 3 women

∴ 1 woman = $\frac{2}{3}$ man

∴ Amount received by 1 woman per day= $\frac{2}{3} \times 600$ = ₹ 400

14. (3) Using Rule 25,
Work done by the third person in 1 day

$= \frac{1}{8} - \frac{1}{16} - \frac{1}{24} = \frac{6-3-2}{48} = \frac{1}{48}$

Ratio of their 1 day's work

$= \frac{1}{16} : \frac{1}{24} : \frac{1}{48}$
= 3 : 2 : 1
∴ Share of the third person

$= \frac{1}{(3+2+1)} \times 960 = \frac{960}{6}$ = ₹ 160

15. (1) Using Rule 25,
Required ratio
= 15 × 22 : 11 × 25 = 6 : 5

16. (4) Expert's 1 day's work

$= \frac{1}{12} - \frac{1}{36} - \frac{1}{48}$

$= \frac{12-4-3}{144} = \frac{5}{144}$

∴ Ratio of their respective work for 1 day

$= \frac{1}{36} : \frac{1}{48} : \frac{5}{144}$ = 4 : 3 : 5

∴ Expert's share

$= \frac{5}{12} \times 28800$ = ₹ 12000

17. (1) Using Rule 25,
According to the question,

$\frac{1}{15} + \frac{1}{12} + \frac{1}{C} = \frac{1}{5}$

Let C's work in day be $\frac{1}{C}$

$\Rightarrow \frac{1}{C} = \frac{1}{5} - \frac{1}{15} - \frac{1}{12}$

$= \frac{12-4-5}{60} = \frac{1}{20}$

∴ A : B : C = $\frac{1}{15} : \frac{1}{12} : \frac{1}{20}$
= 4 : 5 : 3
∴ C's share

$= \frac{3}{12} \times 1200$ = ₹ 300

18. (4) A's 1 day's work = $\frac{1}{21}$

B's 1 day's work = $\frac{1}{28}$

Total work done by both

$= \frac{1}{21} + \frac{1}{28} = \frac{4+3}{84} = \frac{1}{12}$

∴ Amount is sufficient to pay 12 days wages of both.
Aliter : Using Rule 2,
Here, x = 21, y = 28
Required days

$= \frac{x \times y}{x+y} = \frac{21 \times 28}{21+28}$

$= \frac{21 \times 28}{49}$ = 12 days

19. (4) Rule 2 and Rule 25,
Work done by A and B in 5 days

$= 5\left(\frac{1}{12} + \frac{1}{15}\right) = 5\left(\frac{5+4}{60}\right)$

$= \frac{9}{12} = \frac{3}{4}$

Time taken by C in doing $\frac{1}{4}$ work
= 5 days
∴ C will complete in 20 days.

∴ Ratio of wages = $\frac{1}{12} : \frac{1}{15} : \frac{1}{20}$
= 5 : 4 : 3
∴ Amount received by A

$= \frac{5}{12} \times 960$ = ₹ 400

20. (2) The daily earning of 'C' = Daily earning of (A + C) and (B + C) – Daily earning of (A + B + C) = 94 + 76 – 150
= ₹ 20

21. (3) Rule 3 and Rule 25,
If the fourth person completes the work in x days, then

$\frac{3}{8} + \frac{3}{12} + \frac{3}{16} + \frac{3}{x} = 1$

$\Rightarrow \frac{1}{x} = \frac{1}{3} - \frac{1}{8} - \frac{1}{12} - \frac{1}{16}$

$= \frac{16-6-4-3}{48} = \frac{1}{16}$

$\therefore x = 16$

$\therefore$ Ratio of wages

$= \frac{1}{8} : \frac{1}{12} : \frac{1}{16} : \frac{1}{16}$

= 6 : 4 : 3 : 3

Sum of ratios = 6 + 4 + 3+3 = 16

$\therefore$ Fourth person's share

$= \frac{3}{16} \times 1200$ = ₹ 225

22. (1) Rule 3 and Rule 25,

If C alone completes the work in x days, then

$\frac{1}{16} + \frac{1}{24} + \frac{1}{x} = \frac{1}{6}$

$\Rightarrow \frac{1}{x} = \frac{1}{6} - \frac{1}{16} - \frac{1}{24}$

$= \frac{8-3-2}{48} = \frac{1}{16}$

$\Rightarrow x = 16$ days

$\therefore$ Ratio of their remuneration

$= \frac{1}{16} : \frac{1}{24} : \frac{1}{16}$

= 3 : 2 : 3

$\therefore$ A's remuneration

$= \frac{3}{8} \times 400$ = ₹ 150

B's remuneration $= \frac{2}{8} \times 400$

= ₹ 100

C's remuneration $= \frac{3}{8} \times 400$

= ₹ 150

$\Rightarrow$ A : 150, B : 100, C : 150

23. (4) Using Rule 25,

Skilled : half skilled : unskilled

$= \frac{1}{3} : \frac{1}{4} : \frac{1}{6}$

$= \left(\frac{1}{3} \times 12\right) : \left(\frac{1}{4} \times 12\right) : \left(\frac{1}{6} \times 12\right)$

= 4 : 3 : 2

Share of the trained labourer

$= \frac{28}{(7 \times 4 + 8 \times 3 + 2 \times 10)} \times 369$

$= \frac{28}{(28 + 24 + 20)} \times 369$

$= \frac{28}{72} \times 369$ = ₹ 143.50

24. (2) Work done by B

$= 1 - \frac{19}{23} = \frac{23-19}{23} = \frac{4}{23}$

$\therefore$ (A + C) : B $= \frac{19}{23} : \frac{4}{23}$ = 19 : 4

$\therefore$ Sum of ratios = 19 + 4 = 23

$\therefore$ B's share

$= \frac{4}{23} \times 575$ = ₹ 100

25. (4) Earning in the first one hour $= \frac{2000}{50}$ = Rs. 40

Earnings for additional 5 hours

$= 40 \times \frac{3}{2} \times 5$ = Rs. 300

26. (3) (2 men + 1 woman)'s 14 days' work

≡ (4 women + 2 men)'s 8 days' work

$\Rightarrow$ 28 men + 14 women

≡ 32 women + 16 men

$\Rightarrow$ (28 – 16) = 12 men

≡ (32 – 14) = 18 women

$\Rightarrow$ 2 men ≡ 3 women

$\therefore$ 1 woman $\equiv \frac{2}{3}$ man

$\because$ Wages per day of 1 man = Rs. 180

$\therefore$ Wages per day of 1 woman

$= \frac{2}{3} \times 180$ = Rs. 120

27. (1) Time taken by A $= \frac{63}{3.50}$

= 18 days

Time taken by B $= \frac{75}{2.5}$

= 30 days

(A + B)'s 1 day's work

$= \frac{1}{18} + \frac{1}{30}$

$= \frac{5+3}{90} = \frac{8}{90} = \frac{4}{45}$

$\therefore$ Required time $= \frac{45}{4}$ days

$\therefore$ Total wages

= Rs. $\frac{45}{4} \times (3.50 + 2.50)$

= Rs. $\left(\frac{45}{4} \times 6\right)$ = Rs. 67.5

28. (3) Ratio of A's and B's 1 day's work

$= \frac{1}{12} : \frac{1}{15}$ 15 : 12 = 5 : 4

Sum of the terms of ratio

= 5 + 4 = 9

$\therefore$ A's share = Rs. $\left(\frac{5}{9} \times 450\right)$

= Rs. 250

29. (1) Part of work done by C

$= 1 - \frac{7}{11} = \frac{4}{11}$

Total amount received

= Rs. 550

$\therefore$ C's share = Rs. $\left(\frac{4}{11} \times 550\right)$

= Rs. 200

30. (1) Let C alone complete the work in x days.

According to the question,

$\frac{1}{5} + \frac{1}{15} + \frac{1}{x} = \frac{1}{3}$

$\Rightarrow \frac{1}{x} = \frac{1}{3} - \frac{1}{5} - \frac{1}{15}$

$= \frac{5-3-1}{15} = \frac{1}{15}$

$\therefore x = 15$ days = Time taken by C alone.

Ratio of the 1 day's work of A, B and C $= \frac{1}{5} : \frac{1}{15} : \frac{1}{15}$

= 3 : 1 : 1

Sum of the terms of ratio

= 3 + 1 + 1 = 5

$\therefore$ C's share = Rs. $\left(\frac{1}{5} \times 250\right)$ = Rs. 50

31. (1) Let daily wages of a man be Rs. x.

$\therefore$ Daily wages of a woman

= Rs. $\left(x - \frac{1}{2}\right)$

According to the question,

$600x + 400\left(x - \frac{1}{2}\right)$

= 1000 × 2.55

$\Rightarrow 600x + 400x - 200 = 2550$

$\Rightarrow 1000x = 2550 + 200 = 2750$

$\Rightarrow x = \frac{2750}{1000}$ = Rs. 2.75

$\therefore$ Daily wages of a woman

= Rs. (2.75 – 0.5)
= Rs. 2.25

TYPE-VIII

1. (1) Let initially the number of men be x.
$\Rightarrow$ According to question,
$M_1 D_1 W_2 = M_2 D_2 W_1$
$x \times 30 = (x + 5) \times (30 - 10)$
$x \times 30 = 20x + 100$
$30x - 20x = 100$
$10x = 100$
$x = 10$
Aliter : Using Rule 23,
Here, D = 30, a = 5, d = 10

Required number = $\frac{a(D-d)}{d}$

$= \frac{5(30-10)}{10} = 10$

2. (4) Using Rule 1,
Tricky Approach

Expenditure	Days	Hours/ day	Burners
450 ↓	8 ↑	6 ↑	6 ↓
625	10	5	x

$\therefore \left.\begin{array}{l} 450 : 625 \\ 10 : 8 \\ 5 : 6 \end{array}\right\} :: 6 : x$

$\Rightarrow 450 \times 10 \times 5 \times x$
$= 625 \times 8 \times 6 \times 6$

$\Rightarrow x = \frac{625 \times 8 \times 6 \times 6}{450 \times 10 \times 5} = 8$

3. (1) Work done by A in 15 days

$= \frac{1}{60} \times 15 = \frac{1}{4}$

Remaining work $= \left(1 - \frac{1}{4}\right) = \frac{3}{4}$

Now, $\frac{3}{4}$ work is done by B in 30 days
Whole work will be done by B in

$\frac{30 \times 4}{3} = 40$ days

A's 1 day's work $= \frac{1}{60}$ and B's 1 day's work $= \frac{1}{40}$

(A + B)'s 1 day's work

$= \frac{1}{60} + \frac{1}{40} = \frac{2+3}{120} = \frac{5}{120} = \frac{1}{24}$

Hence, both will finish the work in 24 days.

4. (3) A's 1 day's work
= (B +C)'s 1 day's work ...(i)

(A + B)'s 1 day's work $= \frac{1}{10}$

C's 1 day's work $= \frac{1}{50}$

(A + B + C)'s 1 day's work

$= \frac{1}{10} + \frac{1}{50} = \frac{5+1}{50} = \frac{6}{50} = \frac{3}{25}$ ...(iii)

(A + A)'s 1 day's work $= \frac{3}{25}$

(By (i) & (iii)

A's 1 day's work $= \frac{3}{50}$

B's 1 day's work $= \frac{1}{10} - \frac{3}{50}$

$= \frac{5-3}{50} = \frac{2}{50} = \frac{1}{25}$

Hence, B alone will complete the work in 25 days

5. (3) Using Rule 2,
Let the son take x days to do the work.

$\therefore \frac{1}{5} + \frac{1}{x} = \frac{1}{3}$

$\Rightarrow \frac{x+5}{5x} = \frac{1}{3}$

$\Rightarrow 3x + 15 = 5x$

$\Rightarrow 2x = 15 \Rightarrow x = \frac{15}{2}$

$= 7\frac{1}{2}$ days

6. (4) Let the number of men in the beginning = x

Then, $\frac{x+8}{x} = \frac{60}{50}$

$\Rightarrow \frac{x+8}{x} = \frac{6}{5}$

$\Rightarrow 6x = 5x + 40 \Rightarrow x = 40$
Aliter : Using Rule 23,
Here, D = 60, a = 8, d = 10

Required number = $\frac{a(D-d)}{d}$

$= \frac{8(60-10)}{10} = 40$

7. (1) 12 persons can complete a work in 4 days.
$\Rightarrow$ 24 persons can complete the work in 2 days.
$\Rightarrow$ 24 persons can complete the 8 times work in 16 days
$\Rightarrow$ 24 × 8 persons = 192 persons can complete the 8 times work in 2 days.
Aliter : Using Rule 1,
Here, $M_1 = 12$, $W_1 = 1$, $D_1 = 4$
$M_2 = ?$, $W_2 = 8$, $D_2 = 2$
$M_1D_1W_2 = M_2D_2W_1$
$12 \times 4 \times 8 = M_2 \times 2 \times 1$
$M_2 = 192$

8. (2) Let the original number of workers = x. Then,
$x \times 100 = (x - 10) \times 110$
$\Rightarrow 10x = 11x - 110$
$\Rightarrow x = 110$
Aliter : Using Rule 23,
Here, D = 100, a = 10,
d = (110 - 100) = 10

Required number = $\frac{a(D+d)}{d}$

$= \frac{10(100+10)}{10} = 110$

9. (3) Work done by 12 men in 6 days $= \frac{1}{2}$

Remaining work

$= 1 - \frac{1}{2} = \frac{1}{2}$

6 men leave the work.

$\therefore$ Time taken $= \frac{12 \times 12}{6 \times 2}$

= 12 days

10. (2) Using Rule 1,
60 men can complete a work in 250 days.
$\therefore$ Work done by 60 men in 1 day

$= \frac{1}{250}$

$\Rightarrow$ Work done by 60 men in 200 days $= \frac{200}{250} = \frac{4}{5}$

Remaining work $= 1 - \frac{4}{5} = \frac{1}{5}$

Work is stopped for 10 days.

Now, $\frac{1}{5}$ work is to be complete by x men in 40 days.

60 men can complete $\frac{1}{5}$ work in 50 days.

Days	Men
50 ↑	60 ↓
40	x

$\therefore$ 40 : 50 : : 60 : x

$\Rightarrow 40x = 50 \times 60$

$\Rightarrow x = \frac{50 \times 60}{40} = 75$

Hence, 15 more men should be engaged.

11. (1) Using Rule 2,

Working 5 hours a day, A can complete a work in 8 days.

i.e. A can complete the work in 40 hours.

Similarly,

B will complete the same work in 60 hours.

$\therefore$ (A + B)'s 1 hour's work

$= \frac{1}{40} + \frac{1}{60} = \frac{3+2}{120}$

$= \frac{5}{120} = \frac{1}{24}$

Hence, A and B together will complete the work in 24 hours.

$\therefore$ They can complete the work in 3 days working 8 hours a day.

12. (4) According to the question,

2 persons with equal abilities can do 1 job in 1 day

$\therefore$ Time taken by 1 man to complete 1 job = 2 days

$\Rightarrow$ Time taken by 100 persons in completing 100 jobs = 2 days

13. (2) Part of the field mowed by Ganga and Saraswati in first 2 hours $= \frac{1}{8} + \frac{1}{12} = \frac{3+2}{24} = \frac{5}{24}$

$\therefore$ Part of the field mowed in first 8 hours $= \frac{5 \times 4}{24} = \frac{20}{24} = \frac{5}{6}$

Remaining work $= 1 - \frac{5}{6} = \frac{1}{6}$

Now, it is the turn of Ganga, part of work done by Ganga in 1 hour

$= \frac{1}{8}$

Remaining work $= \frac{1}{6} - \frac{1}{8}$

$= \frac{4-3}{24} = \frac{1}{24}$

Now, time taken by Saraswati in completing this part of work

$= \frac{1}{24} \times 12 = \frac{1}{2}$ hour

$\therefore$ Total time $= 9\frac{1}{2}$ hours

The mowing starts at 9 am.

Hence, the mowing will be completed at 6.30 pm.

14. (3) Using Rule 1,

Remaining work

$= 5 - \frac{7}{2} = \frac{3}{2}$

$M_1 \times D_1 \times W_2 = M_2 \times D_2 \times W_1$

$\Rightarrow 280 \times 80 \times \frac{3}{2}$

$= M_2 \times 20 \times \frac{7}{2}$

$\Rightarrow M_2 = \frac{280 \times 80 \times 3}{20 \times 7} = 480$

$\therefore$ Required number of additional men = 480 – 280 = 200

15. (1) Let B alone do the work in x days.

$\therefore 6 \times \frac{1}{12} + 3 \times \frac{1}{x} = 1$

$\Rightarrow \frac{1}{2} + \frac{3}{x} = 1$

$\Rightarrow \frac{3}{x} = \frac{1}{2} \Rightarrow x = 6$ days

16. (4) Using Rule 15,

Efficiency and time taken are inversely proportional.

$\therefore$ Required ratio = 4 : 3

17. (3) Scheduled time to complete the work = 40 days

25 men in 24 days do $\frac{1}{3}$ work

$\therefore$ 1 man in 1 day does

$\frac{1}{3 \times 25 \times 24} = \frac{1}{1800}$ work.

Work remaining $= 1 - \frac{1}{3} = \frac{2}{3}$

The work is to be completed 4 days before schedule i.e.,

in (40 – 4) 36 days

No. of days left for $\frac{2}{3}$rd work

= 36 – 24 = 12 days

$\frac{1}{1800}$ work is done in 1 day by 1man.

$\therefore \frac{2}{3}$ work will be done in 12 days by

$1800 \times \frac{2}{3} \times \frac{1}{12} = 100$ men

25 men are already working

$\therefore$ Extra men to be employed

= 100 – 25 = 75

18. (2) 20 × 16 women

≡ 16 × 15 men

$\Rightarrow$ 4 women ≡ 3 men

$\Rightarrow \frac{\text{men}}{\text{women}} = \frac{4}{3}$

Hence, working capacity of man : woman = 4 : 3

19. (1) Man : Woman (efficiency)

= 3 : 2

i.e., Woman completes $\frac{2}{5}$th work in 18 days.

$\therefore$ Time taken by the woman to complete the whole work

$= \frac{18 \times 5}{2} = 45$ days

20. (1) 1 man's 1 day's work $= \frac{1}{2x}$

1 woman's 1 day's work $= \frac{1}{3y}$

$\therefore$ Required ratio $= \frac{1}{2x} : \frac{1}{3y}$

$= 3y : 2x$

21. (2) Using Rule 1,

$D_1T_1 = D_2T_2$

$\Rightarrow 18 \times 6 = 12 \times T_2$

$\Rightarrow T_2 = \frac{18 \times 6}{12} = 9$ hours

22. (3) Using Rule 1,

Carpenters	Working hours/day	Days	Chairs
12 ↓	6 ↓	240 ↓	460 ↓
18	8	36	x

$$\therefore \left.\begin{array}{ccc} 12 & : & 18 \\ 6 & : & 8 \\ 240 & : & 36 \end{array}\right\} :: 460 : x$$

$\Rightarrow 12 \times 6 \times 240 \times x$

$\Rightarrow = 18 \times 8 \times 36 \times 460$

$\Rightarrow x = \frac{18 \times 8 \times 36 \times 460}{12 \times 6 \times 240} = 138$

23. (3) Using Rule 1,

Length	Breadth	Height	Working hours	days	workers
18 ↓	2 ↓	12 ↓	9 ↑	10 ↑	8 ↓
32	3	9	6	8	x

$$\therefore \left.\begin{array}{ccc} 18 & : & 32 \\ 2 & : & 3 \\ 12 & : & 9 \\ 6 & : & 9 \\ 8 & : & 10 \end{array}\right\} :: 8 : x$$

$\Rightarrow 18 \times 2 \times 12 \times 6 \times 8x = 32 \times 3 \times 9 \times 9 \times 10 \times 8$

$\Rightarrow x = \frac{32 \times 3 \times 9 \times 9 \times 10 \times 8}{18 \times 2 \times 12 \times 6 \times 8}$

= 30 days

24. (2) (P + Q)'s 1 day's work = $\frac{1}{6}$

(Q + R)'s 1 day's work = $\frac{7}{60}$

Let P alone do the work in x days.

According to the question,

$\frac{3}{x} + \frac{6 \times 7}{60} = 1$

$\Rightarrow \frac{3}{x} = 1 - \frac{7}{10} = \frac{3}{10}$

$\Rightarrow x = 10$ days

$\therefore$ Q's 1 day's work

$= \frac{1}{6} - \frac{1}{10} = \frac{5-3}{30} = \frac{1}{15}$

R's 1 day's work

$= \frac{7}{60} - \frac{1}{15} = \frac{7-4}{60} = \frac{1}{20}$

$\therefore$ Time taken by R = 20 days

$\therefore$ Required answer = 20 – 10 = 10 days

25. (3) Let 150 workers complete the work in x days.

$\therefore$ $150 \times x = 150 + 146 + ...$ to $(x + 8)$ terms

On putting $x = 17$

LHS = 150 × 17 = 2550

RHS = 150 + 146 + ... to 25 terms

$a = 150,\ d = -4,\ n = 25$

$\therefore S = \frac{n}{2}[2a + (n-1)d]$

$= \frac{25}{2}[2 \times 150 + 24 \times (-4)]$

$= \frac{25}{2}(300 - 96) = \frac{25 \times 204}{2} =$ 2550

Note : It is better to solve by options.

26. (1) Using Rule 1,

According to the question,

$M_1D_1 = M_2D_2$

$\Rightarrow (x + 4)(x + 5)$

$= (x - 5)(x + 20)$

$\Rightarrow x^2 + 5x + 4x + 20$

$= x^2 - 5x + 20x - 100$

$\Rightarrow 9x + 20 = 15x - 100$

$\Rightarrow 15x - 9x = 100 + 20$

$\Rightarrow 6x = 120$

$\Rightarrow x = \frac{120}{6} = 20$

27. (3) Let the work be finished in x days.

$\frac{x}{50} + \frac{x-1}{50} + \frac{x-2}{50} + ... + \frac{1}{50} = 1$

$\Rightarrow x + x - 1 + x - 2 + ... + 1 = 50$

i.e., 10 + 9 + 8 + ... + 1 = 55

9 + 8 + ... + 1 = 45

$\therefore$ Required time = 10 days

28. (3)

Men	Days	Working hours/day
20 ↑	21 ↑	8 ↓
48	7	x

$$\therefore \left.\begin{array}{ccc} 48 & : & 20 \\ 7 & : & 21 \end{array}\right\} :: 8 : x$$

$\Rightarrow 48 \times 7 \times x = 20 \times 21 \times 8$

$\Rightarrow x = \frac{20 \times 21 \times 8}{48 \times 7} = 10$ days

29. (2) Area of the four walls and ceiling of the room

$= 2h(l + b) + lb$

$= 2 \times 10(25 + 12) + 25 \times 12$

$= (20 \times 37 + 300)$ sq. metre

$= (740 + 300)$ sq. metre

= 1040 sq. metre

Area painted by A in 1 day

$= \frac{200}{5} = 40$ sq. metre

Area painted by B in 1 day

$= \frac{250}{2} = 125$ sq. metre

Area painted by both in1 day

= (125 + 40) sq. metre

= 165 sq. metre

$\therefore$ Required time = $\frac{1040}{165}$

$= \frac{208}{33} = 6\frac{10}{33}$ days

30. (1) Here, the length of wall is same in both cases.

$\therefore M_1D_1 = M_2D_2$

$\Rightarrow 36 \times 21 = M_2 \times 14$

$\Rightarrow M_2 = \frac{36 \times 21}{14} = 54$ days

31. (2) Number of days in April and May = 30 + 31 = 61

$\because$ Requirement of rice for 7 days = 56 kg.

$\therefore$ Requirement of rice for 61 days

$= \left(\frac{56}{7} \times 61\right)$ kg.

= 488 kg.

32. (1) Total working time of school

= (45 × 8) minutes

= 360 minutes

If 9 periods are held per day.

Working time of each period

TEST YOURSELF

1. A alone takes as much time as B and C together take to complete a piece of work. If A and B together take 10 days and B alone takes 50 days to complete it, in what time can A and C together do the work?

(1) $7\frac{1}{2}$ days (2) $7\frac{1}{7}$ days

(3) $8\frac{1}{7}$ days (4) $15\frac{1}{7}$ days

2. A can do a work in 12 days and B can do it in 16 days. A and B started the work jointly and A left 2 days before the work is finished. Find the number of days they took to finish the work.

(1) 6 days (2) 7 days

(3) 9 days (4) 8 days

3. A and B can do a piece of work in 10 days, B and C in 15 days and C and A in 20 days. C alone can do the work in :

(1) 60 days (2) 120 days

(3) 80 days (4) 30 days

4. 12 men and 18 boys working $7\frac{1}{2}$ hours a day can do a work in 60 days. If one man works equal to 2 boys, then the number of boys required to help 21 men to do twice the work in 50 days working 9 hours a day will be :

(1) 42 (2) 44

(3) 46 (4) None of these

5. Rita, Sita and Meeta are employed to do a piece of work for ₹625. Rita and Sita together are supposed to do $\frac{17}{23}$ of the work. What should Meeta be paid?

(1) ₹162.04 (2) ₹163.04

(3) ₹161.04 (4) None of these

6. A contract is to be completed in 50 days and 105 men were set to work, each working 8 hours a day. After 25 days, $\frac{2}{5}$th of the work is finished. How many additional men be employed so that the work may be completed on time, each man now working 9 hours a day?

(1) 35 (2) 40

(3) 45 (4) None of these

7. If *A* alone can do a work in 12 days and *B* alone can do it in 8 days, Working together, in how many days will they complete it?

(1) $4\frac{4}{5}$ days (2) 4 days

(3) $3\frac{4}{5}$ days (4) 6 days

8. *A* can do $\frac{1}{2}$ of a work in 9 days while *B* can do $\frac{1}{3}$ of the same work in 6 days. How long would it take for *A* and *B* together to complete the work?

(1) 8 days (2) 9 days

(3) 10 days (4) 7 days

9. *A* and *B* can do a work in 8 days. *B* alone can do it in 24 days. In how many days, *A* alone can do the same work?

(1) 10 days (2) 9 days

(3) 12 days (4) 14 days

10. *A* and *B* can do a piece of work in 12 days, *B* and *C* in 15 days; *C* and *A* in 20 days. In how many days will they finish it working together? In what time can *A* do it separately?

(1) 45 days (2) 20 days

(3) 60 days (4) 30 days

11. *A*, *B* and *C* can complete a work in 8 days. *B* alone can do it in 18 days and *C* alone can do it in 24 days. In how many days can *A* alone do the same work?

(1) 36 days (2) 24 days

(3) 38 days (4) 30 days

12. *A* can do a piece of work in 40 days. He works on it for 5 days and then *B* completes it in 21 days. How long will *A* and *B* together take to complete the work?

(1) 10 days (2) 15 days

(3) 20 days (4) 25 days

13. Ram can do a piece of work in 20 days and Shyam in 30 days. They work together for 10 days. After that Shyam leaves and rest of the work is completed by Ram alone. How long does it take Ram to finish the remaining work?

(1) 3 days (2) $2\frac{1}{3}$ days

(3) $3\frac{1}{3}$ days (4) $4\frac{1}{3}$ days

14. *A* and *B* can complete a piece of work in 45 and 40 days respectively. Both started to work together, but after some days *A* left and *B* alone completed the rest work in 23 days. For how many days did *A* work?

(1) 12 days (2) 10 days

(3) 8 days (4) 9 days

15. *A* and *B* together can finish a work in 15 days. *A* and *C* take 2 days more to complete the same work than that of *B* and *C*. *A*, *B* and *C* together complete the work in 8 days. In how many days will A finish it separately?

(1) 40 days (2) 24 days

(3) $17\frac{1}{7}$ days (4) 20 days

16. *A* and *B* together can do a piece of work in 30 days, *B* and *C* together can do it in 20 days. *A* starts the work and works on it for 5 days, then *B* takes it up and works for 15 days. Finally *C* finishes the work in 18 days. In how many days can C do the work when doing it separately?

(1) 40 days (2) 24 days

(3) 120 days (4) 60 days

17. *A* and *B* can do a piece of work in 30 days while *B* and *C* can do the same work in 24 days and *C* and *A* in 20 days. They all work for 10 days when *B* and *C* leave. How many days more will *A* take to complete the work?

(1) 16 days (2) 15 days

(3) 18 days (4) 20 days

18. *A*, *B* and *C* can complete a work separately in 24, 36 and 48 days respectively. They started together but *C* left after 4 days of start and *A* left 3 days before the completion of work. In how many days will the work be completed?

(1) 20 days (2) 18 days
(3) 16 days (4) 15 days

19. *A* can complete a work in 24 days, *B* in 32 days and *C* in 64 days. They start together. *A* works for 6 days and leaves and *B* leaves 6 days before the work is finished. In how many days was the work finished?

(1) 20 days (2) 21 days
(3) 22 days (4) 25 days

20. *A* can complete a work in 10 days, *B* can complete the same work in 20 days and *C* in 40 days. *A* starts working on the first day, *B* works for second day and *C* works for third day. Again *A* works for fourth day and *B* for fifth day and so on. If they continued working in the same way, in how many days will the work be completed?

(1) 15 days (2) 16.5 days
(3) 15.5 days (4) 17 days

21. *A* can do a piece of work in 120 days and *B* can do it in 150 days. They work together for 20 days. Then *B* leaves and *A* alone continues the work. 12 days after that *C* joins *A* and the work is completed in 48 days more. In how many days can *C* do it if he works alone?

(1) 230 days (2) 225 days
(3) 240 days (4) 220 days

SHORT ANSWERS

1. (2)	**2.** (4)	**3.** (2)	**4.** (1)
5. (2)	**6.** (1)	**7.** (1)	**8.** (2)
9. (3)	**10.** (4)	**11.** (1)	**12.** (2)
13. (3)	**14.** (4)	**15.** (1)	**16.** (2)
17. (3)	**18.** (4)	**19.** (1)	**20.** (2)
21. (3)			

EXPLANATIONS

1. (2) (A + B)'s 1 day's work = $\frac{1}{10}$

B's 1 day's work = $\frac{1}{50}$

A's 1 day's work = $\frac{1}{10} - \frac{1}{50}$ =

$\frac{5-1}{50} = \frac{2}{25}$

(B + C)'s 1 day's work = $\frac{2}{25}$

C's 1 day's work = $\frac{2}{25} - \frac{1}{50}$

$= \frac{4-1}{50} = \frac{3}{50}$

(A + C)'s 1 day's work

$= \frac{2}{25} + \frac{3}{50}$

$= \frac{4+3}{50} = \frac{7}{50}$

$\therefore$ (A + C) will complete the work

in $\frac{50}{7} = 7\frac{1}{7}$ days.

2. (4) Let the required number of days be x.

$\therefore$ A's work in $(x-2)$ days

$= \frac{x-2}{12}$

B's work in x days = $\frac{x}{16}$

$\therefore \frac{x-2}{12} + \frac{x}{16} = 1$

$\Rightarrow \frac{4x-8+3x}{48} = 1$

$\Rightarrow 7x = 48 + 8 = 56$

$\Rightarrow x = 8$ days

3. (2) According to the question

Work done by A and B together

in one day $= \frac{1}{10}$ part

Work done by B and C together

in one day $= \frac{1}{15}$ part

Work done by C and A together

in one day $= \frac{1}{20}$ part

So,

A + B $= \frac{1}{10}$ ....(I)

B + C $= \frac{1}{15}$ ...(II)

C + A $= \frac{1}{20}$ ....(III)

Adding I, II, III, we get

$2\,(A + B + C) = \frac{1}{10} + \frac{1}{15} + \frac{1}{20}$

$2\,(A + B + C) = \frac{6+4+3}{60} = \frac{13}{60}$

A + B + C $= \frac{13}{120}$ ....(IV)

Putting the value of eqn. (I) in eqn. (IV)

$\frac{1}{10} + C = \frac{13}{120}$

$C = \frac{13}{120} - \frac{1}{10} = \frac{13-12}{120} = \frac{1}{120}$

$\therefore$ Work done in 1 day by C is

$\frac{1}{120}$ part

Hence, C will finish the whole work in 120 days

Aliter : Using Rule 19,

C alone can do the work in

$= \frac{2xyz}{xy - yz + zx}$

$= \frac{2 \times 10 \times 15 \times 20}{10 \times 15 - 15 \times 20 + 20 \times 10}$

$= \frac{6000}{150 - 300 + 200}$

$= \frac{6000}{50} = 120$ days

4. (1) Using Rule 1,

12 men + 18 boys = 21 men

Work	Hours/day	Days	Men
1 ↓	$\frac{15}{2}$ ↑	60 ↑	21 ↓
2	9	50	x

$$\left.\begin{array}{r} 1:2 \\ 9:\frac{15}{2} \\ 50:60 \end{array}\right\} :: 21 : x$$

$$\Rightarrow 9 \times 50 \times x = \frac{15}{2} \times 60 \times 21 \times 2$$

$$\Rightarrow x = \frac{15 \times 60 \times 21 \times 2}{2 \times 9 \times 50} = 42$$

∴ Number of boys
= 2 × 21 = 42

5. (2) Using Rule 1,
Amount received by Meeta

$$= \frac{6}{23} \times 625 = \text{Rs. } 163.04$$

6. (1)

Work	hours/days	Days	Men
$\frac{2}{5}$ ↓	8 ↑	25	105 ↓
$\frac{3}{5}$	9	25	x

$$\therefore \left.\begin{array}{r} \frac{2}{5}:\frac{3}{5} \\ 9:8 \end{array}\right\} :: 105 : x$$

$$\Rightarrow \frac{2}{5} \times 9 \times x = \frac{3}{5} \times 8 \times 105$$

$$\Rightarrow x = \frac{3 \times 8 \times 105}{2 \times 9} = 140$$

Number of additional men
= 140 – 105 = 35

7. (1) A's one day's work $= \frac{1}{12}$

B's one day's work $= \frac{1}{8}$

(A + B)'s one day's work

$$= \frac{1}{12} + \frac{1}{8} = \frac{2+3}{24} = \frac{5}{24}$$

Now, $\frac{5}{24}$ work is done in 1 day

∴ 1 work is done in $= \frac{24}{5}$ days

$= 4\frac{4}{5}$ days

Aliter : Using Rule 2,
Here, x = 12, y = 8
Required time taken

$$= \frac{xy}{x+y}$$

$$= \frac{12 \times 8}{12+8} = \frac{24}{5}$$

$$= 4\frac{4}{5} \text{ days}$$

8. (2) A's 9 days' work $= \frac{1}{2}$

∴ A's 1 day's work

$$= \frac{1}{2 \times 9} = \frac{1}{18}$$

B's 6 days' work $= \frac{1}{3}$

∴ B's 1 day's work

$$= \frac{1}{3 \times 6} = \frac{1}{18}$$

∴ (A + B)'s 1 day's work

$$= \frac{1}{18} + \frac{1}{18} = \frac{2}{18} = \frac{1}{9}$$

∴ A and B both together will complete the work in 9 days.

Aliter : Using Rule 2,
A's 1 day work

$$= \frac{1}{2 \times 9} = \frac{1}{18} \text{ days}$$

$\Rightarrow x = 18$

B's 1 day work

$$= \frac{1}{3 \times 6} = \frac{1}{18} \text{ days}$$

Required time taken $= \frac{x \times y}{x+y}$

$$= \frac{18 \times 18}{18+18}$$

$$= \frac{18 \times 18}{36} = 9 \text{ days}$$

9. (3) (A + B)'s 1 day's work $= \frac{1}{8}$

B's 1 day's work $= \frac{1}{24}$

∴ A's one day's work
= (A + B)'s one day's work – B's one day's work

$$= \frac{1}{8} - \frac{1}{24} = \frac{3-1}{24} = \frac{2}{24} = \frac{1}{12}$$

∴ A will complete the work in 12 days.

Aliter : Using Rule 4,
Here, x = 24, y = 8

Required time $= \frac{xy}{x-y}$ days

$$= \frac{24 \times 8}{24-8} = 12 \text{ days}$$

10. (4) (A + B)'s 1 day's work $= \frac{1}{12}$

(B + C)'s 1 day's work $= \frac{1}{15}$

(C + A)'s 1 day's work $= \frac{1}{20}$

Adding all,
2 (A + B + C)'s 1 day's work

$$= \frac{1}{12} + \frac{1}{15} + \frac{1}{20}$$

$$= \frac{5+4+3}{60} = \frac{12}{60} = \frac{1}{5}$$

∴ (A + B + C)'s 1 day's work

$$= \frac{1}{5 \times 2} = \frac{1}{10}$$

∴ (A + B + C) together can complete the work in 10 days.

Now, A's 1 day's work
= (A + B + C)'s 1 day's work – (B + C)'s 1 day's work

$$= \frac{1}{10} - \frac{1}{15} = \frac{3-2}{30} = \frac{1}{30}$$

∴ A alone can finish the work in 30 days.

Aliter : Using Rule 19,
Here, x = 12, y = 15, z = 20
A alone can do in

$$= \frac{2xyz}{xy + yz - zx}$$

$$= \frac{2 \times 12 \times 15 \times 20}{12 \times 15 + 15 \times 20 - 20 \times 12}$$

$$= \frac{24 \times 300}{180 + 300 - 240}$$

$$= \frac{24 \times 300}{240} = 30 \text{ days}$$

11. (1) (A + B + C)'s 1 day's work

$$= \frac{1}{8}$$

B's 1 day's work $= \frac{1}{18}$

C's 1 day's work $= \frac{1}{24}$

∴ A's 1 day's work
= (A + B + C)'s 1 day's work – B's 1 day's work – C's 1 day's work

$$= \frac{1}{8} - \frac{1}{18} - \frac{1}{24}$$

$$= \frac{9-4-3}{72} = \frac{2}{72} = \frac{1}{36}$$

⇒ A's 1 day's work $= \frac{1}{36}$

∴ A alone can do the same work in 36 days.

Aliter : Using Rule 18,
Here, x = 8, y = 18, z = 24

Required time = $\frac{xyz}{zy - x(y+z)}$

$$= \frac{8 \times 18 \times 24}{24 \times 18 - 8(18+24)}$$

$$= \frac{8 \times 18 \times 24}{432 - 336}$$

$$= \frac{8 \times 18 \times 24}{96} = 36 \text{ days}$$

12. (2) Using Rule 2,

A's 1 day's work $= \frac{1}{40}$

∴ A's 5 days' work $= \frac{5}{40} = \frac{1}{8}$

Remaining work $= 1 - \frac{1}{8} = \frac{7}{8}$

This part of work is done by B in 21 days.

∴ B's 1 day's work

$$= \frac{7}{8 \times 21} = \frac{1}{24}$$

∴ (A + B)'s 1 day's work

$$= \frac{1}{40} + \frac{1}{24} = \frac{3+5}{120}$$

$$= \frac{8}{120} = \frac{1}{15}$$

Hence, A and B together will complete the work in 15 days.

13. (3) Ram's 1 day's work $= \frac{1}{20}$

Shyam's 1 day's work $= \frac{1}{30}$

∴ (Ram + Shyam)'s 1 day's work

$$= \frac{1}{20} + \frac{1}{30} = \frac{3+2}{60}$$

$$= \frac{5}{60} = \frac{1}{12}$$

∴ (Ram + Shyam)'s 10 days' work $= 10 \times \frac{1}{12} = \frac{5}{6}$

Þ Remaining work = $1 - \frac{5}{6} = \frac{1}{6}$

Now, $\frac{1}{6}$ work is completed by Ram alone.

To finish this part Ram will take

$$= \frac{\text{Remaining work}}{\text{Ram's 1 day's work}} = \frac{\frac{1}{6}}{\frac{1}{20}}$$

$$= \frac{1}{6} \times 20 = \frac{10}{3} = 3\frac{1}{3} \text{ days}$$

14. (4) Using Rule 2,

Let A worked for x days.

A's 1 day's work $= \frac{1}{45}$

∴ A's x day's work $= \frac{x}{45}$

B's 1 day's work $= \frac{1}{40}$

∴ B's x day's work

$$= \frac{1}{40} \times x = \frac{x}{40}$$

(A + B) together worked for x days.

∴ (A + B)'s x day's work

$$= \frac{x}{45} + \frac{x}{40}$$

$$= \frac{8x + 9x}{360} = \frac{17x}{360}$$

∴ Remaining work

$$= 1 - \frac{17x}{360} = \frac{360 - 17x}{360}$$

This part of work, i.e., $\frac{360 - 17x}{360}$ is completed by B alone in 23 days.

∴ $\frac{360 - 17x}{360}$ = 23 × B's 1 day's work

$$\frac{360 - 17x}{360} = 23 \times \frac{1}{40} = \frac{23}{40}$$

⇒ 360 – 17x

$= \frac{23}{40} \times 360 = 207$

$\Rightarrow 17x = 360 - 207 = 153$

$\Rightarrow x = \frac{153}{17} = 9$ days

Hence, A worked for 9 days.

15. (1) $(A + B)$'s 1 day's work $= \frac{1}{15}$

$(A + B + C)$'s 1 day's work $= \frac{1}{8}$

$\therefore$ C's 1 day's work

$= \frac{1}{8} - \frac{1}{15} = \frac{15-8}{120} = \frac{7}{120}$

Let $(B + C)$ can complete the work in x days.

$\therefore$ $(A + C)$ can complete the work in $(x + 2)$ days.

$\therefore$ $(B + C)$'s 1 day's work $= \frac{1}{x}$

$(A + C)$'s 1 day's work $= \frac{1}{x+2}$

$\therefore$ B's 1 day's work

$= \frac{1}{x} - \frac{7}{120} = \frac{120-7x}{120x}$

and, A's 1 day's work

$= \frac{1}{x+2} - \frac{7}{120}$

$= \frac{120-7(x+2)}{120(x+2)}$

$= \frac{106-7x}{120(x+2)}$

Now, A's 1 day's work + B's 1 day's work = $(A + B)$'s 1 day's work

$\Rightarrow \frac{106-7x}{120(x+2)} + \frac{120-7x}{120x} = \frac{1}{15}$

$\Rightarrow \frac{106x - 7x^2 + 120x + 240 - 7x^2 - 14x}{120x(x+2)}$

$= \frac{1}{15}$

$\Rightarrow -14x^2 + 212x + 240$
$= 8x^2 + 16x$

$\Rightarrow 22x^2 - 196x - 240 = 0$
$\Rightarrow 11x^2 - 98x - 120 = 0$
$\Rightarrow 11x^2 - 110x + 12x - 120 = 0$
$\Rightarrow 11x(x - 10) + 12(x - 10) = 0$
$\Rightarrow (x - 10)(11x + 12) = 0$

$\Rightarrow x = 10$, and $-\frac{12}{11}$

But no. of days cannot be negative

$\therefore x = 10$

$\therefore$ A's 1 day's work

$= \frac{1}{10+2} - \frac{7}{120}$

$= \frac{1}{12} - \frac{7}{120}$

$= \frac{10-7}{120} = \frac{3}{120} = \frac{1}{40}$

$\therefore$ A alone can complete the work in 40 days.

16. (2) Let us denote A's 1 day's work by A, B's 1 day's work by B and C's work by C.

So, $A + B = \frac{1}{30}$

and $B + C = \frac{1}{20}$

Also, $5A + 15B + 18C = 1$ work.
This can be written as,
$5(A + B) + 10(B + C) + 8C = 1$
Substituting the values of $(A + B)$ and $(B + C)$ we get,

$\left(5 \times \frac{1}{30}\right) + \left(10 \times \frac{1}{20}\right) + 8C = 1$

or $\frac{1}{6} + \frac{1}{2} + 8C = 1$

or $8C = 1 - \frac{1}{6} - \frac{1}{2}$

or $8C = \frac{6-1-3}{6}$

or $8C = \frac{2}{6}$

or $C = \frac{2}{6 \times 8} = \frac{1}{24}$

Hence, C will complete the work in 24 days.

17. (3) Using Rule 3,

$(A + B)$'s 1 day's work $= \frac{1}{30}$

$(B + C)$'s 1 day's work $= \frac{1}{24}$

$(C + A)$'s 1 day's work $= \frac{1}{20}$

Adding all the above, we have
2 $(A + B + C)$'s 1 day's work

$= \frac{1}{30} + \frac{1}{24} + \frac{1}{20}$

$= \frac{4+5+6}{120} = \frac{15}{120} = \frac{1}{8}$

$\therefore$ $(A + B + C)$'s 1 day's work

$= \frac{1}{8 \times 2} = \frac{1}{16}$

Now, all three worked together for 10 days.

$\therefore$ $(A + B + C)$'s 10 days' work

$= \frac{1}{16} \times 10 = \frac{5}{8}$

$\therefore$ Remaining part of work

$= 1 - \frac{5}{8} = \frac{8-5}{8} = \frac{3}{8}$

Now, A's 1 day's work

$= \frac{1}{16} - \frac{1}{24} = \frac{3-2}{48} = \frac{1}{48}$

Since, A finishes $\frac{1}{48}$ part of work in 1 day

$\therefore$ A will finish $\frac{3}{8}$ part of work

in $1 \times 48 \times \frac{3}{8} = 18$ days.

18. (4) Let the work be completed in x days. Therefore, A worked for $x - 3$ days, B for x days and C for 4 days.

A's 1 day's work $= \frac{1}{24}$

B's 1 day's work $= \frac{1}{36}$

and, C's 1 day's work $= \frac{1}{48}$

$\therefore (x-3)\times\frac{1}{24}+x\times\frac{1}{36}+4\times\frac{1}{48} = 1$

$\Rightarrow \frac{x-3}{24}+\frac{x}{36}+\frac{1}{12} = 1$

$\Rightarrow \frac{3x-9+2x+6}{72} = 1$

$\Rightarrow 5x - 3 = 72$

$\Rightarrow 5x = 75$

$\Rightarrow x = \frac{75}{5} = 15$

Hence, the work was completed in 15 days.

19. (1) Let the work was completed in x days. Hence, A worked for 6 days, B worked for $(x-6)$ days and C worked for x days.

Now, A's 1 day's work $= \frac{1}{24}$

$\therefore$ A's 6 days' work

$= \frac{1}{24}\times 6 = \frac{1}{4}$

B's 1 day's work $= \frac{1}{32}$

$\therefore$ B's $(x-6)$ days' work

$= \frac{1}{32}\times(x-6) = \frac{x-6}{32}$

C's 1 day's work $= \frac{1}{64}$

$\therefore$ C's x days' work

$= \frac{1}{64}\times x = \frac{x}{64}$

$\therefore \frac{1}{4}+\frac{x-6}{32}+\frac{x}{64} = 1$

$\Rightarrow \frac{x-6}{32}+\frac{x}{64} = 1-\frac{1}{4} = \frac{3}{4}$

$\Rightarrow \frac{2x-12+x}{64} = \frac{3}{4}$

$\Rightarrow 3x - 12 = 48$

$\Rightarrow 3x = 48 + 12 = 60$

$\Rightarrow x = \frac{60}{3} = 20$

Hence, the work was completed in 20 days.

20. (2) A's work for the first day

$= \frac{1}{10}$

B's work for the second day

$= \frac{1}{20}$

C's work for the third day $= \frac{1}{40}$

Work done in 3 days by them together $= \frac{1}{10}+\frac{1}{20}+\frac{1}{40}$

$= \frac{4+2+1}{40} = \frac{7}{40}$

Hence, $\frac{7}{40}$ part of work will be completed in 3 days.

$\frac{7\times 5}{40}$ i.e $\frac{35}{40}$ part of work will be completed in 3 × 5 or 15 days.

Remaining work

$= 1-\frac{35}{40} = \frac{5}{40} = \frac{1}{8}$

Now, A will work on 16th day. The remaining work after 16 days

$= \frac{1}{8}-\frac{1}{10} = \frac{5-4}{40} = \frac{1}{40}$

Again, B will work on 17th day.

$\because$ B completes the work in 20 days.

$\therefore$ B will complete $\frac{1}{40}$ part of work in $20\times\frac{1}{40} = \frac{1}{2}$ day

Hence, Total time taken in completion of work

$= 15+1+\frac{1}{2} = 16\frac{1}{2}$ days

21. (3) A's 1 day's work $= \frac{1}{120}$

B's 1 day's work $= \frac{1}{150}$

$(A + B)$'s 1 day's work

$= \frac{1}{120}+\frac{1}{150}$

$= \frac{5+4}{600} = \frac{9}{600} = \frac{3}{200}$

$(A + B)$ work together for 20 days

Hence, $(A + B)$'s 20 days' work

$= 20\times\frac{3}{200} = \frac{3}{10}$

After 20 days B leaves, and A alone works for 12 days

$\therefore$ A's 12 days' work

$= \frac{1}{120}\times 12 = \frac{1}{10}$

Now, after 12 days, C joins A and the work is finished in 48 days. It means A works for 48 days more.

$\therefore$ A's 48 days' work

$= \frac{1}{120}\times 48 = \frac{2}{5}$

$\therefore$ Total work done by A and B together

$= \frac{3}{10}+\frac{1}{10}+\frac{2}{5}$

$= \frac{3+1+4}{10} = \frac{8}{10} = \frac{4}{5}$

$\therefore$ Remaining work

$= 1-\frac{4}{5} = \frac{1}{5}$

This part of work, i.e., $\frac{1}{5}$ is done by C in 48 days

$\therefore$ C's 48 days' work $= \frac{1}{5}$

$\therefore$ C's 1 day's work

$= \frac{1}{5\times 48} = \frac{1}{240}$

Hence, C alone can finish the work in 240 days.

□□□

13 PIPE AND CISTERN

Importance : One or two questions are always asked on 'Tap and Tank' chapter. Most importantly, there is less variation in types of questions and hence you can ensure your marks very easily.

Scope of questions : Most questions are based on two or more inlet/outlet/both pipes. You need to find out time of filling/emptying of tank, part of tank filled/ emptied after certain time.

Way to success : Mostly Time and Work concepts are useful to solve Tap & Tank questions. In Emptied Filled tanks calculations are important and practice tricks to improve speed.

There are two types of taps:

Tap < to fill the water (efficiency +) (inlet)
to release the water (efficiency –) (outlet)

The same follows on the formulae of time and work.

RULE 1 : Two taps 'A' and 'B' can fill a tank in 'x' hours and 'y' hours respectively. If both the taps are opened together, then how much time it will take to fill the tank?

$$\text{Required time} = \left(\frac{xy}{x+y}\right) \text{ hrs}$$

RULE 2 : If x, y, z, ... all taps are opened together then, the time required to fill/empty the tank will be:

$$\frac{1}{x} \pm \frac{1}{y} \pm \frac{1}{z} \pm \ldots\ldots\ldots\ldots\ldots\ldots = \frac{1}{T}$$

where T, is the required time

Note: Positive result shows that the tank is filling and Negative result shows that the tank is getting empty.

RULE 3 : Two taps can fill a tank in 'x' and 'y' hours respectively. If both the taps are opened together and 1st tap is closed before 'm' hours of filling the tank, then in how much time the tank will be filled?

$$\text{Required time} = \frac{(x+m)y}{(x+y)} \text{ hrs}$$

If 2nd tap is closed before 'm' hours then,

$$\text{Required time} = \frac{(y+m)x}{(x+y)} \text{ hrs}$$

RULE 4 : If a pipe fills a tank in 'x' hours but it takes 't' more hours to fill it due to leakage in tank. If tank is filled completely, then in how many hours it will be empty? [due to leakage outlet]

$$\text{Required time} = \frac{x(x+t)}{t}$$

RULE 5 : Amount of water released or filled = Rate × time.

RULE 6 : Two taps 'A; and 'B' can empty a tank in 'x' hours and 'y' hours respectively. If both the taps are opened together, then time taken to empty the tank will be Required

$$\text{time} = \left(\frac{xy}{x+y}\right) \text{ hrs}$$

RULE 7 : A tap 'A' can fill a tank in 'x' hours and 'B' can empty the tank in 'y' hours. Then (a) time taken to fill the tank

$$\text{when both are opened} = \left(\frac{xy}{x-y}\right) : x > y$$

(b) time taken to empty the tank

$$\text{when both are opened} = \left(\frac{xy}{y-x}\right) : y > x$$

RULE 8 : Two taps A and B can fill a tank in x hours and y hours respectively. If both the pipes are opened together, then the time after which pipe B should be closed so that the tank is full in t hours

$$\text{Required time} = \left[y\left(1-\frac{t}{x}\right)\right] \text{ hours}$$

RULE 9 : If pipes A & B can fill a tank in time x, B & C in time y and C & A in time z, then the time required/taken to fill the tank by

(i) (A + B + C) together = $\dfrac{2xyz}{xy+yz+zx}$

(ii) A alone = $\dfrac{2xyz}{xy+yz-zx}$

(iii) B alone = $\dfrac{2xyz}{yz+zx-xy}$

(iv) C alone = $\dfrac{2xyz}{zx+xy-yz}$

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. Two pipes A and B can fill a tank in 20 minutes and 30 minutes respectively. If both pipes are opened together, the time taken to fill the tank is :

(1) 50 minutes (2) 12 minutes
(3) 25 minutes (4) 15 minutes

(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC CPO S.I. Exam. 07.09.2003)

2. A tap can empty a tank in one hour. A second tap can empty it in 30 minutes. If both the taps operate simultaneously, how much time is needed to empty the tank?

(1) 20 minutes (2) 30 minutes
(3) 40 minutes (4) 45 minutes

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

3. A cistern can be filled with water by a pipe in 5 hours and it can be emptied by a second pipe in 4 hours. If both the pipes are opened when the cistern is full, the time in which it will be emptied is :

(1) 9 hours (2) 18 hours
(3) 20 hours (4) $20\frac{1}{2}$ hours

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. Two pipes A and B can separately fill a cistern in 60 minutes and 75 minutes respectively. There is a third pipe in the bottom of the cistern to empty it. If all the three pipes are simultaneously opened, then the cistern is full in 50 minutes. In how much time the third pipe alone can empty the cistern?

(1) 110 minutes (2) 100 minutes
(3) 120 minutes (4) 90 minutes

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

5. Two pipes can fill a cistern in 3 hours and 4 hours respectively and a waste pipe can empty it in 2 hours. If all the three pipes are kept open, then the cistern will be filled in :

(1) 5 hours (2) 8 hours
(3) 10 hours (4) 12 hours

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

6. Two pipes can fill a tank in 15 hours and 20 hours respectively, while the third can empty it in 30 hours. If all the pipes are opened simultaneously, the empty tank will be filled in

(1) 10 hours (2) 12 hours
(3) 15 hours (4) $15\frac{1}{2}$ hours

(SSC CPO S.I. Exam. 05.09.2004)

7. A tap can fill a cistern in 8 hours and another tap can empty it in 16 hours. If both the taps are open, the time (in hours) taken to fill the tank will be :

(1) 8 (2) 10
(3) 16 (4) 24

(SSC CPO S.I. Exam. 26.05.2005)

8. A pipe can fill a tank in 'x' hours and another pipe can empty it in 'y' ($y > x$) hours. If both the pipes are open, in how many hours will the tank be filled ?

(1) $(x - y)$ hours
(2) $(y - x)$ hours
(3) $\frac{xy}{x-y}$ hours
(4) $\frac{xy}{y-x}$ hours

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

9. 12 pumps working 6 hours a day can empty a completely filled reservoir in 15 days. How many such pumps working 9 hours a day will empty the same reservoir in 12 days ?

(1) 15 (2) 9
(3) 10 (4) 12

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

10. Three pipes P, Q and R can separately fill a cistern in 4,8 and 12 hours respectively. Another pipe S can empty the completely filled cistern in 10 hours. Which of the following arrangements will fill the empty cistern in less time than others ?

(1) Q alone is open.
(2) P and S are open.
(3) P, R and S are open.
(4) P, Q and S are open.

(SSC CPO S.I. Exam. 09.11.2008)

11. Two pipes can fill a cistern separately in 10 hours and 15 hours. They can together fill the cistern in

(1) 6 hours (2) 7 hours
(3) 8 hours (4) 9 hours

(SSC Data Entry Operator Exam. 02.08.2009)

12. Three taps A,B and C together can fill an empty cistern in 10 minutes. The tap A alone can fill it in 30 minutes and the tap B alone in 40 minutes.How long will the tap C alone take to fill it ?

(1) 16 minutes (2) 24 minutes
(3) 32 minutes (4) 40 minutes

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

13. One tap can fill a water tank in 40 minutes and another tap can make the filled tank empty in 60 minutes. If both the taps are open, in how many hours will the empty tank be filled ?

(1) 2 hours (2) 2.5 hours
(3) 3 hours (4) 3.5 hours

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

14. A tank can be filled by pipe A in 2 hours and pipe B in 6 hours. At 10 A.M. pipe A was opened. At what time will the tank be filled if pipe B is opened at 11 A.M.?

(1) 12.45 A.M. (2) 5 P.M
(3) 11.45 A.M. (4) 12 P.M.

(SSC Graduate Level Tier-II Exam.16.09.2012)

15. Two pipes, P and Q, together can fill a cistern in 20 minutes and P alone can in 30 minutes. Then Q alone can fill the cistern in

(1) 62 minutes (2) 60 minutes
(3) 61 minutes (4) 51 minutes

(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

16. Two pipes A and B can fill a cistern in 3 hours and 5 hours respectively. Pipe C can empty in 2 hours. If all the three pipes are open, in how many hours the cistern will be full?

(1) can't be filled
(2) 10 hours
(3) 15 hours
(4) 30 hours

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

17. Three taps A, B, C can fill an overhead tank in 4, 6 and 12 hours respectively. How long would the three taps take to fill the tank if all of them are opened together ?
(1) 2 hrs. (2) 4 hrs.
(3) 3 hrs. (4) 5 hrs.
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

18. If two pipes function simultaneously, a tank is filled in 12 hours. One pipe fills the tank 10 hours faster than the other. How many hours does the faster pipe alone take to fill the tank?
(1) 20 hrs (2) 18 hrs
(3) 15 hrs (4) 12 hrs
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

19. Two pipes X and Y can fill a cistern in 24 minutes and 32 minutes respectively. If both the pipes are opened together, then after how much time (in minutes) should Y be closed so that the tank is full in 18 minutes ?
(1) 10 (2) 8
(3) 6 (4) 5
(SSC CHSL DEO & LDC Exam. 10.11.2013 (Ist Sitting)

20. A cistern is provided with two pipes A and B. A can fill it in 20 minutes and B can empty it in 30 minutes. If A and B be kept open alternately for one minute each, how soon will the cistern be filled ?
(1) 121 minutes (2) 110 minutes
(3) 115 minutes (4) 120 minutes
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

21. A water tank can be filled by a tap in 30 minutes and another tap can fill it in 60 minutes. If both the taps are kept open for 5 minutes and then the first tap is closed, how long will it take for the tank to be full ?
(1) 20 minutes (2) 25 minutes
(3) 30 minutes (4) 45 minutes
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

22. Two pipes A and B can fill a tank in 36 minutes and 45 minutes respectively. Another pipe C can empty the tank in 30 minutes. First A and B are opened. After 7 minutes, C is also opened. The tank is filled up in
(1) 39 minutes (2) 46 minutes
(3) 40 minutes (4) 45 minutes
(SSC CHSL DEO & LDC Exam. 9.11.2014)

23. Two pipes A and B can separately fill a tank in 2 hours and 3 hours respectively. If both the pipes are opened simultaneously in the empty tank, then the tank will be filled in
(1) 1 hour 12 minutes
(2) 2 hours 30 minutes
(3) 1 hour 15 minutes
(4) 1 hour 20 minutes
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

24. A pipe can fill a tank in x hours and another can empty it in y hours. They can together fill it in $(y > x)$
(1) $\frac{xy}{y-x}$ hours (2) $x - y$ hours
(3) $y - x$ hours (4) $\frac{xy}{x-y}$ hours
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

25. Pipe A can fill an empty tank in 6 hours and pipe B in 8 hours. If both the pipes are opened and after 2 hours pipe. A is closed, how much time B will take to fill the remaining tank?
(1) $7\frac{1}{2}$ hours (2) $2\frac{2}{5}$ hours
(3) $2\frac{1}{3}$ hours (4) $3\frac{1}{3}$ hours
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

TYPE–II

1. If $\frac{1}{3}$ of a tank holds 80 litres of water, then the quantity of water that $\frac{1}{2}$ tank holds is :
(1) 240 litres (2) 120 litres
(3) $\frac{80}{3}$ litres (4) 100 litres
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. A cistern has two pipes. One can fill it with water in 8 hours and other can empty it in 5 hours. In how many hours will the cistern be emptied if both the pipes are opened together when $\frac{3}{4}$ of the cistern is already full of water ?
(1) $13\frac{1}{3}$ hours (2) 10 hours
(3) 6 hours (4) $3\frac{1}{3}$ hours
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

3. $\frac{3}{4}$ part of a tank is full of water. When 30 litres of water is taken out, the tank becomes empty. The capacity of the tank is
(1) 36 litres (2) 42 litres
(3) 40 litres (4) 38 litres
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

4. A tap can fill an empty tank in 12 hours and another tap can empty half the tank in 10 hours. It both the taps are opened simultaneously, how long would it take for the empty tank to be filled to half its capacity ?
(1) 30 hours (2) 20 hours
(3) 15 hours (4) 12 hours
(SSC (South Zone) Investigator Exam. 12.09.2010)

5. Pipes P and Q can fill a tank in 10 and 12 hours respectively and C can empty it in 6 hours. If all the three are opened at 7 a.m., at what time will one-fourth of the tank be filled ?
(1) 10 a.m. (2) 10 p.m.
(3) 11 p.m. (4) 11 a.m.
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

6. If $\frac{3}{5}$ th of a cistern is filled in 1 minute, the time needed to fill the rest is
(1) 40 sec (2) 30 sec
(3) 36 sec (4) 24 sec
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

7. There are two pumps to fill a tank with water. First pump can fill the empty tank in 8 hours, while the second in 10 hours. If both the pumps are opened at the same time and kept open for 4 hours, the part of tank that will be filled up is :
(1) $\frac{9}{10}$ (2) $\frac{1}{10}$
(3) $\frac{2}{5}$ (4) $\frac{1}{5}$
(SSC Multi-Tasking Staff Exam. 10.03.2013)

8. Three pipes A, B and C can fill a tank in 6 hours, 9 hours and 12 hours respectively. B and C are opened for half an hour, then A is also opened. The time taken by the three pipes together to fill the remaining part of the tank is

(1) 3 hours (2) 2 hours

(3) $2\frac{1}{2}$ hours (4) $3\frac{1}{2}$ hours

(SSC Multi-Tasking Staff Exam. 17.03.2013 (Kolkata Region)

TYPE–III

1. Three taps A, B and C can fill a tank in 12, 15 and 20 hours respectively. If A is open all the time and B and C are open for one hour each alternatively, the tank will be full in :

(1) 6 hours (2) $6\frac{1}{2}$ hours

(3) 7 hours (4) $7\frac{1}{2}$ hours

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. A pump can fill a tank with water in 2 hours. Because of a leak in the tank it was taking $2\frac{1}{3}$ hours to fill the tank. The leak can drain all the water off the tank in :

(1) 8 hours (2) 7 hours

(3) $4\frac{1}{3}$ hours (4) 14 hours

(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CPO S.I. Exam. 03.09.2006)

3. A pipe can fill a tank with water in 3 hours. Due to leakage in bottom, it takes $3\frac{1}{2}$ hours to fill it . In what time the leak will empty the fully filled tank ?

(1) 12 hours (2) 21 hours

(3) $6\frac{1}{2}$ hours (4) $10\frac{1}{2}$ hours

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

4. A tap can fill a tank in 6 hours. After half the tank is filled, three more similar taps are opened. What is the total time taken to fill the tank completely ?

(1) 4 hours

(2) 4 hours 15 minutes

(3) 3 hours 15 minutes

(4) 3 hours 45 minutes

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

5. Two pipes A and B can fill a cistern in $37\frac{1}{2}$ minutes and 45 minutes respectively. Both pipes are opened. The cistern will be filled just in half an hour, if the pipe B is turned off after :

(1) 15 minutes (2) 10 minutes

(3) 5 minutes (4) 9 minutes

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

6. A tank is fitted with two taps. The first tap can fill the tank completely in 45 minutes and the second tap can empty the full tank in one hour. If both the taps are opened alternately for one minute, then in how many hours the empty tank will be filled completely ?

(1) 2 hours 55 minutes

(2) 3 hours 40 minutes

(3) 4 hours 48 minutes

(4) 5 hours 53 minutes

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

7. A tank can be filled by two pipes in 20 minutes and 30 minutes respectively. When the tank was empty, the two pipes were opened. After some time, the first pipe was stopped and the tank was filled in 18 minutes. After how much time of the start was the first pipe stopped?

(1) 5 minutes (2) 8 minutes

(3) 10 minutes (4) 12 minutes

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (IInd Sitting) & (SSC MTS Exam. 17.03.2013) (Ist Sitting)

8. A tap takes 36 hours extra to fill a tank due to a leakage equivalent to half of its inflow. The inflow can fill the tank in how many hours ?

(1) 36 hrs (2) 24 hrs

(3) 30 hrs (4) 18 hrs

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

9. A tank can be filled with water by two pipes A and B together in 36 minutes. If the pipe B was stopped after 30 minutes, the tank is filled in 40 minutes. The pipe B can alone fill the tank in

(1) 45 minutes (2) 60 minutes

(3) 75 minutes (4) 90 minutes

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

10. A tank has a leak which would empty the completely filled tank in 10 hours. If the tank is full of water and a tap is opened which admits 4 litres of water per minute in the tank, the leak takes 15 hours to empty the tank. How many litres of water does the tank hold ?

(1) 2400 l (2) 4500 l

(3) 1200 l (4) 7200 l

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

11. An empty tank can be filled by pipe A in 4 hours and by pipe B in 6 hours. If the two pipes are opened for 1 hour each alternately with first opening pipe A, then the tank will be filled in

(1) $1\frac{3}{4}$ hours (2) $2\frac{3}{5}$ hours

(3) $4\frac{2}{3}$ hours (4) $5\frac{1}{2}$ hours

(SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting) & (SSC MTS Exam. 17.03.2013)

12. Three pipes A, B and C can fill a cistern in 6 hours. After working at it together for 2 hours, C is closed and A and B fill it in 7 hours more. The time taken by C alone to fill the cistern is

(1) 14 hours (2) 15 hours

(3) 16 hours (4) 17 hours

(SSC CPO S.I. Exam. 06.09.2009)

13. A tap can fill a cistern in 40 minutes and a second tap can empty the filled cistern in 60 minutes. By mistake without closing the second tap, the first tap was opened. In how many minutes will the empty cistern be filled ?

(1) 72 (2) 84

(3) 108 (4) 120

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

14. Two pipes, P and Q can fill a cistern in 12 and 15 minutes respectively. Both are opened together, but at the end of 3 minutes, P is turned off. In how many more minutes will Q fill the cistern ?

(1) 7 minutes (2) $7\frac{1}{2}$ minutes

(3) 8 minutes (4) $8\frac{1}{4}$ minutes

(SSC CPO S.I. Exam. 12.12.2010 (Paper-I) & (SSC GL Tier-I Exam. 21.04.2013)

15. A cistern is normally filled in 8 hours but takes another 2 hours longer to fill because of a leak in its bottom. If the cistern is full, the leak will empty it in :

(1) 16 hours (2) 20 hours

(3) 25 hours (4) 40 hours

(SSC SAS Exam. 26.06.2010 (Paper-I) & (FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

16. Pipe A can fill a cistern in 6 hours and pipe B can fill it in 8 hours. Both the pipes are opened simultaneously, but after two hours, pipe A is closed. How many hours will B take to fill the remaining part of the cistern ?

(1) 2 hrs (2) $3\frac{1}{3}$ hrs

(3) $2\frac{2}{3}$ hrs (4) 4 hrs

(SSC CHSL DEO & LDC Exam. 27.11.2010)

17. Two pipes A and B can fill a tank in 6 hours and 8 hours respectively. If both the pipes are opened together, then after how many hours should B be closed so that the tank is full in 4 hours?

(1) $\frac{2}{3}$ hrs (2) 1hrs

(3) 2 hrs (4) $\frac{8}{3}$ hrs

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

18. Three pipes A, B and C can fill a tank in 6 hours. After working together for 2 hours, C is closed and A and B fill the tank in 8 hours. The time (in hours) in which the tank can be filled by pipe C alone is

(1) 10 (2) 12

(3) 8 (4) 9

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

19. A pipe can fill a cistern in 9 hours. Due to a leak in its bottom, the cistern fills up in 10 hours. If the cistern is full, in how much time will it be emptied by the leak ?

(1) 70 hours (2) 80 hours

(3) 90 hours (4) 100 hours

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

20. Three pipes A, B and C can fill a tank in 6 hours. After working together for 2 hours, C is closed and A and B can fill the remaining part in 7 hours. The number of hours taken by C alone to fill the tank is

(1) 10 (2) 12

(3) 14 (4) 16

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

21. A tank has two pipes. The first pipe can fill it in 4 hours and the second can empty it in 16 hours. If two pipes be opened together at a time, then the tank will be filled in

(1) $5\frac{1}{2}$ hours (2) 10 hours

(3) 6 hours (4) $5\frac{1}{3}$ hours

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

22. Pipe A can fill a tank in 4 hours and pipe B can fill it in 6 hours. If they are opened on alternate hours and if pipe A is opened first, in how many hours, the tank shall be full ?

(1) $4\frac{1}{2}$ (2) $3\frac{1}{2}$

(3) $3\frac{1}{4}$ (4) $4\frac{2}{3}$

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

23. Two pipes A and B can fill a tank with water in 30 minutes and 45 minutes respectively. The water pipe C can empty the tank in 36 minutes. First A and B are opened. After 12 minutes C is opened. Total time (in minutes) in which the tank will be filled up is :

(1) 30 (2) 12

(3) 36 (4) 24

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

24. A leak in the bottom of a tank can empty the full tank in 6 hours. An inlet pipe fills water at the rate of 4 litres a minute. When the tank is full, the inlet is opened and due to the leak the tank is empty in 8 hours. Find the capacity of the tank.

(1) 5760 litres (2) 96 litres

(3) 10 litres (4) 24 litres

(SSC CGL Tier-I Re-Exam, 30.08.2015)

25. A pipe can fill a tank in 24 hrs. Due to a leakage in the bottom, it is filled in 36 hrs. If the tank is half full, how much time will the leak take to empty the tank?

(1) 48 hrs (2) 72 hrs

(3) 36 hrs (4) 24 hrs

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

26. A water tap fills a tub in 'p' hours and a sink at the bottom empties it in 'q' hours. If $p < q$ and both tap and sink are open, the tank is filled in 'r' hours; then

(1) $\frac{1}{r} = \frac{1}{p} + \frac{1}{q}$

(2) $\frac{1}{r} = \frac{1}{p} - \frac{1}{q}$

(3) $r = p + q$

(4) $r = p - q$

(SSC CGL Tier-II Online Exam.01.12.2016)

TYPE–IV

1. One pipe can fill a tank three times as fast as another pipe. If together the two pipes can fill the tank in 36 minutes, the slower pipe alone will be able to fill the tank in

(1) 81 minutes (2) 108 minutes

(3) 144 minutes (4) 192 minutes

(SSC CPO S.I. Exam. 12.01.2003) & (SSC CGL Tier-I Exam. 16.05.2010) (IInd Sitting)

2. A pipe can empty a tank in 40 minutes. A second pipe with diameter twice as much as that of the first is also attached with the tank to empty it. The two together can empty the tank in :

(1) 8 minutes (2) $13\frac{1}{3}$ minutes

(3) 30 minutes (4) 38 minutes

(SSC CPO S.I. Exam. 26.05.2005)

3. Two pipes can fill a tank with water in 15 and 12 hours respectively and a third pipe can empty it in 4 hours. If the pipes be opened in order at 8, 9 and 11 a.m. respectively, the tank will be emptied at

(1) 11 : 40 a.m. (2) 12 : 40 p.m.
(3) 1 : 40 p.m. (4) 2 : 40 p.m.

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

4. A Boy and girl together fill a cistern with water. The boy pours 4 litres of water every 3 minutes and the girl pours 3 litres every 4 minutes. How much time will it take to fill 100 litres of water in the cistern ?

(1) 36 minutes (2) 42 minutes
(3) 48 minutes (4) 44 minutes

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

5. A pipe of diameter d can drain a certain water tank in 40 minutes. The time taken by a pipe of diameter 2d for doing the same job in :

(1) 5 minutes (2) 10 minutes
(3) 20 minutes (4) 80 minutes

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

6. Two pipes A and B can fill a water tank in 20 and 24 minutes respectively and a third pipe C can empty at the rate of 3 gallons per minute. If A, B and C are opened together to fill the tank in 15 minutes, the capacity (in gallons) of the tank is :

(1) 180 (2) 150
(3) 120 (4) 60

(SSC CPO S.I. Exam. 16.12.2007)

7. A swimming pool has 3 drain pipes. The first two pipes A and B, operating simultaneously, can empty the pool in half the time that C, the 3rd pipe, alone takes to empty it. Pipe A, working alone, takes half the time taken by pipe B. Together they take 6 hours 40 minutes to empty the pool. Time taken by pipe A to empty the pool, (in hours) is

(1) 15 (2) 10
(3) 30 (4) 7

(SSC Graduate Level Tier-II Exam.16.09.2012)

8. Which of these pipes will empty a pool the fastest?

(i) One pipe of diameter 60 cm
(ii) Two pipes of diameter 30 cm each
(iii) Three pipes of diameter 20 cm each

(1) (i) (2) (iii)7
(3) (ii) (4) None of these

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

9. A tap drips at a rate of one drop/sec. 600 drops make 100ml. The number of litres wasted in 300 days is

(1) 4320000 (2) 432000
(3) 43200 (4) 4320

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

10. Having the same capacity 9 taps fill up a water tank in 20 minutes. How many taps of the same capacity are required to fill up the same water tank in 15 minutes ?

(1) 10 (2) 12
(3) 15 (4) 18

(SSC CGL Tier-II Exam. 21.09.2014)

11. A tap can empty a tank in 30 minutes. A second tap can empty it in 45 minutes. If both the taps operate simultaneously, how much time is needed to empty the tank ?

(1) 30 minutes (2) 18 minutes
(3) 14 minutes (4) 15 minutes

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

12. Two pipes can independently fill a bucket in 20 minutes and 25 minutes. Both are opened together for 5 minutes after which the second pipe is turned off. What is the time taken by the first pipe alone to fill the remaining portion of the bucket?

(1) 11 minutes (2) 16 minutes
(3) 20 minutes (4) 15 minutes

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

SHORT ANSWERS

TYPE-I

1. (2)	**2.** (1)	**3.** (3)	**4.** (2)
5. (4)	**6.** (2)	**7.** (3)	**8.** (4)
9. (3)	**10.** (4)	**11.** (1)	**12.** (2)
13. (1)	**14.** (3)	**15.** (2)	**16.** (4)
17. (1)	**18.** (1)	**19.** (2)	**20.** (3)
21. (4)	**22.** (2)	**23.** (1)	**24.** (1)
25. (4)			

TYPE-II

1. (2)	**2.** (2)	**3.** (3)	**4.** (1)
5. (2)	**6.** (1)	**7.** (1)	**8.** (3)

TYPE-III

1. (3)	**2.** (4)	**3.** (2)	**4.** (4)
5. (4)	**6.** (4)	**7.** (2)	**8.** (4)
9. (4)	**10.** (4)	**11.** (3)	**12.** (1)
13. (4)	**14.** (4)	**15.** (4)	**16.** (2)
17. (4)	**18.** (2)	**19.** (3)	**20.** (3)
21. (4)	**22.** (4)	**23.** (4)	**24.** (1)
25. (3)	**26.** (2)		

TYPE-IV

1. (3)	**2.** (1)	**3.** (1)	**4.** (3)
5. (2)	**6.** (3)	**7.** (1)	**8.** (1)
9. (4)	**10.** (2)	**11.** (2)	**12.** (1)

EXPLANATIONS

TYPE-I

1. (2) Part of the tank filled by both pipes in one minute

$$= \frac{1}{20} + \frac{1}{30}$$

$$\text{Required time} = \frac{1}{\frac{1}{20} + \frac{1}{30}}$$

$$= \frac{20 \times 30}{50} = 12 \text{ minutes}$$

Aliter : Using Rule 1,
Here, x = 20, y = 30
Required time

$$= \left(\frac{xy}{x+y}\right) \text{ minutes}$$

$$= \left(\frac{20 \times 30}{20+30}\right) \text{ minutes}$$

= 12 minutes.

2. (1) 1 hour = 60 minutes.
Rate of emptying the tank by the two taps are $\frac{1}{60}$ and $\frac{1}{30}$ of the

tank per minute respectively.

Rate of emptying the tank when both operate simultaneously

$$= \frac{1}{60} + \frac{1}{30} = \frac{1+2}{60} = \frac{3}{60} = \frac{1}{20}$$

of the tank per minute.

$\therefore$ Time taken by the two taps together to empty the tank = 20 minutes

Aliter : Using Rule 6,

Here, x = 60, y = 30

Required time

$$= \left(\frac{xy}{x+y}\right) \text{ minutes}$$

$$= \left(\frac{60 \times 30}{60+30}\right) \text{ minutes}$$

= 20 minutes.

3. (3) According to the question

Cistern filled in 1 hour $= \frac{1}{5}$ part

Cistern emptied in 1 hour

$= \frac{1}{4}$ part

When the both pipes are opened, simultaneously ;

Cistern emptied in 1 hour

$$= \frac{1}{4} - \frac{1}{5} = \frac{5-4}{20} = \frac{1}{20} \text{ part}$$

$\therefore$ The time in which it will be emptied = 20 hours.

Aliter : Using Rule 7,

Here, x = 5, y = 4

$$\text{Required time} = \left(\frac{xy}{x-y}\right)\text{hrs}$$

$$= \frac{5 \times 4}{5-4}\text{hrs}$$

= 20 hrs.

4. (2) Using Rule 2,

Let the third pipe empty the cistern in x minutes.

Part of cistern filled in 1 minute when all three pipes are opened simultaneously

$$= \frac{1}{60} + \frac{1}{75} - \frac{1}{x}$$

According to the question,

$$\frac{1}{60} + \frac{1}{75} - \frac{1}{x} = \frac{1}{50}$$

$$\Rightarrow \frac{1}{x} = \frac{1}{60} + \frac{1}{75} - \frac{1}{50}$$

$$= \frac{5+4-6}{300} = \frac{3}{300} \Rightarrow \frac{1}{x} = \frac{3}{300}$$

$$\therefore \quad x = \frac{300}{3} = 100 \text{ minutes}$$

5. (4) Using Rule 2,

Part of the cistern filled in 1 hour

$$= \frac{1}{3} + \frac{1}{4} - \frac{1}{2}$$

[Cistern filled by 1st pipe + Cistern filled by 2nd pipe – Cistern emptied by 3rd pipe]

$$= \frac{4+3-6}{12} = \frac{1}{12}$$

Hence, the cistern will be filled in 12 hours.

6. (2) Using Rule 2,

Part of tank filled in 1 hour when all three pipes are opened simultaneously

$$= \frac{1}{15} + \frac{1}{20} - \frac{1}{30}$$

$$= \frac{4+3-2}{60} = \frac{5}{60} = \frac{1}{12}$$

Hence, the tank will be filled in 12 hours.

7. (3) Part of the cistern filled in 1 hour $= \frac{1}{8}$

Part of the cistern emptied in 1 hour $= \frac{1}{16}$

When both the taps are opened simultaneously, part of cistern filled in 1 hour

$$= \frac{1}{8} - \frac{1}{16} = \frac{2-1}{16} = \frac{1}{16}$$

Hence, the cistern will be filled in 16 hours.

Aliter : Using Rule 7,

Here, x = 8, y = 16

$$\text{Required time} = \frac{xy}{y-x}$$

$$= \frac{8 \times 16}{16-8}$$

= 16 hours

8. (4) Part of the tank filled in 1 hour $= \frac{1}{x}$

Part of the tank emptied in 1 hour $= \frac{1}{y}$

Part of the tank filled in 1 hour when both are opened

$$= \frac{1}{x} - \frac{1}{y} = \frac{y-x}{xy}$$

$\therefore$ Tank will be filled in

$\frac{xy}{y-x}$ hours.

9. (3)

Hours/day	Days	Pumps
6 ↑	15 ↑	12 ↓
9	12	x

Let x be number of pumps

$\therefore$ 9 : 6 ::12 : x = 12:15 ::12 : x

$\Rightarrow$ 9 × 12 × x = 6 × 12 × 15

$$\Rightarrow x = \frac{6 \times 12 \times 15}{9 \times 12} = 10$$

10. (4) Using Rule 2 and 7,

Part of the cistern filled in 1 hour when pipes P and S are open

$$= \frac{1}{4} - \frac{1}{10} = \frac{5-2}{20} = \frac{3}{20}$$

Hence, the cistern will be filled in $\frac{20}{3}$ hours ≈ 6.6 hours

Part of the cistern filled in 1 hour when pipes P, R and S are open

$$= \frac{1}{4} + \frac{1}{12} - \frac{1}{10}$$

$$= \frac{15+5-6}{60} = \frac{14}{60} = \frac{7}{30}$$

Hence, the cistern will be filled in $\frac{30}{7}$ hours≈ 4.3 hours

Part of the cistern filled in I hour when pipes P, Q and S are open

$$= \frac{1}{4} + \frac{1}{8} - \frac{1}{10}$$

$= \frac{10+5-4}{40} = \frac{11}{40}$

Hence, the cistern will be filled in $\frac{40}{11}$ hours ≈ 3.6 hours

∴ Cistern can be filled faster when P, Q & S are open

11. (1) Using Rule 1,
Part of the cistern filled by both pipes in 1 hour

$= \frac{1}{10} + \frac{1}{15} = \frac{3+2}{30} = \frac{1}{6}$

∴ The cistern will be filled in 6 hours.

12. (2) Using Rule 1 and 7,
Part of the cistern filled by taps A, B and C in 1 minute = $\frac{1}{10}$

Part of the cistern filled by taps A and B in 1 minute

$= \frac{1}{30} + \frac{1}{40} = \frac{4+3}{120} = \frac{7}{120}$

∴ Part of the cistern filled by tap C in 1 minute

$= \frac{1}{10} - \frac{7}{120} = \frac{12-7}{120} = \frac{5}{120} = \frac{1}{24}$

∴ Tap C will fill the cistern in 24 minutes.

13. (1) Using Rule 7,
Part of the tank filled when both taps are opened together

$= \frac{1}{40} - \frac{1}{60} \qquad = \frac{3-2}{120} = \frac{1}{120}$

Hence, the tank will be filled in 120 minutes 2 hours.

14. (3) Part of the tank filled in 1 hour by pipe A = $\frac{1}{2}$

Part of the tank filled by both pipes in1 hour

$= \frac{1}{2} + \frac{1}{6} = \frac{3+1}{6} = \frac{2}{3}$

So, Time taken to fill $\frac{2}{3}$ part

= 60 minutes

∴ Time taken to fill $\frac{1}{2}$ part

$= \frac{60 \times 3}{2} \times \frac{1}{2}$ = 45 minutes

∴ The tank will be filleld at 11:45 A.M.

15. (2) Using Rule 7,
Part of the cistern filled by pipe Q in 1 minute

$= \frac{1}{20} - \frac{1}{30} = \frac{3-2}{60} = \frac{1}{60}$

∴ Required time = 60 minutes

16. (4) Using Rule 2,
Part of cistern filled by three pipes in an hour

$= \frac{1}{3} + \frac{1}{5} - \frac{1}{2} = \frac{10+6-15}{30}$

$= \frac{1}{30}$

Hence, the cistern will be filled in 30 hours.

17. (1) Using Rule 2,
Part of the tank filled by all three taps in an hour

$= \frac{1}{4} + \frac{1}{6} + \frac{1}{12} = \frac{6+4+2}{24} = \frac{1}{2}$

∴ Hence, the tank will be filled in 2 hours.

18. (1) Using Rule 1,
If the slower pipe fills the tank in x hours, then

$\frac{1}{x} + \frac{1}{x-10} = \frac{1}{12}$

$\Rightarrow \frac{x-10+x}{x(x-10)} = \frac{1}{12}$

$\Rightarrow x^2 - 10x = 24x - 120$

$\Rightarrow x^2 - 34x + 120 = 0$

$\Rightarrow x^2 - 30x - 4x + 120 = 0$

$\Rightarrow x(x-30) - 4(x-30) = 0$

$\Rightarrow (x-4)(x-30) = 0$

∴ $x = 30$ because $x \neq 4$

∴ Required time

= 30 – 10 = 20 hours

19. (2) If pipe y be closed after x minutes, then

$\frac{18}{24} + \frac{x}{32} = 1$

$\Rightarrow \frac{x}{32} = 1 - \frac{18}{24} = 1 - \frac{3}{4} = \frac{1}{4}$

$\Rightarrow x = \frac{32}{4} = 8$ minutes

Aliter : Using Rule 8,
x = 24, y = 32, t = 18
Required time

$= \left[y\left(1 - \frac{t}{x}\right)\right]$ minutes

$= \left[32\left(1 - \frac{18}{24}\right)\right]$ minutes

$= \left[32\left(1 - \frac{3}{4}\right)\right]$

$= 32 \times \frac{1}{4}$ = 8 minutes

20. (3) Using Rule 7,
Part of the tank filled in first two minutes $= \frac{1}{20} - \frac{1}{30} = \frac{3-2}{60} = \frac{1}{60}$

∴ Part of tank fillled in 114 minutes

$= \frac{57}{60} = \frac{19}{20}$

∴ Remaining part of cistern will be filled in 115th minute

21. (4) Using Rule 2,
Part of the tank filled by both taps in 5 minutes

$= 5\left(\frac{1}{30} + \frac{1}{60}\right)$

$= 5\left(\frac{2+1}{60}\right) = 5 \times \frac{3}{60} = \frac{1}{4}$

Remaining part = $1 - \frac{1}{4} = \frac{3}{4}$ that is filled by second tap.

∴ Time taken = $\frac{3}{4} \times 60$

= 45 minutes

22. (2) Part of the tank filled by pipes A and B in 1 minute

$= \frac{1}{36} + \frac{1}{45} = \frac{5+4}{180}$

$= \frac{9}{180} = \frac{1}{20}$

Part of the tank filled by these pipes in 7 minutes

$= \frac{7}{20}$

Remaining unfilled part

$= 1 - \frac{7}{20} = \frac{20-7}{20} = \frac{13}{20}$

When all three pipes are opened.

$= \frac{1}{20} - \frac{1}{30}$

$= \frac{3-2}{60} = \frac{1}{60}$

$\therefore$ Time taken in filling $\frac{13}{20}$ part

$= \frac{13}{20} \times 60 = 39$ minutes

Required time = 39 + 7

= 46 minutes

23. (1) Using Rule 1,
Part of tank filled by pipes A and B in 1 hour

$= \frac{1}{2} + \frac{1}{3} = \frac{3+2}{6} = \frac{5}{6}$ parts

$\therefore$ Required time $= \frac{6}{5}$ hours

$= 1$ hour $\frac{1}{5} \times 60$

= 1 hour 12 minutes

24. (1) When both pipes are opened simultaneously, part of the tank filled in 1 hour

$= \frac{1}{x} - \frac{1}{y} = \frac{y-x}{xy}$

$\therefore$ Required time $= \frac{xy}{y-x}$ hours

25. (4) Using Rule 1,
Part of tank filled by pipes A and B in 2 hours

$= 2\left(\frac{1}{6} + \frac{1}{8}\right)$

$= 2\left(\frac{4+3}{24}\right) = \frac{7}{12}$

Remaining part $= 1 - \frac{7}{12} = \frac{5}{12}$

This part is filled by pipe B.

$\therefore$ Required time $= \frac{5}{12} \times 8$

$= \frac{10}{3}$ hours

$= 3\frac{1}{3}$ hours

TYPE-II

1. (2) Let the capacity of the tank be x litres then $\frac{x}{3} = 80$

$\therefore x = 240$

$\therefore \frac{x}{2} = \frac{240}{2} = 120$ litres

2. (2) Part of cistern emptied in 1 hour

$= \frac{1}{5} - \frac{1}{8} = \frac{8-5}{40} = \frac{3}{40}$

$\because \frac{3}{40}$ part is emptied in 1 hour.

$\therefore \frac{3}{4}$ part is emptied in $\frac{40}{3} \times \frac{3}{4}$

= 10 hours.

3. (3) Let the capacity of the tank be x litres.
According to the question,

$\frac{3x}{4} = 30$

$\Rightarrow 3x = 30 \times 4$

$\Rightarrow x = \frac{30 \times 4}{3} = 40$ litres

4. (1) Using Rule 7,
Part of the tank filled in 1 hour

$= \frac{1}{12} - \frac{1}{20} = \frac{5-3}{60} = \frac{1}{30}$

$\therefore$ Tank will be filled in 30 hours.

5. (2) Using Rule 2,
Part of tank filled in 1 hour when all three pipes are opened

$= \frac{1}{10} + \frac{1}{12} - \frac{1}{6}$

$= \frac{6+5-10}{60} = \frac{1}{60}$

$\therefore$ The tank will be filled in 60 hours.

$\therefore$ One fourth of the tank will be filled in 15 hours $\left[\frac{1}{4} \times 60\right]$ i.e. the tank will be filled at 10 p.m.

6. (1) Time taken to fill the $\frac{3}{5}$ of the cistern = 60 seconds

$\therefore$ Time taken in filling $\frac{2}{5}$ part

$= \frac{60 \times 5}{3} \times \frac{2}{5} = 40$ seconds

7. (1) Using Rule 1,
Part of the tank filled in an hour by both pumps

$= \frac{1}{8} + \frac{1}{10} = \frac{5+4}{40} = \frac{9}{40}$

$\therefore$ Part of the tank filled in 4 hours

$= \frac{4 \times 9}{40} = \frac{9}{10}$

8. (3) Using Rule 1 and 2,
Part of the tank filled by B and C in half an hour

$= \frac{1}{2}\left(\frac{1}{9} + \frac{1}{12}\right)$

$= \frac{1}{2}\left(\frac{4+3}{36}\right) = \frac{7}{72}$

Remaining part

$= 1 - \frac{7}{72} = \frac{72-7}{72} = \frac{65}{72}$

Part of tank filled by three pipes in an hour

$= \frac{1}{6} + \frac{1}{9} + \frac{1}{12}$

$= \frac{6+4+3}{36} = \frac{13}{36}$

$\therefore$ Time to fill remaining part

$= \frac{65}{72} \times \frac{36}{13} = \frac{5}{2} = 2\frac{1}{2}$ hours

TYPE-III

1. (3) Using Rule 1,
Part filled by A and B in 1 hour

$= \frac{1}{12} + \frac{1}{15} = \frac{5+4}{60} = \frac{3}{20}$ + ...(i)

Part filled by A and C in the next 1 hour

$= \frac{1}{12} + \frac{1}{20} = \frac{5+3}{60} = \frac{2}{15}$

Part filled in 2 hours

$= \frac{3}{20} + \frac{2}{15} = \frac{9+8}{60} = \frac{17}{60}$

$\Rightarrow$ Part filled in 6 hours $= \frac{51}{60}$

Remaining part

$= 1 - \frac{51}{60} = \frac{9}{60} = \frac{3}{20}$

This part will be filled by (A+B) in 1 hour. [By (i)]

$\therefore$ Total time taken = 7 hours

2. (4) Using Rule 7,
Work done in 1 hour by the filling pump $= \frac{1}{2}$

Work done in 1 hour by the leak and the filling pump $= \frac{3}{7}$

$\therefore$ Work done by the leak in 1 hour

$= \frac{1}{2} - \frac{3}{7} = \frac{7-6}{14} = \frac{1}{14}$

Hence, the leak can empty the tank in 14 hours.

3. (2) Using Rule 7,
Let the leak empty the full tank in x hours.

$\frac{1}{3} - \frac{1}{x} = \frac{2}{7}$

$\Rightarrow \frac{1}{x} = \frac{1}{3} - \frac{2}{7} = \frac{7-6}{21}$

$\Rightarrow \frac{1}{x} = \frac{1}{21} \Rightarrow x = 21$ hours

4. (4) A tap can fill the tank in 6 hours.
In filling the tank to its half, time required = 3 hours.

Remaining part $= \frac{1}{2}$

$\because$ 1 tap takes 6 hours to fill the tank

$\therefore$ Time taken by 4 taps take to fill $\frac{1}{2}$ of the tank

$= \frac{6}{4} \times \frac{1}{2} = \frac{3}{4}$ hour

$\therefore$ Total time $= 3 + \frac{3}{4}$

$= 3\frac{3}{4}$ hours

= 3 hours 45 minutes

5. (4) Pipe A fills the tank in $\frac{75}{2}$ minutes.
$\therefore$ Part of the tank filled by A in 30 minutes

$= \frac{2}{75} \times 30 = \frac{4}{5}$

Remaining part $= 1 - \frac{4}{5} = \frac{1}{5}$

Now, 1 part is filled by pipe B in 45 minutes

$\therefore \frac{1}{5}$ part is filled in

$= 45 \times \frac{1}{5} = 9$ minutes

Hence, the pipe B should be turned off after 9 minutes.

6. (4) Using Rule 7,
Part of the tank filled in one minute

$= \frac{1}{45} - \frac{1}{60}$

$= \frac{4-3}{180} = \frac{1}{180}$

$\because \frac{1}{180}$ part is filled in 1 minute

$\therefore 1 - \frac{1}{45} = \frac{44}{45}$ part is filled in

$\frac{2 \times 180 \times 44}{45} = 352$ minutes

i.e. 5 hours 52 minutes

Remaining $\frac{1}{45}$ part will be filled in 1 minute.

$\therefore$ Total time taken
= 5 hours 53 minutes

7. (2) Let the first pipe be closed after x minutes

$\therefore \frac{x}{20} + \frac{18}{30} = 1$

$\Rightarrow \frac{x}{20} = 1 - \frac{18}{30} = 1 - \frac{3}{5} = \frac{2}{5}$

$\Rightarrow x = \frac{2}{5} \times 20 = 8$ minutes

Aliter : Using Rule 8,
Here, x = 20, y = 30, t = 18

Required time $= \left[x\left(1 - \frac{t}{y}\right)\right]$

[$\because$ first pipe is closed]

$= \left[20\left(1 - \frac{18}{30}\right)\right]$

$= 20 \times \frac{12}{30} = 8$ minutes

8. (4) Using Rule 7,
Let the inflow fill the tank in x hours.

$\therefore \frac{1}{x} - \frac{1}{2x} = \frac{1}{36}$

[leakage being half of inflow]

$\Rightarrow \frac{2-1}{2x} = \frac{1}{36}$

$\Rightarrow 2x = 36$

$\Rightarrow x = \frac{36}{2} = 18$ hours

9. (4) Let the pipe B fill the tank in x minutes.
Part of the tank filled by pipes A and B in 1 minute $= \frac{1}{36}$

$\therefore$ Part of the tank filled by pipe A in 1 minute $= \frac{1}{36} - \frac{1}{x}$

According to the question,

$30 \times \frac{1}{x} + 40\left(\frac{1}{36} - \frac{1}{x}\right) = 1$

$\Rightarrow \frac{30}{x} + \frac{10}{9} - \frac{40}{x} = 1$

$\Rightarrow \frac{40}{x} - \frac{30}{x} = \frac{10}{9} - 1$

$\Rightarrow \frac{10}{x} = \frac{1}{9} \Rightarrow x = 90$ minutes

10. (4) Let the capacity of the tank $= x$ litres
According to the question,
Quantity of water emptied by the leak in 1 hour $= \frac{x}{10}$ litres

Qunatity of water filled by the tap in 1 hour = 240 litres

According to the question,

$$\frac{x}{10} - \frac{x}{15} = 240$$

$$\Rightarrow \frac{3x - 2x}{30} = 240$$

$$\Rightarrow \frac{x}{30} = 240$$

$\Rightarrow x = 240 \times 30 = 7200$ litres

11. (3) Part of the tank filled in first 2 hours

$$= \frac{1}{4} + \frac{1}{6} = \frac{3+2}{12} = \frac{5}{12} \text{ Part}$$

$\therefore$ Part of the tank filled in first 4 hours

$$= \frac{2 \times 5}{12} \text{ parts} = \frac{5}{6} \text{ parts}$$

Remaining part = $1 - \frac{5}{6} = \frac{1}{6}$

Now it is the turn of pipe A

Time taken to fill $\frac{1}{4}$ part = 1 hour

$\therefore$ Time taken to fill $\frac{1}{6}$ part

$$= \frac{1}{6} \times 4 = \frac{2}{3} \text{ hour}$$

$\therefore$ Total time = $4 + \frac{2}{3}$

$$= 4\frac{2}{3} \text{ hours}$$

12. (1) Part of the cistern filled by pipes A, B and C in 1 hour = $\frac{1}{6}$

$\therefore$ Part of the cistern filled by all three pipes in 2 hours = $\frac{1}{3}$

$\therefore$ Remaining part $= 1 - \frac{1}{3} = \frac{2}{3}$

Now, pipe A and B fill $\frac{2}{3}$ part of the cistern in 7 hours

$\therefore$ Pipe A and B will fill the cistern in $\frac{7 \times 3}{2} = \frac{21}{2}$ hours

$\therefore$ Part of the cistern filled by A and B in 1 hour = $\frac{2}{21}$

So Part of the cistern filled by C in 1 hour = $\frac{1}{6} - \frac{2}{21}$

$$= \frac{7-4}{42} = \frac{1}{14}$$

$\therefore$ Pipe C will fill the cistern in 14 hours.

13. (4) Using Rule 7,

Tricky Approach

Part of the cistern filled in 1 minute by both the taps

$$= \frac{1}{40} - \frac{1}{60} = \frac{3-2}{120} = \frac{1}{120}$$

$\therefore$ Empty cistern will be filled in 120 minutes.

14. (4) Using Rule 1,

Part of the tank filled in 3 minutes by pipes P and Q

$$= 3\left(\frac{1}{12} + \frac{1}{15}\right)$$

$$= 3\left(\frac{5+4}{60}\right) = \frac{3 \times 9}{60} = \frac{9}{20}$$

So, Remaining part

$$= 1 - \frac{9}{20} = \frac{11}{20}$$

$\therefore$ Time taken by Q

$$= \frac{11}{20} \times 15 = \frac{33}{4} = 8\frac{1}{4} \text{ minutes}$$

15. (4) Using Rule 7,

Part emptied by the leak in 1 hour

$$= \frac{1}{8} - \frac{1}{10} = \frac{5-4}{40} = \frac{1}{40}$$

$\therefore$ The leak will empty the cistern in 40 hours.

16. (2) Using Rule 1,

Part of the cistern filled in 2 hours by pipe A and B

$$= 2\left(\frac{1}{6} + \frac{1}{8}\right) = 2\left(\frac{4+3}{24}\right) = \frac{7}{12}$$

Remaining part $= 1 - \frac{7}{12} = \frac{5}{12}$

$\therefore$ Time taken by pipe B in filling $\frac{5}{12}$ part

$$= \frac{5}{12} \times 8 = \frac{10}{3} = 3\frac{1}{3} \text{ hours}$$

17. (4) Part of the tank filled in 4 hours by pipe A $= \frac{4}{6} = \frac{2}{3}$

Remaining part $= \frac{1-2}{3} = \frac{1}{3}$

Time taken by pipe B in filling $\frac{1}{3}$ part $= \frac{8}{3}$ hours

Aliter : Using Rule 8,

Here, x = 6, y = 8, t = 4

Required time

$$= \left[y\left(1 - \frac{t}{x}\right)\right] \text{ hours}$$

$$= \left[8\left(1 - \frac{4}{6}\right)\right] \text{ hours}$$

$$= \frac{8}{3} \text{ hours}$$

18. (2) Part of the tank filled by (A + B + C) in 1 hour = $\frac{1}{6}$

Part of tank filled by these in 2 hours = $\frac{2}{6} = \frac{1}{3}$

Remaining part $= 1 - \frac{1}{3} = \frac{2}{3}$

Time taken by A and B in filling $\frac{2}{3}$rd part

= 8 hours

$\therefore$ Time taken by A and B in filling the whole tank

$$= \frac{8 \times 3}{2} = 12 \text{ hours}$$

$\therefore$ Part of tank filled by C in an hour

$$= \frac{1}{6} - \frac{1}{12} = \frac{1}{12}$$

Hence, required time = 12 hours

19. (3) Using Rule 7,
Part of the tank emptied by the leak in 1 hour = $\frac{1}{9} - \frac{1}{10}$

$= \frac{10-9}{90} = \frac{1}{90}$

∴ Required time = 90 hours

20. (3) A, B and C together fill the tank in 6 hours.

∴ Part of the tank filled in 1 hour by (A + B + C) = $\frac{1}{6}$

∴ Part of the tank filled in 2 hours by all three pipes

$= \frac{2}{6} = \frac{1}{3}$

Remaining empty part

$= 1 - \frac{1}{3} = \frac{2}{3}$

This $\frac{2}{3}$ part is filled by (A + B).

∴ Time taken by (A + B) to fill the fully empty tank

$= \frac{7 \times 3}{2} = \frac{21}{2}$ hours

∴ Part of tank filled by C in 1 hour

$= \frac{1}{6} - \frac{2}{21} = \frac{7-4}{42} = \frac{3}{42} = \frac{1}{14}$

∴ Required time = 14 hours.

21. (4) Using Rule 7,
Part of tank filled by both the pipes in 1 hour = $\frac{1}{4} - \frac{1}{16}$

$= \frac{4-1}{16} = \frac{3}{16}$

∴ Required time = $\frac{16}{3}$

$= 5\frac{1}{3}$ hours

22. (4) Using Rule 1,
Part of tank filled in first two hours

$= \frac{1}{4} + \frac{1}{6} = \frac{3+2}{12} = \frac{5}{12}$

Part of tank filled in first 4 hours

$= \frac{10}{12} = \frac{5}{6}$

Remaining part

$= 1 - \frac{5}{6} = \frac{1}{6}$

This remaining part willl be filled by pipe A.
Time taken by pipe A

$= \frac{1}{6} \times 4 = \frac{2}{3}$ hour

∴ Total time

$= 4 + \frac{2}{3} = 4\frac{2}{3}$ hours

23. (4) Using Rule 1 and 2,
Part of tank filled by pipes A and B in 1 minute

$= \frac{1}{30} + \frac{1}{45} = \frac{3+2}{90} = \frac{1}{18}$ part

∴ Part of tank filled in 12 minutes

$= \frac{12}{18} = \frac{2}{3}$ part

Remaining part

$= 1 - \frac{2}{3} = \frac{1}{3}$ part

When pipe C is opened,
Part of tank filled by all three pipes = $\frac{1}{30} + \frac{1}{45} - \frac{1}{36}$

$= \frac{6+4-5}{180} = \frac{5}{180} = \frac{1}{36}$

∴ Time taken in filling $\frac{1}{3}$ part

$= \frac{1}{3} \times 36 = 12$ minutes

∴ Total time = 12 + 12
= 24 miuntes

24. (1) Using Rule 7,
Part of tank filled by inlet pipe in 1 hour

$= \frac{1}{6} - \frac{1}{8} = \frac{4-3}{24} = \frac{1}{24}$

Hence, if there is no leak, the inlet pipe will fill the tank in 24 hours.

∴ Capacity of the tank
= 24 × 60 × 4
= 5760 litres

25. (3) Using Rule 7,
Part of tank emptied by leak in an hour = $\frac{1}{36} - \frac{1}{24}$

$= \frac{2-3}{72} = \frac{-1}{72}$

∴ Time taken in emptying the full tank
= 72 hours
∴ Required time = 36 hours

26. (2) ∵ P < q,
∴ On opening pipe and sink together,
Part of the tub filled in 1 hour = $\frac{1}{P} - \frac{1}{q}$

Clearly, $\frac{1}{P} - \frac{1}{q} = \frac{1}{r}$

TYPE-IV

1. (3) Using Rule 1,
Let time taken by faster pipe be x minutes.

$\therefore \frac{1}{x} + \frac{1}{3x} = \frac{1}{36}$

$\Rightarrow \frac{3+1}{3x} = \frac{1}{36}$

⇒ 3x = 36 × 4
⇒ x = 48
∴ Time taken by slower pipe to fill the tank = 3x
= 3 × 48 = 144 minutes

2. (1) Using Rule 1,
Here, the diameter of the second pipe is twice that of first pipe.
∴ Volume of water emptied by the second pipe will be 4 times to that of first pipe.

Hence, time taken will be $\frac{1}{4}$ of the first pipe.
∴ Second pipe will empty the tank in $\frac{1}{4} \times 40$ = 10 minutes

When both the pipes are open, the part of the tank emptied in 1 minute = $\frac{1}{40} + \frac{1}{10} = \frac{1+4}{40} = \frac{1}{8}$

Hence, the tank will be emptied in 8 minutes.

3. (1) Using Rule 2,
Part filled by A from 8 a.m to 11 a.m. = $\frac{3}{15} = \frac{1}{5}$

Part filled by B from 9 a.m. to 11 a.m. = $\frac{2}{12} = \frac{1}{6}$

Total Part filled till 11 a.m.

$= \frac{1}{5} + \frac{1}{6} = \frac{6+5}{30} = \frac{11}{30}$

At 11 a.m. pipe C is opened to empty it.

∴ Part of tank emptied in 1 hour

$= \frac{1}{4} - \frac{1}{15} - \frac{1}{12}$

$= \frac{15-4-5}{60} = \frac{1}{10}$

∴ $\frac{11}{30}$ part will be emptied in

$\frac{11}{30} \times 10 = \frac{11}{3}$ hours or $3\frac{2}{3}$

i.e. 3 hours 40 minutes
i.e. at 11.40 a.m.

4. (3) Water filled by the boy and girl in 1 minute

$= \frac{4}{3} + \frac{3}{4} = \frac{16+9}{12} = \frac{25}{12}$ litres

∴ Time taken to fill 100 litres

$= \frac{100}{25} \times 12 = 48$ mintues

5. (2)

$$\text{Time } \alpha \frac{1}{\text{cross sectional area of the pipe}}$$

$$\text{Time } \alpha \frac{1}{\frac{\pi}{4}d^2}$$

$$\text{Time } \alpha \frac{1}{d^2}$$

$$\therefore \frac{t_2}{t_1} = \frac{(d_1)^2}{(d_2)^2}$$

[Being inversely related]

$$t_2 = t_1\left(\frac{d_1}{d_2}\right)^2$$

t_1 = 40 minutes, d_1 = d, d_2 = 2d

$$\therefore t_2 = 40\left(\frac{d}{2d}\right)^2$$

$$t_2 = 40\left(\frac{1}{2}\right)^2$$

t_2 = 10 minutes

6. (3) Let the capacity of the tank be x gallons.
Quantity of water filled in the tank in 1 minute when all the pipes A, B and C are opened simultaneously $= \frac{x}{20} + \frac{x}{24} - 3$

According to the question,

$$\frac{x}{20} + \frac{x}{24} - 3 = \frac{x}{15}$$

$$\Rightarrow \frac{x}{20} + \frac{x}{24} - \frac{x}{15} = 3$$

$$\Rightarrow \frac{6x + 5x - 8x}{120} = 3$$

$\Rightarrow 3x = 3 \times 120$

$\Rightarrow x = \frac{3 \times 120}{3} = 120$ gallons

7. (1) Time taken by pipe B = $2x$ hours
Time taken by pipe A = x hours
∴ Time taken by pipe C

$$= \frac{2}{\frac{1}{2x} + \frac{1}{x}} = \frac{2}{\frac{1+2}{2x}}$$

$= \frac{4x}{3}$ hours

$$\therefore \frac{1}{x} + \frac{1}{2x} + \frac{3}{4x}$$

$$= \frac{1}{6 + \frac{40}{60}} = \frac{1}{6 + \frac{2}{3}}$$

$$\Rightarrow \frac{4+2+3}{4x} = \frac{3}{20}$$

$\Rightarrow 9 \times 20 = 4x \times 3$

$\Rightarrow x = \frac{9 \times 20}{4 \times 3} = 15$ hours

8. (1) If the flow of water per unit time be x km, then
$V = \pi r^2 h$ [∵ Pipe is in cylinderical shape]
Greater the radius, larger the capacity of pipe.
Radius is greatest in (i) i.e. 30cm.
Hence, pipe with 60 cm diameter will empty the pool fastest.
Therefore, $V \propto r^2$

9. (4) 300 days = (300 × 24) hours
= (300 × 24 × 60 × 60) seconds
∴ Number of drops
= 300 × 24 × 60 × 60
∵ 600 drops = 100 ml.
∴ 300 × 24 × 60 × 60 drops

$= \left(\frac{300 \times 24 \times 60 \times 60}{6}\right)$ ml.

= (1200 × 60 × 60) ml.

$= \left(\frac{1200 \times 60 \times 60}{1000}\right)$ litre

= 4320 litre.

10. (2) $M_1 D_1 = M_2 D_2$
$\Rightarrow 9 \times 20 = M_2 \times 15$

$\Rightarrow M_2 = \frac{9 \times 20}{15} = 12$ pipes

Note : Same relation as men and days is applicable

11. (2) Using Rule 6,
Part of tank emptied by both pipes in 1 minute

$= \frac{1}{30} + \frac{1}{45} = \frac{3+2}{90}$

$= \frac{5}{90} = \frac{1}{18}$

∴ Required time = 18 minutes

12. (1) Part of bucket filled by both pipes in 5 minutes

$= 5\left(\frac{1}{20} + \frac{1}{25}\right)$

$= 5\left(\frac{5+4}{100}\right) = \frac{9}{20}$

Remaining part = $1 - \frac{9}{20}$

$= \frac{11}{20}$

This remaining part will be filled by first pipe.

∴ Required time = $\frac{11}{20} \times 20$

= 11 minutes

TEST YOURSELF

1. Pipe 1 and 2 can fill a tank alone in 6 hours and 9 hours respectively. Pipe 3 can empty the full tank in 18 hours. If all the 3 pipes are opened simultaneously, then how much time is required to fill the tank completely?

(1) 2 hours
(2) 3.6 hours
(3) 4.5 hours
(4) cannot be filled

2. Pipe A and B can fill a tank in 12 and 15 hours respectively. An outlet pipe C, can empty it in 6 hours. Initially pipes A and B are opened together, and after 5 hours pipe C is also opened. Find the time required to empty the tank?

(1) 45 hours (2) 50 hours
(3) 60 hours (4) None of these

3. Three pipes 1, 2 and 3 together take 24 hours to fill a tank. The three pipes are opened for 6 hours after which Pipe 3 is closed. Pipe 1 and 2 take another 30 hours to fill the tank. In how much time would Pipe 3, alone fill the tank?

(1) 40 hours (2) 30 hours
(3) 68 hours (4) None of these

4. Two pipes x and y can fill a tank in 24 and 30 minutes respectively. Both the pipes are opened for 6 minutes, after which Pipe x is turned off. How much more time will it take to fill the tank?

(1) 16.5 minutes
(2) 22.5 minutes
(3) 24 minutes
(4) cannot be determined

5. A tank is usually filled in 18 hours. But because of a leak in it's bottom, it takes another 6 hours to fill. How much time will it take to the leak to empty the full tank?

(1) 72 (2) 74
(3) 75 (4) 76

6. A pipe can fill a tank in 4 hours, but due to a leak in the tank, it is filled in 5 hours. If the tank is full, how much time will the leak take to empty the tank completely?

(1) 10 hours (2) 15 hours
(3) 20 hours (4) 12 hours

7. Pipes 1 and 2 can fill a tank in 18 and 24 hours respectively. Both pipes work simultaneously for sometime after which Pipe 1 is turned off. It takes 12 hours in all to fill the tank completely. Find the time for which Pipe 1 was turned on.

(1) 9 hours (2) 10 hours
(3) 11 hours (4) 12 hours

8. The volume of water flowing through a pipe is directly proportional to square of it's radius. A tank has four inlet pipes with diameters as 2 cm, 4 cm, 6 cm and 8 cm. If the smallest pipe, alone, can fill a tank in 30 hours, then how much time would all the four pipes, when working together would take?

(1) 1 hour (2) 4 hours
(3) 6 hours (4) None of these

9. Two pipes can fill a tank in 10 minutes and 30 minutes respectively and a third pipe can empty the full tank in 20 minutes. If all the three pipes are opened simultaneously, the tank will be filled in

(1) 10 minutes (2) 8 minutes
(3) 7 minutes (4) None of these

10. A cistern can be filled by two pipes in 20 and 30 minutes respectively. Both pipes being opened, when must the first pipe be turned off so that the cistern may be filled in 10 minutes more?

(1) after 10 minutes
(2) after 12 minutes
(3) after 20 minutes
(4) after 8 minutes

11. Tap A, B and C are connected to a water tank and the rate of flow of water is 42 litres/hr, 56 litres/hr and 48 litres/hr respectively. Tap A and B fill the tank while tap C empties the tank. If all the three taps are opened simultaneously, the tank gets completely filled up in 16 hours. What is the capacity of the tank?

(1) 960 litres (2) 2346 litres
(3) 1600 litres (4) 800 litres

12. Two full tanks, one shaped like a cylinder and the other like a cone, contain jet fuel. The cylindrical tank holds 500 L more than the conical tank. After 200 L of fuel has been pumped out from each tank, the cylindrical tank contains twice the amount of fuel in the conical tank. How many litres of fuel did the cylindrical tank have when it was full?

(1) 700 L (2) 1,000 L
(3) 1,100 L (4) 1,200 L

SHORT ANSWERS

1. (3)	**2.** (1)	**3.** (4)	**4.** (1)
5. (1)	**6.** (3)	**7.** (1)	**8.** (1)
9. (4)	**10.** (4)	**11.** (4)	**12.** (4)

EXPLANATIONS

1. (3) Work done in 1 hour by all 3 pipes $= \frac{1}{6} + \frac{1}{9} - \frac{1}{18} = \frac{4}{18}$

$\therefore$ Time required to fill the tank completely $= \frac{18}{4} = 4.5$ hours

2. (1) Tank filled by A & B in 5 hours

$= \left(\frac{1}{12} + \frac{1}{15}\right)5 = \frac{9 \times 5}{60} = \frac{3}{4}$

Work done in 1 hour when all 3 pipes are opened

$= \frac{1}{12} + \frac{1}{15} - \frac{1}{6} = \frac{9-10}{60} = \frac{-1}{60}$

Since the result (or net effect) is negative, hence tank would be emptied.

So, $\frac{1}{60}$ is emptied in 1 hour

$\frac{3}{4}$ would be emptied in

$\frac{1}{1/60} \times \frac{3}{4} = 45$ hours

3. (4) Tank filled by all 3 in 6 hours

$= \left(\frac{1}{24}\right)6 = \frac{1}{4}$

Remaining $= \left(1 - \frac{1}{4}\right) = \frac{3}{4}$ is filled by, Pipe 1 and 2 in 30 hours

So, the entire tank would be filled by 1 and 2 in 40 hours

1 hour work of all 3 $= \frac{1}{24}$

1 hour work of Pipe 1 & 2 $= \frac{1}{40}$

Hence, 1 hour work of Pipe

$3 = \frac{1}{24} - \frac{1}{40} = \frac{2}{120} = \frac{1}{60}$

$\therefore$ Pipe 3 alone would fill the tank in 60 hours.

4. (1) When Pipe x is turned off (after 6 minutes),
Work done by x and y in 6 minutes

$= \left(\frac{1}{24} + \frac{1}{30}\right)6 = \frac{9}{20}$

Remaining work

$= 1 - \frac{9}{20} = \frac{11}{20}$ which would be done by Pipe y alone.

1 work is done by Pipe y (alone) in 30 minutes

$\frac{11}{20}$ work is done by Pipe y (alone)

in $30 \times \frac{11}{20} = \frac{33}{2}$ minutes = 16.5 minutes.

5. (1) Consider the case when there is no leak – Then in one hour, work done = $\frac{1}{18}$, and in 6 hours

$= \frac{6}{18} = \frac{1}{3}$.

This means $\frac{1}{3}$ rd of the tank is emptied because of the leakage in 18 + 6 = 24 hours.

So, $\frac{1}{3}$ rd is emptied in 24 hours, full tank would be emptied in 24 × 3 = 72 hours.

Method-2 : Using formula directly, we get

Time required by leakage to empty the full tank $= \frac{ab}{b-a}$

Here, $a = 18$, $b = 24$ Hence, t

$= \frac{18 \times 24}{24 - 18} = 72$ hours

6. (3) In 1 hour, water filled = $\frac{1}{4}$ th of the tank.

$\frac{1}{4}$ th is emptied by leakage in 5 hours.

Full tank would be emptied in 20 hours (i.e. 5 × 4).

OR

[Using formula, t

$= \frac{5 \times 4}{5 - 4} = 20$ hours]

7. (1) Let the time for which Pipe 1 is turned on be 'x' hours, hence Pipe 1 has worked for 'x' hours and Pipe 2 has worked for 12 hours.

$\frac{1}{18}(x) + \frac{1}{24}(12) = 1$

$\frac{x}{18} + \frac{1}{2} = 1$ or $\frac{x}{18} = \frac{1}{2} \Rightarrow x = 9$

$\therefore$ Pipe 1 was turned on for 9 hours.

Method-2 :

For 'x' hours both pipes worked, and for $(12 - x)$ hours, only Pipe 2 worked, hence,

$x\left(\frac{1}{18} + \frac{1}{24}\right) + \frac{1}{24}(12 - x) = 1$

$\frac{7}{72}x - \frac{x}{24} = \frac{1}{2}$

$\Rightarrow \frac{(14-6)x}{72 \times 2} = \frac{1}{2}$ and

$x = \frac{1}{2} \times \frac{2 \times 72}{8} = 9$ hours

8. (1) We are given that V = $k\,(r)^2$ where V is volume of water and 'r' is radius of pipe and K is a constant.

The smallest pipe takes 30 hours to fill the tank alone, hence work done in 1 hour $= \frac{1}{30}$,

radius $= \frac{\text{diameter}}{2} = \frac{2}{2} = 1$

$\frac{1}{30} = k(1)^2$ so, $k = \frac{1}{30}$.

Work done in 1 hour by Pipe 2

$= \frac{1}{30}\left(\frac{4}{2}\right)^2 = \frac{4}{30}$

Work done in 1 hour by Pipe 3

$= \frac{1}{30}\left(\frac{6}{2}\right)^2 = \frac{9}{30}$

Work done in 1 hour by Pipe 4

$= \frac{1}{30}\left(\frac{8}{2}\right)^2 = \frac{16}{30}$

In 1 hour, work done by all 4 pipes

$= \frac{1}{30} + \frac{4}{30} + \frac{9}{30} + \frac{16}{30} = \frac{30}{30} = 1$

Hence, the whole tank gets filled in 1 hour.

9. (4) Part of the tank filled in 1 minute when all the three pipes are opened simultaneously

$= \frac{1}{10} + \frac{1}{30} - \frac{1}{20} = \frac{6+2-3}{60}$

$= \frac{5}{60} = \frac{1}{12}$

Hence, the tank will be filled in 12 minutes.

10. (4) In 1 minute both pipes can fill

$= \frac{1}{20} + \frac{1}{30}$ part of the cistern

In 10 minutes, second pipe can fill $= \frac{1}{30} \times 10 = \frac{1}{3}$ part

Cistern filled by both pipes

$= 1 - \frac{1}{3} = \frac{2}{3}$

$\therefore$ Time taken by both the pipes to fill $\frac{2}{3}$ part of cistern

$= \frac{12 \times 2}{3} = 8$ minutes

Therefore, the first pipe can be turned off after 8 minutes.

11. (4) Net amount of water filled in the tank in 1 hour when all three taps are opened simultaneously,
= 42 + 56 – 48 litres = 50 litres

The tank gets completely filled in 16 hours.

$\therefore$ Capacity of the tank
= 16 × 50 = 800 litres

12. (4) Let conical tank contain 'x' litres of fuel, then cylindrical tank would hold $(x + 500)$ litres. So,

$(x - 200)2 = x + 500 - 200$

$2x - 400 = x + 300 \Rightarrow x = 700$

Hence, cylindrical tank would hold

700 + 500 = 1200 L

14 TIME AND DISTANCE

Importance : Normally 1 or 2 questions on Time and distance are always asked in different competitive exams.

Scope of questions : In such questions, average distance, time/average time taken to cover any distance, ratio between speeds or taken times by two persons/ things are asked. Other questions include questions based on – reaching at some place before or after scheduled time, covering a part of distance on foot or on different coveyances.

Way to success : In such questions concentrate on basic concepts – make 'Mind Map' and some time used 'Tricks' as explained.

RULE 1 : Distance = Speed × Time

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}, \text{ Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$1 \text{ m/s} = \frac{18}{5} \text{ km/h}, \ 1 \text{ km/h} = \frac{5}{18} \text{ m/s}$$

RULE 2 : If a man travels different distances d_1, d_2, d_3, ... and so on in different time t_1, t_2, t_3 respectively then,

Average speed

$$= \frac{\text{total travelled distance}}{\text{total time taken in travelling distance}}$$

$$= \frac{d_1 + d_2 + d_3 + ...}{t_1 + t_2 + t_3 + ...}$$

RULE 3 : If a man travels different distances d_1, d_2, d_3, and so on with different speeds s_1, s_2, s_3, respectively then,

$$\text{Average speed} = \frac{(d_1 + d_2 + d_3 + ...)}{\frac{d_1}{s_1} + \frac{d_2}{s_2} + \frac{d_3}{s_3} + ...}$$

RULE 4 : If a distance is divided into n equal parts each travelled with different speeds, then, Average speed

$$= \frac{n}{\left(\frac{1}{s_1} + \frac{1}{s_2} + \frac{1}{s_3} + \frac{1}{s_4}\right)}$$ where n = number of equal parts

s_1, s_2, s_3, ..., s_n are speeds.

RULE 5 : If a bus travels from A to B with the speed x km/h and returns from B to A with the speed y km/h, then the average speed will be $\left(\frac{2xy}{x+y}\right)$

RULE 6 : If d_1 distance is travelled in t_1 time and d_2 distance is travelled in t_2 time then,

$$\boxed{d_1 t_2 = d_2 t_1} \text{ or } \frac{d_1}{t_1} = \frac{d_2}{t_2}$$

$\Rightarrow$ Distance α time [provided speed is constant]

RULE 7 : If an object increases/decreases its speed from x km/hr to y km/hr. to cover a distance in t_2 hours in place of t_1 hours then [Here $(t_2 - t_1)$ will be given].

$$\text{Distance} = \frac{xy}{(\text{Difference of x and y})} \times (\text{Change in time})$$

or, Distance

$$= \left(\frac{\text{Product of Speeds}}{\text{Difference in Speeds}}\right) \times (\text{Change in time})$$

RULE 8 : If an object travels certain distance with the speed of $\frac{A}{B}$ of its original speed and reaches its destination 't' hours before or after, then the taken time by object travelling at original speed is

$$\text{Time} = \frac{A}{(\text{Difference of A and B})} \times \text{time (in hour)}$$

RULE 9 : Speed (s) $\propto \frac{1}{\text{time (t)}} \Rightarrow s \propto \frac{1}{t}$

$\therefore$ $\boxed{s_1 t_1 = s_2 t_2}$ (Provided distance is constant)

RULE 10 : If a man travels at the speed of s_1, he reaches his destination t_1 late while he reaches t_2 before when he travels at s_2 speed, then the distance between the two places is $D = \frac{(s_1 \times s_2) \times (t_1 + t_2)}{s_2 - s_1}$

RULE 11 :

Time taken by 1st man to reach B after meeting 2nd man at C is 't_1' and time taken by 2nd man to reach A after meeting 1st man at C is 't_2' then:

$$\frac{\text{Speed of 1st man}(s_1)}{\text{Speed of 2nd man}(s_2)} = \sqrt{\frac{t_2}{t_1}}$$

$\therefore$ Distance from A to B = $s_1 t_1 + s_2 t_2$

RULE 12 : If both objects run in opposite direction then, Relative speed = Sum of speeds.

If both objects run in the same direction then, Relative speed = Difference of Speeds.

$$\text{Time taken in meeting} = \frac{\text{Distance between them}}{\text{Relative Speed}}$$

RULE 13 : Let a man take 't' hours to travel 'x' km. If he travels some distance on foot with the speed u km/h and remaining distance by cycle with the speed v km/h, then time taken to travel on foot.

$$\text{Time} = \frac{(vt - x)}{(v - u)}$$

Distance travelled on foot = Time × u

RULE 14 : Formula to calculate the no. of rounds.

Circular Distance = (circumference) × No of rounds,

$D = 2\pi r \times n$

RULE 15 : If any one overtakes or follows another, then time taken to catch

$$= \frac{\text{distance between them}}{\text{Relative speed}}$$

$$\text{or meet} = \frac{(\text{Speed of 1st traveller}) \times \text{time}}{(\text{Difference of speeds})}$$

Total travelled distance to catch the thief

$$= \frac{(\text{Product of speeds}) \times \text{time}}{(\text{Difference of speeds})}$$

RULE 16 : Formula to calculate the no. of poles,

Distance = (n – 1)x

where n = No. of poles.

x = distance between consecutive two poles.

RULE 17 : If in a certain time, 'd_1' distance is travelled with 's_1' speed and d_2 distance is travelled with 's_2' speed

then, $\frac{d_1}{s_1} = \frac{d_2}{s_2}$

RULE 18 : If a man covers $\frac{1}{x}$ part of Journey at u km/h, $\frac{1}{y}$ part at v km/h and $\frac{1}{z}$ part at w km/hr and so on, then his average speed for the whole journey will be

$$\frac{1}{\frac{1}{xu} + \frac{1}{yv} + \frac{1}{zw} + \ldots\ldots}$$

THEOREMS OF TRAINS

Importance : Question based Theorems of Trains are asked in almost all competitive exams.

Scope of Questions : In how much time. the train will cross a person/platform/other, train or what will be length of train/platform or relative speed of two trains or speed of a train – kind of questions are asked. Some another type of questions like change in speeds, distance in way or other special situations are also asked.

Key to Success: Most of the questions can be solved with the help of basic formulae on time and distance. Regular practice of different type of question will ensure your success.

RULE 1 : If a train crosses an electric pole, a sitting/standing man, km or mile stone etc. then distance = Length of train. Then,

Length of train = Speed × Time

$$\text{And Time} = \frac{\text{Length of train}}{\text{Speed}} \text{ and}$$

$$\text{Speed} = \frac{\text{Length of train}}{\text{Time}}$$

IMPORTANT POINTS

Time taken in crossing 'b' metre length (i.e. platform, bridge, tunnel, standing train etc) by 'a' metre length train = total time taken in travelling (a + b) metre by the train.

Let a train is travelling with the speed x km/h and in the same direction, another train is travelling on parallel path with the speed y km/h, then, relative speed of the faster train = (x – y) km/h.

Suppose that a train is travelling with the speed 'x' km/h and from the opposite direction another train is coming on parallel path with the speed 'y' km/h, then

Relative speed of the train = (x + y) km/h.

RULE 2 : Let 'a' metre long train is going with the speed 'x' m/s and 'b' metre long train is also going with the speed 'y' m/s in the same direction on parallel path, then total time taken by the faster train to cross the slower train

$$= \frac{a + b}{x - y} \text{ seconds}$$

RULE 3 : Let 'a' metre long train is travelling with the speed 'x' m/s and 'b' metre long train is travelling with the speed 'y' m/s in the opposite direction on parallel path. Then, time taken by the trains to cross each other

$$= \left(\frac{a+b}{x+y}\right) = \text{seconds.}$$

RULE 4 : If a train crosses a standing man/a pole in 't_1' sec time and crosses 'P' meter long platform in 't_2' sec. time, then length of the train = $\frac{P \times t_1}{(t_2 - t_1)}$

RULE 5 : Let 'a' metre long train is running with the speed 'x' m/s. A man is running in same direction and with the speed 'y' m/s, then time taken by the train to cross the man = $\frac{a}{(x-y)}$ seconds. And a = (x – y)t

RULE 6 : Let 'a' metre long train is running with the speed 'x' m/s. A man is running in the opposite direction of train with the speed of 'y' m/s. Then, time taken by the train to cross the man = $\left(\frac{a}{(x+y)}\right)$ seconds.

RULE 7 : A train crosses two men in t_1 seconds and t_2 seconds running in the same direction with the speed s_1 and s_2. then the speed of train is = $\frac{t_1 s_1 - t_2 s_2}{t_1 - t_2}$ and length of train is $l = (s_1 - s_2)\left(\frac{t_1 - t_2}{t_1 - t_2}\right)$

RULE 8 : If two trains of (same lengths) are coming from same direction and cross a man in t_1 and t_2 seconds, then time taken by both the trains to cross each other =

$$\frac{2 \times \text{Product of time}}{\text{Difference of time}}$$

RULE 9 : If two trains of same length are coming from opposite directions and cross a man in t_1 seconds and t_2 seconds then time taken by both trains to cross each other

$$= \frac{2 \times \text{Product of time}}{\text{Sum of time}}$$

RULE 10 : If a train of length x m crosses a platform/tunnel/bridge of length y m with the speed u m/s in t seconds, then, $t = \frac{x+y}{u}$

RULE 11 : Two trains A and B, run from stations X to Y and from Y to X with the speed 'S_A' and 'S_B' respectively. After meeting with each other. A reached at Y after 't_A' time and B reached at X after 't_B' time. Then Ratio of speeds of trains,

$$\frac{S_A}{S_B} = \sqrt{\frac{t_B}{t_A}}$$

RULE 12 : If a train of length l m passes a bridge/platform of 'x' m in t_1 sec, then the time taken by the same train to cross another bridge/platform of length 'y' m is,

$$\text{Time taken} = \left(\frac{l+y}{l+x}\right) t_1$$

RULE 13 : From stations A and B, two trains start travelling towards each other at speeds a and b, respectively. When they meet each other, it was found that one train covers distance d more than that of another train. The distance between stations A and B is given as

$$\left(\frac{a+b}{a-b}\right) \times d$$

RULE 14 : The distance between two places A and B is x km. A train starts from A towards B at a speed of a km/hr and after a gap of t hours another train with speed b km/hr starts from B towards A, then both the trains will meet at a certain point after time T. Then, we have.

$$T = \left(\frac{x \pm tb}{a+b}\right)$$

t is taken as positive if second train starts after first train and t is taken as negative if second train starts before the first train.

RULE 15 : Excluding stoppage, the average speed of a train is u and with stoppage its average speed is v. Then, the stoppage time per hour

$$= \frac{\text{Difference between their average speed}}{\text{Speed without stoppage}}$$

$$= \frac{u-v}{u}$$

With u > v and u, v ≠ 0

RULE 16 : A train covers a distance between stations A and B in time t_1. If the speed is changed by S. then the time taken to cover the same distance is t_2. Then the distance (D) between A and B is given by

$$D = S\left(\frac{t_1 t_2}{t_1 - t_2}\right) \text{ or } \left(\frac{S'}{t'}\right) t_1 t_2$$

Where t' : change in the time taken

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. A train is travelling at the rate of 45km/hr. How many seconds it will take to cover a distance of $\frac{4}{5}$ km ?

(1) 36 sec. (2) 64 sec.
(3) 90 sec. (4) 120 sec.

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. An aeroplane covers a certain distance at a speed of 240 km hour in 5 hours. To cover the same distance in $1\frac{2}{3}$ hours, it must travel at a speed of :

(1) 300 km./hr. (2) 360 km./hr.
(3) 600 km./hr. (4) 720 km./hr.

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. A man walking at the rate of 5 km/hr. crosses a bridge in 15 minutes. The length of the bridge (in metres) is :

(1) 600 (2) 750
(3) 1000 (4) 1250

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. A man crosses a road 250 metres wide in 75 seconds. His speed in km/hr is :

(1) 10 (2) 12
(3) 12.5 (4) 15

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

5. An athlete runs 200 metres race in 24 seconds. His speed (in km/hr) is :

(1) 20 (2) 24
(3) 28.5 (4) 30

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

6. A car goes 10 metres in a second. Find its speed in km/hour.

(1) 40 (2) 32
(3) 48 (4) 36

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

7. A car travelling at a speed of 40 km/hour can complete a journey in 9 hours. How long will it take to travel the same distance at 60 km/hour ?

(1) 6 hours (2) 3 hours
(3) 4 hours (4) $4\frac{1}{2}$ hours

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

8. A man travelled a certain distance by train at the rate of 25 kmph. and walked back at the rate of 4 kmph. If the whole journey took 5 hours 48 minutes, the distance was

(1) 25 km (2) 30 km
(3) 20 km (4) 15 km

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

9. A boy goes to his school from his house at a speed of 3 km/hr and returns at a speed of 2 km/hr. If he takes 5 hours in going and coming, the distance between his house and school is :

(1) 6 km (2) 5 km
(3) 5.5 km (4) 6.5 km

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

10. A boy runs 20 km in 2.5 hours. How long will he take to run 32 km at double the previous speed ?

(1) 2 hours (2) $2\frac{1}{2}$ hours
(3) $4\frac{1}{2}$ hours (4) 5 hours

(SSC CPO S.I. Exam. 26.05.2005)

11. A train is moving with the speed of 180 km/hr. Its speed (in metres per second) is :

(1) 5 (2) 40
(3) 30 (4) 50

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

12. A man riding his bicycle covers 150 metres in 25 seconds. What is his speed in km per hour ?

(1) 25 (2) 21.6
(3) 23 (4) 20

(SSC CGL Prelims Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting)

13. A and B travel the same distance at speed of 9 km/hr and 10 km/hr respectively. If A takes 36 minutes more than B, the distance travelled by each is

(1) 48 km (2) 54 km
(3) 60 km (4) 66 km

(SSC SAS Exam. 26.06.2010 (Paper-1)

14. A person started his journey in the morning. At 11 a.m. he covered $\frac{3}{8}$ of the journey and on the same day at 4.30 p.m. he covered $\frac{5}{6}$ of the journey. He started his journey at

(1) 6.00 a.m. (2) 3.30 a.m.
(3) 7.00 a.m. (4) 6.30 a.m.

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

15. The speed of a bus is 72 km/hr. The distance covered by the bus in 5 seconds is

(1) 100 m (2) 60 m
(3) 50 m (4) 74.5 m

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

16. Two men start together to walk a certain distance, one at 4 km/h and another at 3 km/h. The former arrives half an hour before the latter. Find the distance.

(1) 8 km (2) 7 km
(3) 6 km (4) 9 km

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

17. A train starts from a place A at 6 a.m. and arrives at another place B at 4.30 p.m. on the same day. If the speed of the train is 40 km per hour, find the distance travelled by the train ?

(1) 420 km (2) 230 km
(3) 320 km (4) 400 km

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

18. Walking at the rate of 4 km an hour, a man covers a certain distance in 3 hours 45 minutes. If he covers the same distance on cycle, cycling at the rate of 16·5 km/hour, the time taken by him is
(1) 55.45 minutes
(2) 54.55 minutes
(3) 55.44 minutes
(4) 45.55 minutes
(SSC Multi-Tasking (Non-Technical) Staff Exam. 22.02.2011)

19. A train covers a distance of 10 km in 12 minutes. If its speed is decreased by 5 km/hr, the time taken by it to cover the same distance will be :
(1) 10 minutes
(2) 13 minutes 20 sec
(3) 13 minutes
(4) 11 minutes 20 sec
(SSC CHSL DEO & LDC Exam. 21.10.2012, IInd Sitting)

20. A man walks 'a' km in 'b' hours. The time taken to walk 200 metres is
(1) $\frac{200b}{a}$ hours (2) $\frac{b}{5a}$ hours
(3) $\frac{b}{a}$ hours (4) $\frac{ab}{200}$ hours
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

21. The speed $3\frac{1}{3}$ m/sec when expressed in km/hour becomes
(1) 8 (2) 9
(3) 10 (4) 12
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

22. A bullock cart has to cover a distance of 120 km. in 15 hours. If it covers half of the journey in $\frac{3}{5}$ th time, the speed to cover the remaining distance in the time left has to be
(1) 6.4 km/hr (2) 6.67 km/hr
(3) 10 km/hr (4) 15 km/hr
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

23. A train covers a certain distance in 210 minutes at a speed of 60 kmph. The time taken by the train, to cover the same distance at a speed of 80 kmph is :
(1) $3\frac{5}{8}$ hours (2) $2\frac{5}{8}$ hours
(3) $4\frac{5}{8}$ hours (4) 3 hours
(SSC Multi-Tasking Staff Exam. 10.03.2013

24. A man rides at the rate of 18 km/hr, but stops for 6 mins. to change horses at the end of every 7th km. The time that he will take to cover a distance of 90 km is
(1) 6 hrs.
(2) 6 hrs. 12 min.
(3) 6 hrs. 18 min.
(4) 6 hrs. 24 min.
(SSC Graduate Level Tier-I Exam. 21.04.2013)

25. A speed of 30.6 km/.hr is the same as
(1) 8.5 m/sec. (2) l0 m/sec.
(3) 12 m/sec. (4) 15.5 m/sec.
(SSC Constable (GD) Exam. 12.05.2013)

26. A man covers $\frac{2}{15}$ of the total journey by train, $\frac{9}{20}$ by bus and the remaining 10 km on foot. His total journey (in km) is
(1) 15.6 (2) 24
(3) 16.4 (4) 12.8
(SSC Graduate Level Tier-I Exam. 19.05.2013)

27. You arrive at your school 5 minutes late if you walk with a speed of 4 km/h, but you arrive 10 minutes before the scheduled time if you walk with a speed of 5 km/h. The distance of your school from your house (in km) is
(1) 4 (2) 5
(3) 10 (4) 2
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

28. Sarita and Julie start walking from the same place in the opposite directions. If Julie walks at a speed of $2\frac{1}{2}$ km/hr and Sarita at a speed of 2 km/hr, in how much time will they be 18 km apart ?
(1) 4.0 hrs (2) 4.5 hrs
(3) 5.0 hrs (4) 4.8 hrs
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

29. A man travelled a distance of 80 km in 7 hrs partly on foot at the rate of 8 km per hour and partly on bicycle at 16km per hour. The distance travelled on the foot is
(1) 32 km (2) 48 km
(3) 36 km (4) 44 km
(SSC CGL Tier-II Exam. 21.09.2014)

30. A car driver leaves Bangalore at 8.30 A.M. and expects to reach a place 300 km from Bangalore at 12.30 P.M. At 10.30 he finds that he has covered only 40% of the distance. By how much he has to increase the speed of the car in order to keep up his schedule?
(1) 45 km/hr (2) 40 km/hr
(3) 35 km/hr (4) 30 km/hr
(SSC CGL Tier-II Exam. 21.09.2014)

31. A man is walking at a speed of 10 kmph. After every km, he takes a rest for 5 minutes. How much time will he take to cover a distance of 5 km?
(1) 60 minutes (2) 50 minutes
(3) 40 minutes (4) 70 minutes
(SSC CGL Tier-II Exam. 21.09.2014)

32. A train covers a distance of 10 km in 12 minutes. If its speed is decreased by 5 km/hr, the time taken by it to cover the same distance is equal to
(1) 40 minutes (2) $\frac{40}{3}$ minutes
(3) 20 minutes (4) 15 minutes
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

33. Motor-cyclist P started his journey at a speed of 30 km/hr. After 30 minutes, motor-cyclist Q started from the same place but with a speed of 40 km/hr. How much time (in hours) will Q take to overtake P ?
(1) 1 (2) $\frac{3}{2}$
(3) $\frac{3}{8}$ (4) 2
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

34. A is twice as fast as B and B is thrice as fast as C is. The journey covered by C in $1\frac{1}{2}$ hours will be covered by A in
(1) 15 minutes (2) 20 minutes
(3) 30 minutes (4) 1 hour
(SSC CHSL DEO & LDC Exam. 9.11.2014)

35. A truck travels at 90 km/hr for the first $1\frac{1}{2}$ hours. After that it travels at 70 km/hr. Find the time taken by the truck to travel 310 kilometres.

(1) 2.5 hrs (2) 3 hrs
(3) 3.5 hrs (4) 4 hrs

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

36. A car travels at a speed of 60 km/hr and covers a particular distance in one hour. How long will it take for another car to cover the same distance at 40 km/hr ?

(1) $\frac{5}{2}$ hours (2) 2 hours
(3) $\frac{3}{2}$ hours (4) 1 hour

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

37. A student goes to school at the rate of $\frac{5}{2}$ km/hr and reaches 6 minutes late. If he travels at the speed of 3 km/hr, he reaches 10 minutes earlier. The distance of the school is

(1) 45 km (2) 20 km
(3) 10 km (4) 4 km

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

38. Sriya with her family travelled from Bolpur to Suri by car at a speed of 40 km/hr and returned to Bolpur at a speed of 50 km/hr. The average speed for the whole journey is

(1) $44\frac{4}{9}$ km/hr
(2) 45 km/hr
(3) $45\frac{1}{2}$ km/hr
(4) 44.78 km/hr

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

39. A journey takes 4 hours 30 minutes at a speed of 60 km/hr. If the speed is 15 m/s, then the journey will take

(1) 5 hours
(2) 5 hours 30 minutes
(3) 6 hours
(4) 6 hours 15 minutes

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

40. The distance between 2 places R and S is 42 km. Anita starts from R with a uniform speed of 4 km/h towards S and at the same time Romita starts from S towards R also with some uniform speed. They meet each other after 6 hours. The speed of Romita is

(1) 18 km/hour (2) 6 km/hour
(3) 20 km/hour (4) 8 km/hour

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

41. A farmer travelled a distance of 61 km in 9 hours. He travelled partly on foot at the rate 4 kmph and partly on bicycle at the rate 9 kmph. The distance travelled on foot is

(1) 16 km (2) 14 km
(3) 17 km (4) 15 km

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9) & SSC CGL Tier-I Exam. 09.08.2015 Ist Sitting TF No. 1443088)

42. A bus moving at 40 km per hour covers a distance in 6 hours 15 minutes. If it travels the same distance at 50 km per hour how long will it take to cover the distance ?

(1) 2 hrs. (2) 6 hrs.
(3) 4 hrs. (4) 5 hrs.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

43. A student starting from his house walks at a speed of $2\frac{1}{2}$ km/hour and reaches his school 6 minutes late. Next day starting at the same time he increases his speed by 1 km/hour and reaches 6 minutes early. The distance between the school and his house is

(1) 4 km (2) $3\frac{1}{2}$ km
(3) $1\frac{3}{4}$ km (4) 6 km

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

44. A man starts from a place P and reaches the place Q in 7 hours. He travels $\frac{1}{4}$ th of the distance at 10 km/hour and the remaining distance at 12 km/hour. The distance between P and Q is

(1) 72 km (2) 90 km
(3) 80 km (4) 70 km

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

45. A student goes to school at the rate of $2\frac{1}{2}$ km/hr and reaches 6 minutes late. If he travels at the speed of 3 km/hr. he is 10 minutes early. What is the distance to the school?

(1) 4 km (2) $3\frac{1}{2}$ km
(3) 1 km (4) $3\frac{1}{4}$ km

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

46. A man travels for 5 hours 15 minutes. If he covers the first half of the journey at 60 km/h and rest at 45 km/h. Find the total distance travelled by him.

(1) $1028\frac{6}{7}$ km. (2) 189 km.
(3) 378 km. (4) 270 km.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

47. A car can finish a certain journey in 10 hours at the speed of 42 kmph. In order to cover the same distance in 7 hours, the speed of the car (km/h) must be increased by :

(1) 12 (2) 15
(3) 18 (4) 24

(SSC CGL Tier-II Online Exam.01.12.2016)

48. A man cycles at the speed of 8km/hr and reaches office at 11 am and when he cycles at the speed of 12 km/hr he reaches office at 9 am. At what speed should he cycle so that he reaches his office at 10 am?

(1) 9.6 kmph.
(2) 10 kmph.
(3) 11.2 kmph.
(4) Cannot be determined

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

49. A bus travels at the speed of 36 km/hr, then the distance covered by it in one second is
(1) 10 metre (2) 15 metre
(3) 12.5 metre (4) 13.5 metre
(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

50. Two buses travel to a place at 45 km./hr. and 60 km./hr. respectively. If the second bus takes $5\frac{1}{2}$ hours less than the first for the journey, the length of the journey is :
(1) 900 km. (2) 945 km.
(3) 990 km. (4) 1350 km.
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

51. A train is running at a speed of 116 km/hr. The distance covered by the train in metres in 18 seconds is :
(1) 900 metre (2) 1160 metre
(3) 508 metre (4) 580 metre
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

52. A man travels $\frac{3}{4}$ th of the distance of his journey by bus, $\frac{1}{6}$ th by rickshaw and 2 km on foot. The total distance travelled by the man is :
(1) 12 km (2) 18 km
(3) 20 km (4) 24 km
(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

53. To cover a certain distance with a speed of 60 km/hr, a train takes 15 hours. If it covers the same distance in 12 hours, what will be its speed?
(1) 65 km/h (2) 70 km/h
(3) 75 km/h (4) 80 km/h
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

54. Sound travels at 330 metre per second. The distance (in kilometre) of a thunder cloud when its sound follows the flash after 10 seconds is :
(1) 0.33 km. (2) 3.3 km.
(3) 33 km. (4) 33.3 km.
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

56. A man travels some distance at a speed of 12 km/hr and returns at a speed of 9 km/hr. If the total time taken by him is 2 hrs 20 minutes the distance is
(1) 35 km. (2) 21 km.
(3) 9 km. (4) 12 km.
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–II

1. The length of a train and that of a platform are equal. If with a speed of 90 km/hr the train crosses the platform in one minute, then the length of the train (in metres) is :
(1) 500 (2) 600
(3) 750 (4) 900
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. A train passes two bridges of lengths 800 m and 400 m in 100 seconds and 60 seconds respectively. The length of the train is :
(1) 80 m (2) 90 m
(3) 200 m (4) 150 m
(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

3. A train 300 metres long is running at a speed of 25 metres per second. It will cross a bridge of 200 metres in
(1) 5 seconds (2) 10 seconds
(3) 20 seconds (4) 25 seconds
(SSC CPO S.I. Exam. 12.01.2003

4. A train 800 metres long is running at the speed of 78 km/hr. If it crosses a tunnel in 1 minute, then the length of the tunnel (in metres) is :
(1) 77200 (2) 500
(3) 1300 (4) 13
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

5. A train is moving at a speed of 132 km/hour. If the length of the train is 110 metres, how long will it take to cross a railway platform 165 metres long?
(1) 5 seconds (2) 7.5 seconds
(3) 10 seconds (4) 15 seconds
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

6. A train takes 18 seconds to pass through a platform 162 m long and 15 seconds to pass through another platform 120 m long. The length of the train (in m) is :
(1) 70 (2) 80
(3) 90 (4) 105
(SSC CPO S.I. Exam. 26.05.2005)

7. A train, 150 m long, takes 30 seconds to cross a bridge 500 m long. How much time will the train take to cross a platform 370 m long ?
(1) 36 secs (2) 30 secs
(3) 24 secs (4) 18 secs
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

8. A 120 metre long train is running at a speed of 90 km per hour. It will cross a railway platform 230 m long in :
(1) $4\frac{4}{5}$ seconds (2) $9\frac{1}{5}$ seconds
(3) 7 seconds (4) 14 seconds
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

9. A train travelling at a speed of 30 m/sec crosses a platform, 600 metres long, in 30 seconds. The length (in metres) of train is
(1) 120 (2) 150
(3) 200 (4) 300
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

10. A train with a uniform speed passes a platform, 122 metres long, in 17 seconds and a bridge, 210 metres long, in 25 seconds. The speed of the train is
(1) 46.5 km/hour
(2) 37.5 km/hour
(3) 37.6 km/hour
(4) 39.6 km/hour
(SSC CPO S.I. Exam. 09.11.2008)

11. A train, with a uniform speed, crosses a platform, 162 metres long, in 18 seconds and another platform, 120 metres long, in 15 seconds. The speed of the train is
(1) 14 km/hr (2) 42 km/hr
(3) 50.4 km/hr (4) 67.2 km/hr
(SSC Data Entry Operator Exam. 02.08.2009)

12. A train travelling with uniform speed crosses two bridges of lengths 300 m and 240 m in 21 seconds and 18 seconds respectively. The speed of the train is :
(1) 72 km/hr (2) 68 km/hr
(3) 65 km/hr (4) 60 km/hr
(SSC CHSL DEO & LDC Exam. 27.11.2010)

13. A train, 110m long , is running at a speed of 60km/hr. How many seconds does it take to cross another train, 170 m long, standing on parallel track ?
(1) 15.6 sec (2) 16.8 sec
(3) 17.2 sec (4) 18 sec
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

14. A train of length 500 feet crosses a platform of length 700 feet in 10 seconds. The speed of the train is
(1) 70 ft/second
(2) 85 ft/second
(3) 100 ft/second
(4) 120 ft/second
(SSC CISF Constable (GD) Exam. 05.06.2011)

15. A train 200 m long running at 36 kmph takes 55 seconds to cross a bridge. The length of the bridge is
(1) 375 m. (2) 300 m.
(3) 350 m. (4) 325 m.
(SSC Constable (GD) Exam. 12.05.2013)

16. A train 270 metres long is running at a speed of 36 km per hour, then it will cross a bridge of length 180 metres in :
(1) 40 sec (2) 45 sec
(3) 50 sec (4) 35 sec
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

17. A train 50 metres long passes a platform of length 100 metres in 10 seconds. The speed of the train in metre/second is
(1) 50 (2) 10
(3) 15 (4) 20
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

18. A train 50 metre long passes a platform 100 metre long in 10 seconds. The speed of the train in km/hr is
(1) 10 (2) 54
(3) 15 (4) 100
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

19. How many seconds will a train 120 metre long running at the rate of 36 km/hr take to cross a bridge of 360 metres in length ?
(1) 48 sec (2) 40 sec
(3) 46 sec (4) 36 sec
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

20. If a man running at 15 kmph crosses a bridge in 5 minutes, the length of the bridge is
(1) 1000 metres
(2) 500 metres
(3) 750 metres
(4) 1250 metres
(SSC CGL Tier-I Re-Exam, 30.08.2015)

21. A 200 metre long train is running at a speed of 72 km/hr. How long will it take to cross 800metre long bridge ?
(1) 50 seconds (2) 40 seconds
(3) 60 seconds (4) 30 seconds
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

22. A train passes two bridges of lengths 500 m and 250 m in 100 seconds and 60 seconds respectively. The length of the train is :
(1) 152 m (2) 125 m
(3) 250 m (4) 120 m
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

23. A train 150 metre long takes 20 seconds to cross a platform 450 metre long. The speed of the train in, km per hour, is :
(1) 108 (2) 100
(3) 106 (4) 104
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

24. A moving train passes a platform 50 metre long in 14 seconds and a lamp post in 10 seconds. The speed of the train (in km/h) is :
(1) 24 (2) 36
(3) 40 (4) 45
(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

25. The lengths of a train and that of a platform are equal. If with a speed of 90 km/hr the train crosses the platform in one minute, then the length of the train (in metres) is
(1) 500 (2) 600
(3) 750 (4) 900
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

26. A train, 500 metre long, running at a uniform speed, passes a station in 35 seconds. If the length of the platform is 221 metre, the speed of the train in km/hr is
(1) $72\frac{1}{35}$ (2) 74.16
(3) 24.76 (4) 78.54
(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

27. A train, 200 metre long, is running at a speed of 54 km/hr. The time in seconds that will be taken by train to cross a 175 metre long bridge is :
(1) 12.5 (2) 20
(3) 25 (4) 10
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

TYPE–III

1. A train 180 m long moving at the speed of 20 m/sec. over-takes a man moving at a speed of 10m/sec in the same direction. The train passes the man in :
(1) 6 sec (2) 9 sec
(3) 18 sec (4) 27 sec
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A train 100m long is running at the speed of 30 km/hr. The time (in second) in which it will pass a man standing near the railway line is :
(1) 10 (2) 11
(3) 12 (4) 15
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. How many seconds will a 500 metre long train take to cross a man walking with a speed of 3 km/hr. in the direction of the moving train if the speed of the train is 63 km/hr ?
(1) 25 sec (2) 30 sec
(3) 40 sec (4) 45 sec
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. A train is 125 m long. If the train takes 30 seconds to cross a tree by the railway line, then the speed of the train is :
(1) 14 km/hr (2) 15 km/hr
(3) 16 km/hr (4) 12 km/hr
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

5. A 120 m long train takes 10 seconds to cross a man standing on a platform. What is the speed of the train ?
(1) 12 m/sec. (2) 10 m/sec.
(3) 15 m/sec. (4) 20 m/sec.
(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CPO S.I. Exam. 03.09.2006)

6. A 75 metre long train is moving at 20 kmph. It will cross a man standing on the platform in

(1) 12 seconds
(2) 14 seconds
(3) 13.5 seconds
(4) 15.5 seconds

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

7. In what time will a train 100 metres long cross an electric pole, if its speed be 144 km/hour ?

(1) 2.5 seconds
(2) 5 seconds
(3) 12.5 seconds
(4) $3\frac{5}{4}$ seconds

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

8. A man observed that a train 120 m long crossed him in 9 seconds. The speed (in km/hr) of the train was

(1) 42 (2) 45
(3) 48 (4) 55

(SSC CPO S.I. Exam. 07.09.2003)

9. If a train, with a speed of 60 km/hr, crosses a pole in 30 seconds, the length of the train (in metres) is :

(1) 1000 (2) 900
(3) 750 (4) 500

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

10. A train passes two persons walking in the same direction at a speed of 3 km/hour and 5km/hour respectively in 10 seconds and 11 seconds respectively. The speed of the train is

(1) 28 km/hour (2) 27 km/hour
(3) 25 km/hour (4) 24 km/hour

(SSC CPO S.I. Exam. 03.09.2006)

11. A passenger train 150m long is travelling with a speed of 36 km/hr. If a man is cycling in the direction of train at 9 km/hr., the time taken by the train to pass the man is

(1) 10 sec (2) 15 sec
(3) 18 sec (4) 20 sec

(SSC CPO S.I. Exam. 06.09.2009)

12. Buses start from a bus terminal with a speed of 20 km/hr at intervals of 10 minutes. What is the speed of a man coming from the opposite direction towards the bus terminal if he meets the buses at intervals of 8 minutes?

(1) 3 km/hr (2) 4 km/hr
(3) 5 km/hr (4) 7 km/hr

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

13. A train, 300m long, passed a man, walking along the line in the same direction at the rate of 3 km/hr in 33 seconds. The speed of the train is

(1) 30 km/h (2) 32 km/h
(3) $32\frac{8}{11}$ km/h (4) $35\frac{8}{11}$ km/h

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

14. A train, 240 m long crosses a man walking along the line in opposite direction at the rate of 3 kmph in 10 seconds. The speed of the train is

(1) 63 kmph (2) 75 kmph
(3) 83.4 kmph (4) 86.4 kmph

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

15. A train is running at 36 km/hr. If it crosses a pole in 25 seconds, its length is

(1) 248 m (2) 250 m
(3) 255 m (4) 260 m

(SSC (South Zone) Investigator Exam 12.09.2010)

16. A train is running at a speed of 90 km/hr. If it crosses a signal in 10 sec., the length of the train (in metres) is

(1) 150 (2) 324
(3) 900 (4) 250

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

17. A train 100 metres long meets a man going in opposite direction at 5 km/hr and passes him in $7\frac{1}{5}$ seconds. What is the speed of the train (in km/hr) ?

(1) 45 km/hr (2) 60 km/hr
(3) 55 km/hr (4) 50 km/hr

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

18. A train, 120 m long, takes 6 seconds to pass a telegraph post; the speed of train is

(1) 72 km/hr (2) 62 km/hr
(3) 55 km/hr (4) 85 km/hr

(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting) & (SSC Constable (GD) Exam. 12.05.2013 (Ist Sitting)

19. A train 300 m long is running with a speed of 54 km/hr. In what time will it cross a telephone pole?

(1) 20 seconds (2) 15 seconds
(3) 17 seconds (4) 18 seconds

(SSC CGL Tier-II Exam. 21.09.2014)

20. A train 180 metres long is running at a speed of 90 km/h. How long will it take to pass a post ?

(1) 8.2 secs (2) 7.8 secs
(3) 8 secs (4) 7.2 secs

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

21. If a man walks at the rate of 5 km/hour, he misses a train by 7 minutes. However if he walks at the rate of 6 km/hour, he reaches the station 5 minutes before the arrival of the train. The distance covered by him to reach the station is

(1) 6 km (2) 7 km
(3) 6.25 km (4) 4 km

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

22. A train passes an electrical pole in 20 seconds and passes a platform 250 m long in 45 seconds. Find the length of the train.

(1) 400m (2) 200m
(3) 300m (4) 250m

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

23. A train is 250m long. If the train takes 50 seconds to cross a tree by the railway line, then the speed of the train in km/hr is :

(1) 10 (2) 9
(3) 5 (4) 18

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

24. A train 150m long passes a km stone in 30 seconds and another train of the same length travelling in opposite direction in 10 seconds. The speed ot the second train is :

(1) 90 km/hr (2) 125 km/hr
(3) 25 km/hr (4) 75 km/hr

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

25. The time taken by a train 160 m long, running at 72 km/hr, in crossing an electric pole is

(1) 8 seconds (2) 9 seconds
(3) 6 seconds (4) 4 seconds

(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

26. In what time will a 100 metre long train running with a speed of 50 km/hr cross a pillar ?

(1) 7.0 seconds (2) 72 seconds
(3) 7.2 seconds (4) 70 seconds

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

27. A train 150m long passes a telegraphic post in 12 seconds. Find the speed of the train.(in km/hr)

(1) 50 (2) 12.5
(3) 25 (4) 45

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

28. In what time will a train, 60 metre long, running at the rate of 36 km/hr pass a telegraph post ?

(1) 9 seconds (2) 8 seconds
(3) 7 seconds (4) 6 seconds

(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

29. A train 240 metres in length crosses a telegraph post in 16 seconds. The speed of the train is

(1) 50 km/hr (2) 52 km/hr
(3) 54 km/hr (4) 56 km/hr

(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

30. How long does a train, 75 metre long, moving at 60 km/hr take to pass a certain telegraph post?

(1) 3.5 seconds (2) 4.5 seconds
(3) 5 seconds (4) 5.4 seconds

(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

31. A train 100 metre long is running at a speed of 120 km/hr. The time taken to pass a person standing near the line is

(1) 1 second (2) 3 seconds
(3) 5 seconds (4) 7 seconds

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

TYPE–IV

1. The distance between two cities A and B is 330 km. A train starts from A at 8 a.m. and travels towards B at 60 km/hr. Another train starts from B at 9 a.m. and travels towards A at 75 km/hr. At what time do they meet?

(1) 10 a.m. (2) 10 : 30 a.m.
(3) 11 a.m. (4) 11 : 30 a.m.

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. Two men are standing on opposite ends of a bridge 1200 metres long. If they walk towards each other at the rate of 5m/minute and 10m/minute respectively, in how much time will they meet each other ?

(1) 60 minutes (2) 80 minutes
(3) 85 minutes (4) 90 minutes

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. Two trains, one 160 m and the other 140 m long are running in opposite directions on parallel rails, the first at 77 km an hour and the other at 67 km an hour. How long will they take to cross each other?

(1) 7 seconds (2) $7\frac{1}{2}$ seconds
(3) 6 seconds (4) 10 seconds

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

4. Two trains are running in opposite direction with the same speed. If the length of each train is 120 metres and they cross each other in 12 seconds, the speed of each train (in km/hour) is

(1) 72 (2) 10
(3) 36 (4) 18

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

5. Two trains 140 m and 160 m long run at the speed of 60 km/hour and 40 km/hour respectively in opposite directions on parallel tracks. The time (in seconds) which they take to cross each other, is :

(1) 10 sec. (2) 10.8 sec.
(3) 9 sec. (4) 9.6 sec.

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

6. Two trains start from stations A and B and travel towards each other at speed of 50 km/hour and 60 km/hour respectively. At the time of their meeting, the second train has travelled 120 km more than the first. The distance between A and B is :

(1) 990 km (2) 1200 km
(3) 1320 km (4) 1440 km

(SSC CPO S.I. Exam. 26.05.2005)

7. Two trains are moving on two parallel tracks but in opposite directions. A person sitting in the train moving at the speed of 80 km/hr passes the second train in 18 seconds. If the length of the second train is 1000 m, its speed is

(1) 100 km/hr (2) 120 km/hr
(3) 140 km/hr (4) 150 km/hr

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

8. Two trains 105 metres and 90 metres long, runs at the speed of 45 km/hr and 72 km/hr respectively, in opposite directions on parallel tracks. The time which they take to cross each other, is

(1) 8 seconds (2) 6 seconds
(3) 7 seconds (4) 5 seconds

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

9. Two trains of equal length, running in opposite directions, pass a pole in 18 and 12 seconds. The trains will cross each other in

(1) 14.4 seconds
(2) 15.5 seconds
(3) 18.8 seconds
(4) 20.2 seconds

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

10. A train, 150m long, passes a pole in 15 seconds and another train of the same length travelling in the opposite direction in 12 seconds. The speed of the second train is

(1) 45 km./hr (2) 48 km./hr
(3) 52 km./hr (4) 54 km./hr

(SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting) & (SSC GL Tier-I Exam. 19.05.2013)

11. A train travelling at 48 km/hr crosses another train, having half its length and travelling in opposite direction at 42 km/hr, in 12 seconds. It also passes a railway platform in 45 seconds. The length of the railway platform is

(1) 200 m (2) 300 m
(3) 350 m (4) 400 m

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

12. Two towns A and B are 500 km. apart. A train starts at 8 AM from A towards B at a speed of 70 km/hr. At 10 AM, another train starts from B towards A at a speed of 110 km/hr. When will the two trains meet ?

(1) 1 PM (2) 12 Noon
(3) 12.30 PM (4) 1.30 PM

(SSC CPO S.I. Exam. 06.09.2009)

13. Two trains of length 70 m and 80 m are running at speed of 68 km/hr and 40 km/hr respectively on parallel tracks in opposite directions. In how many seconds will they pass each other ?

(1) 10 sec (2) 8 sec
(3) 5 sec (4) 3 sec

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

14. Two trains of equal length take 10 seconds and 15 seconds respectively to cross a telegraph post. If the length of each train be 120 metres, in what time (in seconds) will they cross each other travelling in opposite direction ?

(1) 16 (2) 15
(3) 12 (4) 10

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

15. Two trains of length 137 metre and 163 metre are running with speed of 42 km/hr and 48 km/hr respectively towards each other on papallel tracks. In how many seconds will they cross each other?

(1) 30 sec (2) 24 sec
(3) 12 sec (4) 10 sec

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

16. Two trains 150 m and 120 m long respectively moving from opposite directions cross each other in 10 secs. If the speed of the second train is 43.2 km/hr, then the speed of the first train is

(1) 54 km/hr (2) 50 km/hr
(3) 52 km/hr (4) 51 km/hr

(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

17. Two trains start from station A and B and travel towards each other at speed of 16 miles/ hour and 21 miles/ hour respectively. At the time of their meeting, the second train has travelled 60 miles more than the first. The distance between A and B (in miles) is :

(1) 444 (2) 496
(3) 333 (4) 540

(SSC Multi-Tasking Staff Exam. 10.03.2013)

18. Two trains 108 m and 112 m in length are running towards each other on the parallel lines at a speed of 45 km/hr and 54 km/hr respectively. To cross each other after they meet, it will take

(1) 12 sec (2) 9 sec
(3) 8 sec (4) 10 sec

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

19. A man standing on a platform finds that a train takes 3 seconds to pass him and another train of the same length moving in the opposite direction, takes 4 seconds. The time taken by the trains to pass each other will be

(1) $2\frac{3}{7}$ seconds (2) $3\frac{3}{7}$ seconds
(3) $4\frac{3}{7}$ seconds (4) $5\frac{3}{7}$ seconds

(SSC CPO S.I. Exam. 03.09.2006)

20. Two trains, each of length 125 metre, are running in parallel tracks in opposite directions. One train is running at a speed 65 km/hour and they cross each other in 6 seconds. The speed of the other train is

(1) 75 km/hour (2) 85 km/hour
(3) 95 km/hour (4) 105 km/hour

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

21. A train running at the speed of 84 km/hr passes a man walking in opposite direction at the speed of 6 km/hr in 4 seconds. What is the length of train (in metre) ?

(1) 150 (2) 120
(3) 100 (4) 90

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

22. Two trains X and Y start from Jodhpur to Jaipur and from Jaipur to Jodhpur respectively. After passing each other they take 4 hours 48 minutes and 3 hours 20 minutes to reach Jaipur and Jodhpur respectively. If X is moving at 45 km/hr, the speed of Y is

(1) 60 km/hr (2) 58 km/hr
(3) 54 km/hr (4) 64.8 km/hr

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

23. P and Q starting simultaneously from two different places proceed towards each other at a speed of 20 km/hour and 30 km/hour respectively. By the time they meet each other. Q has covered 36 km more than that of P. The distance (in km.) between the two places is

(1) 144 (2) 162
(3) 180 (4) 108

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

24. Two places P and Q are 162 km apart. A train leaves P for Q and simultaneously another train leaves Q for P. They meet at the end of 6 hours. If the former train travels 8 km/hour faster than the other, then speed of train from Q is

(1) $12\frac{5}{6}$ km/hour
(2) $10\frac{5}{6}$ km/hour
(3) $9\frac{1}{2}$ km/hour
(4) $8\frac{1}{2}$ km/hour

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

25. Two trains start at the same time from A and B and proceed toward each other at the speed of 75 km/hr and 50 km/hr respectively. When both meet at a point in between, one train was found to have travelled 175 km more than the other. Find the distance between A and B.
(1) 875 km. (2) 785 km.
(3) 758 km. (4) 857 km.
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

26. Two trains of lengths 150m and 180m respectively are running in opposite directions on parallel tracks. If their speeds be 50 km/hr and 58 km/hr respectively, in what time will they cross each other?
(1) 22 seconds (2) 15 seconds
(3) 30 seconds (4) 11 seconds
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

27. Two trains start at the same time from Aligarh and Delhi and proceed towards each other at the rate of 14 km and 21 km per hour respectively. When they meet, it is found that one train has travelled 70 km more than the other. The distance between two stations is
(1) 350 km (2) 210 km
(3) 300 km (4) 140 km
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE–V

1. A train running at $\frac{7}{11}$ of its own speed reached a place in 22 hours. How much time could be saved if the train would run at its own speed?
(1) 14 hours (2) 7 hours
(3) 8 hours (4) 16 hours
(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

2. A man with $\frac{3}{5}$ of his usual speed reaches the destination $2\frac{1}{2}$ hours late. Find his usual time to reach the destination.
(1) 4 hours (2) 3 hours
(3) $3\frac{3}{4}$ hours (4) $4\frac{1}{2}$ hours
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

3. A car travelling with $\frac{5}{7}$ of its usual speed covers 42 km in 1 hour 40 min 48 sec. What is the usual speed of the car?
(1) $17\frac{6}{7}$ km/hr (2) 35 km/hr
(3) 25 km/hr (4) 30 km/hr
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

4. Walking at three-fourth of his usual speed, a man covers a certain distance in 2 hours more than the time he takes to cover the distance at his usual speed. The time taken by him to cover the distance with his usual speed is
(1) 4.5 hours (2) 5.5 hours
(3) 6 hours (4) 5 hours
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

5. By walking at $\frac{3}{4}$ of his usual speed, a man reaches his office 20 minutes later than his usual time. The usual time taken by him to reach his office is
(1) 75 minutes (2) 60 minutes
(3) 40 minutes (4) 30 minutes
(SSC CGL Tier-I Exam. 16.05.2010 (Ist Sitting) & (SSC GL Tier-I Exam. 19.05.2013)

6. Walking at $\frac{3}{4}$ of his usual speed, a man is $1\frac{1}{2}$ hours late. His usual time to cover the same distance, (in hours) is
(1) $4\frac{1}{2}$ (2) 4
(3) $5\frac{1}{2}$ (4) 5
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

7. Walking at $\frac{6}{7}$th of his usual speed a man is 25 minutes late. His usual time to cover this distance is
(1) 2 hours 30 minutes
(2) 2 hours 15 minutes
(3) 2 hours 25 minutes
(4) 2 hours 10 minutes
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

8. Walking $\frac{6}{7}$th of his usual speed, a man is 12 minutes late. The usual time taken by him to cover that distance is
(1) 1 hour
(2) 1 hour 12 minutes
(3) 1 hour 15 minutes
(4) 1 hour 20 minutes
(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

9. A car travels from P to Q at a constant speed. If its speed were increased by 10 km/h, it would have been taken one hour lesser to cover the distance. It would have taken further 45 minutes lesser if the speed was further increased by 10 km/h. The distance between the two cities is
(1) 540 km (2) 420 km
(3) 600 km (4) 620 km
(SSC CGL Tier-I Exam. 19.10.2014)

10. A car covers four successive 7 km distances at speeds of 10 km/hour, 20 km/hour, 30 km/hour and 60 km/hour respectively. Its average speed over this distance is
(1) 30 km/hour (2) 20 km/hour
(3) 60 km/hour (4) 40 km/hour
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

11. A car goes 20 metres in a second. Find its speed in km/hr.
(1) 18 (2) 72
(3) 36 (4) 20
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

12. The speed of a car is 54 km/hr. What is its speed in m/sec?
(1) 15 m/sec (2) 19.44 m/sec
(3) 194.4 m/sec (4) 150 m/sec
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

13. A car covers a certain distance in 25 hours. If it reduces the speed by $\frac{1}{5}$th, the car covers 200 km. less in that time. The speed of car is

(1) 60 km./hr. (2) 30 km./hr.
(3) 40 km./hr. (4) 50 km./hr.

(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

14. A car moving in the morning fog passes a man walking at 4 km/h. in the same direction. The man can see the car for 3 minutes and visibility is upto a distance of 130 m. The speed of the car is :

(1) $7\frac{3}{5}$ km. per hour
(2) $6\frac{3}{5}$ km. per hour
(3) 7 km. per hour
(4) 5 km. per hour

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

TYPE–VI

1. A boy rides his bicycle 10km at an average speed of 12 km/hr and again travels 12 km at an average speed of 10 km/hr. His average speed for the entire trip is approximately :

(1) 10.4 km/hr (2) 10.8 km/hr
(3) 11.0 km/hr (4) 12.2 km/hr

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A person travels 600 km by train at 80km/hr, 800 km by ship at 40 km/hr 500 km by aeroplane at 400 km/hr and 100 km by car at 50km/hr. What is the average speed for the entire distance ?

(1) $65\frac{5}{123}$ km./hr.
(2) 60 km./hr.
(3) $60\frac{5}{123}$ km./hr.
(4) 62 km./hr.

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. A train moves with a speed of 30 kmph for 12 minutes and for next 8 minutes at a speed of 45 kmph. Find the average speed of the train:

(1) 37.5 kmph (2) 36 kmph
(3) 48 kmph (4) 30 kmph

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

4. A man covers half of his journey at 6km/hr and the remaining half at 3km/hr. His average speed is

(1) 9 km/hr (2) 4.5 km/hr
(3) 4 km/hr (4) 3 km/hr

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

5. A man goes from A to B at a uniform speed of 12 kmph and returns with a uniform speed of 4 kmph His average speed (in kmph) for the whole journey is :

(1) 8 (2) 7.5
(3) 6 (4) 4.5

(SSC CPO S.I. Exam. 16.12.2007)

6. A train covers a distance of 3584 km in 2 days 8 hours. If it covers 1440 km on the first day and 1608 km on the second day, by how much does the average speed of the train for the remaining part of the journey differ from that for the entire journey ?

(1) 3 km/hour more
(2) 3 km/hour less
(3) 4 km/hour more
(4) 5 km/hour less

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

7. A man travels a distance of 24 km at 6 kmph. Another distance of 24 km at 8 kmph and a third distance of 24 km at 12 kmph. His average speed for the whole journey (in kmph) is

(1) $8\frac{2}{3}$ (2) 8
(3) $2\frac{10}{13}$ (4) 9

(SSC CPO S.I. Exam. 09.11.2008)

8. A constant distance from Chennai to Bangalore is covered by Express train at 100 km/hr. If it returns to the same distance at 80 km/hr, then the average speed during the whole journey is

(1) 90.20 km/hr
(2) 88.78 km/hr
(3) 88.98 km/hr
(4) 88.89 km/hr

(SSC CPO S.I. Exam. 06.09.2009)

9. A person went from A to B at an average speed of x km/hr and returned from B to A at an average speed of y km/hr. What was his average speed during the total journey ?

(1) $\frac{x+y}{2xy}$ (2) $\frac{2xy}{x+y}$
(3) $\frac{2}{x+y}$ (4) $\frac{1}{x}+\frac{1}{y}$

(SSC SAS Exam. 26.06.2010 (Paper-1)

10. A man goes from Mysore to Bangalore at a uniform speed of 40 km/hr and comes back to Mysore at a uniform speed of 60 km/hr. His average speed for the whole journey is

(1) 48 km/hr (2) 50 km/hr
(3) 54 km/hr (4) 55 km/hr

(SSC CISF ASI Exam. 29.08.2010 (Paper-1) & (SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

11. A man goes from a place A to B at a speed of 12 km/hr and returns from B to A at a speed of 18 km/hr. The average speed for the whole journey is

(1) $14\frac{2}{5}$ km/hr
(2) 15 km/hr
(3) $15\frac{1}{2}$ km/hr
(4) 16 km/hr

(SSC (South Zone) Investigator Exam. 12.09.2010)

12. One third of a certain journey is covered at the rate of 25 km/hour, one-fourth at the rate of 30 km/hour and the rest at 50 km/hour. The average speed for the whole journey is

(1) 35 km/hour
(2) $33\frac{1}{3}$ km/hour
(3) 30 km/hour
(4) $37\frac{1}{12}$ km/hour

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

13. A man completes 30 km of a journey at the speed of 6 km/hr and the remaining 40 km of the journey in 5 hours. His average speed for the whole journey is

(1) 7 km/hr (2) $6\frac{4}{11}$ km/hr

(3) 8 km/hr (4) 7.5 km/hr

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

14. A man covers the journey from a station A to station B at a uniform speed of 36 km/hr and returns to A with a uniform speed of 45 km/hr. His average speed for the whole journey is :

(1) 40 km/hr (2) 40.5 km/hr

(3) 41 km/hr (4) 42 km/hr

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

15. The speed of a train going from Nagpur to Allahabad is 100 kmph while its speed is 150 kmph when coming back from Allahabad to Nagpur. Then the average speed during the whole journey is :

(1) 120 kmph (2) 125 kmph

(3) 140 kmph (4) 135 kmph

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

16. P travels for 6 hours at the rate of 5 km/ hour and for 3 hours at the rate of 6 km/ hour. The average speed of the journey in km/ hour is

(1) $3\frac{1}{5}$ (2) $5\frac{1}{3}$

(3) $1\frac{2}{9}$ (4) $2\frac{2}{5}$

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

17. With an average speed of 40 km/ hr, a train reaches its destination in time. If it goes with an average speed of 35 km/hr, it is late by 15 minutes. The total journey is

(1) 30 km (2) 40 km

(3) 70 km (4) 80 km

(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

18. A bus covers four successive 3 km stretches at speed of 10 km/ hr, 20 km/hr, 30 km/hr and 60 km/hr respectively. Its average speed over this distance is

(1) 30 km/hr (2) 25 km/hr

(3) 20 km/hr (4) 10 km/hr

(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

19. A train travelled at a speed of 35 km/hr for the first 10 minutes and at a speed of 20 km/hr for the next 5 minutes. The average speed of the train for the total 15 minutes is

(1) 30 km/hr (2) 23 km/hr

(3) 31 km/hr (4) 29 km/hr

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

20. On a journey across Kolkata, a taxi averages 50 km per hour for 50% of the distance, 40 km per hour for 40% of it and 20 km per hour for the remaining. The average speed (in km/hour) for the whole journey is :

(1) 42 (2) 40

(3) 35 (4) 45

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

21. A train goes from Ballygunge to Sealdah at an average speed of 20 km/hour and comes back at an average speed of 30 km/hour. The average speed of the train for the whole journey is

(1) 27 km/hr (2) 26 km/hr

(3) 25 km/hr (4) 24 km/hr

(SSC Graduate Level Tier-II Exam. 29.09.2013

22. A and B are 20 km apart. A can walk at an average speed of 4 km/ hour and B at 6 km/hr. If they start walking towards each other at 7 a.m., when they will meet ?

(1) 8.00 a.m. (2) 8.30 a.m.

(3) 9.00 a.m. (4) 10.00 a.m.

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

23. A train runs from Howrah to Bandel at an average speed of 20 km/ hr and returns at an average speed of 30 km/hr. The average speed (in km/hr) of the train in the whole journey is

(1) 20 (2) 22.5

(3) 24 (4) 25

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

24. A motorist travels to a place 150 km away at an average speed of 50 km/hr and returns at 30 km/ hr. His average speed for the whole journey in km/hr is

(1) 37.5 (2) 37

(3) 35 (4) 40

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

25. A man walks from his house at an average speed of 5 km per hour and reaches his office 6 minutes late. If he walks at an average speed of 6 km/h he reaches 2 minutes early. The distance of the office from his house is

(1) 6 km (2) 9 km

(3) 12 km (4) 4 km

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

26. A train runs at an average speed of 75 km/hr. If the distance to be covered is 1050 kms, how long will the train take to cover it ?

(1) 13 hrs (2) 12 hrs

(3) 15 hrs (4) 14 hrs

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

27. A train travels 500 m in first minute. In the next 4 minutes, it travels in each minute 125 m more than that in the previous minute. The average speed per hour of the train during those 5 minutes will be

(1) 30 km/hr (2) 45 km/hr

(3) 50 km/hr (4) 55 km/hr

(SSC CGL Tier-I Re-Exam, 30.08.2015)

28. A man covers a total distance of 100 km on bicycle. For the first 2 hours, the speed was 20 km/ hr and for the rest of the journey, it came down to 10 km/hr. The average speed will be

(1) $12\frac{1}{2}$ km/hr

(2) 13 km/hr

(3) $15\frac{1}{8}$ km/hr

(4) 20 km/hr

(SSC CGL Tier-I (CBE) Exam.10.09.2016)

29. When Alisha goes by car at 50 kmph, she reaches her office 5 minutes late. But when she takes her motorbike, she reaches 3 minutes early. If her office is 25 kms away, what is the approximate average speed at which she rides her motorbike ?
(1) 68 kmph (2) 62 kmph
(3) 58 kmph (4) 52 kmph
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

30. A man goes to a place on bicycle at speed of 16 km/hr and comes back at lower speed. If the average speed is 6.4 km/hr in total journey, then the return speed (in km/hr) is :
(1) 10 (2) 8
(3) 6 (4) 4
(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

31. A car completed a journey of 400 km in $12\frac{1}{2}$ hrs. The first $\frac{3}{4}$ th of the journey was done at 30 km/hr. Calculate the speed for the rest of the journey.
(1) 45 km/hr (2) 25 km/hr
(3) 40 km/hr (4) 30 km/hr
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

32. Durga walks 5 km from her home to school in 60 minutes, then bicycles back to home along the same route at 15 km per hour. Her sister Smriti makes the same round trip, but does so at half of Durga's average speed. How much time does Smriti spend on her round trip ?
(1) 120 minutes (2) 40 minutes
(3) 160 minutes (4) 80 minutes
(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

33. Gautam travels 160 kms at 32 kmph and returns at 40 kmph. Then his average speed is
(1) 72 kmph (2) 71.11 kmph
(3) 36 kmph (4) 35.55 kmph
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

34. A car travels from A to B at the rate of 40 km/h and returns from B to A at the rate of 60 km/h. Its average speed during the whole journey is
(1) 48 km/h (2) 50 km/h
(3) 45 km/h (4) 60 km/h
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

35. A bus travels 150 km in 3 hours and then travels next 2 hours at 60 km/hr. Then the average speed of the bus will be
(1) 55 km/hr. (2) 54 km/hr.
(3) 50 km/hr. (4) 60 km/hr.
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

36. Gautam goes to office at a speed of 12 kmph and returns home at 10 kmph. His average speed is :
(1) 11 kmph (2) 22 kmph
(3) 10.9 kmph (4) 12.5 kmph
(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

37. A man travels 50 km at speed 25 km/h and next 40 km at 20 km/h and there after travels 90 km at 15 km/h. His average speed is :
(1) 18 kmph. (2) 25 kmph.
(3) 20 kmph. (4) 15 kmph.
(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

38. At an average of 80 km/hr Shatabdi Express reaches Ranchi from Kolkata in 7 hrs. The distance between Kolkata and Ranchi is
(1) 560 km. (2) 506 km.
(3) 560 m. (4) 650 m.
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

39. To cover a distance of 216 km in 3.2 hours, what should be the average speed of the car in metre/second?
(1) 67.5 metre/second
(2) 33.75 metre/second
(3) 37.5 metre/second
(4) 18.75 metre/second
(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

TYPE–VII

1. In covering a certain distance, the speed of A and B are in the ratio of 3 : 4. A takes 30 minutes more than B to reach the destination. The time taken by A to reach the destination is :
(1) 1 hour (2) $1\frac{1}{2}$ hours
(3) 2 hours (4) $2\frac{1}{2}$ hours
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The speed of A and B are in the ratio 3 : 4. A takes 20 minutes more than B to reach a destination. In what time does A reach the destination ?
(1) $1\frac{1}{3}$ hours (2) 2 hours
(3) $2\frac{2}{3}$ hours (4) $1\frac{2}{3}$ hours
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

3. The ratio of length of two trains is 5 : 3 and the ratio of their speed is 6 : 5. The ratio of time taken by them to cross a pole is
(1) 5 : 6 (2) 11 : 8
(3) 25 : 18 (4) 27 : 16
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

4. A train starts from *A* at 7 a.m. towards *B* with speed 50 km/h. Another train starts from *B* at 8 a.m. with speed 60 km/h towards *A*. Both of them meet at 10 a.m. at *C*. The ratio of the distance *AC* to *BC* is
(1) 5 : 6 (2) 5 : 4
(3) 6 : 5 (4) 4 : 5
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

5. Two trains started at the same time, one from A to B and the other from B to A. If they arrived at B and A respectively 4 hours and 9 hours after they passed each other, the ratio of the speed of the two trains was
(1) 2 : 1 (2) 3 : 2
(3) 4 : 3 (4) 5 : 4
(SSC CGL Prelim Exam. 08.02.2004 (Ist Sitting) & (SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

6. The speed of two trains are in the ratio 6 : 7. If the second train runs 364 km in 4 hours, then the speed of first train is
(1) 60 km/hr (2) 72 km/hr
(3) 78 km/hr (4) 84 km/hr
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

7. A truck covers a distance of 550 metres in 1 minute whereas a bus covers a distance of 33 kms in 45 minutes. The ratio of their speed is :
(1) 4 : 3 (2) 3 : 5
(3) 3 : 4 (4) 50 : 3
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

8. Three cars travelled distance in the ratio 1 : 2 : 3. If the ratio of the time of travel is 3 : 2 : 1, then the ratio of their speed is
(1) 3 : 9 : 1 (2) 1 : 3 : 9
(3) 1 : 2 : 4 (4) 4 : 3 : 2
(SSC CPO S.I. Exam. 06.09.2009)

9. *A* and *B* run a 5 km race on a round course of 400 m. If their speed are in the ratio 5 : 4, the number of times, the winner passes the other, is
(1) 1 (2) 2
(3) 3 (4) 5
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

10. A cyclist, after cycling a distance of 70 km on the second day, finds that the ratio of distance covered by him on the first two days is 4 : 5. If he travels a distance of 42 km. on the third day, then the ratio of distance travelled on the third day and the first day is :
(1) 4 : 3 (2) 3 : 2
(3) 3 : 4 (4) 2 : 3
(SSC Multi-Tasking Staff Exam. 10.03.2013)

11. A certain distance is covered by a cyclist at a certain speed. If a jogger covers half the distance in double the time, the ratio of the speed of the jogger to that of the cyclist is
(1) 1 : 4 (2) 4 : 1
(3) 1 : 2 (4) 2 : 1
(SSC GL Tier-I Exam. 19.05.2013 (Ist Sitting) & (SSC Graduate Level Tier-II Exam. 29.09.2013)

12. It takes 8 hours for a 600 km journey, if 120 km is done by train and the rest by car. It takes 20 minutes more if 200 km is done by train and the rest by car. The ratio of the speed of the train to that of the car is
(1) 2 : 3 (2) 3 : 2
(3) 3 : 4 (4) 4 : 3
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

13. It takes eight hours for a 600 km journey, if 120 km is done by train and the rest by car. It takes 20 minutes more, if 200 km is done by train and the rest by car. The ratio of the speed of the train to that of the car is :
(1) 3 : 5 (2) 3 : 4
(3) 4 : 3 (4) 4 : 5
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

14. A truck covers a distance of 550 metre in one minute where as a bus covers a distance of 33 km in $\frac{3}{4}$ hour. Then the ratio of their speeds is :
(1) 1 : 3 (2) 2 : 3
(3) 3 : 4 (4) 1 : 4
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

15. A car travels 80 km. in 2 hours and a train travels 180 km. in 3 hours. The ratio of the speed of the car to that of the train is :
(1) 2 : 3 (2) 3 : 2
(3) 3 : 4 (4) 4 : 3
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

16. The speeds of three cars are in the ratio of 1 : 3 : 5. The ratio among the time taken by these cars to travel the same distance is
(1) 3 : 5 : 15 (2) 15 : 3 : 5
(3) 15 : 5 : 3 (4) 5 : 3 : 1
(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE–VIII

1. A thief is noticed by a policeman from a distance of 200m. The thief starts running and the policeman chases him. The thief and the policeman run at the rate of 10 km./hr and 11 km./hr respectively. What is the distance between them after 6 minutes ?
(1) 100 m (2) 190 m
(3) 200 m (4) 150 m
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. A moving train, 66 metres long, overtakes another train of 88 metres long, moving in the same direction in 0.168 minutes. If the second train is moving at 30 km/hr, at what speed is the first train moving ?
(1) 85 km/hr. (2) 50 km/hr.
(3) 55 km/hr. (4) 25 km/hr.
(SSC CPO S.I. Exam. 07.09.2003)

3. A constable is 114 metres behind a thief. The constable runs 21 metres and the thief runs 15 metres in a minute. In what time will the constable catch the thief ?
(1) 19 minutes (2) 18 minutes
(3) 17 minutes (4) 16 minutes
(SSC CPO S.I. Exam. 07.09.2003)

4. How much time does a train, 50 m long, moving at 68 km/hour take to pass another train, 75 m long, moving at 50 km/hour in the same direction ?
(1) 5 seconds (2) 10 seconds
(3) 20 seconds (4) 25 seconds
(SSC CPO S.I. Exam. 05.09.2004)

5. A constable follows a thief who is 200 m ahead of the constable. If the constable and the thief run at speed of 8 km/hour and 7 km/hour respectively, the constable would catch the thief in
(1) 10 minutes (2) 12 minutes
(3) 15 minutes (4) 20 minutes
(SSC CPO S.I. Exam. 05.09.2004)

6. Two trains are running with speed 30 km/hr and 58 km/hr in the same direction. A man in the slower train passes the faster train in 18 seconds. The length (in metres) of the faster train is :
(1) 70 (2) 100
(3) 128 (4) 140
(SSC CPO S.I. Exam. 26.05.2005)

7. Two trains travel in the same direction at the speed of 56 km/h and 29 km/h respectively. The faster train passes a man in the slower train in 10 seconds. The length of the faster train (in metres) is
(1) 100 (2) 80
(3) 75 (4) 120
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

8. A bus moving at a speed of 45 km/hr overtakes a truck 150 metres ahead going in the same direction in 30 seconds. The speed of the truck is
(1) 27 km/hr (2) 24 km/hr
(3) 25 km/hr (4) 28 km/hr
(SSC Data Entry Operator Exam. 31.08.2008)

9. Two trains of equal length are running on parallel lines in the same direction at 46 km/h and 36 km/h. The faster train passes, the slower train in 36 seconds. The length of each train is :
(1) 82 m (2) 50 m
(3) 80 m (4) 72 m
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

10. Two trains start from a certain place on two parallel tracks in the same direction. The speed of the trains are 45 km/hr and 40 km/hr respectively. The distance between the two trains after 45 minutes will be
(1) 2 km 500 m (2) 2 km 750 m
(3) 3 km 750 m (4) 3 km 250 m
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

11. A boy started from his house by bicycle at 10 a.m. at a speed of 12 km per hour. His elder brother started after 1 hr 15 mins by scooter along the same path and caught him at 1.30 p.m. The speed of the scooter will be (in km/hr)

(1) 4.5 (2) 36

(3) $18\frac{2}{3}$ (4) 9

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

12. A policeman goes after a thief who has 100 metres start, if the policeman runs a kilometre in 8 min, and the thief a km in 10 min, the distance covered by thief before he is over-powered is

(1) 350 m (2) 400 m

(3) 320 m (4) 420 m

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

13. Two trains are running 40 km/hr and 20 km/hr respectively in the same direction. The fast train completely passes a man sitting in the slow train in 5 seconds. The length of the fast train is

(1) $23\frac{2}{9}$ m (2) 27 m

(3) $27\frac{7}{9}$ m (3) 23 m

(SSC Graduate Level Tier-II Exam. 29.09.2013

14. A train is moving at a speed of 80 km/h and covers a certain distance in 4.5 hours. The speed of the train to cover the same distance in 4 hours is

(1) 100 km/h (2) 70 km/h

(3) 85 km/h (4) 90 km/h

(SSC CHSL DEO & LDC Exam. 20.10.2013)

15. Two trains 180 metres and 120 metres in length are running towards each other on parallel tracks, one at the rate 65 km/hour and another at 55 km/hour. In how many seconds will they be clear of each other from the moment they meet ?

(1) 6 (2) 9

(3) 12 (4) 15

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

16. Two trains, of same length, are running on parallel tracks in the same direction with speed 60 km/hour and 90 km/hour respectively. The latter completely crosses the former in 30 seconds. The length of each train (in metres) is

(1) 125 (2) 150

(3) 100 (4) 115

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

17. Two trains, 80 metres and 120 metres long, are running at the speed of 25 km/hr and 35 km/hr respectively in the same direction on parallel tracks. How many seconds will they take to pass each other ?

(1) 48 (2) 64

(3) 70 (4) 72

(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

18. A goods train starts running from a place at 1 P.M. at the rate of 18 km/hour. Another goods train starts from the same place at 3 P.M. in the same direction and overtakes the first train at 9 P.M. The speed of the second train in km/hr is

(1) 24 (2) 30

(3) 15 (4) 18

(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

19. Two trains 125 metres and 115 metres in length, are running towards each other on parallel lines, one at the rate of 33 km/hr and the other at 39 km/hr. How much time (in seconds) will they take to pass each other from the moment they meet ?

(1) 8 (2) 10

(3) 12 (4) 15

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

20. A thief steals a car at 1.30 p.m. and drives it off at 40 km/hr. The theft is discovered at 2 p.m. and the owner sets off in another car at 50 km/hr. He will overtake the thief at

(1) 5 p.m. (2) 4 p.m.

(3) 4.30 p.m. (4) 6 p.m.

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

21. Two trains of equal length are running on parallel lines in the same direction at the rate of 46 km/hr and 36 km/hr. The faster train passes the slower train in 36 seconds. The length of each train is

(1) 50 m (2) 72 m

(3) 80 m (4) 82 m

(SSC CGL Tier-II Exam. 21.09.2014)

22. Two trains start from stations A and B and travel towards each other at speeds of 50 kmph and 60 kmph respectively. At the time of their meeting, the second train has travelled 120 km more than the first. The distance between A and B is

(1) 1200 km (2) 1440 km

(3) 1320 km (4) 990 km

(SSC CHSL DEO & LDC Exam. 16.11.2014)

23. The distance between two places A and B is 60 km. Two cars start at the same time from A and B, travelling at the speeds of 35 km/h and 25 km/h, respectively. If the cars run in the same direction, then they will meet after (in hours)

(1) 6.5 (2) 6.2

(3) 6 (4) 6.52

(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

24. A train 'B' speeding with 100 kmph crosses another train C, running in the same direction, in 2 minutes. If the length of the train B and C be 150 metre and 250 metre respectively, what is the speed of the train C (in kmph)?

(1) 75 (2) 88

(3) 95 (4) 110

(SSC CGL Tier-II Online Exam.01.12.2016)

25. A passenger train running at the speed of 80 kms./hr leaves the railway station 6 hours after a goods train leaves and overtakes it in 4 hours. What is the speed of the goods train?

(1) 32 kmph (2) 50 kmph

(3) 45 kmph (4) 64 kmph

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

26. Two trains start from a certain place on two parallel tracks in the same direction. The speed of the trains are 45 km/hr. and 40 km/hr respectively. The distance between the two trains after 45 minutes will be

(1) 2.5 km. (2) 2.75 km.
(3) 3.7 km. (4) 3.75 km.

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

27. A thief is stopped by a policeman from a distance of 400 metres. When the policeman starts the chase, the thief also starts running. Assuming the speed of the thief as 5 km/h and that of policeman as 9 km/h, how far the thief would have run, before he is over taken by the policeman ?

(1) 400 metre (2) 600 metre
(3) 500 metre (4) 300 metre

(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

28. Two trains of equal length are running on parallel lines in the same direction at 46 km/hour and 36 km/hour. The faster train passes the slower train in 36 seconds. The length of each train is

(1) 72 m (2) 80 m
(3) 82 m (4) 50 m

(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE–IX

1. If a man walks 20 km at 5 km/hr, he will be late by 40 minutes. If he walks at 8 km/hr, how early from the fixed time will he reach?

(1) 15 minutes (2) 25 minutes
(3) 50 minutes (4) $1\frac{1}{2}$ hours

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If a man reduces his speed to 2/3, he takes 1 hour more in walking a certain distance. The time (in hours) to cover the distance with his normal speed is :

(1) 2 (2) 1
(3) 3 (4) 1.5

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

3. A student rides on bicycle at 8 km/hour and reaches his school 2.5 minutes late. The next day he increases his speed to 10 km/hour and reaches school 5 minutes early. How far is the school from his house ?

(1) $\frac{5}{8}$ km (2) 8 km
(3) 5 km (4) 10 km

(SSC CPO S.I. Exam. 12.01.2003

4. A man covered a certain distance at some speed. Had he moved 3 km per hour faster, he would have taken 40 minutes less. If he had moved 2 km per hour slower, he would have taken 40 minutes more. The distance (in km) is :

(1) 20 (2) 35
(3) $36\frac{2}{3}$ (4) 40

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

5. If a train runs at 40 km/hour, it reaches its destination late by 11 minutes. But if it runs at 50 km/hour, it is late by 5 minutes only. The correct time (in minutes) for the train to complete the journey is

(1) 13 (2) 15
(3) 19 (4) 21

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

6. A student walks from his house at a speed of $2\frac{1}{2}$ km per hour and reaches his school 6 minutes late. The next day he increases his speed by 1 km per hour and reaches 6 minutes before school time. How far is the school from his house ?

(1) $\frac{5}{4}$ km (2) $\frac{7}{4}$ km
(3) $\frac{9}{4}$ km (4) $\frac{11}{4}$ km

(SSC CGL Prelim Exam. 08.02.2004) (Ist Sitting) & (SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

7. A boy is late by 9 minutes if he walks to school at a speed of 4 km/hour. If he walks at the rate of 5 km/hour, he arrives 9 minutes early. The distance to his school is

(1) 9 km (2) 5 km
(3) 4 km (4) 6 km

(SSC CPO S.I. Exam. 06.09.2009)

8. A car can cover a certain distance in $4\frac{1}{2}$ hours. If the speed is increased by 5 km/hour, it would take $\frac{1}{2}$ hour less to cover the same distance. Find the slower speed of the car.

(1) 50 km/hour (2) 40 km/hour
(3) 45 km/hour (4) 60 km/hour

(SSC CPO S.I. Exam. 06.09.2009)

9. Shri X goes to his office by scooter at a speed of 30km/h and reaches 6 minutes earlier. If he goes at a speed of 24 km/h, he reaches 5 minutes late. The distance of his office is

(1) 20 km (2) 21 km
(3) 22 km (4) 24 km

(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

10. Walking at 5 km/hr a student reaches his school from his house 15 minutes early and walking at 3 km/hr he is late by 9 minutes. What is the distance between his school and his house ?

(1) 5 km (2) 8 km
(3) 3 km (4) 2 km

(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

11. A student goes to school at the rate of $2\frac{1}{2}$ km/h and reaches 6 minutes late. If he travels at the speed of 3 km/h. he is 10 minutes early. The distance (in km) between the school and his house is

(1) 5 (2) 4
(3) 3 (4) 1

(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

12. When a person cycled at 10 km per hour he arrived at his office 6 minutes late. He arrived 6 minutes early, when he increased his speed by 2 km per hour. The distance of his office from the starting place is

(1) 6 km (2) 7 km
(3) 12 km (4) 16 km

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

13. A train covers a distance between station A and station B in 45 minutes. If the speed of the train is reduced by 5 km/hr, then the same distance is covered in 48 minutes. The distance between station A and B is

(1) 60 km (2) 64 km
(3) 80 km (4) 55 km

(SSC Graduate Level Tier-II Exam.16.09.2012)

14. A train covers a distance of 10 km in 12 minutes. If its speed is decreased by 5 km/hr, the time taken by it to cover the same distance will be :

(1) 10 minutes
(2) 13 minutes 20 sec
(3) 13 minutes
(4) 11 minutes 20 sec

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

15. Walking at a speed of 5 km/hr, a man reaches his office 6 minutes late. Walking at 6 km/hr, he reaches there 2 minutes early. The distance of his office is

(1) 3 km (2) 4 km
(3) 3.5 km (4) 2 km

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

16. If a boy walks from his house to school at the rate of 4 km per hour, he reaches the school 10 minutes earlier than the scheduled time. However, if he walks at the rate of 3 km per hour, he reaches 10 minutes late. Find the distance of his school from his house.

(1) 5 km (2) 4 km
(3) 6 km (4) 4.5 km

(SSC Graduate Level Tier-II Exam. 29.09.2013

17. A train travelling at a speed of 55 km/hr travels from place X to place Y in 4 hours. If its speed is increased by 5 km/hr., then the time of journey is reduced by

(1) 25 minutes (2) 35 minutes
(3) 20 minutes (4) 30 minutes

(SSC CGL Tier-I Exam. 26.10.2014)

18. If a train runs at 70 km/hour, it reaches its destination late by 12 minutes. But if it runs at 80 km/hour, it is late by 3 minutes. The correct time to cover the journey is

(1) 58 minutes (2) 2 hours
(3) 1 hour (4) 59 minutes

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

TYPE–X

1. A train passes a 50 metres long platform in 14 seconds and a man standing on the platform in 10 seconds.The speed of the train is :

(1) 24 km/hr (2) 36km/hr
(3) 40 km/hr (4) 45 km/hr

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. A train passes a man standing on a platform in 8 seconds and also crosses the platform which is 264 metres long in 20 seconds. The length of the train (in metres) is :

(1) 188 (2) 176
(3) 175 (4) 96

(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CGL Prelim Exam. 13.11.2005)

3. A train moves past a telegraph post and a bridge 264 m long in 8 seconds and 20 seconds respectively. What is the speed of the train ?

(1) 69.5 km/hr (2) 70 km/hr
(3) 79 km/hr (4) 79.2 km/hr

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

4. A person standing on a railway platform noticed that a train took 21 seconds to completely pass through the platform which was 84 m long and it took 9 seconds in passing him. The speed of the train was

(1) 25.2 km/hour
(2) 32.4 km/hour
(3) 50.4 km/hour
(4) 75.6 km/hour

(SSC CPO S.I. Exam. 05.09.2004)

5. A moving train passes a platform 50 metres long in 14 seconds and a lamp-post in 10 seconds. The speed of the train is

(1) 24 km/hr. (2) 36 km/hr.
(3) 40 km/hr. (4) 45 km/hr.

(SSC CPO S.I. Exam. 07.09.2003)

6. A train passes a platform 90 metre long in 30 seconds and a man standing on the platform in 15 seconds. The speed of the train is :

(1) 12.4 kmph (2) 14.6 kmph
(3) 18.4 kmph (4) 21.6 kmph

(SSC CPO S.I. Exam. 16.12.2007)

7. A moving train crosses a man standing on a platform and a bridge 300 metres long in 10 seconds and 25 seconds respectively. What will be the time taken by the train to cross a platform 200 metres long ?

(1) $16\frac{2}{3}$ seconds (2) 18 seconds
(3) 20 seconds (4) 22 seconds

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

8. A train passes a platform 110 m long in 40 seconds and a boy standing on the platform in 30 seconds . The length of the train is

(1) 100 m (2) 110 m
(3) 220 m (4) 330 m

(SSC CPO S.I. Exam. 09.11.2008)

9. A train crosses a pole in 15 seconds and a platform 100 metres long in 25 seconds. Its length (in metres) is

(1) 50 (2) 100
(3) 150 (4) 200

(SSC (South Zone) Investigator Exam 12.09.2010)

10. Points 'A' and 'B' are 70 km apart on a highway. A car starts from 'A' and another from 'B' at the same time. If they travel in the same direction, they meet in 7 hours, but if they travel towards each-other, they meet in one hour. Find the speed of the two cars (in km/hr).

(1) 20, 30 (2) 40, 30
(3) 30, 50 (4) 20, 40

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

11. Two trains 100 metres and 95 metres long respectively pass each other in 27 seconds when they run in the same direction and in 9 seconds when they run in opposite directions. Speed of the two trains are

(1) 44 km/hr, 22 km/hr
(2) 52 km/hr, 26 km/hr
(3) 36 km/hr. 18 km/hr
(4) 40 km/hr, 20 km/hr

(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

12. A train passes by a lamp post on a platform in 7 sec. and passes by the platform completely in 28 sec. If the length of the platform is 390 m, then length of the train (in metres) is

(1) 120 (2) 130
(3) 140 (4) 150

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

13. A train moving at a rate of 36 km/hr. crosses a standing man in 10 seconds. It will cross a platform 55 metres long, in :

(1) 6 seconds
(2) 7 seconds
(3) $15\frac{1}{2}$ seconds
(4) $5\frac{1}{2}$ seconds

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

14. A train crosses a platform in 30 seconds travelling with a speed of 60 km/h. If the length of the train be 200 metres, then the length (in metres) of the platform is

(1) 400 (2) 300
(3) 200 (4) 500

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

15. A train leaves a station A at 7 am and reaches another station B at 11 am. Another train leaves B at 8 am and reaches A at 11.30 am. The two trains cross one another at

(1) 8:36 am (2) 8:56 am
(3) 9:00 am (4) 9:24 am

(SSC CGL Tier-I Exam. 19.10.2014)

16. The time for a train of length 110 metre running at the speed of 72 km/hr to cross a bridge of length 132 metre is

(1) 9.8 seconds
(2) 12.1 seconds
(3) 12.42 seconds
(4) 14.3 seconds

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

17. A train 110 metre long is running with a speed of 60 kmph. In what time will it pass a man who is running at 6 kmph in the direction opposite to that in which the train is going ?

(1) 5 seconds (2) 6 seconds
(3) 7 seconds (4) 10 seconds

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

TYPE–XI

1. In a one-kilometre race A, B and C are the three participants. A can give B a start of 50 m. and C a start of 69 m. The start, which B can allow C is

(1) 17 m. (2) 20 m.
(3) 19 m. (4) 18 m.

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

2. A runs twice as fast as B and B runs thrice as fast as C. The distance covered by C in 72 minutes, will be covered by A in :

(1) 18 minutes (2) 24 minutes
(3) 16 minutes (4) 12 minutes

(SSC CPO S.I. Exam. 16.12.2007)

3. In a race of one kilometre, A gives B a start of 100 metres and still wins by 20 seconds. But if A gives B a start of 25 seconds, B wins by 50 metres. The time taken by A to run one kilometre is

(1) 17 seconds
(2) $\frac{500}{29}$ seconds
(3) $\frac{1200}{29}$ seconds
(4) $\frac{700}{29}$ seconds

(SSC CPO S.I. Exam. 09.11.2008)

4. In a 100m race, Kamal defeats Bimal by 5 seconds. If the speed of Kamal is 18 Kmph, then the speed of Bimal is

(1) 15.4 kmph (2) 14.5 kmph
(3) 14.4 kmph (4) 14 kmph

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

5. In a race of 1000 m, A can beat B by 100m. In a race of 400 m, B beats C by 40m. In a race of 500m. A will beat C by

(1) 95 m (2) 50 m
(3) 45 m (4) 60 m

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

6. In a race of 800 metres, A can beat B by 40 metres. In a race of 500 metres, B can beat C by 5 metres. In a race of 200 metres, A will beat C by

(1) 11.9 metre (2) 1.19 metre
(3) 12.7 metre (4) 1.27 metre

(SSC CPO S.I. Exam. 16.12.2007)

7. In a race of 200 metres, B can give a start of 10 metres to A, and C can give a start of 20 metres to B. The start that C can give to A, in the same race, is

(1) 30 metres (2) 25 metres
(3) 29 metres (4) 27 metres

(SSC CPO S.I. Exam. 16.12.2007)

8. A can give 40 metres start to B and 70 metres to C in a race of one kilometre How many metres start can B give to C in a race of one kilometre ?

(1) 30 metre (2) $31\frac{1}{4}$ metre
(3) $31\frac{3}{4}$ metre (4) 32 metre

(SSC CPO S.I. Exam. 09.11.2008)

9. A jeep is chasing a car which is 5km ahead. Their respective speed are 90 km/hr and 75 km/hr. After how many minutes will the jeep catch the car ?

(1) 18 min. (2) 20 min.
(3) 24 min. (4) 25 min.

(SSC Data Entry Operator Exam. 02.08.2009)

10. A is twice as fast as B, and B is thrice as fast as C is. The journey covered by C in $1\frac{1}{2}$ hours will be covered by A in

(1) 15 minutes (2) 30 minutes
(3) 1 hour (4) 10 minutes

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

11. Walking at the rate of 4 kmph a man covers certain distance in 2 hrs 45 min. Running at a speed of 16.5 kmph the man will cover the same distance in how many minutes ?

(1) 50 min. (2) 35 min.
(3) 40 min. (4) 45 min.

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

12. Sarthak completed a marathon in 4 hours and 35 minutes. The marathon consisted of a 10 km run followed by 20 km cycle ride and the remaining distance again a run. He ran the first stage at 6 km/hr and then cycled at 16 km/hr. How much distance did Sarthak cover in total, if his speed in the last run was just half that of his first run?

(1) 5 km. (2) 35 km.
(3) 40 km. (4) 45 km.

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

13. Walking at $\frac{3}{4}$ of his usual speed, a man reaches his office 20 minutes late. Then his usual time for walking to his office is :

(1) 1 hour (2) 30 minutes
(3) 45 minutes (4) 40 minutes

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

14. A is faster than B. A and B each walk 24 km. The sum of their speeds is 7 km/hr and the sum of times taken by them is 14 hours. Then A's speed is equal to:

(1) 3 km/hr. (2) 4 km/hr.
(3) 5 km/hr. (4) 7 km/hr.

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

15. Two persons ride towards each other from two places 55 km apart, one riding at 12km/hr and the other at 10 km/hr. In what time will they be 11 km apart?

(1) 2 hours and 30 minutes
(2) 1 hour and 30 minutes
(3) 2 hours
(4) 2 hours and 45 minutes

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

16. A and B start running at the same time and from the same point around a circle. If A can complete one round in 40 seconds and B in 50 seconds, how many seconds will they take to reach the starting point simultaneously ?

(1) 10 (2) 200
(3) 90 (4) 2000

(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (IST Sitting)

17. Rubi goes to a multiplex at the speed of 3 km/hr to see a movie and reaches 5 minutes late. If she travels at the speed of 4 km/hr she reaches 5 minutes early. Then the distance of the multiplex from her starting point is

(1) 2 km. (2) 5 km.
(3) 2 metre (4) 5 metre

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–XII

1. I walk a certain distance and ride back taking a total time of 37 minutes. I could walk both ways in 55 minutes. How long would it take me to ride both ways?

(1) 9.5 minutes (2) 19 minutes
(3) 18 minutes (4) 20 minutes

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. A and B start at the same time with speed of 40 km/hr and 50 km/hr respectively. If in covering the journey A takes 15 minutes longer than B, the total distance of the journey is :

(1) 46 km (2) 48 km
(3) 50 km (4) 52 km

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. A man can reach a certain place in 30 hours. If he reduces his speed by $\frac{1}{15}$th, he goes 10 km less in that time. Find his speed per hour.

(1) 6 km/hr (2) $5\frac{1}{2}$ km/hr
(3) 4 km/hr (4) 5 km/hr

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. A, B and C start at the same time in the same direction to run around a circular stadium. A completes a round in 252 seconds, B in 308 seconds and C in 198 seconds, all starting at the same point. After what time will they next meet at the starting point again ?

(1) 46 minutes 12 seconds
(2) 45 minutes
(3) 42 minutes 36 seconds
(4) 26 minutes 18 seconds

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

5. A man walks a certain distance and rides back in 4 hours 30 minutes. He could ride both ways in 3 hours. The time required by the man to walk both ways is

(1) 4 hours 30 minutes
(2) 4 hours 45 minutes
(3) 5 hours
(4) 6 hours

(SSC CPO S.I. Exam. 07.09.2003)

6. A person, who can walk down a hill at the rate of $4\frac{1}{2}$ km/hour and up the hill at the rate of 3 km/hour, ascends and comes down to his starting point in 5 hours. How far did he ascend ?

(1) 13.5 km (2) 3 km
(3) 15 km (4) 9 km

(SSC CPO S.I. Exam. 05.09.2004)

7. A walks at a uniform rate of 4 km an hour; and 4 hours after his start, B bicycles after him at the uniform rate of 10 km an hour. How far from the starting point will B catch A ?

(1) 16.7 km (2) 18.6 km
(3) 21.5 km (4) 26.7 km

(SSC CPO S.I. Exam. 26.05.2005)

8. A car completes a journey in 10 hours. If it covers half of the journey at 40 kmph and the remaining half at 60 kmph, the distance covered by car is

(1) 400 km (2) 480 km
(3) 380 km (4) 300 km

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

9. *A* and *B* run a kilometre and *A* wins by 25 sec. *A* and *C* run a kilometre and *A* wins by 275 m. When *B* and *C* run the same distance, *B* wins by 30 sec. The time taken by *A* to run a kilometre is

(1) 2 min 25 sec
(2) 2 min 50 sec
(3) 3 min 20 sec
(4) 3 min 30 sec

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

10. Two cars start at the same time from one point and move along two roads at right angles to each other. Their speeds are 36 km/hour and 48 km/hour respectively. After 15 seconds the distance between them will be

(1) 400 m (2) 150 m
(3) 300 m (4) 250 m

(SSC CPO S.I. Exam. 03.09.2006)

11. In a kilometre race, A beats B by 30 seconds and B beats C by 15 seconds. If A beats C by 180 metres, the time taken by A to run 1 kilometre is

(1) 250 seconds (2) 205 seconds
(3) 200 seconds (4) 210 seconds

(SSC CPO S.I. Exam. 03.09.2006)

12. Two guns are fired from the same place at an interval of 6 minutes. A person approaching the place observes that 5 minutes 52 seconds have elapsed between the hearing of the sound of the two guns. If the velocity of the sound is 330 m/sec, the man was approaching that place at what speed (in km/hr) ?

(1) 24 (2) 27
(3) 30 (4) 36

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

13. Ram arrives at a Bank 15 minutes earlier than scheduled time if he drives his car at 42 km/hr. If he drives car at 35 km/hr he arrives 5 minutes late. The distance of the Bank from his starting point is

(1) 70 km (2) 210 km
(3) 72 km (4) 60 km

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

14. A and B started at the same time from the same place for a certain destination. B walking at $\frac{5}{6}$ of A's speed reached the destination 1 hour 15 minutes after A. B reached the destination in

(1) 6 hours 45 minutes
(2) 7 hours 15 minutes
(3) 7 hours 30 minutes
(4) 8 hours 15 minutes

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

15. In covering a distance of 30 km, Abhay takes 2 hours more than Sameer. If Abhay doubles his speed, then he would take 1 hour less than Sameer. Abhay's speed (in km/hr) is

(1) 5 (2) 6
(3) 6.25 (4) 7.5

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

16. A man takes 6 hours 15 minutes in walking a distance and riding back to the starting place. He could walk both ways in 7 hours 45 minutes. The time taken by him to ride both ways, is

(1) 4 hours
(2) 4 hours 30 minutes
(3) 4 hours 45 minutes
(4) 5 hours

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

17. A man completed a certain journey by a car. If he covered 30% of the distance at the speed of 20km/hr, 60% of the distance at 40km/hr and the remaining distance at 10km/hr; his average speed for the whole journey was

(1) 25 km/hr (2) 28 km/hr
(3) 30 km/hr (4) 33 km/hr

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

18. From two places, 60 km apart, A and B start towards each other at the same time and meet each other after 6 hours. Had A travelled with $\frac{2}{3}$ of his speed and B travelled with double of his speed, they would have met after 5 hours. The speed of A is

(1) 4 km/hr. (2) 6 km/hr.
(3) 10 km/hr. (4) 12 km/hr.

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

19. P and Q are 27 km away. Two trains with speed of 24 km/hr and 18 km/hr respectively start simultaneously from P and Q and travel in the same direction. They meet at a point R beyond Q. Distance QR is

(1) 126 km (2) 81 km
(3) 48 km (4) 36 km

(SSC Graduate Level Tier-II Exam.16.09.2012)

20. Ravi and Ajay start simultaneously from a place A towards B, 60 km apart. Ravi's speed is 4km/hr less than that of Ajay. Ajay, after reaching B, turns back and meets Ravi at a place 12 km away from B. Ravi's speed is

(1) 12 km/hr (2) 10 km/hr
(3) 8 km/hr (4) 6 km/hr

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

21. A man travelled a distance of 61 km in 9 hours, partly on foot at the rate of 4 km/hr and partly on bicycle at the rate of 9 km/hr. The distance travelled on foot was

(1) 12 km (2) 16 km
(3) 20 km (4) 24 km

(SSC (South Zone) Investigator Exam 12.09.2010)

22. If I walk at 5 km/hour, I miss a train by 7 minutes. If, however, I walk at 6 km/hour, I reach the station 5 minutes before the departure of the train. The distance (in km) between my house and the station is

(1) 6 (2) 5
(3) 4 (4) 3

(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

23. A man has to be at a certain place at a certain time. He finds that he shall be 20 minutes late if he walks at 3 km/hour speed and 10 minutes earlier if he walks at a speed of 4 km/hour. The distance he has to walk is

(1) 24 km (2) 12·5 km
(3) 10 km (4) 6 km

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

24. Ravi travels 300 km partly by train and partly by car. He takes 4 hours to reach, if he travels 60 km by train and rest by car. He will take 10 minutes more if he were to travel 100 km by train and rest by car. The speed of the train is :

(1) 50 km/hr (2) 60 km/hr
(3) 100 km/hr (4) 120 km/hr

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

25. A is twice as fast runner as B, and B is thrice as fast runner as C. If C travelled a distance in 1 hour 54 minutes, the time taken by B to cover the same distance is

(1) 19 minutes (2) 38 minutes
(3) 51 minutes (4) 57 minutes

(SSC SAS Exam. 26.06.2010 (Paper-1)

26. Two trains, A and B, start from stations X and Y towards Y and X respectively. After passing each other, they take 4 hours 48 minutes and 3 hours 20 minutes to reach Y and X respectively. If train A is moving at 45 km/hr., then the speed of the train B is

(1) 60 km/hr (2) 64.8 km/hr
(3) 54 km/hr (4) 37.5 km/hr

(SSC Graduate Level Tier-II Exam.16.09.2012)

27. Ram travelled 1200 km by air which formed $\frac{2}{5}$ of his trip. He travelled one-third of the trip by car and the rest by train. The distance (in km) travelled by train was

(1) 480 (2) 800
(3) 1600 (4) 1800

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

28. A, B, C walk 1 km in 5 minutes, 8 minutes and 10 minutes respectively. C starts walking from a point, at a certain time, B starts from the same point 1 minutes later and A starts from the same point 2 minutes later than C. Then A meets B and C after

(1) $\frac{5}{3}$ min, 2 min
(2) 1 min, 2 min
(3) 2 min, 3 min
(4) $\frac{4}{3}$ min, 3 min

(SSC Graduate Level Tier-I Exam. 21.04.2013)

29. Two cars are moving with speed v_1, v_2 towards a crossing along two roads. If their distance from the crossing be 40 metres and 50 metres at an instant of time then they do not collide if their speed are such that

(1) $v_1 : v_2 = 16 : 25$
(2) $v_1 : v_2 \neq 4 : 5$
(3) $v_1 : v_2 \neq 5 : 4$
(4) $v_1 : v_2 = 25 : 16$

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

30. The distance between place A and B is 999 km. An express train leaves place A at 6 am and runs at a speed of 55.5 km/hr. The train stops on the way for 1 hour 20 minutes. It reaches B at

(1) 1.20 am (2) 12 pm
(3) 6 pm (4) 11 pm

(SSC Graduate Level Tier-II Exam. 29.09.2013)

31. A speed of 45 km per hour is the same as

(1) 12.5 metre/seccond
(2) 13 metre/seccond
(3) 15 metre/seccond
(4) 12 metre/seccond

(SSC CGL Tier-I Exam. 26.10.2014)

32. If a distance of 50 m is covered in 1 minute, that 90 m in 2 minutes and 130 m in 3 minutes find the distance covered in 15 minutes.

(1) 610 m (2) 750 m
(3) 1000 m (4) 650 m

(SSC CGL Tier-II Exam. 21.09.2014)

33. A train leaves station A at 5 AM and reaches station B at 9 AM on the same day. Another train leaves station B at 7 AM and reaches station A at 10:30 AM on the same day. The time at which the two trains cross each other is :

(1) 8 : 26 AM (2) 7: 36 AM
(3) 7: 56 AM (4) 8 AM

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

34. A plane can cover 6000 km in 8 hours. If the speed is increased by 250 kmph, then the time taken by the plane to cover 9000 km is

(1) 8 hours (2) 6 hours
(3) 5 hours (4) 9 hours

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

35. A man travels 450 km to his home partly by train and partly by car. He takes 8 hours 40 minutes if he travels 240 km by train and rest by car. He takes 20 minutes more if he travels 180 km by train and the rest by car. The speed of the car in km/hr is

(1) 45 (2) 50
(3) 60 (4) 48

(SSC CGL Tier-II Online Exam.01.12.2016)

36. Two rifles are fired from the same place at a difference of 11 min. 45 seconds. But a man who is coming towards the same place in a train hears the second sound after 11 minutes. Find the speed of the train (Assuming speed of sound = 330 m/s).

(1) 72 km/h (2) 36 km/h
(3) 81 km/h (4) 108 km/h

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

37. A man can cover a certain distance in 3 hours 36 minutes if he walks at the rate of 5 km/hr. If he covers the same distance on cycle at the rate of 24 km/hr, then the time taken by him in minutes is

(1) 40 (2) 45
(3) 50 (4) 55

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

38. Due to inclement weather, an air plane reduced its speed by 300 km/hr, and reached the destination of 1200 km late by 2hrs. Then the schedule duration of the flight was

(1) 1 hour (2) 1.5 hours
(3) 2 hours (4) 2.5 hours

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

39. A motor cycle gives an average of 45 km per litre. If the cost of petrol is Rs. 20 per litre, the amount required to complete a journey of 540 km is, (in Rupees)

(1) 120 (2) 360
(3) 200 (4) 240

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

40. Ravi has a roadmap with a scale of 1.5 cm for 18 km. He drives on that road for 72 km. What would be his distance covered in that map?

(1) 4 cm (2) 6 cm
(3) 8 cm (4) 7 cm

(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

41. A farmer travelled a distance of 61 km in 9 hours. He travelled partly on foot at a speed of 4 km/hour and partly on bicycle at a speed of 9 km/hour. The distance travelled on foot is :

(1) 14 km. (2) 16 km.
(3) 20 km. (4) 18 km.

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

42. A man travelled a distance of 61 km. in 9 hours, partly by walking at the speed of 4 km./hr. and partly on bicycle at the speed of 9 km./hr. The distance covered by walking is

(1) 16 km. (2) 12 km.
(3) 15 km. (4) 17 km.

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

43. Sound travels 330 metre in a second.When the sound follows the flash of lightning after 10 seconds the thunder cloud will be at a distance of :

(1) 1300 metre (2) 2000 metre
(3) 3650 metre (4) 3300 metre

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

44. A man travels for 14 hours 40 minutes. He covers half of the journey by train at the rate of 60 km/hr and rest half by road at the rate of 50 km/hr. The distance travelled by him is :

(1) 720 km (2) 800 km
(3) 960 km (4) 1000 km

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

45. Two donkeys are standing 400 metres apart. First donkey can run at a speed of 3 m/sec and the second can run at 2 m/sec. If two donkeys run towards each other after how much time (in seconds) will they bump into each other?

(1) 60 (2) 80
(3) 400 (4) 40

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

46. A and B are 15 kms apart and when travelling towards each other meet after half an hour whereas they meet two and a half hours later if they travel in the same direction. The faster of the two travels at the speed of

(1) 15 km./hr. (2) 18 km./hr.
(3) 10 km./hr. (4) 8 km./hr.

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

47. A man walking at 3 km/hour crosses a square field diagonally in 2 minutes. The area of the field (in square metre) is

(1) 3000 (2) 5000
(3) 6000 (4) 2500

(SSC Multi-Tasking Staff Exam. 30.04.2017)

SHORT ANSWERS

TYPE-I

1. (2)	**2.** (4)	**3.** (4)	**4.** (2)
5. (4)	**6.** (4)	**7.** (1)	**8.** (3)
9. (1)	**10.** (1)	**11.** (4)	**12.** (2)
13. (2)	**14.** (4)	**15.** (1)	**16.** (3)
17. (1)	**18.** (2)	**19.** (2)	**20.** (2)
21. (4)	**22.** (3)	**23.** (2)	**24.** (2)
25. (1)	**26.** (2)	**27.** (2)	**28.** (1)
29. (1)	**30.** (4)	**31.** (2)	**32.** (2)
33. (2)	**34.** (1)	**35.** (4)	**36.** (3)
37. (4)	**38.** (1)	**39.** (1)	**40.** (*)
41. (1)	**42.** (4)	**43.** (3)	**44.** (3)
45. (1)	**46.** (4)	**47.** (3)	**48.** (1)
49. (1)	**50.** (3)	**51.** (4)	**52.** (4)
53. (3)	**54.** (2)	**55.** (4)	

TYPE-II

1. (3)	**2.** (3)	**3.** (3)	**4.** (2)
5. (2)	**6.** (3)	**7.** (3)	**8.** (4)
9. (4)	**10.** (4)	**11.** (3)	**12.** (1)
13. (2)	**14.** (4)	**15.** (3)	**16.** (2)
17. (3)	**18.** (2)	**19.** (1)	**20.** (4)
21. (1)	**22.** (2)	**23.** (1)	**24.** (4)
25. (3)	**26.** (2)	**27.** (3)	

TYPE-III

1. (3)	**2.** (3)	**3.** (2)	**4.** (2)
5. (1)	**6.** (3)	**7.** (1)	**8.** (3)
9. (4)	**10.** (3)	**11.** (4)	**12.** (3)
13. (4)	**14.** (3)	**15.** (2)	**16.** (4)
17. (1)	**18.** (1)	**19.** (1)	**20.** (4)
21. (1)	**22.** (2)	**23.** (4)	**24.** (1)
25. (1)	**26.** (3)	**27.** (4)	**28.** (4)
29. (3)	**30.** (2)	**31.** (2)	

TYPE-IV

1. (3)	**2.** (2)	**3.** (2)	**4.** (3)
5. (2)	**6.** (3)	**7.** (2)	**8.** (2)
9. (1)	**10.** (4)	**11.** (4)	**12.** (2)
13. (3)	**14.** (3)	**15.** (3)	**16.** (1)
17. (1)	**18.** (3)	**19.** (2)	**20.** (2)
21. (3)	**22.** (3)	**23.** (3)	**24.** (3)
25. (1)	**26.** (4)	**27.** (1)	

TYPE-V

1. (3)	**2.** (3)	**3.** (2)	**4.** (3)
5. (2)	**6.** (1)	**7.** (1)	**8.** (2)
9. (2)	**10.** (2)	**11.** (2)	**12.** (1)
13. (3)	**14.** (2)		

TYPE-VI

1. (2)	**2.** (1)	**3.** (2)	**4.** (3)
5. (3)	**6.** (1)	**7.** (2)	**8.** (4)
9. (2)	**10.** (1)	**11.** (1)	**12.** (2)
13. (1)	**14.** (1)	**15.** (1)	**16.** (2)
17. (3)	**18.** (3)	**19.** (1)	**20.** (2)
21. (4)	**22.** (3)	**23.** (3)	**24.** (1)
25. (4)	**26.** (4)	**27.** (2)	**28.** (1)
29. (1)	**30.** (4)	**31.** (3)	**32.** (3)
33. (4)	**34.** (1)	**35.** (2)	**36.** (3)
37. (1)	**38.** (1)	**39.** (4)	

TYPE-VII

1. (3)	**2.** (1)	**3.** (3)	**4.** (2)
5. (2)	**6.** (3)	**7.** (3)	**8.** (2)
9. (3)	**10.** (3)	**11.** (1)	**12.** (3)
13. (2)	**14.** (3)	**15.** (1)	**16.** (1)

TYPE-VIII

1. (1)	**2.** (1)	**3.** (1)	**4.** (4)
5. (2)	**6.** (4)	**7.** (3)	**8.** (1)
9. (2)	**10.** (3)	**11.** (3)	**12.** (2)
13. (3)	**14.** (4)	**15.** (2)	**16.** (1)
17. (4)	**18.** (1)	**19.** (3)	**20.** (2)
21. (1)	**22.** (3)	**23.** (3)	**24.** (2)
25. (1)	**26.** (4)	**27.** (3)	**28.** (4)

TYPE-IX

1. (3)	**2.** (1)	**3.** (3)	**4.** (4)
5. (3)	**6.** (2)	**7.** (4)	**8.** (2)
9. (3)	**10.** (3)	**11.** (2)	**12.** (3)
13. (1)	**14.** (2)	**15.** (2)	**16.** (2)
17. (3)	**18.** (3)		

TYPE-X

1. (4)	**2.** (2)	**3.** (4)	**4.** (1)
5. (4)	**6.** (4)	**7.** (3)	**8.** (4)
9. (3)	**10.** (2)	**11.** (2)	**12.** (2)
13. (3)	**14.** (2)	**15.** (4)	**16.** (2)
17. (2)			

TYPE-XI

1. (2)	**2.** (4)	**3.** (2)	**4.** (3)
5. (1)	**6.** (1)	**7.** (3)	**8.** (2)
9. (2)	**10.** (1)	**11.** (3)	**12.** (2)
13. (1)	**14.** (2)	**15.** (3)	**16.** (2)
17. (1)			

TYPE-XII

1. (2)	**2.** (3)	**3.** (4)	**4.** (1)
5. (4)	**6.** (4)	**7.** (4)	**8.** (2)
9. (1)	**10.** (4)	**11.** (2)	**12.** (2)
13. (1)	**14.** (3)	**15.** (1)	**16.** (3)
17. (1)	**18.** (2)	**19.** (2)	**20.** (3)
21. (2)	**22.** (1)	**23.** (4)	**24.** (2)
25. (2)	**26.** (3)	**27.** (2)	**28.** (1)
29. (2)	**30.** (1)	**31.** (1)	**32.** (1)
33. (3)	**34.** (4)	**35.** (1)	**36.** (3)
37. (2)	**38.** (3)	**39.** (4)	**40.** (2)
41. (2)	**42.** (1)	**43.** (4)	**44.** (2)
45. (2)	**46.** (2)	**47.** (2)	

EXPLANATIONS

TYPE-I

1. (2) Using Rule 1,

Time taken = $\frac{\text{Distance}}{\text{time}}$

$= \frac{\frac{4}{5}}{45}$ hour = $\frac{4 \times 60 \times 60}{5 \times 45}$ sec.

= 64 seconds

2. (4) Using Rule 1,
Let the required speed is x km/hr

Then, $240 \times 5 = \frac{5}{3} \times x$

$\therefore$ x = 720 km/hr.

3. (4) Using Rule 1,
Speed of the man = 5km/hr

$= 5 \times \frac{1000}{60} \text{m/min} = \frac{250}{3} \text{m/min}$

Time taken to cross the bridge
= 15 minutes
Length of the bridge
= speed × time

$= \frac{250}{3} \times 15\text{m} = 1250\text{m}$

4. (2) Using Rule 1,

Speed $= \frac{\text{Distance}}{\text{Time}} = \frac{250}{75}$

$= \frac{10}{3} \text{m/sec} = \frac{10}{3} \times \frac{18}{5} \text{km/hr.}$

$\left[\because 1 \text{ m/s} = \frac{18}{5} \text{km/hr}\right]$

= 2 × 6 km/hr. = 12 km/hr.

5. (4) Using Rule 1,

Speed $= \frac{\text{Distance}}{\text{Time}}$

$= \frac{200}{24} \text{m/s}$

$\frac{200}{24} \text{m/s} = \frac{200}{24} \times \frac{18}{5}$

= 30 km/h

$[\because x \text{ m/s} = \frac{18}{5} x \text{ km/h}]$

6. (4) Using Rule 1,
Speed of car = 10 m/sec.
Required speed in kmph

$= \frac{10 \times 18}{5} = 36$ km/hr

7. (1) Total distance covered
= Speed × Time
= 40 × 9 = 360 km.
The required time at 60 kmph

$= \frac{360}{60} = 6$ hours.

Aliter : Using Rule 9,
Here, $S_1 = 40$, $t_1 = 9$
$S_2 = 60$, $t_2 = ?$
$S_1t_1 = S_2t_2$
$40 \times 9 = 60 \times t_2$

$t_2 = \frac{4 \times 9}{6} = 6$ hours

8. (3) Let the distance be *x* km.
Total time = 5 hours 48 minutes

$= 5 + \frac{48}{60} = \left(5 + \frac{4}{5}\right)$ hours

$= \frac{29}{5}$ hours

$\therefore \frac{x}{25} + \frac{x}{4} = \frac{29}{5}$

$\Rightarrow \frac{4x + 25x}{100} = \frac{29}{5}$

$\Rightarrow 5 \times 29x = 29 \times 100$

$\Rightarrow x = \frac{29 \times 100}{5 \times 29} = 20$ km.

Aliter : Using Rule 5,
Here, x = 25, y = 4

Average speed $= \frac{2xy}{x+y}$

$= \frac{2 \times 25 \times 4}{25 + 4} = \frac{200}{29}$

Total Distance $= \frac{200}{29} \times 5\frac{4}{5}$

$= \frac{200}{29} \times \frac{29}{5} = 40$ km

$\Rightarrow$ Required distance = 20 km

9. (1) Let the required distance be *x* km.
Then,

$\frac{x}{3} + \frac{x}{2} = 5$

$\Rightarrow \frac{2x + 3x}{6} = 5$

$\Rightarrow 5x = 6 \times 5$

$\therefore x = \frac{6 \times 5}{5} = 6$ km

Aliter : Using Rule 5,
Here, x = 3, y = 2

Average Speed $= \frac{2 \times x \times y}{x + y}$

$= \frac{2 \times 3 \times 2}{3 + 2}$

$= \frac{12}{5}$ km/hr

Total distance $= \frac{12}{5} \times 5 = 12$km

$\therefore$ Required distance

$= \frac{12}{2} = 6$ km

10. (1) Using Rule 1,
The boy covers 20 km in 2.5 hours.

$\Rightarrow$ Speed $= \frac{20}{2.5} = 8$ km/hr.

New speed = 16 km/hr

$\therefore$ Time $= \frac{32}{16} = 2$ hours.

11. (4) Using Rule 1,
Speed = 180 kmph

$= \frac{180 \times 5}{18}$ m/sec = 50 m/sec

$\left[\because 1 \text{ km/hr} = \frac{5}{18} \text{m/s}\right]$

12. (2) Using Rule 1,

Speed $= \frac{150}{25} = 6$ m/sec

$= 6 \times \frac{18}{5} = \frac{108}{5} = 21.6$ kmph

13. (2) Let the distance between A and B be *x* km, then

$\frac{x}{9} - \frac{x}{10} = \frac{36}{60} = \frac{3}{5}$

$\Rightarrow \frac{x}{90} = \frac{3}{5}$

$\Rightarrow x = \frac{3}{5} \times 90 = 54$ km.

Aliter :
Using Rule 9,
Here, $S_1 = 9$, $t_1 = x$

$S_2 = 10$, $t_2 = x - \frac{36}{60}$

$S_1t_1 = S_2t_2$

$9 \times x = 10\left(x - \frac{36}{60}\right)$

9x = 10x − 6x = 6
Distance travelled
= 9 × 6 = 54 km

14. (4) Difference of time
= 4.30 p.m – 11.a.m.

$= 5\frac{1}{2}$ hours $= \frac{11}{2}$ hours

Distance covered in $\frac{11}{2}$ hrs

$= \frac{5}{6} - \frac{3}{8} = \frac{20-9}{24} = \frac{11}{24}$ part

$\because \frac{11}{24}$ part of the journey is covered in $\frac{11}{2}$ hours

$\Rightarrow \frac{3}{8}$ part of the journey is covered in

$= \frac{11}{2} \times \frac{24}{11} \times \frac{3}{8} = \frac{9}{2}$ hours

$= 4\frac{1}{2}$ hours.

Clearly the person started at 6.30 a.m.

15. (1) Using Rule 1,
Speed of bus = 72 kmph

$= \left(\frac{72 \times 5}{18}\right)$ metre/second

= 20 metre/second
∴ Required distance
= 20 × 5 = 100 metre

16. (3) If the required distance be x km, then

$\frac{x}{3} - \frac{x}{4} = \frac{1}{2}$

$\Rightarrow \frac{4x - 3x}{12} = \frac{1}{2}$

$\Rightarrow \frac{x}{12} = \frac{1}{2} \Rightarrow x = 6$ km

Aliter : Using Rule 9,
Here $S_1 = 4$, $t_1 = x$

$S_2 = 3$, $t_2 = x + \frac{1}{2}$

$S_1t_1 = S_2t_2$

$4 \times x = 3\left(x + \frac{1}{2}\right)$

$4x - 3x = \frac{3}{2}$ $x = \frac{3}{2}$

Distance= $4 \times \frac{3}{2} = 6$ kms

17. (1) Using Rule 1,

Time = $10\frac{1}{2}$ hours

$= \frac{21}{2}$ hours

Speed = 40 kmph
Distance = Speed × Time

$= 40 \times \frac{21}{2} = 420$ km

18. (2) Using Rule 1,
Distance covered on foot

$= 4 \times 3\frac{3}{4}$ km. = 15 km.

∴ Time taken on cycle

$= \frac{\text{Distance}}{\text{Speed}} = \frac{15}{16.5}$ hour

$= \frac{15 \times 60}{16.5}$ minutes

= 54.55 minutes

19. (2) Using Rule 1,

Speed of train = $\frac{\text{Distance}}{\text{Time}}$

$= \frac{10}{\frac{12}{60}}$ kmph

$= \frac{10 \times 60}{12} = 50$ kmph

New speed = 45 kmph

∴ Required time = $\frac{10}{45}$ hour

$= \frac{2}{9} \times 60$ minutes

$= \frac{40}{3}$ minutes

= 13 minutes 20 seconds

20. (2) Using Rule 1,

Man's speed = $\frac{\text{Distance}}{\text{Time}}$

$= \frac{a}{b}$ kmph

$= \frac{1000a}{b}$ m/hour

∴ Time taken in walking 200 metre

$= \frac{200}{\frac{1000a}{b}} = \frac{b}{5a}$ hours

21. (4) $\because$ 1 m/sec = $\frac{18}{5}$ kmph

$\therefore \frac{10}{3}$ m/sec

$= \frac{18}{5} \times \frac{10}{3} = 12$ kmph

22. (3) Using Rule 1,
Remaining time

$= \frac{2}{5} \times 15 = 6$ hours

∴ Required speed

$= \frac{60}{6} = 10$ kmph

23. (2) Speed of train = 60 kmph
Time = 210 minutes

$= \frac{210}{60}$ hours

or $\frac{7}{2}$ hours

Distance covered

$= 60 \times \frac{7}{2} = 210$ km

Time taken at 80 kmph

$= \frac{210}{80} = \frac{21}{8}$ hours

$= 2\frac{5}{8}$ hours

Aliter : Using Rule 9,

Here, $S_1 = 60$, $t_1 = \frac{210}{60}$ hrs

$S_2 = 80$, $t_2 = ?$
$S_1t_1 = S_2t_2$

$60 \times \frac{210}{60} = 80 \times t_2$

$t_2 = \frac{21}{8}$ hrs

$t_2 = 2\frac{5}{8}$ hrs

24. (2) 90 km = 12 × 7km + 6 km. To cover 7 km total time taken = $\frac{7}{18}$ hours + 6 min. = $\frac{88}{3}$ min. So, (12 × 7 km) would be covered in $\left(12 \times \frac{88}{3}\right)$ min. and remaining 6

km is $\frac{6}{18}$ hrs or 20 min.

$\therefore$ Total time $= \frac{1056}{3} + 20$

$= \frac{1116}{3 \times 60}$ hours $= 6\frac{1}{5}$ hours

= 6 hours 12 minutes.

25. (1) 30.6 kmph

$= \left(30.6 \times \frac{5}{18}\right)$ m/sec.

= 8.5 m/sec

26. (2) Let the total journey be of x km, then

$\frac{2x}{15} + \frac{9x}{20} + 10 = x$

$\Rightarrow x - \frac{2x}{15} - \frac{9x}{20} = 10$

$\Rightarrow \frac{60x - 8x - 27x}{60} = 10$

$\Rightarrow \frac{25x}{60} = 10$

$\Rightarrow x = \frac{60 \times 10}{25} = 24$ km

27. (2) If the required distance be = x km, then

$\frac{x}{4} - \frac{x}{5} = \frac{10+5}{60}$

$\Rightarrow \frac{5x - 4x}{20} = \frac{1}{4}$

$\Rightarrow \frac{x}{20} = \frac{1}{4}$

$\Rightarrow x = \frac{1}{4} \times 20 = 5$ km.

Aliter : Using Rule 10,

Here, $S_1 = 4$, $t_1 = 5$

$S_2 = 5$, $t_2 = 10$

Distance $= \frac{(S_1 \times S_2)(t_1 + t_2)}{S_2 - S_1}$

$= \frac{(4 \times 5)(5+10)}{5-4}$

$= 20 \times \frac{15}{60} = 5$ kms

28. (1) Using Rule 12,

Relative speed

$= \left(\frac{5}{2} + 2\right)$kmph $= \frac{9}{2}$ kmph

Time $= \frac{\text{Distance}}{\text{Relative speed}} = \frac{18}{\frac{9}{2}}$

$= \frac{18 \times 2}{9} = 4$ hours

29. (1) Journey on foot = x km

Journey on cycle = $(80 - x)$ km

$\therefore \frac{x}{8} + \frac{80 - x}{16} = 7$

$\Rightarrow \frac{2x + 80 - x}{16} = 7$

$\Rightarrow x + 80 = 16 \times 7 = 112$

$\Rightarrow x = 112 - 80 = 32$ km.

Aliter : Using Rule 13,

Here, x = 80, t = 7

u = 8, v = 16

Time $= \left(\frac{vt - x}{v - u}\right)$

$= \left(\frac{16 \times 7 - 80}{16 - 8}\right)$

$= \left(\frac{112 - 80}{8}\right)$

$= \frac{32}{8} = 4$ hrs

Distance travelled

$= 4 \times 8 = 32$ kms

30. (4) Distance covered by car in 2 hours

$= \frac{300 \times 40}{100} = 120$ km

Remaining distance

= 300 – 120 = 180 km

Remaining time = 4 – 2

= 2 hours

$\therefore$ Required speed $= \frac{180}{2}$

= 90 kmph

Original speed of car $= \frac{120}{2}$

= 60 kmph

$\therefore$ Required increase in speed

= 90 – 60 = 30 kmph

31. (2) Time taken in covering 5 Km

$= \frac{5}{10} = \frac{1}{2}$ hour

= 30 minutes

That person will take rest for four times.

$\therefore$ Required time

= (30 + 4 × 5) minutes

= 50 minutes

32. (2) Time = 12 minutes

$= \frac{12}{60}$ hour $= \frac{1}{5}$ hour

Speed of train $= \frac{10}{\frac{1}{5}}$

= 50 kmph

New speed = 50 – 5 = 45 kmph

$\therefore$ Required time $= \frac{\text{Distance}}{\text{Speed}}$

$= \frac{10}{45} = \frac{2}{9}$ hour

$= \left(\frac{2}{9} \times 60\right)$ minutes

$= \frac{40}{3}$ minutes

Aliter : Using Rule 9,

Here, $S_1 = \frac{10}{12}$km / min

$= \frac{10}{12} \times 60$km / hr

= 50 km/hr, $t_1 = \frac{12}{60} = \frac{1}{5}$hr

S_2 = 45 km/hr, t_2 = ?

$S_1t_1 = S_2t_2$

$50 \times \frac{1}{5} = 45 \times t_2$

$t_2 = \frac{10}{45} \times 60$ min

$= \frac{40}{3}$ min

33. (2) Using Rule 12,

Distance covered by motor cyclist P in 30 minutes

$= 30 \times \frac{1}{2} = 15$ km

Relative speed

= 40 – 30 = 10 kmph

$\therefore$ Required speed = Time taken to cover is km at 10 kmph

$= \frac{15}{10} = \frac{3}{2}$ hours

34. (1) Speed of B = x kmph (let)

Speed of A = $2x$ kmph

Speed of C = $\frac{x}{3}$ kmph

$\therefore \frac{\text{Speed of A}}{\text{Speed of C}} = \frac{2x}{\frac{x}{3}} = 6$

$\therefore$ Required time = $\frac{1}{6}$ of $\frac{3}{2}$ hours

$= \frac{1}{4}$ hour = 15 minutes

35. (4) Using Rule 12,

Distance covered by truck in $\frac{3}{2}$ hours

= Speed × Time

$= 90 \times \frac{3}{2} = 135$ km

Remaining distance

= 310 – 135 = 175 km

$\therefore$ Time taken at 70 kmph

$= \frac{175}{70} = 2.5$ hours

$\therefore$ Total time = 1.5 + 2.5

= 4 hours

36. (3) Distance = Speed × Time

= 60 km.

Time taken at 40 kmph

$= \frac{60}{40} = \frac{3}{2}$ hours

Aliter : Using Rule 9,

Here, $S_1 = 60$, $t_1 = 1$

$S_2 = 40$, $t_2 = ?$

$S_1t_1 = S_2t_2$

$60 \times 1 = 40 \times t_2$

$t_2 = \frac{3}{2}$ hours.

37. (4) Distance of school = x km

Difference of time

= 16 minutes $= \frac{16}{60}$ hour

$\therefore \frac{x}{\frac{5}{2}} - \frac{x}{3} = \frac{16}{60}$

$\Rightarrow \frac{2x}{5} - \frac{x}{3} = \frac{4}{15}$

$\Rightarrow \frac{6x - 5x}{15} = \frac{4}{15}$

$\Rightarrow \frac{x}{15} = \frac{4}{15}$

$\Rightarrow x = \frac{4}{15} \times 15 = 4$ km

Aliter : Using Rule 10,

Here, $S_1 = \frac{5}{2}$, $t_1 = 6$

$S_2 = 3$, $t_2 = 10$

Distance $= \frac{(S_1 \times S_2)(t_1 + t_2)}{S_2 - S_1}$

$= \frac{\frac{5}{2} \times 3(6+10)}{3 - \frac{5}{2}}$

$= 15 \times \frac{16}{60}$ km = 4 km.

38. (1) Using Rule 5,

Average speed of journey

$= \left(\frac{2xy}{x+y}\right)$ kmph

$= \frac{2 \times 40 \times 50}{40 + 50} = \frac{2 \times 40 \times 50}{90}$

$= \frac{400}{9} = 44\frac{4}{9}$ kmph

39. (1) 60 kmph $= \left(\frac{60 \times 5}{18}\right)$ m/sec

$= \frac{50}{3}$ m/sec.

$\therefore$ Speed $\propto \frac{1}{\text{Time}}$

$\Rightarrow S_1 \times T_1 = S_2 \times T_2$

$\Rightarrow \frac{50}{3} \times \frac{9}{2} = 15 \times T_2$

$\Rightarrow 75 = 15 \times T_2$

$\Rightarrow T_2 = \frac{75}{15} = 5$ hours

Aliter : Using Rule 9,

Here, $S_1 = 60$, $t_1 = 4\frac{1}{2} = \frac{9}{2}$

$S_2 = 15 \times \frac{18}{5} = 54$

$S_1t_1 = S_2t_2$

$60 \times \frac{9}{2} = 54 \times t_2$

$t_2 = \frac{270}{54} = 5$ hours

40. (*) Speed of Romita = x kmph (let)

Distance = Speed × Time

According to the question,

$4 \times 6 + x \times 6 = 42$

$\Rightarrow 6x = 42 - 24 = 18$

$\Rightarrow x = 18 \div 6 = 3$ kmph

Aliter : Using Rule 11,

Distance from R to S

$= S_1t_1 + S_2t_2$

$42 = 4 \times 6 + x \times 6$

$6x = 18$ $x = 3$ km/hr.

41. (1) Distance travelled by farmer on foot = x km (let)

$\therefore$ Distance covered by cycling = $(61 - x)$ km.

Time $= \frac{\text{Distance}}{\text{Speed}}$

According to the question,

$\frac{x}{4} + \frac{61 - x}{9} = 9$

$\Rightarrow \frac{9x + 61 \times 4 - 4x}{9 \times 4} = 9$

$\Rightarrow 5x + 244 = 9 \times 9 \times 4 = 324$

$\Rightarrow 5x = 324 - 244 = 80$

$\Rightarrow x = \frac{80}{5} = 16$ km.

Aliter : Using Rule 13,

Here, t = 9, x = 61

u = 4, v = 9

Time taken $= \left(\frac{vt - x}{v - u}\right)$

$= \frac{9 \times 9 - 61}{9 - 4}$

$= \frac{20}{5} = 4$ hrs.

Distance travelled

$= 4 \times 4 = 16$ km

42. (4) Distance = Speed × TIme

$= \left(40 \times 6\frac{1}{4}\right)$ km

$= \left(\frac{40 \times 25}{4}\right)$ km = 250 km

New speed = 50 kmph

$\therefore$ Required time

$= \frac{\text{Distance}}{\text{Speed}} = \frac{250}{50} = 5$ hours

Aliter : Using Rule 9,

Here, $S_1 = 40$, $t_1 = 6\frac{15}{60} = \frac{25}{4}$

$S_2 = 50$, $t_2 = ?$

$S_1t_1 = S_2t_2$

$40 \times \frac{25}{4} = 50 \times t_2$

$t_2 = 5$ hrs.

43. (3) Distance between school and house = x km (let)

$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$

According to the question,

$$\frac{x}{\frac{5}{2}} - \frac{x}{\frac{7}{2}} = \frac{6+6}{60} = \frac{1}{5}$$

(Difference of time = 6 + 6 =12 minutes)

$$\Rightarrow \frac{2x}{5} - \frac{2x}{7} = \frac{1}{5}$$

$$\Rightarrow \frac{14x - 10x}{35} = \frac{1}{5} \Rightarrow \frac{4x}{35} = \frac{1}{5}$$

$$\Rightarrow 4x = \frac{35}{5} = 7$$

$$\Rightarrow x = \frac{7}{4} = 1\frac{3}{4} \text{ km.}$$

Aliter : Using Rule 10,

Here, $S_1 = 2\frac{1}{2}$, $t_1 = 6$

$S_2 = 3\frac{1}{2}$, $t_2 = 6$

$$\text{Distance} = \frac{(S_1 \times S_2)(t_1 + t_2)}{S_2 - S_1}$$

$$= \frac{\left(\frac{5}{2} \times \frac{7}{2}\right)(6+6)}{\frac{7}{2} - \frac{5}{2}}$$

$$= \frac{35}{4} \times \frac{12}{60}$$

$$= \frac{7}{4} \text{ km} = 1\frac{3}{4} \text{ km}$$

44. (3) Using Rule 1,

Let the total distance be $4x$ km.

$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$

According to the question,

$$\frac{x}{10} + \frac{3x}{12} = 7$$

$$\Rightarrow \frac{x}{10} + \frac{x}{4} = 7$$

$$\Rightarrow \frac{2x + 5x}{20} = 7$$

$$\Rightarrow 7x = 7 \times 20$$

$$\therefore x = \frac{7 \times 20}{7} = 20 \text{ km.}$$

$\therefore$ PQ = $4x = 4 \times 20 = 80$ km.

45. (1) Let the distance of school be x km.

Difference of time = 6 + 10

$= 16$ minutes $= \frac{16}{60}$ hour

$= \frac{4}{15}$ hour

$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$

$$\therefore \frac{x}{\frac{5}{2}} - \frac{x}{3} = \frac{4}{15}$$

$$\Rightarrow \frac{2x}{5} - \frac{x}{3} = \frac{4}{15}$$

$$\Rightarrow \frac{6x - 5x}{15} = \frac{4}{15}$$

$\Rightarrow x = 4$ km.

Aliter : Using Rule 10,

Here, $S_1 = 2\frac{1}{2}$, $t_1 = 6$

$S_2 = 3$, $t_2 = 10$

$$\text{Distance} = \frac{(S_1 \times S_2)(t_1 + t_2)}{S_2 - S_1}$$

$$= \frac{\frac{5}{2} \times 3(6 + 10)}{3 - \frac{5}{2}}$$

$$= 15 \times \frac{16}{60}$$

$$= \frac{16}{4} = 4 \text{ km}$$

46. (4) Using Rule 1,

Let the distance covered be $2x$ km.

$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$

According to the question,

$$\frac{x}{60} + \frac{x}{45} = 5\frac{15}{60} = 5\frac{1}{4}$$

$$\Rightarrow \frac{3x + 4x}{180} = \frac{21}{4}$$

$$\Rightarrow 7x = \frac{21}{4} \times 180$$

$$\Rightarrow x = \frac{21 \times 180}{4 \times 7} = 135 \text{ km.}$$

$\therefore$ Length of total journey

$= 2 \times 135 = 270$ km.

47. (3) Distance covered by car

$= 42 \times 10 = 420$ km.

New time = 7 hours

$\therefore$ Required speed $= \frac{420}{7}$

= 60 kmph.

$\therefore$ Required increase

= (60 – 42) kmph

= 18 kmph

48. (1) Distance of the office

= x km.

Difference of time = 2 hours

$$\therefore \frac{x}{8} - \frac{x}{12} = 2$$

$$\Rightarrow \frac{3x - 2x}{24} = 2$$

$$\Rightarrow \frac{x}{24} = 2 \Rightarrow x = 48 \text{ km.}$$

$\therefore$ Time taken at the speed of 8 kmph $= \frac{48}{8} = 6$ hours

$\therefore$ Required time to reach the office at 10 a.m. i.e., in 5 hours

$= \left(\frac{48}{5}\right)$ kmph

= 9.6 kmph

49. (1) Speed of bus = 36 kmph.

$= \left(36 \times \frac{5}{18}\right)$ m/sec.

= 10 m/sec.

$\therefore$ Distance covered in 1 second

= 10 metre

50. (3) Time taken by bus moving at 60 kmph = t hours

Distance = Speed × Time

$$\therefore 60 \times t = 45 \times \left(t + \frac{11}{2}\right)$$

$$\Rightarrow 60t - 45t = \frac{45 \times 11}{2}$$

$\Rightarrow 15t = \frac{45 \times 11}{2}$

$\Rightarrow t = \frac{45 \times 11}{15 \times 2} = \frac{33}{2}$ hours

$\therefore$ Required distance

$= \frac{60 \times 33}{2} = 990$ km.

51. (4) Speed of train = 116 kmph

$= \left(116 \times \frac{5}{18}\right)$ m./sec.

$= \left(\frac{580}{18}\right)$ m./sec.

$\therefore$ Required distance

= Speed × Time

$= \left(\frac{580}{18} \times 18\right)$ metre

= 580 metre

52. (4) Part of journey covered by bus and rickshaw

$= \frac{3}{4} + \frac{1}{6} = \frac{9+2}{12} = \frac{11}{12}$

Distance covered on foot

$= 1 - \frac{11}{12} = \frac{1}{12}$ part

$\therefore$ Total journey

= 12 × 2 = 24 km.

53. (3) Distance covered by train in 15 hours = Speed × Time

= (60 × 15) km. = 900 km.

Required speed to cover 900 km.

in 12 hours $= \frac{900}{12}$

= 75 kmph

54. (2) Distance = Speed × Time

= 330 × 10 = 3300 metre

$= \left(\frac{3300}{1000}\right)$ km. = 3.3 km.

55. (4) Let the required distance be x km.

Time = 2 hours 20 minutes

$= 2\frac{1}{3}$ hours

According to the question,

$\frac{x}{12} + \frac{x}{9} = \frac{7}{3}$

$\Rightarrow \frac{3x + 4x}{36} = \frac{7}{3}$

$\Rightarrow \frac{7x}{36} = \frac{7}{3}$

$\Rightarrow x = \frac{7}{3} \times \frac{36}{7} = 12$ km.

TYPE-II

1. (3) Using Rule 1,

Let the length of train be x metre

Speed = 90 km/hr

$= \frac{90 \times 5}{18}$ metre / sec.

= 25 metre/sec.

$\therefore$ Distance covered in 60 sec.

= 25 × 60 = 1500 metres

Now, according to question,

2x = 1500

$\therefore$ x = 750 metre

2. (3) Using Rule 1,

When a train crosses a bridge it covers the distance equal to length of Bridge & its own length

Let the length of the train be = x

$\therefore$ Speed of the train

$= \frac{x + 800}{100}$ m/s

Since train passes the 800 m bridge in 100 seconds.

Again, train passes the 400 m bridge in 60 seconds.

$\therefore \frac{400 + x}{\frac{x + 800}{100}} = 60$

$\Rightarrow \frac{(400 + x) \times 100}{x + 800} = 60$

$\Rightarrow$ 40000 + 100x

= 60x + 48000

$\Rightarrow$ 100x – 60x = 48000 – 40000

$\Rightarrow$ 40x = 8000

$\therefore x = \frac{8000}{40} = 200$m

3. (3) In crossing the bridge, the train travels its own length plus the length of the bridge.

Total distance (length)

= 300 + 200 = 500 m.

Speed = 25m/sec.

$\therefore$ The required time

= 500 ÷ 25 = 20 seconds

Aliter : Using Rule 10,

Here, x = 300m, y= 200 m, t = ?

u= 25 m/sec

$t = \frac{x + y}{u}$

$= \frac{300 + 200}{25}$

$= \frac{500}{25}$ t = 20 seconds

4. (2) When a train crosses a tunnel, it covers a distance equal to the sum of its own length and tunnel.

Let the length of tunnel be x

Speed = 78 kmph

$= \frac{78 \times 1000}{60 \times 60}$ m/sec. $= \frac{65}{3}$ m/sec.

$\therefore$ Speed $= \frac{\text{Distance}}{\text{Time}}$

$\Rightarrow \frac{65}{3} = \frac{800 + x}{60}$

$\Rightarrow$ (800 + x) × 3 = 65× 60

$\Rightarrow$ 800 + x = 65 × 20 m

$\Rightarrow$ x = 1300 – 800 = 500

$\therefore$ Length of tunnel = 500 metres.

Aliter : Using Rule 10,

Here, x = 800 m,

u = 78 km/hr

$= 78\frac{5}{18} = \frac{65}{3}$ m/sec

t = 1 min = 60 sec, y = ?

using $t = \frac{x + y}{u}$

$60 = \frac{800 + y}{\frac{65}{3}}$

$60 \times \frac{65}{3} = 800 + y$

1300 – 800 = y

y = 500 metres

5. (2) When a train crosses a railway platform, it travels a distance equal to sum of length of platform and its own length.

Speed = 132 kmph

$= 132 \times \frac{5}{18} = \frac{110}{3}$ m/sec.

$\therefore$ Required time

$= \frac{110 + 165}{\frac{110}{3}}$ seconds

$= \frac{275 \times 3}{110} = 7.5$ seconds

Aliter : Using Rule 10,

Here, x = 110m,

u = 132 km/hr.

$= 132 \times \frac{5}{18} = \frac{110}{3}$ m/sec

y = 165m, t = ?

using $t = \frac{x + y}{u}$

$t = \frac{110 + 165}{\frac{110}{3}}$

$$t = \frac{275 \times 3}{110}$$

$$= \frac{25 \times 3}{10} = \frac{15}{2} = 7.5 \text{ sec}$$

6. (3) Using Rule 10,
Let the length of the train be x metres.
When a train corsses a platform it covers a distance equal to the sum of lengths of train and platform. Also, the speed of train is same.

$$\therefore \frac{x+162}{18} = \frac{x+120}{15}$$

$\Rightarrow 6x + 720 = 5x + 810$
$\Rightarrow 6x - 5x = 810 - 720$
$\Rightarrow x = 90$
$\therefore$ The length of the train = 90m.

7. (3) Using Rule 10,
When a train croses a bridge, distance covered = length of (bridge + train).
$\therefore$ Speed of train

$$= \frac{150+500}{30}$$

$$= \frac{650}{30} = \frac{65}{3} \text{ m/sec.}$$

$\therefore$ Time taken to cross the 370m long platform

$$= \frac{370+150}{\frac{65}{3}}$$

$$= \frac{520 \times 3}{65} = 24 \text{ seconds}$$

8. (4) Using Rule 10,
Speed of train = 90 kmph

$$= 90 \times \frac{5}{18} = 25 \text{ m/sec}$$

Distance covered
= 230 + 120 = 350 m

$$\therefore \text{Time taken} = \frac{350}{25}$$

= 14 seconds

9. (4) Using Rule 10,
Let the length of train be x
According to the question,

$$\frac{x+600}{30} = 30$$

$\Rightarrow x + 600 = 900$
$\Rightarrow x = 900 - 600 = 300$ m

10. (4) Using Rule 10,
Let the length of the train be x
According to the question,

$$\frac{x+122}{17} = \frac{x+210}{25}$$

$\Rightarrow 25x + 3050 = 17x + 3570$
$\Rightarrow 25x - 17x = 3570 - 3050$
$\Rightarrow 8x = 520$

$$\Rightarrow x = \frac{520}{8} = 65 \text{ metres}$$

$\therefore$ Speed of the train

$$= \frac{65+122}{17}$$

$$= \frac{187}{17} \text{ metre/second}$$

= 11 metre/second

$$= \frac{11 \times 18}{5} \text{ kmph}$$

= 39.6 kmph

11. (3) Using Rule 10,
Let the Length of the train be x

$$\text{Then, } \frac{x+162}{18} = \frac{x+120}{15}$$

(Speed of the train)

$$\Rightarrow \frac{x+162}{6} = \frac{x+120}{5}$$

$\Rightarrow 6x + 720 = 5x + 810$
$\Rightarrow x = 810 - 720 = 90$
$\therefore$ Speed of the train

$$= \frac{90+162}{18} \text{ m/sec.}$$

$$= \frac{252}{18} \times \frac{18}{5} \text{ kmph}$$

= 50.4 kmph

12. (1) Using Rule 10,
Let the length of the train be x
$\therefore$ Speed of train

$$\frac{x+300}{21} = \frac{x+240}{18}$$

$$\Rightarrow \frac{x+300}{7} = \frac{x+240}{6}$$

$\Rightarrow 7x + 1680 = 6x + 1800$
$\Rightarrow x = 120$
$\therefore$ Speed of train

$$= \frac{x+300}{21} = \frac{420}{21} = 20 \text{ m/sec}$$

$$= \left(\frac{20 \times 18}{5}\right) \text{kmph} = 72 \text{ kmph}$$

13. (2) Speed of train

$$= \frac{\text{Sum of length of both trains}}{\text{Time taken}}$$

$$\Rightarrow \frac{60 \times 5}{18} = \frac{110+170}{t} = \frac{280}{t}$$

$$\Rightarrow t = \frac{280 \times 18}{60 \times 5} = 16.8 \text{ seconds.}$$

14. (4) Speed of train

$$= \frac{\text{Length of (train + platform)}}{\text{Time taken to cross}}$$

$$= \left(\frac{500+700}{10}\right) \text{ feet/second}$$

= 120 feet/second
Aliter : Using Rule 10,
Here, x = 500 feet, y = 700 feet
t = 10 seconds, u = ?

$$\text{using } t = \frac{x+y}{u}$$

$$u = \frac{500+700}{10}$$

= 120ft/second

15. (3) Speed of train = 36kmph

$$= 36 \times \frac{5}{18} = 10 \text{ m/sec.}$$

If the length of bridge be x metre, then

$$10 = \frac{200+x}{55}$$

$\Rightarrow 200 + x = 550$
$\Rightarrow x = 550 - 200 = 350$ metre.
Aliter : Using Rule 10,
Here, x = 200 m

$$u = 36 \text{ km/hr}, \frac{36 \times 5}{18} \text{ m/second}$$

= 10 m/sec
y = ?, t = 55 sec

$$\text{using } t = \frac{x+y}{u}$$

$$55 = \frac{200+y}{10}$$

y = 550 – 200
y = 350 m

16. (2) Using Rule 10,

$$36 \text{ kmph} = \left(36 \times \frac{5}{18}\right) \text{m/sec.}$$

= 10 m/sec.

$$\text{Required time} = \frac{270+180}{10}$$

= 45 seconds

17. (3) Using Rule 10,
Speed of train

$$= \frac{\text{Length of (train + platform)}}{\text{Time taken in crossing}}$$

$$= \frac{(50+100)}{10}$$

$$= \frac{150}{10} = 15 \text{ m/sec}$$

18. (2) Using Rule 10,
Speed of train

$$= \frac{\text{Length of platform and train}}{\text{Time taken in crossing}}$$

$$= \left(\frac{100+50}{10}\right) \text{ metre/second}$$

= 15 metre/second

$$= \left(15 \times \frac{18}{5}\right) \text{kmph}$$

= 54 kmph

19. (1) Using Rule 10,
Speed of train = 36 kmph

$$= \left(\frac{36 \times 5}{18}\right) \text{ m/sec.}$$

= 10 m/sec
Required time

$$= \frac{\text{Length of train and bridge}}{\text{Speed of train}}$$

$$= \frac{120+360}{10} = \frac{480}{10}$$

= 48 seconds

20. (4) Using Rule 10,
Time = 5 minutes

$$= \frac{1}{12} \text{ hour}$$

∴ Length of bridge = Speed × Time

$$= 15 \times \frac{1}{12} = \frac{5}{4} \text{ km.}$$

$$= \left(\frac{5}{4} \times 1000\right) \text{ metre}$$

= 1250 metre

21. (1) Using Rule 10,
Speed of train = 72 kmph

$$= \left(\frac{72 \times 5}{18}\right) \text{m/sec.}$$

= 20 m/sec.
Required time

$$= \frac{\text{Length of train and bridge}}{\text{Speed of train}}$$

$$= \frac{(200+800)}{20}$$

$$= \frac{1000}{20} = 50 \text{ seconds}$$

22. (2) Using Rule 10,
Length of train = x metre (let)
Speed of train

$$= \frac{\text{(Length of train and bridge)}}{\text{Time taken in crossing}}$$

$$\Rightarrow \frac{x+500}{100} = \frac{x+250}{60}$$

$$\Rightarrow \frac{x+500}{5} = \frac{x+250}{3}$$

$\Rightarrow 5x + 1250 = 3x + 1500$
$\Rightarrow 5x - 3x = 1500 - 1250$
$\Rightarrow 2x = 250$

$$\Rightarrow x = \frac{250}{2} = 125 \text{ metre}$$

23. (1) Speed of train

$$= \frac{\text{length of platform and train}}{\text{Time taken in crossing}}$$

$$= \left(\frac{450+150}{20}\right) \text{ m/sec.}$$

$$= \left(\frac{600}{20}\right) \text{ m/sec.}$$

$$= \left(30 \times \frac{18}{5}\right) \text{ kmph}$$

= 108 kmph.

24. (4) Let the length of train be x metre.

When a train crosses a platform, distance covered by it = length of train and platform.

∴ Speed of train

$$= \frac{x+50}{14} = \frac{x}{10}$$

$$\Rightarrow \frac{x+50}{7} = \frac{x}{5}$$

$\Rightarrow 7x = 5x + 250$
$\Rightarrow 7x - 5x = 250$

$$\Rightarrow 2x = 250 \Rightarrow x = \frac{250}{2}$$

= 125 metre

$$\therefore \text{Speed of train} = \frac{x}{10}$$

$$= \left(\frac{125}{10}\right) \text{ m./sec.}$$

$$= \left(\frac{125}{10} \times \frac{18}{5}\right) \text{ kmph}$$

= 45 kmph.

25. (3) Let, length of train = length of platform = x metre
Speed of train = 90 kmph

$$= \left(\frac{90 \times 5}{18}\right) \text{ m/sec.}$$

= 25 m/sec.
∴ Speed of train

$$= \frac{\text{Length of train and platform}}{\text{Time taken in crossing}}$$

$$\Rightarrow 25 = \frac{2x}{60} \Rightarrow 2x = 25 \times 60$$

$$\Rightarrow x = \frac{25 \times 60}{2} = 750 \text{ metre}$$

26. (2) Speed of train

$$= \frac{\text{Length of train and platform}}{\text{Time taken in crossing}}$$

$$= \left(\frac{221+500}{35}\right) \text{ metre/second}$$

$$= \left(\frac{721}{35}\right) \text{ metre/second}$$

$$= \left(\frac{721 \times 18}{35 \times 5}\right) \text{ kmph}$$

= 74.16 kmph

27. (3) Speed of train
= 54 kmph

$$= \left(\frac{54 \times 5}{18}\right) \text{ m/sec.}$$

= 15 m/sec.
∴ Required time

$$= \frac{\text{Length of train and bridge}}{\text{Speed of train}}$$

$$= \left(\frac{200+175}{15}\right) \text{seconds}$$

$$= \left(\frac{375}{15}\right) \text{ seconds}$$

= 25 seconds

TYPE-III

1. (3) Using Rule 5,
Relative speed of man and train
= 20 – 10 = 10m/sec.

$\therefore$ Required time $= \frac{180}{10}$

= 18 seconds

2. (3) Using Rule 1,
In this situation, the train covers it length.
Required time

$= \frac{100}{30 \times 1000}$hr.

$= \frac{100 \times 60 \times 60}{30 \times 1000}$ = 12 seconds

3. (2) Using Rule 5,
Relative speed of train
= 63–3 = 60 kmph

$= 60 \times \frac{5}{18} m/\text{sec}$

$\therefore$ Time = $\frac{\text{Length of train}}{\text{Relative Speed}}$

$= \frac{500 \times 18}{60 \times 5}$ = 30 sec.

4. (2) Using Rule 1,

Speed $= \frac{\text{Distance}}{\text{Time}}$

$= \frac{125}{30} = 4.16$m/s

4.16 m/s $= 4.16 \times \frac{18}{5}$

= 15 km/hr

5. (1) Using Rule 1,
In crossing a man standing on platform, train crosses its own length.
$\therefore$ Speed of train

$= \frac{120}{10} = 12$ m/s

6. (3) Using Rule 1,
Speed of train (in m/s)

$= 20 \times \frac{5}{18} = \frac{50}{9}$ m/sec

Required time = $\frac{75}{50} \times 9$

= 13.5 seconds

7. (1) Using Rule 1,
Speed of the train

= 144 kmph $= 144 \times \frac{5}{18}$

= 40 m/s
When a train crosses a pole, it covers a distance equal to its own length.

The required time $= \frac{100}{40}$

$= \frac{5}{2} = 2.5$ seconds.

8. (3) Using Rule 1,
Speed of train

$= \frac{120}{9} \times \frac{18}{5}$ = 48 kmph

9. (4) Using Rule 1,
Speed of train = 60 kmph

$= 60 \times \frac{5}{18} = \frac{50}{3}$ m/sec

$\therefore$ Length of train
= Speed × Time

$= \frac{50}{3} \times 30$ = 500 m

10. (3) Let the speed of train be x kmph and its length be y km.
When the train crosses a man, it covers its own length
According to he question,

$\frac{y}{(x-3) \times \frac{5}{18}} = 10$

$\Rightarrow 18y = 10 \times 5(x-3)$
$\Rightarrow 18y = 50x - 150$ ..... (i)

and, $\frac{y}{(x-5) \times \frac{5}{18}} = 11$

$\Rightarrow 18y = 55(x-5)$
$\Rightarrow 18y = 55x - 275$ .... (ii)
From equations (i) and (ii),
$55x - 275 = 50x - 150$
$\Rightarrow 55x - 50x = 275 - 150$
$\Rightarrow 5x = 125$

$\Rightarrow x = \frac{125}{5} = 25$

$\therefore$ Speed of the train = 25 kmph
Aliter : Using Rule 7,
Here, $S_1 = 3$, $S_2 = 5$

$t_1 = \frac{10}{3600}$, $t_2 = \frac{11}{3600}$

Speed of train $= \frac{t_1S_1 - t_2S_2}{t_1 - t_2}$

$= \frac{\frac{3 \times 10}{3600} - \frac{5 \times 11}{3600}}{\frac{10}{3600} - \frac{11}{3600}}$

$= \frac{-25}{3600} \times \frac{3600}{-1}$

= 25 m/sec

11. (4) Using Rule 5,
Relative speed of train
= (36 – 9) kmph = 27 kmph

$= \frac{27 \times 5}{18}$ m/sec

$= \frac{15}{2}$ m/sec

$\therefore$ Required time

$= \frac{\text{Length of the train}}{\text{Relative speed}}$

$= \frac{150 \times 2}{15} = 20$ seconds

12. (3) Distance covered in 10 minutes at 20kmph = distance covered in 8 minutes at (20 + x) kmph

$\Rightarrow 20 \times \frac{10}{60} = \frac{8}{60}(20 + x)$
$\Rightarrow 200 = 160 + 8x$
$\Rightarrow 8x = 40$

$\Rightarrow x = \frac{40}{8} = 5$ kmph

13. (4) Using Rule 5,
If the speed of the train be x kmph, then relative speed
= (x – 3) kmph.

or $(x - 3) \times \frac{5}{18}$ m/sec

$\therefore \frac{300}{(x-3) \times \frac{5}{18}} = 33$

$\Rightarrow 5400 = 33 \times 5\ (x - 3)$
$\Rightarrow 360 = 11\ (x - 3)$
$\Rightarrow 11x - 33 = 360$

$\Rightarrow x = \frac{393}{11} = 35\frac{8}{11}$ kmph

14. (3) Using Rule 6,
If the speed of train be x kmph then,
Its relative speed = (x + 3) kmph

$\therefore$ Time = $\frac{\text{Length of the train}}{\text{Relative speed}}$

$\Rightarrow \frac{10}{3600} = \frac{\frac{240}{1000}}{(x+3)} = \frac{240}{1000(x+3)}$

$\Rightarrow x + 3 = 86.4$
$\Rightarrow x = 83.4$ kmph

15. (2) Using Rule 1,
Speed of train = 36 kmph

$= \left(\frac{36 \times 5}{18}\right)$ m/sec = 10 m/sec.

$\therefore$ Length of train
= Speed × time
= 10 × 25 = 250 metre

16. (4) Using Rule 1,
Speed of train = 90 kmph

$= \left(\frac{90 \times 5}{18}\right)$ metre/second

= 25 metre/second
If the length of the train be x then,
Speed of train

$= \frac{\text{Length of train}}{\text{Time taken in crossing the signal}}$

$\Rightarrow 25 = \frac{x}{10}$

$\Rightarrow x = 250$ metre

17. (1) Using Rule 6,
Let speed of train be x kmph
Relative speed = $(x + 5)$ kmph

Length of train $= \frac{100}{1000}$ km

$= \frac{1}{10}$ km

$\therefore \frac{\frac{1}{10}}{x+5} = \frac{36}{5 \times 60 \times 60}$

$\Rightarrow \frac{1}{10(x+5)} = \frac{1}{500}$

$\Rightarrow x + 5 = 50$
$\Rightarrow x = 45$ kmph

18. (1) Using Rule 1,
Speed of train

$= \frac{\text{Length of train}}{\text{Time taken in crossing the pole}}$

$= \frac{120}{6} = 20$ m/sec

$= 20 \times \frac{18}{5} = 72$ kmph

19. (1) Using Rule 1,
Speed of train = 54 kmph

$= \left(\frac{54 \times 5}{18}\right)$ m/sec = 15 m/sec

Required time

$= \frac{\text{Length of trains}}{\text{Speed of train}}$

$= \frac{300}{15} = 20$ seconds

20. (4) Using Rule 1,
Speed of train = 90 kmph

$= \left(90 \times \frac{5}{18}\right)$ m/sec.

= 25 m/sec.

When a train crosses a post, it covers a distance equal to its own length.

$\therefore$ Required time $= \frac{\text{Distance}}{\text{Speed}}$

$= \frac{180}{25} = 7.2$ seconds

21. (1) Let the required distance be x km.
Difference of time = 7 + 5 = 12 minutes $= \frac{1}{5}$ hour

Time $= \frac{\text{Distance}}{\text{Speed}}$

According to the question,

$\frac{x}{5} - \frac{x}{6} = \frac{1}{5}$

$\Rightarrow \frac{6x - 5x}{30} = \frac{1}{5}$

$\Rightarrow \frac{x}{30} = \frac{1}{5}$

$\Rightarrow x = \frac{30}{5} = 6$ km.

22. (2) Using Rule 1,
If the length of train be x metre, then speed of train

$= \frac{x}{20} = \frac{x+250}{45}$

$\Rightarrow \frac{x}{4} = \frac{x+250}{9}$

$\Rightarrow 9x = 4x + 1000$
$\Rightarrow 9x - 4x = 1000$
$\Rightarrow 5x = 1000$

$\Rightarrow x = \frac{1000}{5}$

= 200 metre

23. (4) Using Rule 1,
Speed of train

$= \frac{\text{Length of train}}{\text{Time taken in crossing}}$

$= \frac{250}{50} = 5$ m/sec.

$= \left(5 \times \frac{18}{5}\right)$ kmph

= 18 kmph

24. (1) $\therefore$ Speed of train A

$= \frac{150}{30} = 5$ m/sec.

Speed of train B = x m/sec.
Relative speed = $(5+x)$ m/sec.
$\therefore$ Length of both trains = Relative speed × Time
$\Rightarrow 300 = (5 + x) \times 10$

$\Rightarrow 5 + x = \frac{300}{10} = 30$

$\Rightarrow x = 30 - 5 = 25$ m/sec.

$= \left(\frac{25 \times 18}{5}\right)$ kmph.

= 90 kmph.

25. (1) Distance covered in crossing a pole = Length of train
Speed of train = 72 kmph

$= \left(\frac{72 \times 5}{18}\right)$ m./sec.

= 20 m./sec.

$\therefore$ Required time $= \frac{160}{20}$

= 8 seconds

26. (3) Speed of train = 50 kmph

$= \left(\frac{50 \times 5}{18}\right)$ m./sec.

$= \frac{125}{9}$ m./sec.

$\therefore$ Required time

$= \left(\frac{100}{\frac{125}{9}}\right)$ seconds

$= \left(\frac{100 \times 9}{125}\right)$ seconds

= 7.2 seconds

27. (4) Distance covered by train in crossing a telegraphic post = length of train

$\therefore$ Speed of train $= \frac{\text{Distance}}{\text{Time}}$

$= \left(\frac{150}{12}\right)$ m./sec.

$= \left(\frac{150}{12} \times \frac{18}{5}\right)$ kmph

= 45 kmph

28. (4) Speed of train = 36 kmph

$= \left(\frac{36 \times 5}{18}\right)$ m./sec.

= 10 m./sec.

∴ Required time

$= \frac{\text{Length of train}}{\text{Speed of train}}$

$= \frac{60}{10}$ = 6 seconds

29. (3) When a train crosses a pole it travels a distance equal to its length.

∴ Speed of train

$= \frac{240}{16}$ = 15 m./sec.

$= \left(15 \times \frac{18}{5}\right)$ kmph

= 54 kmph.

30. (2) Distance covered by train = Length of train

Speed of train = 60 kmph

$= \left(\frac{60 \times 5}{18}\right)$ m./sec.

$= \left(\frac{50}{3}\right)$ m./sec.

∴ Required time = $\frac{\text{Distance}}{\text{Speed}}$

$= \left(\frac{75}{\frac{50}{3}}\right)$ seconds

$= \frac{75 \times 3}{50}$ seconds

= 4.5 seconds

31. (2) Speed of train = 120 kmph.

$= \left(\frac{120 \times 5}{18}\right)$ m./sec.

$= \frac{100}{3}$ m./sec.

∴ Required time = $\frac{\text{Length of train}}{\text{Speed of train}}$

$= \left(\frac{100}{\frac{100}{3}}\right)$ seconds

$= \left(\frac{100}{100} \times 3\right)$ seconds

= 3 seconds

TYPE-IV

1. (3) Distance travelled by first train in one hour

= 60 × 1 = 60km

Therefore, distance between two train at 9 a.m.

= 330 – 60 = 270 km

Now, Relative speed of two trains

= 60 + 75 = 135 km/hr

∴ Time of meeting of two trains

$= \frac{270}{135}$ = 2 hrs.

Therefore, both the trains will meet at 9 + 2 = 11 A.M.

2. (2) Using Rule 6,

Men are walking in opposite directions. Hence, they will cover the length of bridge at their relative speed.

Required time

$= \frac{1200}{(5+10)}$ = 80 minutes

3. (2) Using Rule 3,

If two trains be moving in opposite directions at rate u and v kmph respectively, then their relative speed

= $(u + v)$ kmph.

Further, if their length be x and y km. then time taken to cross each other $= \frac{x+y}{u+v}$ hours.

Here,

Total length = 160 + 140

= 300m.

Relative speed = (77 + 67) kmph

= 144 kmph $= 144 \times \frac{5}{18}$ m/s

or 40 m/sec.

∴ Time $= \frac{300}{40} = 7\frac{1}{2}$ Seconds

4. (3) Using Rule 3,

Let the speed of each train be x kmph.

Their relative speed

$= x + x = 2x$ kmph.

Time taken

$= \frac{\text{Total length of trains}}{\text{Relative Speed}}$

$= \frac{12}{60 \times 60} = \frac{240 \times \frac{1}{1000}}{2x}$

$= \frac{1}{300} = \frac{120}{1000x}$

$x = \frac{300 \times 120}{1000} = 36$

The required speed = 36 kmph.

5. (2) Using Rule 3,

Total length of trains

= 140 + 160 = 300 m.

Relative speed = 60 + 40

= 100 kmph

$= 100 \times \frac{5}{18}$ m/sec.

or $\frac{250}{9}$ m/sec.

∴ Time taken to cross each other

$= \frac{300}{\frac{250}{9}} = \frac{300 \times 9}{250} = 10.8$ sec.

6. (3) Let train A start from station A and B from station B.

Let the trains A and B meet after t hours.

∴ Distance covered by train A in t hours = $50t$

Distance covered by train B in t hours = $60t$ km

According to the question,

$60t - 50t = 120$

$\Rightarrow t = \frac{120}{10}$ = 12 hours.

∴ Distance AB = 50 × 12 + 60 × 12 = 600 + 720 = 1320 km

Aliter : Using Rule 12,

Here, a = 60, b = 50, d = 120

Distance between A and B

$= \left(\frac{a+b}{a-b}\right) \times d$

$= \left(\frac{60+50}{60-50}\right) \times 120$

$= \frac{110}{10} \times 120$ = 1320 km

7. (2) Let the speed of second train be x m/s.

$80 \text{ km/h} = \frac{80 \times 5}{18} \text{ m/s}$

According to the question

$\frac{1000}{x + \frac{80 \times 5}{18}} = 18$

$\Rightarrow 1000 = 18x + 400$

$\therefore x = \frac{600}{18}$ m/s

$= \frac{600}{18} \times \frac{18}{5}$ km/h $= 120$ km/h

8. (2) Using Rule 3,
Length of both trains
= 105 + 90 = 195 m.
Relative speed = (45 + 72)
= 117 kmph

$= 117 \times \frac{5}{18}$ or $\frac{65}{2}$ m/sec.

$\therefore$ Time taken $= \frac{195}{\frac{65}{2}} = \frac{195 \times 2}{65}$

= 6 seconds

9. (1) Using Rule 3,
Let the length of each train be x metre.

Speed of first train $= \frac{x}{18}$ m/sec

Speed of second train $= \frac{x}{12}$ m/sec

When both trains cross each other, time taken

$= \frac{2x}{\frac{x}{18} + \frac{x}{12}}$

$= \frac{2x}{\frac{2x + 3x}{36}} = \frac{2x \times 36}{5x}$

$= \frac{72}{5} = 14.4$ seconds

10. (4) Using Rule 3,
Let the speed of the second train be x m/s
Speed of first train

$= \frac{150}{15} = 10$ m/sec

Relative speed of trains
= $(x + 10)$ m/s
Total distance covered
= 150 + 150 = 300 metre

$\therefore$ Time taken $= \frac{300}{x + 10}$

$\Rightarrow \frac{300}{x + 10} = 12$

$\Rightarrow 12x + 120 = 300$

$\Rightarrow 12x = 300 - 120 = 180$

$\Rightarrow x = \frac{180}{12} = 15$ m/s

$= \frac{15 \times 18}{5}$ or 54 kmph.

11. (4) Let the length of the train travelling at 48 kmph be x metres.
Let the length of the platform be y metres.
Relative speed of train
= (48 + 42) kmph

$= \frac{90 \times 5}{18}$ m./sec.

= 25 m./sec.
and 48 kmph

$= \frac{48 \times 5}{18} = \frac{40}{3}$ m./sec.

According to the question,

$\frac{x + \frac{x}{2}}{25} = 12$

$\Rightarrow \frac{3x}{2 \times 25} = 12$

$\Rightarrow 3x = 2 \times 12 \times 25 = 600$

$\Rightarrow x = 200$ m.

Also, $\frac{200 + y}{40/3} = 45$

$\Rightarrow 600 + 3y = 40 \times 45$

$\Rightarrow 3y = 1800 - 600 = 1200$

$\Rightarrow y = \frac{1200}{3} = 400$ m.

12. (2) Let two trains meet after t hours when the train from town A leaves at 8 AM.
$\therefore$ Distance covered in t hours at 70 kmph + Distance covered in $(t - 2)$ hours at 110 kmph = 500km

$\therefore 70t + 110(t - 2) = 500$

$\Rightarrow 70t + 110t - 220 = 500$

$\Rightarrow 180t = 500 + 220 = 720$

$\Rightarrow t = \frac{720}{180} = 4$ hours

Hence, the trains will meet at 12 noon.

13. (3) Using Rule 3,
Relative speed
= (68 + 40) kmph = 108 kmph

$= \left(\frac{108 \times 5}{18}\right)$ m/s or 30 m/s

$\therefore$ Required time

$= \frac{\text{Sum of the lengths of both trains}}{\text{Relative speed}}$

$= \left(\frac{70 + 80}{30}\right)$ second = 5 seconds

14. (3) Using Rule 3,
When a train crosses a telegraph post, it covers its own length.

$\therefore$ Speed of first train $= \frac{120}{10}$

= 12 m/sec.

Speed of second train $= \frac{120}{15}$

= 8 m/sec.
Relative speed = 12 + 8
= 20 m/sec.
Required time

$= \frac{\text{Total length of trains}}{\text{Relative speed}}$

$= \frac{2 \times 120}{20} = 12$ seconds.

15. (3) Using Rule 3,
Relative speed = 42 + 48
= 90 kmph

$= \left(\frac{90 \times 5}{18}\right)$ m/s = 25 m/s

Sum of the length of both trains
= 137 + 163 = 300 metres
$\therefore$ Required time

$= \frac{300}{25} = 12$ seconds

16. (1) Using Rule 3,
Speed of second train
= 43.2 kmph

$= \frac{43.2 \times 5}{18}$ m/sec.

or 12 m/sec.
Let the speed of first train be x m per second, then

$\frac{150 + 120}{x + 12} = 10$

$\Rightarrow 27 = x + 12$

$\Rightarrow x = 15$ m/s

$= 15 \times \frac{18}{5}$ kmph = 54 kmph

17. (1) Let the trains meet after t hours

Then, $21t - 16t = 60$

$\Rightarrow 5t = 60 \Rightarrow t = 12$ hours

$\therefore$ Distance between A and B

$= (16 + 21) \times 12$

$= 37 \times 12 = 444$ miles

Aliter : Using Rule 13,

Here, a = 21, b = 16, d = 60

Distance between A and B

$$= \left(\frac{a+b}{a-b}\right) \times d$$

$$= \left(\frac{21+16}{21-16}\right) \times 60$$

$$= \frac{37}{5} \times 60$$

$= 37 \times 12 = 444$ miles

18. (3) Using Rule 3,

Relative speed = 45 + 54

= 99 kmph

$$= \left(99 \times \frac{5}{18}\right) \text{ m/sec.}$$

or $\frac{55}{2}$ m/sec.

$$\therefore \text{Required time} = \frac{108+112}{\frac{55}{2}}$$

$$= \frac{220 \times 2}{55} = 8 \text{ seconds}$$

19. (2) Let the length of each train be x metres

Then, Speed of first train $= \frac{x}{3}$ m/sec

Speed of second train $= \frac{x}{4}$ m/sec

They are moving in opposite directions

$$\therefore \text{Relaive speed} = \frac{x}{3} + \frac{x}{4}$$

$$= \frac{4x+3x}{12} = \frac{7x}{12} \text{ m/sec.}$$

Total length $= x + x = 2x$ m.

$$\therefore \text{Time taken} = \frac{2x}{\frac{7x}{12}} = \frac{24}{7}$$

$$= 3\frac{3}{7} \text{ sec.}$$

20. (2) Using Rule 3,

Total length of both trains = 250 metres

Let speed of second train = x kmph

Relative speed = $(65 + x)$ kmph

$$= (65 + x) \times \frac{5}{18} \text{ m/sec}$$

$\therefore$ Time

$$= \frac{\text{Sum of length of trains}}{\text{Relative speed}}$$

$$\Rightarrow 6 = \frac{250}{(65+x) \times \frac{5}{18}}$$

$$\Rightarrow 6 \times \frac{5}{18} \times (65 + x) = 250$$

$$\Rightarrow 65 + x = \frac{250 \times 3}{5}$$

$\Rightarrow 65 + x = 150$

$\Rightarrow x = 150 - 65 = 85$ kmph

21. (3) Using Rule 6,

Relative speed = (84 + 6)

= 90 kmph

$$= \left(90 \times \frac{5}{18}\right) \text{ m/sec.}$$

= 25 m/sec.

$\therefore$ Length of train

= Relative speed × Time

= 25 × 4 = 100 metre

22. (3) Using Rule 11,

$$\frac{\text{Speed of X}}{\text{Speed of Y}}$$

$$= \sqrt{\frac{\text{Time taken by Y}}{\text{Time taken by X}}}$$

$$\Rightarrow \frac{45}{y} = \sqrt{\frac{3 \text{ hours } 20 \text{ min.}}{4 \text{ hours } 48 \text{ min.}}}$$

$$\Rightarrow \frac{45}{y} = \sqrt{\frac{200 \text{ minutes}}{288 \text{ minutes}}}$$

$$= \frac{10}{12}$$

$\Rightarrow 10y = 12 \times 45$

$$\Rightarrow y = \frac{12 \times 45}{10} = 54 \text{ kmph}$$

23. (3) Let P and Q meet after t hours.

Distance = speed × time

According to the question,

$30t - 20t = 36$

$\Rightarrow 10t = 36$

$$\Rightarrow t = \frac{36}{10} = 3.6 \text{ hours}$$

$\therefore$ Distance between P and Q

$= 30t + 20t$

$= 50t = (50 \times 3.6)$ km.

= 180 km.

Aliter : Using Rule 13,

Here, a = 30, b = 20, d = 36

Required distance

$$= \left(\frac{a+b}{a-b}\right) \times d$$

$$= \left(\frac{30+20}{30-20}\right) \times 36$$

$$= \frac{50}{10} \times 36 = 180 \text{ km}$$

24. (3)

Speed of train starting from Q

= x kmph

$\therefore$ Speed of train starting from P

= $(x + 8)$ kmph

According to the question,

PR + RQ = PQ

$\Rightarrow (x + 8) \times 6 + x \times 6 = 162$

[Distance = Speed × Time]

$\Rightarrow 6x + 48 + 6x = 162$

$\Rightarrow 12x = 162 - 48 = 114$

$$\Rightarrow x = \frac{114}{12} = \frac{19}{2}$$

$$= 9\frac{1}{2} \text{ kmph}$$

25. (1) Let the trains meet after t hours.

Distance = Speed × Time

According to the question,

$75t - 50t = 175$

$\Rightarrow 25t = 175$

$$\Rightarrow t = \frac{175}{25} = 7 \text{ hours}$$

$\therefore$ Distance between A and B

$= 75t + 50t = 125t$

$= 125 \times 7 = 875$ km.

Aliter : Using Rule 13,

Here, a = 75, b = 50, d = 175

Required distance

$$= \left(\frac{a+b}{a-b}\right) \times d$$

$$= \left(\frac{75+50}{75-50}\right) \times 175$$

$$= \frac{125}{25} \times 175$$

$= 125 \times 7 = 875$ km

26. (4) Using Rule 3,
Relative speed
= (50 + 58) kmph

$= \left(108 \times \frac{5}{18}\right)$ m/sec.

= 30 m/sec

∴ Required time

$= \frac{\text{Total length of trains}}{\text{Relative speed}}$

$= \left(\frac{150+180}{30}\right)$ seconds

$= \left(\frac{330}{30}\right)$ seconds

= 11 seconds

27. (1) Let the trains meet each other after t hours.
Distance = Speed × Time
According to the question,
$21t - 14t = 70$

$\Rightarrow 7t = 70 \Rightarrow t = \frac{70}{7}$

= 10 hours

∴ Required distance
$= 21t + 14t = 35t$
= 35 × 10 = 350 km.
Aliter : Using Rule 13,
Here, a = 21, b = 14, d = 70
Required distance

$= \left(\frac{a+b}{a-b}\right) \times d$

$= \left(\frac{21+14}{21-14}\right) \times 70$

$= \frac{35}{7} \times 70 = 350$ km.

TYPE-V

1. (3) Since the train runs at $\frac{7}{11}$ of its own speed, the time it takes is $\frac{11}{7}$ of its usual speed.

Let the usual time taken be t hours.

Then we can write, $\frac{11}{7}t = 22$

$\therefore t = \frac{22 \times 7}{11} = 14$ hours

Hence, time saved
= 22 – 14 = 8 hours

2. (3) $\frac{3}{5}$ of usual speed will take $\frac{5}{3}$ of usual time.

[∵ time & speed are inversely proportional]

$\therefore \frac{5}{3}$ of usual time

$= \text{usual time} + \frac{5}{2}$

$\Rightarrow \frac{2}{3}$ of usual time $= \frac{5}{2}$

⇒ usual time

$= \frac{5}{2} \times \frac{3}{2} = \frac{15}{4} = 3\frac{3}{4}$ hours.

Aliter : Using Rule 8,

Here, A = 3, B = 5, $t = 2\frac{1}{2}$

Usual time

$= \frac{A}{\text{Diff. of A and B}} \times \text{time}$

$= \frac{3}{5-3} \times 2\frac{1}{2}$

$= \frac{3}{2} \times \frac{5}{2}$

$= \frac{15}{4} = 3\frac{3}{4}$ hours

3. (2) 1 hr 40 min 48 sec

$= 1 \text{ hr } \left(40 + \frac{48}{60}\right) \text{ min}$

$= 1 \text{ hr } \left(40 + \frac{4}{5}\right) \text{ min}$

$= 1 \text{ hr } \frac{204}{5} \text{ min}$

$= \left(1 + \frac{204}{300}\right) \text{ hr} = \frac{504}{300} \text{ hr}$

$\therefore \text{Speed} = \frac{42}{\frac{504}{300}} = 25$ kmph

Now, $\frac{5}{7} \times$ usual speed = 25

$\therefore$ Usual speed $= \frac{25 \times 7}{5}$

= 35 kmph

4. (3) $\frac{4}{3} \times \text{usual time} - \text{usual time} = 2$

$\Rightarrow \frac{1}{3}$ usual time = 2

∴ Usual time = 2 × 3 = 6 hours
Aliter : Using Rule 8,

Here, $\frac{A}{B} = \frac{3}{4}$, time= 2 hrs.

Usual Speed

$= \frac{A}{\text{Diff. of A \& B}} \times \text{time}$

$= \frac{3}{(4-3)} \times 2 = 6$ hours

5. (2) $\frac{4}{3}$ of usual time

= Usual time + 20 minutes

$\therefore \frac{1}{3}$ of usual time = 20 minutes

⇒ Usual time = 20 × 3
= 60 minutes
Aliter : Using Rule 8,
Here, A = 3, B= 4, t = 20 minutes
Usual time taken

$= \frac{A}{\text{Diff. of A \& B}} \times \text{time}$

$= \frac{3}{(4-3)} \times 20 = 60$ minutes

6. (1) Time and speed are inversely proportional.

$\therefore \frac{4}{3}$ of usual time – usual time

$= \frac{3}{2}$

$\Rightarrow \frac{1}{3} \times$ usual time $= \frac{3}{2}$

$\therefore$ Usual time $= \frac{3 \times 3}{2} = \frac{9}{2}$

$= 4\frac{1}{2}$ hours

Aliter : Using Rule 8,

Here, A = 3, B = 4, t= $\frac{3}{2}$

Usual time

$= \frac{A}{\text{Diff. of A \& B}} \times \text{time}$

$= \frac{3}{(4-3)} \times \frac{3}{2}$

$= 4\frac{1}{2}$ hrs.

7. (1) Time and speed are inversely proportional.

$\therefore \frac{7}{6} \times$ Usual time – Usual time

= 25 minutes

$\Rightarrow$ Usual time $\left(\frac{7}{6} - 1\right)$

= 25 minutes

$\Rightarrow$ Usual time $\times \frac{1}{6}$

= 25 minutes

$\therefore$ Usual time = 25 × 6

= 150 minutes

= 2 hours 30 minutes

Aliter : Using Rule 8,

Here, A = 6, B = 7,

$t = \frac{25}{60} = \frac{5}{12}$ hrs.

Usual time

$= \frac{A}{\text{Diff. of A \& B}} \times \text{time}$

$= \frac{6}{(7-6)} \times \frac{5}{12} = \frac{5}{2}$ hrs.

= 2 hours 30 minutes

8. (2) Time and speed are inversely proportional.

$\therefore$ Usual time $\times \frac{7}{6}$ – usual time

= 12 minutes

$\Rightarrow$ Usual time $\times \frac{1}{6} = 12$ minutes

$\therefore$ Usual time = 72 minutes

= 1 hour 12 minutes

Aliter : Using Rule 8,

Here, A = 6, B = 7,

$t = \frac{12}{60} = \frac{1}{5}$ hrs.

Usual time

$= \frac{A}{\text{Diff. of A \& B}} \times \text{time}$

$= \frac{6}{(7-6)} \times \frac{1}{5} = 1\frac{1}{5}$ hrs.

= 1 hrs. 12 minutes

9. (2) Fixed distance = x km and certain speed = y kmph (let).

Case I,

$\frac{x}{y+10} = \frac{x}{y} - 1$

$\Rightarrow \frac{x}{y+10} + 1 = \frac{x}{y}$ --- (i)

Case II,

$\frac{x}{y+20} = \frac{x}{y} - 1 - \frac{3}{4}$

$= \frac{x}{y} - \frac{4+3}{4}$

$\Rightarrow \frac{x}{y+20} + \frac{7}{4} = \frac{x}{y}$ --- (ii)

From equations (i) and (ii),

$\frac{x}{y+10} + 1 = \frac{x}{y+20} + \frac{7}{4}$

$\Rightarrow \frac{x}{y+10} - \frac{x}{y+20} = \frac{7}{4} - 1$

$\Rightarrow x\left(\frac{y+20-y-10}{(y+10)(y+20)}\right)$

$= \frac{7-4}{4} = \frac{3}{4}$

$\Rightarrow \frac{x \times 10}{(y+10)(y+20)} = \frac{3}{4}$

$\Rightarrow 3\ (y + 10)\ (y + 20) = 40\ x$

$\Rightarrow \frac{3(y+10)(y+20)}{40} = x$ --(iii)

From equation (i),

$\frac{3(y+10)(y+20)}{40(y+10)} + 1$

$= \frac{3\ (y+10)\ (y+20)}{40y}$

$\Rightarrow 3\ (y + 20) + 40$

$= \frac{3(y+10)(y+20)}{y}$

$\Rightarrow 3y^2 + 60y + 40\ y = 3(y^2 + 30y + 200)$

$\Rightarrow 3y^2 + 100y = 3y^2 + 90y + 600$

$\Rightarrow 10y = 600 \Rightarrow y = 60$

Again from equation (i),

$\frac{x}{y+10} + 1 = \frac{x}{y}$

$\Rightarrow \frac{x}{60+10} + 1 = \frac{x}{60}$

$\Rightarrow \frac{x}{70} + 1 = \frac{x}{60}$

$\Rightarrow \frac{x+70}{70} = \frac{x}{60}$

$\Rightarrow 6x + 420 = 7x$

$\Rightarrow 7x - 6x = 420$

$\Rightarrow x = 420$ km.

10. (2) Total distance

= 7 × 4 = 28 km.

Total time

$= \left(\frac{7}{10} + \frac{7}{20} + \frac{7}{30} + \frac{7}{60}\right)$ hours

$= \left(\frac{42+21+14+7}{60}\right)$ hours

$= \frac{84}{60}$ hours $= \frac{7}{5}$ hours

$\therefore$ Average speed

$= \frac{\text{Total distance}}{\text{Total time}} = \left(\frac{28}{\frac{7}{5}}\right)$ kmph

$= \frac{28 \times 5}{7} = 20$ kmph

11. (2) 1 m/sec = $\frac{18}{5}$ kmph

$\therefore$ 20 m/sec = $\frac{20 \times 18}{5}$

= 72 kmph

12. (1) 1 kmph = $\frac{5}{18}$ m/sec

$\therefore$ 54 kmph = $\frac{5}{18} \times 54$

= 15 m/sec.

13. (3) Speed of car = x kmph.

$\therefore$ Distance = Speed × Time

= $25x$ km.

Case II,

Speed of car = $\frac{4x}{5}$ kmph.

Distance covered = $\frac{4x}{5} \times 25$

= $20x$ km.

According to the question,

$25x - 20x = 200$

$\Rightarrow 5x = 200$

$\Rightarrow x = \frac{200}{5} = 40$ kmph.

14. (2) Speed of car = x kmph.

Relative speed = $(x - 4)$ kmph.

Time = 3 minutes = $\frac{3}{60}$ hour = $\frac{1}{20}$ hour

Distance = 130 metre

$= \frac{130}{1000}$ km. $= \frac{13}{100}$ km.

$\therefore$ Relative speed = $\frac{\text{Distance}}{\text{Time}}$

$\Rightarrow x - 4 = \frac{13}{100} \times 20$

$\Rightarrow 5x - 20 = 13$

$\Rightarrow 5x = 20 + 13 = 33$

$\Rightarrow x = \frac{33}{5} = 6\frac{3}{5}$ kmph.

TYPE-VI

1. (2) Total distance = 10 + 12 = 22 km

Total time $= \frac{10}{12} + \frac{12}{10} = \frac{244}{120}$ hours

$\therefore$ Required average speed

$= \frac{\text{Total distance}}{\text{Total time}} = \frac{22}{\frac{244}{120}} = \frac{22}{244} \times 120$

= 10.8 km/hr.

Aliter : Using Rule 3,

Here, $d_1 = 10$, $S_1 = 12$

$d_2 = 12$, $S_2 = 10$

Average Speed = $\frac{d_1 + d_2}{\frac{d_1}{S_1} + \frac{d_2}{S_2}}$

$= \frac{10+12}{\frac{10}{12} + \frac{12}{10}} = \frac{22 \times 120}{244}$

= 10.8 km/hrs.

2. (1) Using Rule 3,

Total time

$= \frac{600}{80} + \frac{800}{40} + \frac{500}{400} + \frac{100}{50}$

$= \frac{246}{8}$ hours.

Average speed

$= \frac{600 + 800 + 500 + 100}{\frac{246}{8}}$

$= \frac{2000 \times 8}{246} = 65\frac{5}{123}$ km/hr.

3. (2) Using Rule 3,

Average speed

$= \frac{\text{Total distance}}{\text{time taken}}$

$= \frac{30 \times \frac{12}{60} + 45 \times \frac{8}{60}}{\frac{12}{60} + \frac{8}{60}}$

= 12 × 3 = 36 kmph

4. (3) Using Rule 5,

If the same distance are covered at different speed of x kmph and y kmph, the average speed of the whole journey is given by $= \frac{2xy}{x+y}$ kmph.

$\therefore$ Required average speed

$= \frac{2 \times 6 \times 3}{6+3} = \frac{36}{9} = 4$ kmph

5. (3) Using Rule 5,

If two equal distances are covered at two unequal speed of x kmph and y kmph, then average speed = $\left(\frac{2xy}{x+y}\right)$ kmph

$= \frac{2 \times 12 \times 4}{12 + 4} = \frac{96}{16} = 6$ kmph

6. (1) Using Rule 2,

Remaining distance

= (3584 – 1440 – 1608) km

= 536 km.

This distance is covered at the rate of $\frac{536}{8} = 67$ kmph.

Average speed of whole journey

$= \frac{3584}{56} = 64$ kmph

$\therefore$ Required difference in speed = (67 – 64) kmph i.e. = 3 kmph more

7. (2) Using Rule 2,

Total distance

= 24 + 24 + 24 = 72 km.

Total time

$= \left(\frac{24}{6} + \frac{24}{8} + \frac{24}{12}\right)$ hours

= (4 + 3 + 2) hours = 9 hours

$\therefore$ Required average speed

$= \frac{\text{Total distance}}{\text{Total time}} = \frac{72}{9} = 8$ kmph.

8. (4) Using Rule 5,

If same distance are covered at two different speed of x and y kmph, the average speed of journey = $\frac{2xy}{x+y}$

$= \left(\frac{2 \times 100 \times 80}{100 + 80}\right)$ kmph

= 88.89 kmph

9. (2) Using Rule 5,

Required average speed

$= \left(\frac{2xy}{x+y}\right)$ kmph

[Since, can be given as corollary If the distance between A and B be z units, then

Average speed = $\frac{\text{Total distance}}{\text{Time taken}}$

$= \frac{z+z}{\frac{z}{x} + \frac{z}{y}}$

$= \frac{2}{\frac{1}{x} + \frac{1}{y}} = \frac{2}{\frac{x+y}{xy}} = \frac{2xy}{x+y}$]

10. (1) Using Rule 5,

Average speed

$= \left(\frac{2xy}{x+y}\right)$ kmph

$= \left(\frac{2 \times 40 \times 60}{40 + 60}\right)$ kmph

= 48 kmph

11. (1) Using Rule 5,

Average speed

$= \left(\frac{2\,xy}{x+y}\right)$ kmph

$= \left(\frac{2 \times 12 \times 18}{12 + 18}\right)$ kmph

$= \left(\frac{2 \times 12 \times 18}{30}\right)$ kmph

$= 14\frac{2}{5}$ kmph

12. (2) Let the total distance be x km.

$$\text{Total time} = \frac{\frac{x}{3}}{25} + \frac{\frac{x}{4}}{30} + \frac{\frac{5x}{12}}{50}$$

$$= \frac{x}{75} + \frac{x}{120} + \frac{x}{120}$$

$$= \frac{x}{75} + \frac{x}{60} = \frac{4x+5x}{300} = \frac{3x}{100} \text{ hours}$$

$\therefore$ Average speed

$$= \frac{\text{Total distance}}{\text{Time taken}}$$

$$= \frac{x}{\frac{3x}{100}} = \frac{100}{3} = 33\frac{1}{3} \text{ kmph}$$

Aliter : Using Rule 18,

Here, x = 3, u = 25

y = 4, v = 30

$z = \frac{12}{5}$, w = 50

$$\text{Average Speed} = \frac{1}{\frac{1}{xu} + \frac{1}{yv} + \frac{1}{zw}}$$

$$= \frac{1}{\frac{1}{3\times25} + \frac{1}{4\times30} + \frac{1}{\frac{12}{5}\times50}}$$

$$= \frac{1}{\frac{1}{75} + \frac{1}{120} + \frac{1}{120}}$$

$$= \frac{1}{\frac{1}{75} + \frac{1}{60}} = \frac{1}{\frac{4+5}{300}}$$

$$= \frac{300}{9} = \frac{100}{3}$$

$$= 33\frac{1}{3} \text{ km/hr.}$$

13. (1) Time taken to cover 30km at 6 kmph $= \frac{30}{6} = 5$ hours

Time taken to cover 40 km = 5 hours

$\therefore$ Average speed

$$= \frac{\text{Total distance}}{\text{Total time}} = \frac{30+40}{10}$$

$$= \frac{70}{10} = 7 \text{ kmph}$$

14. (1) Using Rule 5,

Here same distances are covered at different speeds.

$\therefore$ Average speed

$$= \left(\frac{2xy}{x+y}\right) \text{kmph}$$

$$= \left[\frac{2\times36\times45}{(36+45)}\right] \text{ kmph}$$

$$= \frac{2\times36\times45}{81} = 40 \text{ kmph}$$

15. (1) Using Rule 5,

Here, the distances are equal.

$\therefore$ Average speed

$$= \left(\frac{2\times100\times150}{100+150}\right) \text{ kmph}$$

$$= \frac{2\times100\times150}{250}$$

= 120 kmph

16. (2) Using Rule 2,

Total distance

= 5 × 6 + 3 × 6

= 30 + 18 = 48 km

Total time = 9 hours

$\therefore$ Average speed

$$= \frac{48}{9} = \frac{16}{3} = 5\frac{1}{3} \text{ kmph}$$

17. (3) Let the length of journey be x km, then

$$\frac{x}{35} - \frac{x}{40} = \frac{15}{60} = \frac{1}{4}$$

$$\Rightarrow \frac{8x-7x}{280} = \frac{1}{4}$$

$$\Rightarrow x = \frac{280}{4} = 70 \text{ km}$$

18. (3) Using Rule 3,

Average speed

$$= \frac{\text{Total distance}}{\text{Time taken}}$$

$$= \frac{12}{\frac{3}{10} + \frac{3}{20} + \frac{3}{30} + \frac{3}{60}}$$

$$= \frac{12}{3\left(\frac{6+3+2+1}{60}\right)}$$

$$= \frac{12\times60}{3\times12} = 20 \text{ kmph}$$

19. (1) Using Rule 2,

Distance covered

$$= \left(35\times\frac{10}{60} + 20\times\frac{5}{60}\right) \text{ km}$$

$$= \left(\frac{35}{6} + \frac{10}{6}\right) = \frac{45}{6} \text{ km}$$

Total time = 15 minutes

$$= \frac{1}{4} \text{ hour}$$

$\therefore$ Required average speed

$$= \frac{\text{Distance covered}}{\text{Time taken}}$$

$$= \frac{45}{6}\times4$$

= 30 kmph

20. (2) Using Rule 2,

Total distance = 100 km.

Total time

$$= \frac{50}{50} + \frac{40}{40} + \frac{10}{20}$$

$$= 1 + 1 + \frac{1}{2} = \frac{5}{2} \text{hours}$$

$$\therefore \text{Average speed} = \frac{100\times2}{5}$$

= 40 kmph

21. (4) Using Rule 5,

Required average speed

$$= \frac{2\times30\times20}{30+20}$$

[$\because$ Distance covered is same]

$$= \frac{2\times30\times20}{50} = 24 \text{ kmph}$$

22. (3) Using Rule 11,

If A and B meet after t hours, then

$4t + 6t = 20$

$\Rightarrow 10t = 20$

$$\Rightarrow t = \frac{20}{10} = 2 \text{ hours.}$$

Hence, both will meet at 9 a.m.

23. (3) Using Rule 5,

$$\text{Average speed} = \frac{2xy}{x+y} \text{ kmph}$$

$$= \frac{2\times20\times30}{20+30} = \frac{2\times20\times30}{50}$$

= 24 kmph

24. (1) Using Rule 5,
Average speed of whole journey

$$= \left(\frac{2xy}{x+y}\right) \text{ kmph}$$

$$= \frac{2 \times 50 \times 30}{50+30} = \frac{2 \times 50 \times 30}{80}$$

= 37.5 kmph

25. (4) Required distance of office from house = x km. (let)

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

∴ According to the question,

$$\frac{x}{5} - \frac{x}{6} = \frac{6+2}{60} = \frac{2}{15}$$

$$\Rightarrow \frac{6x-5x}{30} = \frac{2}{15}$$

$$\Rightarrow \frac{x}{30} = \frac{2}{15}$$

$$\Rightarrow x = \frac{2}{15} \times 30 = 4 \text{ km.}$$

Aliter : Using Rule 10,
Here, $S_1 = 5$, $t_1 = 6$
$S_2 = 6$, $t_2 = 2$

$$\text{Distance} = \frac{(S_1 \times S_2)(t_1 + t_2)}{S_2 - S_1}$$

$$= \frac{(5 \times 6)(6+2)}{6-5}$$

$$= 30 \times \frac{8}{60} = 4 \text{ km.}$$

26. (4) Using Rule 1,

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{1050}{75}$$

= 14 hours

27. (2) Using Rule 2,
Total distance covered by train in 5 minutes
= (500 + 625 + 750 + 875 + 1000) metre = 3750 metre
= 3.75 km.

$$\text{Time} = 5 \text{ minutes} = \frac{5}{60} \text{ hour}$$

$$= \frac{1}{12} \text{ hour}$$

$$\text{Speed of train} = \frac{\text{Distance}}{\text{Time}}$$

$$= \left(\frac{3.75}{\frac{1}{12}}\right) \text{ kmph}$$

= (3.75 × 12) kmph
= 45 kmph

28. (1) Distance covered in first 2 hours
= 2 × 20 = 40 km.
Remaining distance
= 100 – 40 = 60 km.
Time taken in covering 60 km at 10 kmph

$$= \frac{60}{10} = 6 \text{ hours}$$

∴ Required average speed

$$= \frac{\text{Total distance}}{\text{Total Time}}$$

$$= \left(\frac{100}{2+6}\right) \text{ kmph}$$

$$= \left(\frac{100}{8}\right) \text{ kmph}$$

$$= \frac{25}{2} \text{ kmph} = 12\frac{1}{2} \text{ kmph}$$

29. (1) Difference of time = 5 + 3 = 8 minutes

$$= \frac{8}{60} \text{ hour} = \frac{2}{15} \text{ hour}$$

If the speed of motorbike be x kmph, then

$$\frac{25}{50} - \frac{25}{x} = \frac{2}{15}$$

$$\Rightarrow \frac{25}{x} = \frac{1}{2} - \frac{2}{15}$$

$$\Rightarrow \frac{25}{x} = \frac{15-4}{30} = \frac{11}{30}$$

$\Rightarrow 11x = 25 \times 30$

$$\Rightarrow x = \frac{25 \times 30}{11} = \frac{750}{11}$$

= 68.18 kmph
≈ 68 kmph

30. (4) Let the speed of cyclist while returning be x kmph.
∴ Average speed

$$= \frac{2 \times 16 \times x}{16+x}$$

$$\Rightarrow 6.4 = \frac{32x}{16+x}$$

$\Rightarrow 6.4 \times 16 + 6.4x = 32x$
$\Rightarrow 32x - 6.4x = 6.4 \times 16$
$\Rightarrow 25.6x = 6.4 \times 16$

$$\Rightarrow x = \frac{6.4 \times 16}{25.6} = 4 \text{ kmph.}$$

31. (3) Total distance covered = 400 km.

$$\text{Total time} = \frac{25}{2} \text{ hours}$$

$$\therefore \frac{3}{4} \text{ th of total journey}$$

$$= \frac{3}{4} \times 400 = 300 \text{ km.}$$

$$\text{Time taken} = \frac{\text{Distance}}{\text{Speed}}$$

$$= \frac{300}{30} = 10 \text{ hours}$$

$$\text{Remaining time} = \frac{25}{2} - 10$$

$$= \frac{25-20}{2} = \frac{5}{2} \text{ hours}$$

Remaining distance
= 100 km.
∴ Required speed of car

$$= \frac{100}{\frac{5}{2}} = \frac{100 \times 2}{5} = 40 \text{ kmph.}$$

32. (3) Durga's average speed

$$= \left(\frac{2xy}{x+y}\right) \text{ kmph.}$$

$$= \left(\frac{2 \times 5 \times 15}{5+15}\right) \text{ kmph.}$$

$$= \left(\frac{2 \times 5 \times 15}{20}\right) \text{ kmph}$$

$$= \frac{15}{2} \text{ kmph}$$

Distance of School = 5 km.

$$\text{Smriti's speed} = \frac{15}{4} \text{ kmph}$$

$$\therefore \text{Required time} = 2\left(\frac{5}{\frac{15}{4}}\right) \text{ hours}$$

$$= \left(\frac{2 \times 5 \times 4}{15}\right) = \frac{8}{3} \text{ hours}$$

$$= \left(\frac{8}{3} \times 60\right) \text{ minutes}$$

= 160 minutes

33. (4) Here, distances are equal.

$\therefore$ Average speed

$= \left(\frac{2xy}{x+y}\right)$ kmph.

$= \left(\frac{2 \times 32 \times 40}{32+40}\right)$ kmph.

$= \left(\frac{2 \times 32 \times 40}{72}\right)$ kmph.

$= \left(\frac{320}{9}\right)$ kmph. = 35.55 kmph.

34. (1) Here, distance is same.

$\therefore$ Average speed $= \frac{2xy}{x+y}$

$= \left(\frac{2 \times 40 \times 60}{40+60}\right)$ kmph.

$= \left(\frac{2 \times 40 \times 60}{100}\right)$ kmph.

= 48 kmph.

35. (2) Total distance covered by the bus = 150 km. + 2 × 60 km.

= (150 + 120) km.

= 270 km.

$\therefore$ Average speed

$= \frac{\text{Total distance}}{\text{Time taken}}$

$= \frac{270}{5}$ = 54 kmph.

36. (3) Here distances are same.

$\therefore$ Average speed $= \left(\frac{2xy}{x+y}\right)$ kmph

$= \left(\frac{2 \times 12 \times 10}{12+10}\right)$ kmph

$= \left(\frac{240}{22}\right)$ kmph

= 10.9 kmph

37. (1) Total distance covered

= (50 + 40 + 90) km

= 180 km

Time $= \frac{\text{Distance}}{\text{Speed}}$

$\therefore$ Total time taken

$= \left(\frac{50}{25} + \frac{40}{20} + \frac{90}{15}\right)$ hours

= (2 + 2 + 6) hours

= 10 hours

$\therefore$ Average speed

$= \frac{\text{Total distance}}{\text{Total time taken}}$

$= \frac{180}{10}$ = 18 kmph

38. (1) Distance = Speed × Time

= (80 × 7) km.

= 560 km.

39. (4) Required speed of car

$= \frac{\text{Distance}}{\text{Time}}$

$= \left(\frac{216}{3.2}\right)$ kmph.

$= \left(\frac{216}{3.2} \times \frac{5}{18}\right)$ m./sec.

= 18.75 m./sec.

TYPE-VII

1. (3) Let the distance of destination be D km

Let the speed of A = 3x km/hr

then speed of B = 4x km/hr

$\therefore$ According to question,

$\frac{D}{3x} - \frac{D}{4x}$ = 30 minutes

$= \frac{1}{2}$ hr

$\therefore \frac{D}{12x} = \frac{1}{2}$

$\Rightarrow \frac{D}{3x} = \frac{4}{2}$ = 2 hours

Hence, time taken by A to reach destination = 2hrs.

Aliter : Using Rule 9,

Here, S_1 = 3x, S_2 = 4x

t_2 = y, t_1 = y + $\frac{30}{60}$ = $y + \frac{1}{2}$

$S_1t_1 = S_2t_2$

$3x \times \left(y + \frac{1}{2}\right) = 4 \text{ x} \times \text{y}$

$3y + \frac{3}{2} = 4y$

$y = \frac{3}{2}$

$\therefore$ Time taken by A

$= \frac{3}{2} + \frac{1}{2}$ = 2 hrs.

2. (1) Ratio of speed = 3 : 4

Ratio of time taken = 4 : 3

Let the time taken by A and B be $4x$ hours and 3 x hours respectively.

Then, $4x - 3x = \frac{20}{60} \Rightarrow x = \frac{1}{3}$

$\therefore$ Time taken by A = $4x$ hours

$= \left(4 \times \frac{1}{3}\right)$ hours = $1\frac{1}{3}$ hours

Aliter : Using Rule 9,

Here, S_1 = 3x, S_2 = 4x

t_2 = y, t_1 = $y + \frac{20}{60}$ = $y + \frac{1}{3}$

$S_1t_1 = S_2t_2$

$3x\left(y + \frac{1}{3}\right) = 4xy$

3y + 1 = 4y, y = 1

$\therefore$ Time taken by A

$= 1 + \frac{1}{3} = 1\frac{1}{3}$ hours

3. (3) Required ratio

$= \frac{5}{6} : \frac{3}{5} = \frac{30 \times 5}{6} : \frac{30 \times 3}{5}$

= 25 : 18

4. (2)

AC = Distance covered by train starting from A in 3 hours

= 50 × 3 = 150 km

BC = Distance covered by train starting from B in 2 hours

= 60 ×2 = 120 km

$\therefore$ AC : BC = 150 : 120 = 5 : 4

5. (2) Using Rule 11,

Required ratio of the speed of two trains $= \frac{\sqrt{9}}{\sqrt{4}} = \frac{3}{2}$ or 3 : 2

6. (3) Using Rule 1,

Speed of second train

$= \frac{364}{4}$ = 91 kmph

$\therefore$ $7x \equiv 91$

$\Rightarrow 6x \equiv \frac{91}{7x} \times 6x \equiv$ 78 kmph

7. (3) Using Rule 1,

Speed of truck

= 550m/minute

Speed of bus $= \frac{33000}{45}$ m/minute

or $\frac{2200}{3}$ m/minute

$\therefore$ Required ratio $= 550 : \frac{2200}{3}$

$= 1 : \frac{4}{3} = 3 : 4$

8. (2) Required ratio $= \frac{1}{3} : \frac{2}{2} : \frac{3}{1}$

$= \frac{1}{3} : 1 : 3$

$\frac{1}{3} \times 3 : 1 \times 3 : 3 \times 3$

$\left[\because \text{ Speed} = \frac{\text{Distance}}{\text{Time}}\right]$

$= 1 : 3 : 9$

9. (3) The winner will pass the other, one time in covering 1600m. Hence, the winner will pass the other 3 times in completing 5km race.

10. (3) Using Rule 1,
Distance covered on the first day

$= \frac{4}{5} \times 70 = 56$ km

$\therefore$ Required ratio $= 42 : 56$
$= 3 : 4$

11. (1) Using Rule 1,
Let speed of cyclist $= x$ kmph
& Time $= t$ hours

Distance $= \frac{xt}{2}$ while time $= 2t$

$\therefore$ Required ratio $= \frac{xt}{2 \times 2t} : x$

$= 1 : 4$

12. (3) Using Rule 1,
Speed of train $= x$ kmph
Speed of car $= y$ kmph
Case I,

$\frac{120}{x} + \frac{600-120}{y} = 8$

$\Rightarrow \frac{120}{x} + \frac{480}{y} = 8$

$\Rightarrow \frac{15}{x} + \frac{60}{y} = 1$ ...(i)

Case II,

$\frac{200}{x} + \frac{400}{y} = 8$ hours 20 minutes

$\Rightarrow \frac{200}{x} + \frac{400}{y} = 8\frac{1}{3}$ hours

$= \frac{25}{3}$

$\Rightarrow \frac{8}{x} + \frac{16}{y} = \frac{1}{3}$

$\Rightarrow \frac{24}{x} + \frac{48}{y} = 1$ .....(ii)

$\therefore \frac{15}{x} + \frac{60}{y} = \frac{24}{x} + \frac{48}{y}$

$\Rightarrow \frac{24}{x} - \frac{15}{x} = \frac{60}{y} - \frac{48}{y}$

$\Rightarrow \frac{9}{x} = \frac{12}{y} \Rightarrow \frac{x}{y} = \frac{9}{12} = \frac{3}{4} = 3 : 4$

13. (2) Let the speed of train be x kmph. and the speed of car be y kmph.

Time $= \frac{\text{Distance}}{\text{Speed}}$

According to the question,

$\frac{120}{x} + \frac{480}{y} = 8$

$\Rightarrow \frac{15}{x} + \frac{60}{y} = 1$ ..... (i)

and, $\frac{200}{x} + \frac{400}{y} = \frac{25}{3}$

$\Rightarrow \frac{8}{x} + \frac{16}{y} = \frac{1}{3}$

$\Rightarrow \frac{24}{x} + \frac{48}{y} = 1$ ..... (ii)

From equations (i) and (ii),

$\Rightarrow \frac{24}{x} + \frac{48}{y} = \frac{15}{x} + \frac{60}{y}$

$\Rightarrow \frac{24}{x} - \frac{15}{x} = \frac{60}{y} - \frac{48}{y}$

$\Rightarrow \frac{9}{x} = \frac{12}{y}$

$\Rightarrow \frac{x}{y} = \frac{9}{12} = \frac{3}{4} = 3 : 4$

14. (3) Speed of truck $= \frac{550 \text{ metre}}{60 \text{ second}}$

$= \left(\frac{55}{6}\right)$ m./sec.

Speed of bus $= \frac{33 \times 1000 \text{ metre}}{\frac{3}{4} \times 60 \times 60 \text{ second}}$

$= \frac{440}{36}$ m./sec.

$\therefore$ Required ratio $= \frac{55}{6} : \frac{440}{36}$

$= 55 \times 6 : 440$
$= 3 : 4$

15. (1) Speed $= \frac{\text{Distance}}{\text{Time}}$

$\therefore$ Speed of car : Speed of train

$= \frac{80}{2} : \frac{180}{3} = 40 : 60 = 2 : 3$

16. (3) Speed $\propto \frac{1}{\text{Time}}$

$\therefore$ Required ratio of time

$= 1 : \frac{1}{3} : \frac{1}{5}$

$= 15 : \frac{1}{3} \times 15 : \frac{1}{5} \times 15$

$= 15 : 5 : 3$

TYPE-VIII

1. (1) Using Rule 12,
Relative speed of police
$= 11 - 10 = 1$ kmph

$= \frac{5}{18} m/\text{sec}$

$\therefore$ Distance decreased in 6 minutes $= \frac{5}{18} \times 6 \times 60 = 100$ m

$\therefore$ Distance remained between them $= 200 - 100 = 100$ m

2. (1) Suppose the speed of first train be x kmph
Speed of second train
$= 30$ kmph

$= \frac{30 \times 1000}{60} = 500$ m per min.

$\therefore$ According to question

$\frac{\text{Total Distance}}{\text{Relative speed}}$

$= \frac{(66+88)}{x-500} = 0.168$

$\Rightarrow \frac{154}{x-500} = 0.168$

$\Rightarrow 0.168x - 84 = 154$
$\Rightarrow 0.168x = 238$

$\Rightarrow x = \frac{238}{0.168}$

$= \left(\frac{238 \times 1000}{168}\right)$ m per minute

$= \frac{238 \times 1000}{168} \times \frac{3}{50}$ kmph

$= 85$ kmph

3. (1) Using Rule 1,
The gap of 114 metre will be filled at relative speed. Required time

$= \left(\frac{114}{21-15}\right)$ minutes

$= \frac{114}{6} = 19$ minutes

4. (4) Both trains are moving in the same direction.
∴ Their relative speed
= (68 – 50) kmph = 18 kmph

$= 18 \times \frac{5}{8} = 5$ m/sec

Total length = 50 + 75 = 125 m
∴ Required time

$= \frac{\text{Total length}}{\text{Relative speed}}$

$= \frac{125}{5} = 25$ seconds.

5. (2) The constable and thief are running in the same direction
∴ Their relative speed
= 8 – 7 = 1km.

$= 1 \times \frac{5}{18}$ m/sec.

∴ Required time $= \frac{200}{\frac{5}{18}}$

$= \frac{200 \times 18}{5} = 720$ sec

$= \frac{720}{60}$ minutes = 12 minutes

6. (4) Relative speed
= (58 – 30) km/hr

$= \left(28 \times \frac{5}{18}\right)$ m/sec. $= \frac{70}{9}$ m/sec.

∴ Length of train $= \frac{70}{9} \times 18$

= 140 metres

7. (3) Relative speed
= 56 – 29 = 27 kmph

$= 27 \times \frac{5}{18} = \frac{15}{2}$ m/sec

∴ Distance covered in 10 seconds

$= \frac{15}{2} \times 10 = 75$ m

Hence, length of train = 75 m.

8. (1) Let the speed of the truck be x kmph
Relative speed of the bus

$= (45 - x)$ kmph

∴ Time $= \frac{\text{Distance}}{\text{Relative speed}}$

$\Rightarrow \frac{30}{60 \times 60} = \frac{\frac{150}{1000}}{(45-x)}$

$\Rightarrow \frac{1}{120} = \frac{15}{100(45-x)}$

$\Rightarrow \frac{1}{6} = \frac{3}{(45-x)} \Rightarrow (45 - x) = 18$

$\Rightarrow x = 45 - 18 = 27$ kmph

9. (2) Let the length of each train be x metre.
Relative speed
= 46 – 36 = 10 kmph

$= \frac{10 \times 5}{18}$ metre/second

$= \frac{25}{9}$ metre/second

$\therefore \frac{2x}{\frac{25}{9}} = 36$

$\Rightarrow 2x = \frac{36 \times 25}{9} = 100$

$\Rightarrow x = 50$ metre

10. (3) Relative speed
= 45– 40 = 5 kmph
∴ Required distance

$= \left(5 \times \frac{45}{60}\right)$ km

$= \frac{15}{4}$ km = 3 km 750

11. (3) Let the speed of Scooter be x
Distance covered by cycling in

$3\frac{1}{2}$ hours = Distance covered

by scooter in $2\frac{1}{4}$ hours

$\Rightarrow 12 \times \frac{7}{2} = x \times \frac{9}{4}$

$\Rightarrow x = \frac{12 \times 7 \times 2}{9}$

$= \frac{56}{3} = 18\frac{2}{3}$ kmph

12. (2) Relative speed

$= \frac{1000}{8} - \frac{1000}{10}$

$= \frac{5000 - 4000}{40} = \frac{1000}{40}$ m/minute

∴ Required time

$= \frac{100}{\frac{1000}{40}} = \frac{4000}{1000} = 4$ m/minute

∴ Distance covered by the thief

$= \frac{1000}{10} \times 4 = 400$ metres

13. (3) Relative speed = 40 – 20
= 20 km/hour

$= \frac{20 \times 5}{18}$ m/sec.

∴ Length of the faster train

$= \frac{20 \times 5}{18} \times 5$ metres

$= \frac{250}{9} = 27\frac{7}{9}$ metres

14. (4) Distance = Speed × Time
= 80 × 4.5 = 360 km

∴ Required speed $= \frac{360}{4}$

= 90 kmph.

15. (2) Required time

$= \frac{\text{Sum of the lengths of trains}}{\text{Relative speed}}$

Relative speed = 65 + 55
= 120 kmph

$= \frac{120 \times 5}{18}$ m/sec

Required time $= \frac{180 + 120}{\frac{120 \times 5}{18}}$

$= \frac{300 \times 18}{120 \times 5} = 9$ seconds

16. (1) When two trains cross each other, they cover distance equal to the sum of their length with relative speed.
Let length of each train = x metre
Relative speed = 90 – 60
= 30 kmph

$= \left(\frac{30 \times 5}{18}\right)$ m/sec.

$= \left(\frac{25}{3}\right)$ m/sec.

$\therefore \dfrac{2x}{\frac{25}{3}} = 30$

$\Rightarrow 2x = \dfrac{30 \times 25}{3}$

$\Rightarrow 2x = 250$

$\Rightarrow x = 125$ metres

17. (4) Relative speed = 35 – 25
= 10 kmph

$= \dfrac{10 \times 5}{18}$ m/sec.

Total length = 80 + 120
= 200 metres

$\therefore$ Required time

$= \dfrac{\text{Sum of the length of trains}}{\text{Relative speed}}$

$= \dfrac{200}{\frac{10 \times 5}{18}} = \dfrac{200 \times 18}{10 \times 5}$

= 72 seconds

18. (1) Distance covered by the first goods train in 8 hours = Distance covered by the second goods train in 6 hours.

$\Rightarrow 18 \times 8 = 6 \times x$

$\Rightarrow x = \dfrac{18 \times 8}{6} = 24$ kmph

19. (3) Relative speed
= (33 + 39) kmph
= 72 kmph

$= \left(\dfrac{72 \times 5}{18}\right)$ m/sec.

= 20 m/sec.

$\therefore$ Time taken in crossing

$= \dfrac{\text{Length of both trains}}{\text{Relative speed}}$

$= \dfrac{125 + 115}{20} = \dfrac{240}{20}$

= 12 seconds

20. (2) Distance covered by the thief in half an hour $= \dfrac{1}{2} \times 40 = 20$ km

Relative speed of car owner
= 50 – 40 = 10 km

$\therefore$ Required time

$= \dfrac{\text{Difference of distance}}{\text{Relative speed}}$

$= \dfrac{20}{10} = 2$ hours

i.e. at 4 p.m.

21. (1) Length of each train
= x metre

Relative speed = 46 – 36
= 10 kmph

$= \left(10 \times \dfrac{5}{18}\right)$ m/sec

$= \dfrac{25}{9}$ m/sec

$\therefore$ Time taken in crossing

$= \dfrac{\text{Length of both trains}}{\text{Relative speed}}$

$\Rightarrow 36 = \dfrac{2x}{\frac{25}{9}}$

$\Rightarrow 2x = 36 \times \dfrac{25}{9} = 100$

$\Rightarrow x = \dfrac{100}{2} = 50$ metre

22. (3) Let both trains meet after t hours.

$\therefore$ Distance = speed × time

$\therefore 60t - 50t = 120$

$\Rightarrow 10t = 120 \Rightarrow t = 12$ hours

$\therefore$ Required distance

$= 60t + 50t$

$= 110t = 110 \times 12$

= 1320 km

23. (3)

Let both cars meet at C after t hours.

$\therefore$ Distance covered by car A
= AC = $35t$ km

Distance covered by car B
= BC = $25t$ km

$\therefore$ AC – BC = AB = 60 km.

$\Rightarrow 35t - 25t = 60$

$\Rightarrow 10t = 60$

$\Rightarrow t = \dfrac{60}{10} = 6$ hours

24. (2) Let the speed of train C be x kmph.

$\therefore$ Relative speed of B
= $(100 - x)$ kmph.

$\therefore$ Time taken in crossing

$= \dfrac{\text{Length of both trains}}{\text{Relative speed}}$

$\Rightarrow \dfrac{2}{60} = \dfrac{\left(\frac{150 + 250}{1000}\right)}{100 - x}$

$\Rightarrow \dfrac{1}{30} = \dfrac{2}{5(100 - x)}$

$\Rightarrow \dfrac{1}{6} = \dfrac{2}{100 - x}$

$\Rightarrow 100 - x = 12$

$\Rightarrow x = 100 - 12 = 88$ kmph.

25. (1) Let the speed of goods train be x kmph.

$\therefore$ Distance covered by goods train in 10 hour = distance covered by passenger train in 4 hours

$\Rightarrow 10x = 80 \times 4$

$\Rightarrow x = \dfrac{80 \times 4}{10} = 32$ kmph.

26. (4) Relative speed = 45 – 40
= 5 kmph.

$\therefore$ Gap between trains after 45 minutes $= \left(5 \times \dfrac{45}{60}\right)$ km.

= 3.75 km.

27. (3) Distance between thief and policeman = 400 metre

Relative speed of policeman with respect to thief
= (9 – 5) kmph
= 4 kmph

$= \left(\dfrac{4 \times 5}{18}\right)$ m./sec.

$= \dfrac{10}{9}$ m./sec.

Time taken in overtaking the thief

$= \left(\dfrac{400}{\frac{10}{9}}\right)$ second

$= \left(\dfrac{400 \times 9}{10}\right)$ second

= 360 second

$\therefore$ Distance covered by thief
= Speed × Time

$= \left(5 \times \dfrac{5}{18} \times 360\right)$ metre

= 500 metre

28. (4) Let the length of each train be x metre.

Relative speed = (46 – 36) kmph
= 10 kmph

$= \left(\dfrac{10 \times 5}{18}\right)$ m./sec.

$= \dfrac{25}{9}$ m./sec.

$\therefore \dfrac{2x}{\frac{25}{9}} = 36$

$\therefore 2x = 36 \times \dfrac{25}{9} = 100$

$\Rightarrow x = \dfrac{100}{2} = 50$ metre

TYPE-IX

1. (3) Time taken to cover 20 km at the speed of 5km/hr
= 4 hours.
∴ Fixed time = 4 hours – 40 minutes
= 3 hour 20 minutes
Time taken to cover 20 km at the speed of 8 km/hr $= \frac{20}{8}$ = 2 hours 30 minutes
∴ Required time = 3 hours 20 minutes – 2 hours 30 minutes = 50 minutes

2. (1) Since man walks at $\frac{2}{3}$ of usual speed, time taken wil be $\frac{3}{2}$ of usual time.

∴ $\frac{3}{2}$ of usual time
= usual time + 1 hour.

$\Rightarrow \left(\frac{3}{2}-1\right)$ of usual time = 1

⇒ usual time = 2 hours.

3. (3) Let x km. be the required distance.
Difference in time
= 2.5 + 5 = 7.5 minutes

$= \frac{7.5}{60}$ hrs. $= \frac{1}{8}$ hrs.

Now, $\frac{x}{8}-\frac{x}{10}=\frac{1}{8}$

$\Rightarrow \frac{5x-4x}{40}=\frac{1}{8}$

$\Rightarrow x = \frac{40}{8} = 5$ km.

Aliter : Using Rule 10,
Here, $S_1 = 8$, $t_1 = 2.5$
$S_2 = 10$, $t_2 = 5$

Distance $= \frac{(S_1 \times S_2)(t_1+t_2)}{S_2-S_1}$

$= \frac{(8 \times 10)(2.5+5)}{10-8}$

$= 40 \times \frac{7.5}{60} = 5$ km

4. (4) Let the distance be x km and initial speed be y kmph.
According to question,

$\frac{x}{y}-\frac{x}{y+3}=\frac{40}{60}$ ...(i)

and,

$\frac{x}{y-2}-\frac{x}{y}=\frac{40}{60}$ ...(ii)

From equations (i) and (ii),

$\frac{x}{y}-\frac{x}{y+3}=\frac{x}{y-2}-\frac{x}{y}$

$\Rightarrow \frac{1}{y}-\frac{1}{y+3}=\frac{1}{y-2}-\frac{1}{y}$

$\Rightarrow \frac{y+3-y}{y(y+3)}=\frac{y-y+2}{y(y-2)}$

⇒ 3 (y – 2) = 2 (y + 3)
⇒ 3y – 6 = 2y + 6
⇒ y = 12
From equation (i),

$\frac{x}{12}-\frac{x}{15}=\frac{40}{60} \Rightarrow \frac{5x-4x}{60}=\frac{2}{3}$

$\Rightarrow x = \frac{2}{3} \times 60 = 40$

∴ Distance = 40 km.

5. (3) If the distance be x km, then

$\frac{x}{40}-\frac{x}{50}=\frac{6}{60}$

$\Rightarrow \frac{x}{4}-\frac{x}{5}=1$

⇒ x = 20 km.
∴ Required time

$= \left(\frac{20}{40}\right)$ hour – 11 minutes

$= \left(\frac{1}{2} \times 60 - 11\right)$ minutes

= 19 minutes

6. (2) Let the required distance be x km.
Difference of time

= 6 + 6 = 12 minutes $= \frac{1}{5}$ hr.

According to the question,

$\frac{x}{\frac{5}{2}}-\frac{x}{\frac{7}{2}}=\frac{1}{5} \Rightarrow \frac{2x}{5}-\frac{2x}{7}=\frac{1}{5}$

$\Rightarrow \frac{14x-10x}{35}=\frac{1}{5}$

$\Rightarrow \frac{4x}{35}=\frac{1}{5} \Rightarrow x = \frac{35}{20} = \frac{7}{4}$ km.

Aliter : Using Rule 10,

Here, $S_1 = 2\frac{1}{2}$, $t_1 = 6$

$S_2 = 3\frac{1}{2}$, $t_2 = 6$

Distance $= \frac{(S_1 \times S_2)(t_1+t_2)}{S_2-S_1}$

$= \frac{\frac{5}{2} \times \frac{7}{2} \times (6+6)}{\frac{7}{2}-\frac{5}{2}}$

$= \frac{35}{4} \times \frac{12}{60} = \frac{7}{4}$ km

7. (4) Let the required distance be x km.
According to the question,

$\frac{x}{4}-\frac{x}{5}=\frac{18}{60}$

$\Rightarrow \frac{5x-4x}{20}=\frac{3}{10}$

$\Rightarrow x = \frac{3}{10} \times 20 = 6$ km

Aliter : Using Rule 10,
Here, $S_1 = 4$, $t_1 = 9$
$S_2 = 5$, $t_2 = 9$

Distance $= \frac{(S_1 \times S_2)(t_1+t_2)}{S_2-S_1}$

$= \frac{(4 \times 5)(9+9)}{5-4}$

$= 20 \times \frac{18}{60} = 6$ km

8. (2) Let the initial speed of the car be x kmph and the distance be y km.

Then, $y = \frac{9}{2}x$ ...(i)

and, $y = 4(x + 5)$ ...(ii)

∴ $\frac{9x}{2} = 4(x+5)$

⇒ 9x = 8x + 40
⇒ x = 40 kmph

9. (3) Let the distance of office be x km.

∴ $\frac{x}{24}-\frac{x}{30}=\frac{11}{60}$

$\Rightarrow \frac{5x-4x}{120} = \frac{11}{60}$

$\Rightarrow \frac{x}{120} = \frac{11}{60}$

$\Rightarrow x = \frac{11}{60} \times 120 = 22$ km.

Aliter : Using Rule 10,
Here, $S_1 = 24$, $t_1 = 5$
$S_2 = 30$, $t_2 = 6$

Distance $= \frac{(S_1 \times S_2)(t_1+t_2)}{S_2 - S_1}$

$= \frac{24 \times 30(5+6)}{30-24}$

$= \frac{720 \times 11}{6 \times 60} = 22$ km

10. (3) Let the required distance be x km.

Then, $\frac{x}{3} - \frac{x}{5} = \frac{24}{60}$

$\Rightarrow \frac{5x-3x}{15} = \frac{2}{5} \Rightarrow \frac{2x}{3} = 2$

$\Rightarrow 2x = 2 \times 3 \Rightarrow x = 3$ km

Aliter : Using Rule 10,
Here, $S_1 = 3$, $t_1 = 9$
$S_2 = 5$, $t_2 = 15$

Distance $= \frac{(S_1 \times S_2)(t_1+t_2)}{S_2 - S_1}$

$= \frac{(3 \times 5)(9+15)}{5-3}$

$= \frac{15}{2} \times \frac{24}{60} = 3$ km

11. (2) Let the required distance be x km.

$\frac{x}{\frac{5}{2}} - \frac{x}{3} = \frac{16}{60}$

$\Rightarrow \frac{2x}{5} - \frac{x}{3} = \frac{4}{15}$

$\Rightarrow \frac{6x-5x}{15} = \frac{4}{15} \Rightarrow x = 4$ km.

Aliter : Using Rule 10,

Here, $S_1 = 2\frac{1}{2}$, $t_1 = 6$

$S_2 = 3$, $t_2 = 10$

Distance $= \frac{(S_1 \times S_2)(t_1+t_2)}{S_2 - S_1}$

$= \frac{\frac{5}{2} \times 3(6+10)}{3 - \frac{5}{2}}$

$= 15 \times \frac{16}{60}$ km $= 4$ km

12. (3) Let the distance be x km.

$\therefore \frac{x}{10} - \frac{x}{12} = \frac{12}{60}$

$\Rightarrow \frac{6x-5x}{60} = \frac{1}{5}$

$\Rightarrow x = \frac{1}{5} \times 60 = 12$ km.

Aliter : Using Rule 10,
Here, $S_1 = 10$, $t_1 = 6$
$S_2 = 12$, $t_2 = 6$

Distance $= \frac{(S_1 \times S_2)(t_1+t_2)}{S_2 - S_1}$

$= \frac{(10 \times 12)(6+6)}{12-10}$

$= \frac{120 \times 12}{2}$

$= 60 \times \frac{12}{60}$ km $= 12$km

13. (1) Using Rule 1,
Let the distance between stations be x km, then speed of train

$= \frac{x}{\frac{45}{60}} = \frac{4x}{3}$ kmph

$\therefore \frac{x}{\frac{4x}{3} - 5} = \frac{48}{60}$

$\Rightarrow \frac{3x}{4x-15} = \frac{4}{5}$

$\Rightarrow 16x - 60 = 15x$

$\Rightarrow x = 60$ km

14. (2) Using Rule 1,

Speed of train $= \frac{\text{Distance}}{\text{Time}}$

$= \frac{10}{\frac{12}{60}}$ kmph

$= \frac{10 \times 60}{12} = 50$ kmph

New speed = 45 kmph

$\therefore$ Required time $= \frac{10}{45}$ hour

$= \frac{2}{9} \times 60$ minutes

$= \frac{40}{3}$ minutes

or 13 minutes 20 seconds

15. (2) Let the distance of the office be x km, then

$\frac{x}{5} - \frac{x}{6} = \frac{8}{60}$

$\Rightarrow \frac{6x-5x}{30} = \frac{2}{15}$

$\Rightarrow x = 2 \times 2 = 4$ km

Aliter : Using Rule 10,
Here, $S_1 = 5$, $t_1 = 6$
$S_2 = 6$, $t_2 = 2$

Distance $= \frac{(S_1 \times S_2)(t_1+t_2)}{S_2 - S_1}$

$= \frac{(6 \times 5) \times (6+2)}{6-5}$

$= 30 \times \frac{8}{60} = 4$ km

16. (2) Let the distance of school be x km, then

$\frac{x}{3} - \frac{x}{4} = \frac{20}{60}$

$\Rightarrow \frac{x}{12} = \frac{1}{3} \Rightarrow x = \frac{12}{3} = 4$ km

Aliter : Using Rule 10,
Here, $S_1 = 3$, $t_1 = 10$
$S_2 = 4$, $t_2 = 10$

Distance $= \frac{(S_1 \times S_2)(t_1+t_2)}{S_2 - S_1}$

$= \frac{(3 \times 4)(10+10)}{4-3}$

$= 12 \times \frac{20}{60} = 4$ km

17. (3) Using Rule 1
Distance between stations X and Y = Speed × Time
= 55 × 4 = 220 km.
New speed = 55 + 5 = 60 kmph

$\therefore$ Required time $= \frac{220}{60}$

$= \frac{11}{3}$ hours

= 3 hours 40 minutes.

$\therefore$ Required answer

= 4 hours – 3 hours 40 minutes

= 20 minutes

18. (3) Distance of journey $= x$ km

Difference of time = 12 – 3

= 9 minutes

$= \frac{9}{60}$ hour $= \frac{3}{20}$ hour

$\therefore \frac{x}{70} - \frac{x}{80} = \frac{3}{20}$

$\Rightarrow \frac{x}{7} - \frac{x}{8} = \frac{3}{2}$

$\Rightarrow \frac{8x - 7x}{56} = \frac{3}{2}$

$\Rightarrow \frac{x}{56} = \frac{3}{2}$

$\Rightarrow x = \frac{3}{2} \times 56 = 84$ km

$\therefore$ Required correct time

$= \frac{84}{70}$ hours – 12 minutes

$= \left(\frac{84}{70} \times 60 - 12\right)$ minutes

= 72 – 12 = 60 minutes

= 1 hour

TYPE-X

1. (4) Rule 10 and Rule 1,
Let the length of train be x metres

$\therefore$ According to question

Speed of the train $= \frac{x}{10}$ m/sec.

Also, the speed of the train

$= \left(\frac{x+50}{14}\right)$ m/sec.

[$\because$ It passes the platform in 14 seconds]

Both the speeds should be equal, i.e.,

$\frac{x}{10} = \frac{x+50}{14}$

or 14x = 10x + 500

or 14x – 10x = 500

or 4x = 500

$\therefore$ x = 125 metres

Hence, Speed $= \frac{125}{10} = 12.5$ m/sec.

$= \frac{12.5 \times 18}{5}$ km/hr.

= 45 km/hr.

2. (2) Rule 10 and Rule 1,
Let length of train be x m

$\therefore$ Speed of train $= \frac{x+264}{20}$

Also, speed of train $= \frac{x}{8}$

Obviously, $\frac{x}{8} = \frac{x+264}{20}$

$\Rightarrow \frac{x}{2} = \frac{x+264}{5}$

$\Rightarrow$ 5x = 2x + 528

$\Rightarrow$ 5x – 2x = 528

$\Rightarrow$ x = 528 ÷ 3 = 176 m

3. (4) Rule 10 and Rule 1,
Let the length of train be x metres.
Then, speed of train when it passes a telegraph post $= \frac{x}{8}$ m/sec.
and speed of train, when it passes the bridge $= \frac{x+264}{20}$

Clearly,

$\frac{x}{8} = \frac{x+264}{20}$

$\Rightarrow \frac{x}{2} = \frac{x+264}{5}$

$\Rightarrow 5x = 2x + 528$

$\Rightarrow 3x = 528$

$\Rightarrow x = \frac{528}{3} = 176$m

$\therefore$ Speed of train

$= \frac{176}{8} = 22$ m/sec.

$= 22 \times \frac{18}{5}$ Kmph

= 79.2 kmph

4. (1) Rule 10 and Rule 1,
Let the length of train be x metres.
When the train crosses the standing man, its speed $= \frac{x}{9}$
When the train crosses the platform of length 84 m, its speed

$= \frac{x+84}{21}$

Obviously, $\frac{x}{9} = \frac{x+84}{21}$

$\Rightarrow 21x - 9x = 9 \times 84$

$\Rightarrow 12x = 9 \times 84$

$\Rightarrow x = \frac{9 \times 84}{12} = 63\ m$

$\therefore$ Required speed $= \frac{63}{9}$ m/sec

$= \frac{63}{9} \times \frac{18}{5}$ kmph = 25.2 kmph

5. (4) Rule 10 and Rule 1,
Suppose length of train be x
According to question

$\frac{x+50}{14} = \frac{x}{10}$

$\Rightarrow 14x = 10x + 500$

$\Rightarrow 4x = 500$

$\Rightarrow x = \frac{500}{4} = 125$ m

Therefore, speed

$= \frac{125}{10} \times \frac{18}{5} = 45$ kmph

6. (4) Rule 10 and Rule 1,
Let the length of the train be x
According to the question,
Speed of the train

$= \frac{x+90}{30} = \frac{x}{15}$

$\Rightarrow x + 90 = 2x$

$\Rightarrow x = 90$ m

$\therefore$ Speed of train $= \frac{90}{15}$

$= 6$ m/s $= 6 \times \frac{18}{5}$ kmph

= 21.6 kmph

7. (3) Rule 10 and Rule 1,
Let the length of the train be x metre
Speed of train when it crosses man $= \frac{x}{10}$
Speed of train when it crosses platform $= \frac{x+300}{25}$
According to the question,

Speed of train $= \frac{x}{10} = \frac{x+300}{25}$

$\Rightarrow 25x = 10x + 3000$

$\Rightarrow 15x = 3000$

$\Rightarrow x = \frac{3000}{15} = 200$ metres

$\therefore$ Length of train = 200 metre

Speed of train $= \frac{x}{10} = \frac{200}{10}$

= 20 m/sce

$\therefore$ Time taken in crossing a 200 m long platform $= \frac{200+200}{20}$

= 20 seconds

8. (4) Rule 10 and Rule 1,
Let the length of the train be x metres.
Speed of train in crossing boy = $\frac{x}{30}$
Speed of train in crossing platform = $\frac{x+110}{40}$
According to the question,
$\frac{x+110}{40} = \frac{x}{30}$
$\Rightarrow \frac{x+110}{4} = \frac{x}{3}$
$\Rightarrow 4x = 3x + 330$
$\Rightarrow x = 330$ metres

9. (3) Rule 10 and Rule 1,
Let the length of train be x metre.
$\therefore \frac{x}{15} = \frac{x+100}{25}$
$\Rightarrow \frac{x}{3} = \frac{x+100}{5}$
$\Rightarrow 5x = 3x + 300$
$\Rightarrow 2x = 300$
$\Rightarrow x = \frac{300}{2} = 150$ metres

10. (2)

Let speed of car starting from A be x kmph
and speed of car starting from B be y kmph
Case I
When cars meet at P,
$7x = AP = AB + BP = 70 + 7y$
$\Rightarrow 7x - 7y = 70$
$\Rightarrow x - y = 10$ ...(i)
Case II
When cars meet at Q,
$x + y = 70$ ...(ii)
On adding these equations,
$x = 40$ kmph
Putting the value of x in equation (i),
$y = 40 - 10 = 30$ kmph

11. (2) Let the speed of trains be x and y metre/sec respectively,
$\frac{100+95}{x-y} = 27$
$\Rightarrow x - y = \frac{195}{27} = \frac{65}{9}$ .....(i)
Again,
$\frac{195}{x+y} = 9$
$\Rightarrow x + y = \frac{195}{9}$ .....(ii)
By equation (i) + (ii)
$2x = \frac{65}{9} + \frac{195}{9} = \frac{260}{9}$
$\Rightarrow x = \frac{260}{2 \times 9} = \frac{130}{9}$ m/sec.
$= \left(\frac{130}{9} \times \frac{18}{5}\right)$ kmph = 52 kmph
From equation (ii),
$y = \frac{195}{9} - \frac{130}{9} = \frac{65}{9}$ m/sec.
$= \frac{65}{9} \times \frac{18}{5} = 26$ kmph

12. (2) Rule 10 and Rule 1,
Let the length of train be x metre, then
$\therefore$ Speed of train
$= \frac{x}{7} = \frac{x+390}{28}$
$\Rightarrow x = \frac{x+390}{4}$
$\Rightarrow 4x - x = 390$
$\Rightarrow x = \frac{390}{3} = 130$ metres

13. (3) Rule 10 and Rule 1,
Speed of train = 36 kmph
$= 36 \times \frac{5}{18} = 10$ m/sec
Length of train = 10 × 10
= 100 metres
$\therefore$ Required time = $\frac{100+55}{10}$
$= 15\frac{5}{10} = 15\frac{1}{2}$ second
= 15.5 seconds

14. (2) Rule 10 and Rule 1,
Speed of train = 60 kmph
$= \left(60 \times \frac{5}{18}\right)$ m/sec.
$= \frac{50}{3}$ m/sec.
If the length of platform be = x metre, then
Speed of train
$= \frac{\text{Length of (train + platform)}}{\text{Time taken in crossing}}$
$\Rightarrow \frac{50}{3} = \frac{200+x}{30}$
$\Rightarrow 50 \times 10 = 200 + x$
$\Rightarrow x = 500 - 200 = 300$ metre

15. (4) Let both trains meet after t hours since 7 a.m.
Distance between stations A and B = x Km.
$\therefore \frac{x}{4} \times t + \frac{x}{\frac{7}{2}} \times (t - 1) = x$
$\left[\text{Speed} = \frac{\text{Distance}}{\text{Time}}\right]$
$\Rightarrow \frac{t}{4} + \frac{2(t-1)}{7} = 1$
$\Rightarrow \frac{7t + 8t - 8}{28} = 1$
$\Rightarrow 15t - 8 = 28$
$\Rightarrow 15t = 28 + 8 = 36$
$\Rightarrow t = \frac{36}{15} = \frac{12}{5}$ hours
= 2 hours 24 minutes
$\therefore$ Required time = 9 :24 a.m.

16. (2) Speed of train = 72 kmph.
$= \left(\frac{72 \times 5}{18}\right)$ m./sec.
= 20 m./sec.
Required time
$= \frac{\text{Length of train and bridge}}{\text{Speed of train}}$
$= \left(\frac{110+132}{20}\right)$ seconds
$= \left(\frac{242}{20}\right)$ seconds
= 12.1 seconds

17. (2) Relative speed of train = (60 + 6) kmph.
$= \left(\frac{66 \times 5}{18}\right)$ m/sec.
$= \frac{55}{3}$ m/sec.
Length of train = 110 metre
$\therefore$ Required time = $\left(\frac{110}{\frac{55}{3}}\right)$ seconds
$= \left(\frac{110 \times 3}{55}\right)$ seconds
= 6 seconds

TYPE-XI

1. (2) Let the time taken to complete the race by A,B, and C be x minutes.

$\therefore$ Speed of A = $\frac{1000}{x}$,

B = $\frac{1000-50}{x} = \frac{950}{x}$

C = $\frac{1000-69}{x} = \frac{931}{x}$

Now, time taken to complete the race by

B = $\frac{1000}{\frac{950}{x}} = \frac{1000 \times x}{950}$

and distance travelled by C in

$\frac{1000x}{950}$ min

$= \frac{1000x}{950} \times \frac{931}{x} = 980$ km.

$\therefore$ B can allow C

= 1000 – 980 = 20 m

2. (4) Ratio of the speed of A, B and C = 6 : 3 : 1

$\Rightarrow$ Ratio of the time taken

$= \frac{1}{6} : \frac{1}{3} : 1 = 1 : 2 : 6$

$\therefore$ Time taken by A

$= \frac{72}{6} = 12$ minutes

3. (2) Let A take x seconds in covering 1000m and b takes y seconds

According to the question,

$x + 20 = \frac{900}{1000}y$

$\Rightarrow x + 20 = \frac{9y}{10}$ ...(i)

and, $\frac{950}{1000}x + 25 = y$ ...(ii)

From equation (i),

$\frac{10x}{9} + \frac{200}{9} = y$

$\Rightarrow \frac{10x}{9} + \frac{200}{9} = \frac{950x}{1000} + 25$

$\Rightarrow \frac{10x}{9} + \frac{200}{9} = \frac{19x}{20} + 25$

$\Rightarrow \frac{10x}{9} - \frac{19x}{20} = 25 - \frac{200}{9}$

$\Rightarrow \frac{200x - 171x}{180} = \frac{225-200}{9}$

$\Rightarrow \frac{29x}{180} = \frac{25}{9}$

$\Rightarrow x = \frac{25}{9} \times \frac{180}{29} = \frac{500}{29}$

seconds.

4. (3) Time taken by Kamal

$= \frac{100}{18 \times \frac{5}{18}} = 20$ seconds

$\therefore$ Time taken by Bimal

= 20 + 5 = 25 seconds

$\therefore$ Bimal's speed = $\frac{100}{25}$ =4 m/sec

$= \frac{4 \times 18}{5}$ kmph = 14.4 kmph.

5. (1) When A runs 1000m, B runs 900m.

$\therefore$ When A runs 500m, B runs 450 m.

Again, when B runs 400m, C runs 360 m.

$\therefore$ When B runs 450m, C runs

$= \frac{360}{400} \times 450 = 405$ metres

Required distance = 500 – 405

= 95 metres

6. (1) According to the question,

$\therefore$ When A runs 800 metres, B runs 760 metres

$\therefore$ When A runs 200 metres, B runs $= \frac{760}{800} \times 200 = 190$ metres

Again, when B runs 500 metres, C runs 495 metres.

$\therefore$ When B runs 190 metres, C runs $= \frac{495}{500} \times 190 = 188.1$ metres

$\therefore$ Hence, A will beat C by 200 – 188.1 = 11.9 metres in a race of 200 metres.

7. (3) According to the question,

$\because$ When B runs 200 m metres, A runs 190 metres

$\therefore$ When B runs 180 metres, A runs $= \frac{190}{200} \times 180 = 171$ metres

When C runs 200m, B runs 180 metres.

Hence, C will give a start to A by

= 200 – 171 = 29 metres

8. (2) According to the question,

When A covers 1000m, B covers

= 1000 – 40 = 960 m

and C covers =1000 – 70 = 930 m

When B covers 960m, C covers 930 m.

$\therefore$ When B covers 1000m, C covers $= \frac{930}{960} \times 1000$

= 968.75 metre

Hence, B gives C a start of

= 1000 – 968.75 = 31.25 metre

9. (2) Relative speed

= 95 – 75 = 15 kmph

Required time = $\frac{\text{Distance}}{\text{Relative speed}}$

$= \frac{5}{15}$ hours $= \frac{5}{15} \times 60$ minutes

= 20 minutes

10. (1) Time taken by C = t hours

$\therefore$ Time taken by B = $\frac{t}{3}$ hours

and time taken by A = $\frac{t}{6}$ hours

Here, $t = \frac{3}{2}$ hours

$\therefore$ Required time taken by A

$= \frac{3}{\frac{2}{6}}$ hour

$= \frac{1}{4}$ hour

$= \left(\frac{1}{4} \times 60\right)$ minutes

= 15 minutes

11. (3) 2 hours 45 minutes

$= \left(2 + \frac{45}{60}\right)$ hours

$= \left(2 + \frac{3}{4}\right)$ hours $= \frac{11}{4}$ hours

$\therefore$ Distance = Speed × Time

$= 4 \times \frac{11}{4} = 11$ km.

$\therefore$ Time taken in covering 11 km at 16.5 kmph

$= \frac{11}{16.5}$ hour

$= \left(\frac{11 \times 10 \times 60}{165}\right)$ minutes

= 40 minutes

12. (2) Let the total distance be x km.

Time = $\frac{\text{Distance}}{\text{Speed}}$

According to the question,

$\frac{10}{6} + \frac{20}{16} + \frac{x-30}{3} = 4\frac{35}{60}$

$= 4\frac{7}{12}$

$$\Rightarrow \frac{5}{3} + \frac{5}{4} + \frac{x}{3} - 10 = \frac{55}{12}$$

$$\Rightarrow \frac{x}{3} + \frac{5}{3} + \frac{5}{4} - 10 = \frac{55}{12}$$

$$\Rightarrow \frac{x}{3} + \left(\frac{20+15-120}{12}\right) = \frac{55}{12}$$

$$\Rightarrow \frac{x}{3} - \frac{85}{12} = \frac{55}{12}$$

$$\Rightarrow \frac{x}{3} = \frac{85}{12} + \frac{55}{12} = \frac{140}{12}$$

$$\Rightarrow x = \frac{140}{12} \times 3 = 35 \text{ km.}$$

13. (1) Usual time = x minutes

New time = $\frac{4x}{3}$ minutes

$$\left(\because \text{ Speed} \propto \frac{1}{\text{Time}}\right)$$

According to the question,

$$\frac{4x}{3} - x = 20$$

$$\Rightarrow \frac{x}{3} = 20$$

$\Rightarrow x = 60$ minutes i.e. 1 hour.

14. (2) Let, A's speed = x kmph.

$\therefore$ B's speed = $(7 - x)$ kmph

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

According to the question,

$$\frac{24}{x} + \frac{24}{7-x} = 14$$

$$\Rightarrow 24\left(\frac{7-x+x}{x(7-x)}\right) = 14$$

$$\Rightarrow \frac{24 \times 7}{x(7-x)} = 14$$

$\Rightarrow x(7 - x) = 12 = 4 \times 3$ or 3×4

$\Rightarrow x(7 - x) = 4(7 - 4)$ or $3(7 - 3)$

$\Rightarrow x = 4$ or 3

$\therefore$ A's speed = 4 kmph.

15. (3) Relative speed

= 12 + 10 = 22 kmph

Distance covered

= 55 – 11 = 44 km

$\therefore$ Required time

$$= \left(\frac{44}{22}\right) \text{ hours}$$

= 2 hours

16. (2) Required time = LCM of 40 and 50 seconds

= 200 seconds

17. (1) Distance between starting point and multiplex = x metre

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

According to the question,

$$\frac{x}{3} - \frac{x}{4} = \frac{5+5}{60} \Rightarrow \frac{4x-3x}{12} = \frac{1}{6}$$

$$\Rightarrow \frac{x}{12} = \frac{1}{6} \Rightarrow x = \frac{12}{6} = 2 \text{ km.}$$

TYPE-XII

1. (2) Two ways walking time = 55 min ...(i)

One way walking + One way riding time = 37 min. ....(ii)

By 2 × (ii) – (i),

2 ways riding time

= 2×37–55 = 19 minutes.

2. (3) Let the distance be x km

Time taken by $A = \frac{x}{40}$ hrs.

Time taken by $B = \frac{x}{50}$ hrs.

Now, $\frac{x}{40} - \frac{x}{50} = \frac{15}{60}$

$$\frac{5x-4x}{200} = \frac{15}{60}$$

$$\therefore x = \frac{15}{60} \times 200 = 50\text{km}$$

Method 2 :

Distance

$$= \frac{\text{Product of speed}}{\text{Diff. of speed}} \times \text{Diff. in time}$$

$$= \frac{40 \times 50}{50-40} \times \frac{15}{60} = 50 \text{ km}$$

3. (4) Let the speed of man be x kmph.

$$\therefore 30x - 30\left(x - \frac{x}{15}\right) = 10$$

$$\Rightarrow 30\left(x - x + \frac{x}{15}\right) = 10$$

$$\Rightarrow \frac{x}{15} = \frac{10}{30}$$

$$\Rightarrow x = \frac{150}{30} = 5 \text{ kmph}$$

4. (1) Required time = LCM of 252, 308 and 198 seconds.

Now, 252 = 2 × 2 × 3 × 3 × 7

308 = 2 × 2 × 7 × 11

198 = 2 × 3 × 3 × 11

$\therefore$ LCM = 2 × 2 × 3 × 3 × 7 × 11

= 36 × 77 seconds

$$= \frac{36 \times 77}{60} \text{ minutes}$$

$$= \frac{231}{5} = 46 \text{ minutes } 12 \text{ seconds}$$

5. (4) Suppose, time taken while walking be x hours

And, time taken on riding be y hours

$\therefore$ According to question

$$x + y = 4\frac{1}{2} \text{ hours} \quad \text{...(i)}$$

Then, $2y = 3$ hours

$$y = 1\frac{1}{2} \text{ hours}$$

From equation (i)

$$x = 4\frac{1}{2} - 1\frac{1}{2} = 3 \text{ hours}$$

Time required to walk both ways = 6 hours

6. (4) Let the required distance be x km.

$$\therefore \frac{x}{\frac{9}{2}} + \frac{x}{3} = 5$$

$$\Rightarrow x\left(\frac{2}{9} + \frac{1}{3}\right) = 5 \Rightarrow x\left(\frac{2+3}{9}\right) = 5$$

$$\Rightarrow x = \frac{5 \times 9}{5} = 9 \text{ km.}$$

7. (4) Distance covered by A in 4 hours = 4 × 4 = 16 km

Relative speed of B with respect to A = 10 – 4 = 6 km/hr

$\therefore$ Time taken to catch A

$$= \frac{16}{6} = \frac{8}{3} \text{ hours}$$

$\therefore$ Required distance

$$= \frac{8}{3} \times 10 = \frac{80}{3}$$

= 26.67 km. ≈ 26.7 km

8. (2) Suppose distance be x km

$$\frac{x}{2 \times 40} + \frac{x}{2 \times 60} = 10$$

$$\Rightarrow \frac{x}{80} + \frac{x}{120} = 10$$

$$\Rightarrow \frac{3x + 2x}{240} = 10$$

$$\Rightarrow \frac{5x}{240} = 10$$

$x = 480$ km

9. (1) If A covers the distance of 1 km in x seconds, B covers the distance of 1 km in $(x + 25)$ seconds. If A covers the distance of 1 km, then in the same time C covers only 725 metres.

If B covers 1 km in $(x + 25)$ seconds, then C covers 1 km in $(x + 55)$ seconds.

Thus in x seconds, C covers the distance of 725 m.

$\therefore \frac{x}{725} \times 1000 = x + 55$

$\Rightarrow x = 145$

$\therefore$ A covers the distance of 1 km in 2 minutes 25 seconds.

10. (4)

Let O be the starting point. The car running at 36 kmph is moving along OB and that at 48 kmph moving along OA. Also let they reach at B and A respectively after 15 seconds.

$\therefore$ OA = $48 \times \frac{5}{18} \times 15 = 200$ m

and OB = $36 \times \frac{5}{18} \times 15 = 150$ m

$\therefore$ Required distance = AB

$= \sqrt{(200)^2 + (150)^2}$

W (By Pythagoras theorem)

$= \sqrt{40000 + 22500}$

$= \sqrt{62500} = 250$ m

11. (2) A beats B by 30 seconds and B beats C by 15 seconds.
Clearly, A beats C by 45 seconds.
Also, A beats C by 180 metres.
Hence, C covers 180 metres in 45 seconds.

$\therefore$ Speed of C = $\frac{180}{45}$ = 4 m/sec

$\therefore$ Time taken by C to cover 1000 m

$= \frac{1000}{4} = 250$ sec.

$\therefore$ Time taken by A to cover 1000 m = 250–45 = 205 sec.

12. (2) Difference of time
= 6 min. – 5 min. 52 sec.
= 8 seconds
Distance covered by man in 5 min. 52 seconds
= Distance covered by sound in 8 seconds
= 330 × 8 = 2640 m.
$\therefore$ Speed of man

$= \frac{2640\text{ m}}{5\text{ min.}52\text{ sec.}}$

$= \frac{2640}{352}$ m/sec

$= \frac{2640}{352} \times \frac{18}{5}$ kmph

= 27 kmph

13. (1) Let the required distance be x km.
Difference of time
= 15 + 5 = 20 minutes

$= \frac{1}{3}$ hour

According to the question,

$\frac{x}{35} - \frac{x}{42} = \frac{1}{3} \Rightarrow \frac{6x - 5x}{210} = \frac{1}{3}$

$\Rightarrow \frac{x}{210} = \frac{1}{3}$

$\Rightarrow x = \frac{210}{3} = 70$ km.

14. (3) $\left(1 - \frac{5}{6}\right)$ of time taken by B

=1 hour 15 minutes
$\therefore$ Time taken by B
= 1 hour 15 minutes × 6
=7 hours 30 minutes

15. (1) Abhay's speed = x kmph
Sameer's speed = y kmph

$\therefore \frac{30}{x} - \frac{30}{y} = 2$ ...(i)

and, $\frac{30}{y} - \frac{30}{2x} = 1$ ...(ii)

On adding,

$\frac{30}{x} - \frac{30}{2x} = 3$

$\Rightarrow \frac{60 - 30}{2x} = 3$

$\Rightarrow \frac{30}{2x} = 3 \Rightarrow 6x = 30$

$\Rightarrow x = 5$ kmph

16. (3) Time taken in walking both ways = 7 hours 45 minutes ....(i)
Time taken in walking one way and riding back = 6 hours 15 minutes ....(ii)
By equation (ii) × 2 – (i), we have
Time taken by the man to ride both ways
= 12 hours 30 minutes – 7 hours 45 minutes
= 4 hours 45 minutes

17. (1) Let the total distance be 100 km.
Average speed

$= \frac{\text{Total distance covered}}{\text{Time taken}}$

$= \frac{100}{\frac{30}{20} + \frac{60}{40} + \frac{10}{10}}$

$= \frac{100}{\frac{3}{2} + \frac{3}{2} + 1} = \frac{100}{\frac{3+3+2}{2}}$

$= \frac{100 \times 2}{8} = 25$ kmph

18. (2)

Let the speed of A = x kmph and that of B = y kmph
According to the question,
$x \times 6 + y \times 6 = 60$
$\Rightarrow x + y = 10$ ....(i)

and, $\frac{2}{3}x \times 5 + 2y \times 5 = 60$

$\Rightarrow 10x + 30y = 180$

$\Rightarrow x + 3y = 18$ ...(ii)

From equations (i) × (3) – (ii)
$3x + 3y - x - 3y = 30 - 18$
$\Rightarrow 12x = 12$
$\Rightarrow x = 6$ kmph.

19. (2)

Let the trains meet after t hours, then
$24t - 18t = 27$
$\Rightarrow 6t = 27$

$\Rightarrow t = \frac{27}{6} = \frac{9}{2}$ hours

$\therefore$ QR = $18t = 18 \times \frac{9}{2} = 81$ km

20. (3) Let the speed of Ravi be x kmph then, Ajay's speed = $(x + 4)$ kmph
Distance covered by Ajay
= 60 + 12 = 72 km
Distance covered by Ravi
= 60 – 12 = 48 km.
According to the question,

$\frac{72}{x+4} = \frac{48}{x}$

$\Rightarrow \frac{3}{x+4} = \frac{2}{x}$

$\Rightarrow 3x = 2x + 8$

$\Rightarrow x = 8$ kmph

21. (2) Let man walked for t hours.
then, $t \times 4 + (9 - t) \times 9 = 61$
$\Rightarrow 4t + 81 - 9t = 61$
$\Rightarrow 81 - 5t = 61$
$\Rightarrow 5t = 20$
$\Rightarrow t = 4$
$\therefore$ Distance travelled on foot
= 4 × 4 = 16 km.

22. (1) Let the required distance be x km, then

$\frac{x}{5} - \frac{x}{6} = \frac{12}{60} = \frac{1}{5}$

$\Rightarrow \frac{6x - 5x}{30} = \frac{1}{5} \Rightarrow \frac{x}{30} = \frac{1}{5}$

$\Rightarrow x = 6$ km.

23. (4) Let the required distance be x km.

$\therefore \frac{x}{3} - \frac{x}{4} = \frac{30}{60}$

$\Rightarrow \frac{x}{12} = \frac{1}{2} \Rightarrow x = \frac{1}{2} \times 12 = 6$ km

24. (2) Let the speed of train be x kmph and that of car be y kmph, then

$$\frac{60}{x}+\frac{240}{y}=4 \quad ...(i)$$

and, $\frac{100}{x}+\frac{200}{y}=\frac{25}{6}$

$$\Rightarrow \frac{4}{x}+\frac{8}{y}=\frac{1}{6} \quad ...(ii)$$

By equation (i) – equation (ii) × 30

$$\frac{60}{x}+\frac{240}{y}-\frac{120}{x}-\frac{240}{y}=4-5$$

$$\Rightarrow -\frac{60}{x}=-1$$

$\Rightarrow x = 60$ kmph

25. (2) Ratio of the speed of A and B = A : B = 2 : 1 = 6 : 3
B : C = 3 : 1
∴ A : B : C = 6 : 3 : 1
∴ Ratio of their time taken

$$=\frac{1}{6}:\frac{1}{3}:1 = 1:2:6$$

∴ Time taken by B

$$=\left(\frac{2}{6}\times 114\right) \text{ minutes}$$

= 38 minutes

26. (3) Let speed of train A = x kmph and speed of train B = y kmph

$$\therefore \frac{x}{y}=\sqrt{\frac{t_2}{t_1}}$$

$$\Rightarrow \frac{45}{y}=\sqrt{\frac{3+\frac{1}{3}}{4+\frac{48}{60}}}=\sqrt{\frac{\frac{10}{3}}{4+\frac{4}{5}}}$$

$$=\sqrt{\frac{10}{3}\times\frac{5}{24}}=\sqrt{\frac{25}{36}}=\frac{5}{6}$$

$$\Rightarrow 5y = 45\times 6 \Rightarrow y=\frac{45\times 6}{5}$$

= 54 kmph

27. (2) Total distance of trip

$$=\frac{1200\times 5}{2}=3000 \text{ km}$$

Part of journey covered by train

$$=1-\frac{2}{5}-\frac{1}{3}=\frac{15-6-5}{15}=\frac{4}{15}$$

∴ Distance covered by train

$$=3000\times\frac{4}{15}=800 \text{ km}$$

28. (1) A's speed = $\frac{1000}{5}$

= 200 m/minute

B's speed = $\frac{1000}{8}$

= 125 m/minute

C's speed = $\frac{1000}{10}$

= 100 m/minute

Distance covered by C in 2 minutes = 200 metre

Distance covered by B in 1 minute = 125 metre

Relative speed of A with respect to C = 100 metre

$$\therefore \text{Time} = \frac{200}{100}=2 \text{ minutes}$$

Relative speed of A with respect ot B = 75 metre

$$\therefore \text{Time} = \frac{125}{75}=\frac{5}{3} \text{ minutes}$$

29. (2)

Let time taken be equal

i.e., $\frac{40}{V_1}=\frac{50}{V_2}$, then they will collide i.e. cars will reach at the same time.

$$\therefore \frac{V_1}{V_2}\neq\frac{40}{50}=\frac{4}{5}$$

30. (1) Time taken in covering 999km

$$=\frac{999}{55.5}=18 \text{ hours}$$

∴ Required time = 18 hours + 1 hour 20 minutes
= 19 hours 20 minutes
i.e. 1 : 20 am

31. (1) Speed = 45 kmph

$$=\left(\frac{45\times 1000}{60\times 60}\right) \text{ metre/second}$$

$$=\left(\frac{45\times 5}{18}\right) \text{ metre/second}$$

= 12.5 metre/second

32. (1) Distance covered in 2nd minute = 90 – 50 = 40 metre

Distance covered in 3rd minute = 130 – 90 = 40 metre

∴ Required distance
= 50 + 40 × 14
= 50 + 560 = 610 metre

33. (3) Here distance is constant.

$$\therefore \text{Speed} \propto \frac{1}{\text{Time}}$$

∴ Ratio of the speeds of A and B

$$=\frac{\frac{7}{2}}{4}=7:8$$

∴ A's speed = $7x$ kmph (let)
B's speed = $8x$ kmph
∴ AB = $7x \times 4 = 28x$ km.
Let both trains cross each other after t hours from 7 a.m.
According to the question,
$7x(t + 2) + 8x \times t = 28x$
$\Rightarrow 7t + 14 + 8t = 28$
$\Rightarrow 15t = 28 - 14 = 14$

$$\Rightarrow t=\frac{14}{15} \text{ hours}$$

$$=\left(\frac{14}{15}\times 60\right) \text{ minutes}$$

= 56 minutes
∴ Required time = 7 : 56 A.M.

34. (4) Speed of plane = $\frac{\text{Distance}}{\text{Time}}$

$$=\frac{6000}{8}=750 \text{ kmph}$$

New speed = (750 + 250) kmph
= 1000 kmph

$$\therefore \text{Required time} = \frac{9000}{1000}$$

= 9 hours

35. (1) Let speed of train be x kmph.
Speed of car = y kmph.
Case I,

$$\because \text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\therefore \frac{240}{x}+\frac{210}{y}=8\frac{40}{60}=8\frac{2}{3}$$

$$\Rightarrow \frac{240}{x}+\frac{210}{y}=\frac{26}{3} \quad ...(i)$$

Case II,

$$\frac{180}{x}+\frac{270}{y}=9 \quad .....(ii)$$

By equation (i) × 3 – (ii) × 4,

$$\frac{720}{x}+\frac{630}{y}-\frac{720}{x}-\frac{1080}{y}$$

= 26 – 36

$$\Rightarrow \frac{-450}{y}=-10$$

$\Rightarrow y = 45$ kmph.

36. (3) Difference of time = 11 minutes 45 seconds – 11 minutes = 45 seconds

Distance covered by sound in 45 seconds = Distance covered by train in 11 minutes

$\Rightarrow 330 \times 45 = 11 \times 60 \times$ Speed of train

$\Rightarrow$ Speed of train

$= \left(\frac{330 \times 45}{11 \times 60}\right)$ m/sec.

$= \left(\frac{45}{2} \times \frac{18}{5}\right)$ kmph.

= 81 kmph.

37. (2) Distance covered in 3 hours 36 minutes i.e. $3\frac{36}{60}$ hours

i.e. $3\frac{3}{5}$ hours

$= 5 \times \frac{18}{5} = 18$ km.

$\therefore$ Time taken at 24 kmph.

$= \frac{18}{24}$ hour

$= \left(\frac{18}{24} \times 60\right)$ minutes

= 45 minutes

38. (3) Let the original speed of aeroplane be x kmph.

According to the question,

$$\frac{1200}{x-300} - \frac{1200}{x} = 2$$

$$\Rightarrow 1200\left(\frac{x - x + 300}{x(x-300)}\right) = 2$$

$$\Rightarrow x(x-300) = \frac{1200 \times 300}{2}$$

$\Rightarrow x(x-300) = 600 \times 300$

$\Rightarrow x(x-300) = 600(600-300)$

$\Rightarrow x = 600$ kmph.

$\therefore$ Scheduled duration of flight = $\frac{1200}{600} = 2$ hours

39. (4) Consumption of petrol in covering 540 km

$= \frac{540}{45} = 12$ litres

$\therefore$ Required expenses

= Rs. (12 × 20)

= Rs. 240

40. (2) $\because$ 18 km ≡ 1.5 cm

$\therefore$ 1 km $\equiv \frac{1.5}{18}$ cm

$\therefore 72 \equiv \left(\frac{1.5 \times 72}{18}\right)$ cm = 6 cm

41. (2) Length of journey on foot = x km. (let).

$\therefore$ Length of journey on cycle = $(61 - x)$ km.

According to the question,

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\therefore \frac{x}{4} + \frac{61-x}{9} = 9$$

$$\Rightarrow \frac{9x + 244 - 4x}{36} = 9$$

$\Rightarrow 5x + 244 = 36 \times 9 = 324$

$\Rightarrow 5x = 324 - 244 = 80$

$\Rightarrow x = \frac{80}{5} = 16$ km.

42. (1) Let the distance covered on foot be x km.

$\therefore$ Distance covered on cycle = $(61 - x)$ km.

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\therefore \frac{x}{4} + \frac{61-x}{9} = 9$$

$$\Rightarrow \frac{x}{4} - \frac{x}{9} = 9 - \frac{61}{9}$$

$$\Rightarrow \frac{9x - 4x}{36} = \frac{81-61}{9}$$

$$\Rightarrow \frac{5x}{36} = \frac{20}{9}$$

$$\Rightarrow x = \frac{20}{9} \times \frac{36}{5} = 16 \text{ km.}$$

43. (4) Distance = Speed × Time

= 330 × 10 = 3300 metre

44. (2) Let total distance covered be $2x$ km.

Total time = 14 hours 40 minutes

$= 14\frac{40}{60}$ hours $= 14\frac{2}{3}$ hours

$= \frac{44}{3}$ hours

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

According to the question,

$$\frac{x}{60} + \frac{x}{50} = \frac{44}{3}$$

$$\therefore \frac{5x + 6x}{300} = \frac{44}{3}$$

$$\Rightarrow \frac{11x}{300} = \frac{44}{3}$$

$$\Rightarrow x = \frac{44}{3} \times \frac{300}{11} = 400$$

$\therefore$ Total distance

$= 2x = 2 \times 400 = 800$ km

45. (2) Distance between both donkeys = 400 metre.

Relative speed = (3 + 2) m./sec.

= 5 m./sec.

$\therefore$ Required time

$$= \frac{\text{Distance}}{\text{Relative speed}}$$

$= \frac{400}{5} = 80$ seconds

46. (2)

A's speed = x kmph.

B's speed = y kmph.

When A and B move in opposite directions they meet at C and when they move in the same direction, they meet at D.

Case I,

AC + CB = AB

$\frac{x}{2} + \frac{y}{2} = 15$

$\Rightarrow x + y = 30$ ..... (i)

Case II,

AD – BD = AB

$\Rightarrow x \times \frac{5}{2} - y \times \frac{5}{2} = 15$

$\frac{5}{2}(x - y) = 15$

$\Rightarrow x - y = \frac{15 \times 2}{5} = 6$ .....(ii)

$\therefore$ On adding equations (i) and (ii),

$x + y + x - y = 30 + 6$

$\Rightarrow 2x = 36$

$\Rightarrow x = \frac{36}{2} = 18$ kmph.

47. (2) Speed of person = 3 kmph

$= \left(\frac{3000}{60}\right)$ m./min.

= 50 m./min.

$\therefore$ Length of the diagonal of square field

= 50 × 2 = 100 metre

$\therefore$ Required area $= \frac{1}{2} \times (100)^2$

= 5000 sq. metre

❑❑❑

TEST YOURSELF

1. Express speed of 36 km per hr. in metres per second.
(1) 10 m/sec. (2) 8 m/sec.
(3) 12 m/sec. (4) 18m/sec.

2. Express speed of 60 metres per sec. in km per hour.
(1) 232 kmph (2) 216 kmph
(3) 116 kmph (4) 118 kmph

3. A man covers 20 kms in 2 hours. Find the distance covered by him in $5\frac{1}{2}$ hours.
(1) 50 km (2) 65 km
(3) 55 km (4) 45 km

4. A car runs at 60 km per hr. A man runs at one-third the speed of the car and reaches office from his house in 15 minutes. How far is his office from his house?
(1) 7 km (2) 5.5 km
(3) 6 km (4) 5 km

5. Walking at a speed of 6 km per hour, a man takes 5 hours to complete his journey. How much time will he need to complete the same journey at the rate of 8 km per hr.?
(1) $3\frac{3}{4}$ hours (2) 3 hours
(3) $2\frac{3}{4}$ hours (4) 3.5 hours

6. A person covers 10 kms at 4 km per hr. and then further 21 kms at 6 km per hr. Find his average speed for whole journey.
(1) $5\frac{1}{3}$ kmph (2) $5\frac{1}{6}$ kmph
(3) $5\frac{1}{2}$ kmph (4) $4\frac{1}{2}$ kmph

7. *P* and *Q* are two cities. A boy travels on cycle from *P* to *Q* at a speed of 20 km per hr. and returns at the rate of 10 km per hr. Find his average speed for the whole journey.
(1) $13\frac{2}{3}$ kmph (2) $12\frac{1}{3}$ kmph
(3) $13\frac{1}{3}$ kmph (4) $12\frac{2}{3}$ kmph

8. A man walked a certain distance. One-third he walked at 5 km per hr. Another one-third he walked at 10 km per hr. and the rest at 15 km per hr. Find his average speed.
(1) $8\frac{1}{11}$ kmph (2) $7\frac{1}{11}$ kmph
(3) $7\frac{2}{11}$ kmph (4) $8\frac{2}{11}$ kmph

9. An aeroplane travels a distance in the form of a square with the speed of 400 km per hr, 600 km per hr, 800 km per hr. and 1200 km per hr respectively. Find the average speed for the whole distance along the four sides of the square.
(1) 640 kmph (2) 620 kmph
(3) 630 kmph (4) 650 kmph

10. A man covers one-third of his journey at 30 km per hr. and the remaining two-third at 45 km per hr. If the total journey is of 150 kms, what is his average speed for the whole journey?
(1) 38 kmph (2) $38\frac{4}{7}$ kmph
(3) 64 kmph (4) $39\frac{4}{7}$ kmph

11. When a person covers the distance between his house and office at 50 km per hr. he is late by 20 minutes. But when he travels at 60 km per hr. he reaches 10 minutes early. What is the distance between his office and his house?
(1) 140 km. (2) 160 km.
(3) 150 km. (4) 120 km.

12. A boy walks from his house at 4 km per hr. and reaches his school 9 minutes late. If his speed had been 5 km per hr. he would have reached his school 6 minutes earlier. How far his school from house?
(1) 6.5 km. (2) 5.5 km.
(3) 6 km. (4) 5 km.

13. A car travels a distance of 300 kms at uniform speed. If the speed of the car is 5 km per hr more it takes two hours less to cover the same distance. Find the original speed of the car.
(1) 25 kmph (2) 20 kmph
(3) 24 kmph (4) 28 kmph

14. A car can finish a certain journey in 10 hours at a speed of 48 km per hr. In order to cover the same distance in 8 hours, how much the speed be increased by ?
(1) 10 kmph (2) 12 kmph
(3) 14 kmph (4) 15 kmph

15. If a boy walks from his house to school at the rate of 4 km per hr, he reaches the school 10 minutes earlier than the scheduled time. However if he walks at the rate of 3 km per hr, he reaches 10 minutes late. Find the distance of his school from his house.
(1) 3.5 km (2) 3 km
(3) 4 km (4) 4.5 km

16. A man has to reach a place 40 kms away. He walks at the rate of 4 km per hr. for the first 16 kms and then he hires a rickshaw for the rest of the journey. However if he had travelled by the rickshaw for the first 16 kms and the remaining distance on foot at 4 km per hr, he would have taken an hour longer to complete the journey. Find the speed of rickshaw.
(1) 6.5 kmph (2) 7.5 kmph
(3) 6 kmph (4) 8 kmph

17. Walking $\frac{3}{4}$ of my usual speed, a late is marked on my cards by 10 minutes. Find my usual time.
(1) 30 minutes (2) 35 minutes
(3) 32 minutes (4) 36 minutes

18. By walking $\frac{5}{3}$ of usual speed a student reaches school 20 minutes earlier. Find his usual time.
(1) 45 minutes
(2) 50 minutes
(3) 60 minutes
(4) None of these

19. Walking at $\frac{3}{4}$ of his usual speed a man is late by $2\frac{1}{2}$ hours. The usual time would have been what?
(1) 7 hours (2) 7.5 hours
(3) 8 hours (4) 8.5 hours

20. Two men *A* and *B* walk from *X* to *Y* a distance of 42 kms at 5 km and 7 km an hour respectively. *B* reaches *Y* and returns immediately and meets *A* at *R*. Find the distance from *X* to *R*.
(1) 32 km (2) 30 km
(3) 35 km (4) 40 km

21. Two men *A* and *B* start walking simultaneously from *P* to *Q*, a distance of 21 kms, at the speed of 3 km and 4 km an hour respectively. *B* reaches *Q*, returns immediately and meets *A* at *R*. Find the distance from *P* to *R*.
(1) 22 km (2) 20 km
(3) 16 km (4) 18 km

22. Ram travelled one-third of a journey with a speed of 10 km per hr, the next one-third with a speed of 9 km per hr. and the rest at a speed of 8 km per hr. If he had travelled half the journey at speed of 10 km per hr. and the other half with a speed of 8 km per hr, he would have been 1 minute longer on the way. What distance did he travel?
(1) 36 km (2) 32 km
(3) 35 km (4) 40 km

23. A man walks a distance of 35 kms. He walks for some time at 4 km per hour and for some time at 5 km per hr. If he walks at 5 km per hr. instead of 4 km per hr. and 4 km per hr. instead of 5 km per hr, he will walk 2 kms more in the same span of time. Find his total time of total journey.
(1) 8.5 hours (2) 7.5 hours
(3) 8 hours (4) 7 hours

24. A man travels 400 kms in 4 hours partly by air and partly by train. If he had travelled all the way by air, he would have saved $\frac{4}{5}$ of the time he was in train and would have arrived his destination 2 hours early. Find the distance he travelled by train.
(1) 95 km. (2) 85 km.
(3) 90 km. (4) 100 km.

25. On increasing the speed of a train at the rate of 10 km per hr, 30 minutes is saved in a journey of 100 kms. Find the initial speed of train.
(1) 40 kmph (2) 45 kmph
(3) 42 kmph (4) 44 kmph

26. Ravi can walk a certain distance in 40 days when he rests 9 hours a day. How long will he take to walk twice the distance, twice as fast and rest twice as long each day?
(1) 80 days (2) 100 days
(3) 90 days (4) 95 days

27. A monkey climbing up a greased pole ascends 12 metres and slips down 5 metres in alternate minutes. If the pole is 63 metres high, how long will it take him to reach the top?
(1) 18 minutes
(2) 16 minutes
(3) $16\frac{7}{12}$ minutes
(4) 18 minutes 20 seconds

28. A hare sees a dog 100 metres away from her and scuds off in the opposite direction at a speed of 12 km per hr. A minute later the dog perceives her and chases her at a speed of 16 km per hr. How soon will the dog overtake the hare and at what distance from the spot when the hare took flight?
(1) 900 metres (2) 950 metres
(3) 1000 metres (4) 1100 metres

29. A hare, pursued by a grey hound is 50 of her own leaps before him. While the hare takes 4 leaps, the grey hound takes 3 leaps. In one leap, the hare goes 1.75 metres and the grey hound 2.75 metres. In how many leaps, will the grey hound overtake the hare?
(1) 210 leaps (2) 220 leaps
(3) 230 leaps (4) 250 leaps

30. In a flight of 600 kms, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200 km per hr. and the time of flight increased by 30 minutes. Find the duration of flight.
(1) 1.2 hours (2) 1 hour
(3) 1.5 hours (4) 2 hours

31. Two trains leave a railway station at the same time. The first train travels due west and the second train due north. The first train travels 5 km per hr. faster than the second train. If after two hours they are 50 km apart, find the average speed of faster train.
(1) 18 kmph (2) 15 kmph
(3) 20 kmph (4) 25 kmph

32. A carriage driving in a fog passed a man who was walking at the rate of 6 km per hr. in the same direction. He could see the carriage for 4 minutes and it was visible to him up to a distance of 200 metres. Find the speed of the carriage.
(1) 8.75 kmph (2) 8.5 kmph
(3) 8 kmph (4) 9 kmph

33. Two bullets were fired at a place at an interval of 12 minutes. A person approaching the firing point in his car hears the two sounds at an interval of 11 minutes 40 seconds. The speed of sound is 330 metres per second. What is the approximate speed of the car?
(1) 34 kmph (2) 32 kmph
(3) 36 kmph (4) 38 kmph

34. *A* and *B* start simultaneously at 5 km per hr. and 4 km per hr. from *P* and *Q*, 180 kms apart, towards *Q* and *P* respectively. They cross each other at *M* and after reaching *Q* and *P* turn back immediately and meet again at *N*. Find the distance *MN*.
(1) 45 km (2) 40 km
(3) 35km (4) 42 km

35. A car driving in the morning fog passes a man walking at 4 km per hr. in the same direction. The man can see the car for 3 minutes and visibility is upto a distance of 130 metres. Find the speed of the car.
(1) 7.5 kmph (2) 6.6 kmph
(3) 6 kmph (4) 7 kmph

36. Ram starts his journey from Bombay to Pune and simultaneously Mohan starts from Pune to Bombay. After crossing each other they finish their remaining journey in $6\frac{1}{4}$ and 4 hours re-

spectively. What is Mohan's speed if Ram's speed is 20 km per hr. ?

(1) 28 kmph (2) 24 kmph
(3) 25 kmph (4) 30 kmph

37. A train meets with an accident after travelling 30 kms, after which it moves with $\frac{4}{5}$ th of its original speed and arrives at the destination 45 minutes late. Had the accident happened 18 kms further on, it would have been 9 minutes before. Find the distance of journey and original speed of the train.

(1) 120 km ; 25 kmph
(2) 125 km ; 25 kmph
(3) 130 km ; 30 kmph
(4) 120 km ; 30 kmph

38. A train met with an accident 3 hours after starting, which detains it for one hour, after which it proceeds at 75% of its original speed. It arrives at the destination 4 hours late. Had the accident taken place 150 km further along the railway line, the train would have arrived only $3\frac{1}{2}$ hours late. Find the length of the trip and the original speed of the train.

(1) 1100 km ; 100 kmph
(2) 1200 km ; 100 kmph
(3) 1200 km ; 90 kmph
(4) 1600 km ; 90 kmph

39. A train after travelling 100 kms from *P* meets with an accident and then proceeds at $\frac{3}{4}$ th of its original speed and arrives at the terminus *Q* 90 minutes late. Had the accident occurred 60 kms further on, it would have reached 15 minutes sooner. Find the original speed of the train and the distance *PQ*.

(1) 65 kmph; 480 km
(2) 75 kmph; 450 km
(3) 80 kmph; 460 km
(4) 85 kmph; 460 km

40. Two trains *A* and *B* are 110 km apart on a straight line. One train starts from *A* at 7 a.m. and travels towards *B* at 20 km per hr. Another train starts from *B* at 8 am. and travels towards *A* at a speed of 25 km per hr. At what time will they meet?

(1) 10 : 15 a.m.
(2) 09 : 50 a.m.
(3) 09 : 30 a.m.
(4) 10 : 00 a.m.

41. Two boys begin together to write out a booklet containing 817 lines. The first boy starts with the first line, writing at the rate of 200 lines an hour and the second boy starts with the last lines then writes line 816 and so on. Backward proceeding at the rate of 150 lines an hour. At what line will they meet?

(1) 467th line (2) 468th line
(3) 470th line (4) 475th line

42. Two men set out the same time to walk towards each other from two points *A* and *B*, 72 km apart. The first man walks at the rate of 4 km per hr. The second man walks 2 km in the first hour, $2\frac{1}{2}$ km in the second hour, 3 km in the third hour and so on. Find the time after which the two men will meet.

(1) 8 hours (2) 9 hours
(3) 8.5 hours (4) 9.5 hours

43. A man is standing on a railway bridge which is 50 metres long. He finds that a train crosses the bridge in $4\frac{1}{2}$ seconds but himself in 2 seconds. Find the length of the train and its speed.

(1) 60 m ; 20 m/sec
(2) 40 m ; 20 kmph
(3) 40 m ; 20 m/sec
(4) 40 m ; 25 m/sec

44. Two places *A* and *B* are 162 kms apart. A train leaves *A* for *B* and at the same time another train leaves *B* for *A*. The two trains meet at the end of 6 hours. If the train travelling from *A* to *B* travels 8 km per hr. faster than the other, find the speed of the faster train.

(1) 16.5 kmph (2) 16 kmph
(3) 17 kmph (4) 17.5 kmph

45. A train running at 25 km per hour take 18 seconds to pass a platform. Next, it takes 12 seconds to pass a man walking at the rate of 5 km per hr. in the same direction. Find the length of the platform.

(1) 25 metres (2) 20 metres
(3) 24 metres (4) 28 metres

46. Two trains 200 metres and 175 metres long are running on parallel lines.They take $7\frac{1}{2}$ seconds when running in opposite directions and $37\frac{1}{2}$ seconds when running in the same direction to pass each other. Find their speeds in km per hour.

(1) 118 kmph ; 75 kmph
(2) 108 kmph ; 72 kmph
(3) 120 kmph ; 75 kmph
(4) 125 kmph ; 80 kmph

47. A train travelling at the rate of 60 km per hr, while inside a tunnel, meets another train of half its length travelling at 90 km per hr. and passes completely in $4\frac{1}{2}$ seconds. Find the length of the tunnel if the first train passes completely through it in 4 minutes $37\frac{1}{2}$ seconds.

(1) 5 km (2) 3.5 km
(3) 4.5 km (4) 6 km

48. A train overtakes two person walking at 2 km per hr. and 4 km per hr. respectively and passes completely them in 9 sec. and 10 sec. respectively. What is the length of the train?

(1) 65 metres (2) 60 metres
(3) 55 metres (4) 50 metres

49. A train takes 18 seconds to pass completely through a station 162 metres long and 15 seconds to pass completely through another station 120 metres long. Find the speed of train in km per hr.

(1) 50.4 kmph (2) 52 kmph
(3) 55 kmph (4) 60 kmph

50. Two trains of which one is 50 metres longer than the other are running in opposite directions and cross each other in 10 seconds. If they be running in the same direction then faster train would have passed the other train in 1 minute 30 seconds. The speed of faster train is 90 km per hr. Find the speed of other train.

(1) 25 m/sec. (2) 20 m/sec.
(3) 30 m/sec. (4) 35 m/sec.

51. A man standing on a 170 metre long platform watches that a train takes $7\frac{1}{2}$ seconds to pass him and 21 seconds to cross the platform. Find the speed of train.

(1) $12\frac{16}{27}$ m/sec.
(2) 12.5 m/sec.
(3) $12\frac{13}{27}$ m/sec.
(4) None of these

52. A goods train 158 metres long and travelling at the speed of 32 km per hr. leaves Delhi at 6 am. Another mail train 130 metres long and travelling at the average speed of 80 km per hr. leaves Delhi at 12 noon and follows the goods train. At what time will the mail train completely cross the goods train?

(1) 4 hours
(2) 4 hours 21.6 sec.
(3) 5 hours 21.6 sec.
(4) None of these

53. A motor-boat goes 2 km upstream in a stream flowing at 3 km per hr. and then returns downstream to the starting point in 30 minutes. Find the speed of the motor-boat in still water.

(1) 9.5 kmph (2) 8.5 kmph
(3) 9 kmph (4) 8 kmph

54. A person can row a boat 32 km upstream and 60 km downstream in 9 hours. Also, he can row 40 km upstream and 84 km downstream in 12 hours. Find the rate of the current.

(1) 3 kmph (2) 2.5 kmph
(3) 1.5 kmph (4) 2 kmph

55. A boatman takes his boat in a river against the stream from a place *A* to a place *B* where *AB* is 21 km and again returns to *A*. Thus he takes 10 hours in all. The time taken by him downstream in going 7 km is equal to the time taken by him against stream in going 3 km. Find the speed of river.

(1) 2 kmph (2) 2.5 kmph
(3) 3 kmph (4) 3.5 kmph

56. A motorist and a cyclist start from *A* to *B* at the same time. *AB* is 18 km. The speed of motorist is 15 m per hr. more than the cyclist. After covering half the distance, the motorist rests for 30 minutes and thereafter his speed is reduced by 20%. If the motorist reaches the destination *B*, 15 minutes earlier than that of the cyclist, then find the speed of the cyclist.

(1) 16 kmph (2) 12 kmph
(3) 14 kmph (4) 15 kmph

57. A man covered a distance of 3990 km partly by air, partly by sea and remaining by land. The time spent in air, on sea and on land is in the ratio 1 : 16 : 2 and the ratio of average speed is 20 : 1 : 3 respectively. If total average speed is 42 km per hr, find the distance covered by sea.

(1) 1720 km. (2) 1620 km.
(3) 1520 km. (4) 1820 km.

58. A railway engine is proceeding towards *A* at uniform speed of 30 km/hr. While the engine is 20 kms away from *A* an insect starting from *A* flies again and again between *A* and the engine relentlessly. The speed of insect is 42 km per hr. Find the distance covered by the insect till the engine reaches *A*.

(1) 25 km. (2) 32 km.
(3) 30 km. (4) 28 km.

59. Distance between two stations *X* and *Y* is 220 km. Trains *P* and *Q* leave station *X* at 8 a.m. and 9.51 a.m. respectively at the speed of 25 kmph and 20 kmph respectively for journey towards *Y*. A train *R* leaves station *Y* at 11.30 a.m. at a speed of a 30 kmph. for journey towards *X*. When will *P* be at equal distance from *Q* and *R*?

(1) 12:48 pm. (2) 12:30 pm.
(3) 12:45 pm. (4) 11:48 pm.

60. A person travels a certain distance on a bicycle at a certain speed. Had he moved 3 km/hour faster, he would have taken 40 minutes less. Had he moved 2km/hour slower, he would have taken 40 minutes more. Find the distance.

(1) 45 km. (2) 40 km.
(3) 50 km. (4) 55 km.

61. A steamer goes downstream from one port to another in 4 hours. It covers the same distance upstream in 5 hours. If the speed of the stream be 2 km/hr, find the distance between the two ports.

(1) 60 km. (2) 45 km.
(3) 80 km. (4) 65 km.

62. In a 200 metre race, A beats B by 20 metres; while in a 100 metres race, B beats C by 5 metres. Assuming that the speed of A, B and C remain the same in various races, by how many metres will A beat C in one kilometre race ?

(1) 140 metre (2) 145 metre
(3) 135 metre (4) 125 metre

63. Two places A and B are 80 km apart from each other on a highway. A car starts from A and another from B at the same time. If they move in the same direction, they meet each other in 8 hours. If they move in opposite directions towards each other, they meet in 1 hour 20 minutes. Determine the speed of the faster car.

(1) 20 kmph (2) 25 kmph
(3) 35 kmph (4) 30 kmph

64. In a one-kilometre race, A beats B by 15 seconds and B beats C by 15 seconds. If C is 100 metres away from the finishing mark, when B has reached it, find the speed of A.

(1) 9.5 m/sec. (2) 9 m/sec.
(3) 8 m/sec. (4) 8.3 m/sec.

65. A train running at the speed of 72 km/hr passes a tunnel completely in 3 minutes. While inside the tunnel, it meets another train of $\frac{3}{4}$ of its length coming from opposite direction at the speed of 90km/hr and passes it completely in $3\frac{1}{2}$ seconds. Find the length of the tunnel.

(1) 3510 metre (2) 3500 metre
(3) 3400 metre (4) 3600 metre

SHORT ANSWERS

1. (1)	**2.** (2)	**3.** (3)	**4.** (4)
5. (1)	**6.** (2)	**7.** (3)	**8.** (4)
9. (1)	**10.** (2)	**11.** (3)	**12.** (4)
13. (1)	**14.** (2)	**15.** (3)	**16.** (4)
17. (1)	**18.** (2)	**19.** (2)	**20.** (3)
21. (4)	**22.** (1)	**23.** (3)	**24.** (4)
25. (1)	**26.** (2)	**27.** (3)	**28.** (4)
29. (1)	**30.** (2)	**31.** (3)	**32.** (4)
33. (1)	**34.** (2)	**35.** (2)	**36.** (3)
37. (4)	**38.** (2)	**39.** (3)	**40.** (4)
41. (1)	**42.** (2)	**43.** (3)	**44.** (4)
45. (1)	**46.** (2)	**47.** (3)	**48.** (4)
49. (1)	**50.** (2)	**51.** (1)	**52.** (2)
53. (3)	**54.** (4)	**55.** (1)	**56.** (2)
57. (3)	**58.** (4)	**59.** (1)	**60.** (2)
61. (3)	**62.** (2)	**63.** (3)	**64.** (4)
65. (1)			

EXPLANATIONS

1. (1) 36 km/hr.

$$= \left(36 \times \frac{5}{18}\right) \text{ m/sec.}$$

= 10 m/sec.

2. (2) 60 metres per sec.

$$= \left(60 \times \frac{18}{5}\right) \text{ km per hr.}$$

= 216 km per hr.

3. (3) Distance = 20 kms
Time = 2 hours

$$\therefore \text{ Speed } = \frac{\text{Distance}}{\text{Time}}$$

$$= \frac{20}{2} = 10 \text{ km per hr.}$$

Now, we have, Speed = 10 km per hr.

$$\text{Time } = \frac{11}{2} \text{ hr.}$$

$\therefore$ Distance = Speed × Time

$$= 10 \times \frac{11}{2} = 55 \text{ km.}$$

4. (4) Man's speed $= \frac{1}{3}$ of the speed of car

$$= \frac{1}{3} \times 60 = 20 \text{ km per hr.}$$

Time taken to reach office= 15 minutes $= \frac{15}{60} = \frac{1}{4}$ hr.

$\therefore$ Distance between his house and office
= Speed × Time

$$= 20 \times \frac{1}{4} = 5 \text{ km.}$$

5. (1) Speed = 6 km/hr
Time taken = 5 hours
$\therefore$ Distance covered
= 6 × 5 = 30 kms
$\therefore$ Time required to cover 30 kms at the speed of 8 km/hr.

$$= \frac{\text{Distance}}{\text{Speed}} = \frac{30}{8} = \frac{15}{4} \text{ hours}$$

$$= 3\frac{3}{4} \text{ hours}$$

6. (2) **Case I.**
Distance = 10 kms
Speed = 4 km/hr.

$$\therefore \text{ Time taken } (t_1) = \frac{10}{4} = \frac{5}{2} \text{ hrs.}$$

Case II.
Distance = 21 kms
Speed = 6 km/hr.

$$\therefore \text{ Time taken } (t_2) = \frac{21}{6} = \frac{7}{2} \text{ hrs.}$$

$$\text{Total time taken } = \frac{5}{2} + \frac{7}{2}$$

$$= \frac{5+7}{2} = 6 \text{ hrs.}$$

Total distance covered
= 10 + 21 = 31 kms
$\therefore$ Average Speed

$$= \frac{\text{Total distance}}{\text{Total time}}$$

$$= \frac{31}{6} \text{ km per hr.}$$

$$= 5\frac{1}{6} \text{ km per hr.}$$

7. (3) Let the speed between P and Q be x km.
Then time taken to cover x km.

$$P \text{ to } Q = \frac{x}{20} \text{ hrs.}$$

Time taken to cover x km from Q to P at 10 km per hr. P to Q

$$= \frac{x}{10} \text{ hrs.}$$

$\therefore$ Total distance covered
= $x + x = 2x$ km.
Time taken to cover $2x$ km.

$$= \frac{x}{20} + \frac{x}{10} = \frac{x+2x}{20} = \frac{3x}{20} \text{ hrs.}$$

$\therefore$ Average Speed

$$= \frac{2x}{\frac{3x}{20}} = \frac{2x \times 20}{3x}$$

$$= \frac{40}{3} \text{ km per hr.}$$

$$= 13\frac{1}{3} \text{ km per hr.}$$

Method 2 :
Here, x = 20 km per hr.
y = 10 km per hr.
$\therefore$ Average speed
[$\because$ Distance is same]

$$= \frac{2xy}{x+y} = \frac{2 \times 20 \times 10}{20+10}$$

$$= \frac{400}{30} = \frac{40}{3} = 13\frac{1}{3} \text{ km per hr.}$$

8. (4) Here, the man covers equal distance at different speeds. Using the formula, the Average Speed is given by

$$= \frac{3}{\frac{1}{5} + \frac{1}{10} + \frac{1}{15}} = \frac{3}{\frac{6+3+2}{30}}$$

$$= \frac{90}{11} = 8\frac{2}{11} \text{ km per hour.}$$

9. (1) As distance is covered along four sides (equal) of a square at different speeds, the average speed of the aeroplane

$$= \frac{4}{\frac{1}{400} + \frac{1}{600} + \frac{1}{800} + \frac{1}{1200}}$$

[$\because$ All the sides of square are equal, so distance between them is same]

$$= \frac{4}{\frac{30+20+15+10}{12000}}$$

$$= \frac{48000}{75} = 640 \text{ km per hr.}$$

10. (2) Length of journey = 150 kms

$\frac{1}{3}$ rd of journey $= \frac{150}{3} = 50$ kms

Remaining $\frac{2}{3}$ journey

= 150 – 50 = 100 kms

Time taken in $\frac{1}{3}$ rd journey at 30 km per hr.

$$t_1 = \frac{50}{30} = \frac{5}{3} \text{ hrs.}$$

Time taken in $\frac{2}{3}$ rd journey at 45 km per hr.

$$t_2 = \frac{100}{45} = \frac{20}{9} \text{ hrs.}$$

Total time taken in whole journey = $t_1 + t_2$

$$= \frac{5}{3} + \frac{20}{9} = \frac{15+20}{9} = \frac{35}{9} \text{ hrs.}$$

Average Speed

$$= \frac{150}{\frac{35}{9}} = \frac{150 \times 9}{35} = \frac{270}{7}$$

$$= 38\frac{4}{7} \text{ km per hr.}$$

11. (3) Let time taken to reach office at 50 kmph be x hrs

Then time taken to reach office at 60 kmph = $\left(x + \frac{30}{60}\right)$ hrs

As, distance covered is same,

$$\therefore x \times 50 = 60\left(x + \frac{30}{60}\right)$$

$50x = 60x + 30$

$\Rightarrow x = 3$ hrs

Hence, distance = 3 × 50

= 150 km

12. (4) Let time taken to reach school at 4 kmph be x hrs.

Then time taken to reach school at 5 kmph = $\left(x + \frac{15}{60}\right)$ hrs

Since, distance is equal.

$$\therefore 4x = 5\left(x + \frac{15}{60}\right)$$

$x = \frac{5}{4}$ hrs.

Hence, distance between school & house = $4 \times \frac{5}{4}$ km = 5 km

13. (1) Let the original speed of the car = x km per hr.

When it is increased by 5 km per hr, the speed = $x + 5$ km per hr.

As per the given information in the question,

$$\frac{300}{x} - \frac{300}{x+5} = 2$$

$$\Rightarrow \frac{300(x+5) - 300x}{x(x+5)} = 2$$

$$\Rightarrow \frac{300x + 1500 - 300x}{x^2 + 5x} = 2$$

$$\Rightarrow \frac{1500}{x^2 + 5x} = 2$$

$$\Rightarrow \frac{750}{x^2 + 5x} = 1$$

$\Rightarrow x^2 + 5x = 750$

$\Rightarrow x^2 + 5x - 750 = 0$

$\Rightarrow x^2 + 30x - 25x - 750 = 0$

$\Rightarrow x(x + 30) - 25(x + 30) = 0$

$\Rightarrow (x + 30)(x - 25) = 0$

$\Rightarrow x = -30$ or 25

The negative value of speed is inadmissible.

Hence, the required speed = 25 km per hr.

14. (2) Time = 10 hours,

Speed = 48 km per hr.

∴ Distance = Speed × Time

= 48 × 10 = 480 km

Now, this distance of 480 kms is to be covered in 8 hours. Hence, the required Speed

$$= \frac{\text{Distance}}{\text{New time}} = \frac{480}{8}$$

= 60 km per hr.

∴ Increase in speed

= 60 – 48 = 12 km per hr.

15. (3) Let the distance be x kms.

∴ Time taken at 4 km per hr. t_1

$= \frac{x}{4}$ hrs.

Time taken at 3 km per hr. t_2

$= \frac{x}{3}$ hrs.

Difference in timings

= 10 + 10 = 20 minutes

or $\frac{20}{60} = \frac{1}{3}$ hour

$$\therefore \frac{x}{3} - \frac{x}{4} = \frac{1}{3}$$

$$\Rightarrow \frac{4x - 3x}{12} = \frac{1}{3}$$

$$\Rightarrow \frac{x}{12} = \frac{1}{3}$$

∴ $x = 4$ km.

Hence the required distance

= 4 kms.

16. (4) Let the speed of Rickshaw be 'x'.

Then, time taken to cover 16 km on foot and 24 km on Rikshaw $= \frac{16}{4} + \frac{24}{x}$ hrs

and time taken to travel 24 km on foot & 16 km on Rikshaw

$= \frac{16}{x} + \frac{24}{4}$ hrs

According to question,

$$= \frac{16}{4} + \frac{24}{x} + 1 = \frac{16}{x} + \frac{24}{4}$$

$$\Rightarrow \frac{5+24}{x} = \frac{16}{x} + 6$$

$$\Rightarrow \frac{24-16}{x} = 1$$

$\Rightarrow x = 8$ km/hr

17. (1) Since I walk at $\frac{3}{4}$ of my usual speed the time taken is $\frac{4}{3}$ of my usual time.

[$\because$ the speed and time are in the inverse ratio]

$\therefore$ $\frac{4}{3}$ of usual time

= Usual time + Time I reach late

$\therefore$ $\frac{1}{3}$ of usual time

= 10 minutes

$\therefore$ Usual time

= 10 × 3 = 30 minutes.

18. (2) $\frac{5}{3}$ of usual speed means $\frac{3}{5}$ of usual time as he reaches earlier.

$\therefore$ $\frac{3}{5}$ usual time + 20 minutes= Usual time

20 minutes $=\left(1-\frac{3}{5}\right)$ usual time

$=\frac{2}{5}$ usual time

$\therefore$ Usual time

$=\frac{20\times 5}{2}$ = 50 minutes.

19. (2) New speed is $\frac{3}{4}$ of the usual speed

$\therefore$ New time taken $=\frac{4}{3}$ of the usual time

$\therefore$ $\frac{4}{3}$ of the usual time – Usual time $=\frac{5}{2}$

$\Rightarrow$ $\frac{1}{3}$ of the usual time $=\frac{5}{2}$

$\therefore$ Usual time $=\frac{5}{2}\times 3$

$=\frac{15}{2}$ hours or 7.5 hrs

20. (3) When B meets A at R, by then B has walked a distance (XY + YR) and A, the distance XR. That is both of them have together walked twice the distance from X to Y, i.e., 42 kms.

Now, the ratio of speed of A and B is 5 : 7 and they walk 84 kms.

$\therefore$ Hence, the distance XR travelled by

A $=\frac{5}{5+7}\times 84$ = 35 kms.

21. (4) Let A and B meet after time t hours.

Distance covered by A in t hours = 3 t km.

Distance covered by B in t hours = 4 t km.

Total distance covered by A and B = ($3t$ + $4t$) km = 7 t km.

From the diagram we can see that the total distance covered by A and B is equal to twice the distance between P and Q.

$\therefore$ $7t = 2 \times 21$

$t = \frac{2\times 21}{7}$

t = 6 hours

Distance PR = 6 × 3 = 18 km.

22. (1) Let the total distance travelled be x kms.

Case I :

Speed for the first one-third distance i.e. $\frac{x}{3}$ kms =10 km per hr.

$\therefore$ Time taken $=\frac{x}{30}$ hours

Similarly, time taken for the next one-third distance

$=\frac{x}{27}$ hours

and time taken for the last one-third distance $=\frac{x}{24}$ hours.

$\therefore$ Total time taken to cover x kms.

$=\left(\frac{x}{30}+\frac{x}{27}+\frac{x}{24}\right)$ hours.

Case II :

Time taken for one-half distance at the speed of 10 km per hr.

$=\frac{x}{20}$ hrs.

and time taken for remaining $\frac{1}{2}$ of distance $=\frac{x}{16}$ hrs. at 8 km per hr.

Total time taken

$=\left(\frac{x}{20}+\frac{x}{16}\right)$ hrs.

Time taken in (Case II – Case I)

= 1 minute $=\frac{1}{60}$ hr.

$\therefore$ According to the question

$$\frac{x}{20}+\frac{x}{16}-\left(\frac{x}{30}+\frac{x}{27}+\frac{x}{24}\right)$$

$$=\frac{1}{60}$$

$$\Rightarrow\frac{108x+135x-72x-80x-90x}{2160}$$

$$=\frac{1}{60}$$

$$\Rightarrow\frac{243x-242x}{2160}=\frac{1}{60}$$

$$\Rightarrow\frac{x}{2160}=\frac{1}{60}$$

$$\Rightarrow x=\frac{2160}{60}=36 \text{ km.}$$

Hence the required distance = 36 km.

23. (3) Let the man walks for x hours at 4 km per hr. and y hours at 5 km per hr. and covers a distance of 35 kms.

$\therefore$ Distance = $4x + 5y = 35$ ...(*i*)

Now, he walks at 5 km per hr.

for x hours and at 4 km per hr. for y hours and covers a distance (35 + 2) = 37 kms

$\therefore$ Distance = $5x + 4y = 37$...(*ii*)

By 5 × (*i*) – 4 × (*ii*) we have

$20x + 25y = 175$

$20x + 16y = 148$

– – –

$9y = 27$

$\Rightarrow y = 3$

Putting the value of (y) in equation (*i*), we have

$4x + 5 \times 3 = 35$

$\Rightarrow 4x = 35 - 15 = 20$

$\Rightarrow x = 5$

$\therefore$ Total time taken

$= x + y = 5 + 3 = 8$ hours.

24. (4) Obviously, $\frac{4}{5}$ of total time in train = 2 hours

$\therefore$ Total time in train

$= \frac{5}{4} \times 2 = \frac{5}{2}$ hours

Total time to cover 400 km is 4 hours

$\therefore$ Time spent in travelling by air $= 4 - \frac{5}{2} = \frac{8-5}{2} = \frac{3}{2}$ hours

If 400 kms is travelled by air, then time taken = 2 hours

$\therefore$ In 2 hours, distance covered by air = 400 kms

In $\frac{3}{2}$ hours distance covered

$= \frac{400}{2} \times \frac{3}{2}$ = 300 kms

Distance covered by the train

= 400 – 300 = 100 kms.

25. (1) Let the original speed be x km/hr

then, increased speed

$= (x + 10)$ km/hr

According to question,

$$\frac{100}{x} - \frac{100}{x+10} = \frac{30}{60}$$

$$\left[\begin{array}{l} \because \text{Original time} - \text{New time} \\ = 30 \text{ minute or } \frac{30}{60} hr \end{array}\right]$$

$$\Rightarrow 100\left[\frac{1}{x} - \frac{1}{x+10}\right] = \frac{1}{2}$$

$$\Rightarrow \frac{x+10-x}{x(x+10)} = \frac{1}{200}$$

$\Rightarrow 10 \times 200 = x(x + 10)$

$\Rightarrow x^2 + 10x - 2000 = 0$

$\Rightarrow x^2 + 50x - 40x - 2000 = 0$

$\Rightarrow x(x + 50) - 40(x + 50) = 0$

$\Rightarrow x = -50, 40$

Speed can't be negative.

Hence, Original speed = 40 kmph

26. (2) Working hours per day= 24 – 9 = 15 hrs.

Total working hours for 40 days = 15 × 40 = 600 hrs.

On doubling the distance, the time required becomes twice but on walking twice as fast, the time required gets halved. Therefore, the two together cancel each other with respect to time required. Increasing rest to twice reduces walking hours per day to

24 – (2 × 9) = 6 hrs.

$\therefore$ Total number of days required to cover twice the distance, at twice speed with twice the rest.

$= \frac{600}{6} = 100$ days

27. (3) In 1 minute the monkey climbs 12 metres but then he takes 1 minute to slip down 5 metres. So, at the end of 2 minutes the net ascending of the monkey is 12 – 5 = 7 metres. So, to cover 63 metres the above process is repeated $\frac{63}{7} = 9$ times. Obviously, in 9 such happenings the monkey will slip 8 times, because on 9th time, it will climb to the top.

Thus, in climbing 8 times and slipping 8 times, he covers 8 × 7 = 56 metres.

Time taken to cover 56 metres

$= \frac{56 \times 2}{7}$ = 16 minutes

Remaining distance

= 63 – 56 = 7 metres

Time taken to ascend 7 metres

$= \frac{7}{12}$ minutes

$\therefore$ Total time taken $= 16 + \frac{7}{12}$

$= 16\frac{7}{12}$ minutes.

28. (4)

Let the hare at B sees that dog is at A.

$\therefore AB$ = 100 metres

Again, let C be the position of the hare when the dog sees her.

$\therefore BC$= the distance covered by the hare in 1 minute

$= \frac{12 \times 1000 \times 1}{60}$ = 200 metres

$\therefore AC = AB + BC$

= 100 + 200 = 300 metres

Thus, hare has a start of 300 metres.

Now, the dog gains 16 – 12 = 4 kms

4000 metres in 1 hour i.e. 60 minutes

$\therefore$ The distance gained by dog in 1 minute

$= \frac{4000}{60} = \frac{200}{3}$ metres

$\because \frac{200}{3}$ metres is covered in 1 minute

$\therefore$ 300 metres is covered in $\frac{300 \times 3}{200} = \frac{9}{2}$ minutes

Again the distance walked by hare in $\frac{9}{2}$ minutes

$= \frac{12000}{60} \times \frac{9}{2}$ = 900 metres

$\therefore$ Total distance from

B = 200 + 900 = 1100 metres.

29. (1) Grey hound and hare make 3 leaps and 4 leaps respectively. This happens at the same time. The hare goes 1.75 metres in 1 leap.

∴ Distance covered by hare in 4 leaps = 4 × 1.75 = 7 metres

The grey hound goes 2.75 metres in one leap.

∴ Distance covered by it in 3 leaps

= 3 × 2.75 = 8.25 metres

Distance gained by grey hound in 3 leaps $= (8.25 - 7)$

= 1.25 metres

Distance covered by hare in 50 leaps = 50 × 1.75 metres

= 87.5 metres

Now, 1.25 metres is gained by grey hound in 3 leaps

∴ 87.5 metres is gained in

$\frac{3}{1.25} \times 87.5$ = 210 leaps.

30. (2) Let the original speed be x kmph

then, new speed = $(x - 200)$ kmph

According to question,

Time taken with new speed – time taken with original speed = 30 min. i.e $\frac{1}{2}$ hr.

$$\therefore \frac{600}{x-200} - \frac{600}{x} = \frac{1}{2}$$

$$\Rightarrow 600\left[\frac{1}{x-200} - \frac{1}{x}\right] = \frac{1}{2}$$

$$\Rightarrow \frac{x - x + 200}{x(x-200)} = \frac{1}{1200}$$

$\Rightarrow 24000 = x(x - 200)$

$\Rightarrow x^2 - 200x - 24000 = 0$

$\Rightarrow x^2 - 600x + 400x - 24000 = 0$

$\Rightarrow x(x - 600) + 400(x - 600) = 0$

$\Rightarrow (x - 600)(x + 400) = 0$

$\Rightarrow x = 600, -400$

Speed cannot be negative

Hence, original speed = 600 kmph and duration of flight

$= \frac{600}{600}$ hr. = 1 hr.

31. (3) Let the speed of the second train be x km per hr. Then the speed of the first train is $x + 5$ km per hr.

Let O be the position of the railway station from which the two trains leave. Distance travelled by the first train in 2 hours = $OA = 2(x + 5)$ km.

Distance travelled by the 2nd train in 2 hours= $OB = 2x$ km.

By Pythagoras theorem, $AB^2 = OA^2 + OB^2$

$\Rightarrow 50^2 = [2(x + 5)]^2 + [2x]^2$

$\Rightarrow 2500 = 4(x + 5)^2 + 4x^2$

$\Rightarrow 2500 = 4(x^2 + 10x + 25) + 4x^2$

$\Rightarrow 8x^2 + 40x - 2400 = 0$

$\Rightarrow x^2 + 5x - 300 = 0$

$\Rightarrow x^2 + 20x - 15x - 300 = 0$

$\Rightarrow x(x + 20) - 15(x + 20) = 0$

$\Rightarrow (x - 15)(x + 20) = 0$

$\Rightarrow x = 15, -20$

But x cannot be negative

$\therefore x = 15$

∴ The speed of the second train is 15 km per hr. and the speed of the first train is 20 km per hr.

32. (4) The distance covered by man in 4 minutes

$$= \frac{6 \times 1000 \times 4}{60} = 400 \text{ metres}$$

The distance covered by carriage in 4 minutes

= 200 + 400 = 600 metres

∴ Speed of carriage

$$= \frac{600}{4} \times \frac{60}{1000} \text{ km per hr.}$$

= 9 km per hr.

33. (1) If the car were not moving, the person would have heard the two sounds at an interval of 12 minutes. Therefore, the distance travelled by car in 11 minutes 40 seconds is equal to the distance that could have been covered by sound in 12 min – 11 min. 40 seconds = 20 seconds.

Distance covered by sound in 20 seconds

= 330 × 20 = 6600 m

In 11 min 40 seconds

or 700 seconds the car travels 6600 m.

In 1 second the car will travel

$$\frac{6600}{700} \text{ metre} = \frac{66}{7} \text{ metre}$$

$$\therefore \text{ Speed of the car} = \frac{66}{7} \text{ metre per second}$$

$$= \frac{66}{7} \times \frac{18}{5} \text{ km per hr.}$$

$$= \frac{1188}{35} \text{ km per hr.}$$

$$= 33\frac{33}{35} \text{ km per hr.} \approx 34 \text{ kmph}$$

34. (2)

When A and B cross each other at M for the first time, they have together covered the whole distance PQ = 180 km.

When they meet again at N, they have together covered total distance equal to 3 times of PQ = 3 × 180 = 540 km.

$$PM = \frac{5}{5+4} \times 180 = 100 \text{ km}$$

[Distance covered by each will be in the ratio of their speeds)

$$QP + PN = \frac{4}{5+4} \times 540$$

= 240 km

or PN = 240 – QP = 240 – 180

= 60 km.

Then, $MN = PM - PN$

= 100 – 60 = 40 km.

35. (2) Distance covered by man in 3 minutes

$$= \left(\frac{4 \times 1000}{60}\right) \frac{\text{m}}{\text{minutes}} \times 3 \text{ minutes}$$

=200 metres

Total distance covered by the car in 3 min.

= (200 + 130) m = 330 metres

∴ Speed of the car

$$= \frac{330}{3} \text{ m per min.}$$

= 110 m per minutes

$$= \frac{\frac{110}{1000}}{\frac{1}{60}} = \frac{33}{5} \text{ km per hr.}$$

or 6.6 kmph

36. (3)

Suppose that Ram and Mohan meet at A. Let Ram's speed be x km per hr. and Mohan's speed be y km per hr. Then $AP = \frac{25}{4}x$ km and $AB = 4y$ km.

Now, time taken by Ram in going from B to $A = \frac{4y}{x}$

and the time taken by Mohan in going from P to $A = \frac{25x}{4y}$.

Obviously time taken is equal

$$\therefore \frac{4y}{x} = \frac{25x}{4y}$$

$$\Rightarrow 16y^2 = 25x^2$$

$$\Rightarrow \frac{y^2}{x^2} = \frac{25}{16}$$

$$\Rightarrow \frac{y}{x} = \frac{5}{4}$$

$$\Rightarrow y = \frac{5}{4}x$$

Here, x = 20 km per hr.

$\therefore$ y = Mohan's speed

$$= \frac{5}{4} \times 20 = 25 \text{ km per hr.}$$

37. (4) Let the original speed be x and distance be y

Case I.

Time taken by train to travel

30 km = $\frac{30}{x}$

Time taken by train after accident

$$= \frac{y-30}{4/5\,x}$$

Total time taken = $\frac{30}{x} + \frac{y-30}{4/5\,x}$

Case II :

Time taken by train to travel

48 km = $\frac{48}{x}$

Time taken by train after accident = $\frac{y-48}{4/5\,x}$

Total time taken = $\frac{48}{x} + \frac{y-48}{4/5\,x}$

According to question,

$$\left(\frac{30}{x} + \frac{y-30}{4/5\,x}\right) - \left(\frac{48}{x} + \frac{y-48}{4/5\,x}\right)$$

$= \frac{9}{60}$ [$\because$ Difference between time is 9 minutes]

$$\left(\frac{y-30}{4/5x} - \frac{y-48}{4/5x}\right) + \left(\frac{30}{x} - \frac{48}{x}\right)$$

$$= \frac{9}{60}$$

$$\frac{y-y-30+48}{4/5x} + \frac{(-18)}{x} = \frac{9}{60}$$

$$\frac{5(18)}{4x} - \frac{18}{4x} = \frac{9}{60}$$

$$\Rightarrow \frac{90-72}{4x} = \frac{9}{60}$$

$$x = \frac{18 \times 60}{4 \times 9} = 30$$

Hence, original speed = 30 kmph

Also,

$$\frac{30}{x} + \frac{y-30}{4/5x} = \frac{y}{x} + \frac{45}{60}$$

[Original time + 45 minute = New time]

$\Rightarrow 3x - y = -30$

$\Rightarrow 3(30) - y = -30$

$\Rightarrow y = 120$ km

i.e. Distance = 120 km

38. (2) Let A be the starting point, B the terminus. C and D are points where accidents take place.

$$\therefore 0.75 = \frac{3}{4}$$

By travelling at $\frac{3}{4}$ of its original speed, the train would take $\frac{4}{3}$ of its usual time i.e., $\frac{1}{3}$ more of the usual time.

$\therefore$ $\frac{1}{3}$ of the usual time taken to travel the distance CB.

= 4 – 1 = 3 hrs. ...(*i*)

and $\frac{1}{3}$ of the usual time taken to travel the distance

$$DB = 3\frac{1}{2} - 1 = 2\frac{1}{2} \text{ hrs.} \quad ...(ii)$$

Subtracting equation (*ii*) from (*i*) we can write,

$\frac{1}{3}$ of the usual time taken to travel the distance

$$CD = 3 - 2\frac{1}{2} = \frac{1}{2} \text{ hr.}$$

$\therefore$ Usual time taken to travel

$$CD \text{ (150 km)} = \frac{\frac{1}{2}}{\frac{1}{3}} = \frac{3}{2} \text{ hr.}$$

Usual speed of the train

$$= \frac{150}{\frac{3}{2}} = 100 \text{ km per hr.}$$

Usual time taken to travel CB

$$= \frac{3}{\frac{1}{3}} = 9 \text{ hrs.}$$

Total time = 3 + 9 = 12 hrs.

$\therefore$ Length of the trip = 12 × 100 = 1200 km.

39. (3)

Let P be the starting point, Q the terminus, M and N the places where accidents occur.

At $\frac{3}{4}$th of the original speed, the train will take $\frac{4}{3}$ of its usual time to cover the same distance i.e., $\frac{1}{3}$rd more than the usual time.

$\frac{1}{3}$rd of the usual time to travel a distance of 60 kms between MN = 15 min.

∴ Usual time to travel 60 kms

= 15 × 3 = 45 min. = $\frac{3}{4}$ hr.

∴ Usual speed of the train per hour = $60 \times \frac{4}{3}$ = 80 km per hr.

Usual time taken to travel MQ= 90 × 3

= 270 min. or $\frac{9}{2}$ hrs.

∴ The distance MQ

$= 80 \times \frac{9}{2} = 360$ km.

Therefore, the total distance PQ = PM + MQ

= 100 + 360 = 460 kms.

40. (4) Let they meet x hrs after 7 am.

Distance covered by A in x hours = $20x$ km

Distance covered by B in $(x-1)$ hr. = 25 $(x - 1)$ km

∴ $20x + 25(x - 1) = 110$

$\Rightarrow 20x + 25x - 25 = 110$

$\Rightarrow 45x = 110 + 25 = 135$

$\Rightarrow x = 3$

∴ Trains meet at 10 a.m.

41. (1) Writing ratio = 200 : 150 = 4 : 3

In a given time first boy will be writing the line number

$\frac{4}{7} \times 817$

$= \frac{3268}{7}$ th line $= 466\frac{6}{7}$ th line

or, 467 th line

Hence, both of them shall meet on 467th line.

42. (2) Let the two men meet after t hours.

Distance covered by the first man starting from A = 4 t km.

Distance covered by the second man starting from B

$$= 2 + 2.5 + 3 + \ldots + \left[2 + \left(\frac{t-1}{2}\right)\right]$$

This is an arithmetic series of t terms with $\frac{1}{2}$ as common difference.

∴ By applying formula

$$S = \frac{n}{2}\left[2a + (n-1)d\right]$$

Where, n = no. of terms

a = first term

d = common difference

We have its sum

$$= \frac{t}{2}\left[(2 \times 2) + (t-1) \times \frac{1}{2}\right]$$

$$= 2t + \frac{t^2 - t}{4}$$

Total distance covered by two men $= 4t + 2t + \frac{t^2 - t}{4} = 72$

or $6t + \frac{t^2 - t}{4} = 72$

or $24t + t^2 - t = 288$

or $t^2 + 23t - 288 = 0$

or $t^2 - 9t + 32t - 288 = 0$

or $t(t-9) + 32(t-9) = 0$

or $(t - 9)(t + 32) = 0$

∴ Either $t - 9 = 0 \Rightarrow t = 9$

or, $(t + 32) = 0 \Rightarrow t = -32$

Time cannot be negative. Hence, the two men will meet after 9 hrs.

43. (3) Let the length of the train be x metres

Then, the time taken by the train to cover $(x + 50)$ metres is $4\frac{1}{2}$ seconds

∴ Speed of the train

$$= \frac{x+50}{\frac{9}{2}} \text{ m/s}$$

or $\frac{2x+100}{9}$ m per second ...(*i*)

Again, the time taken by the train to cover x metres in 2 seconds.

∴ Speed of the train $= \frac{x}{2}$ metre per second ..(*ii*)

From equations (*i*) and (*ii*), we have

$$\frac{2x+100}{9} = \frac{x}{2}$$

$\Rightarrow 4x + 200 = 9x$

$\Rightarrow 5x = 200$

$\Rightarrow x = 40$

∴ Length of the train = 40 metres

∴ Speed of the train

$= \frac{x}{2} = \frac{40}{2}$ = 20 m per sec.

44. (4) Both trains meet after 6 hours.

∴ The relative speed of two trains $= \frac{162}{6}$ = 27 km per hr.

The speed of the slower train starting from B

$= \frac{27-8}{2} = \frac{19}{2} = 9\frac{1}{2}$ km per hr.

∴ The speed of the faster train

$= 9\frac{1}{2} + 8 = 17\frac{1}{2}$ km per hr.

45. (1) Let the length of train be x metres and the length of platform be y metres.

Speed of the train

$$= \left(25 \times \frac{5}{18}\right) \text{m/sec}$$

$$= \frac{125}{18} \text{m per sec.}$$

Time taken by train to pass the platform

$= \left[(x+y)\times\frac{18}{125}\right]$ sec.

$\therefore\ (x+y)\times\frac{18}{125} = 18$

or, $x + y = 125$ ...(*i*)

Speed of train relative to man = (25 + 5) km per hr.

$= \left(30\times\frac{5}{18}\right)$ m per sec.

$= \frac{25}{3}$ m per sec.

Time taken by the train to pass the man

$= \left(x\times\frac{3}{25}\right)$ sec. $= \frac{3x}{25}$ sec.

$\therefore\ \frac{3x}{25} = 12$

$\Rightarrow x = \left(\frac{25\times 12}{3}\right) = 100$ metres

Putting $x = 100$ in equation (*i*), we get, $y = 25$ metres.

$\therefore$ Length of train = 100 metres and length of the platform = 25 metres.

46. (2) Let the speed of the train be x metre per sec. and y metre per sec. respectively.

Sum of the length of the trains = 200 + 175 = 375 metres

Case : I

When the trains are moving in opposite directions

Relative speed = $(x + y)$ m per sec.

In this case the time taken by the trains to cross each other

$= \frac{375}{x+y}$ sec.

$\therefore\ \frac{375}{x+y} = \frac{15}{2}$

$\Rightarrow x + y = 50$ ...(*i*)

Case : II

When the trains are moving in the same direction.

Relative speed = $(x - y)$ m per sec.

In this case, the time taken by the trains to cross each other

$= \frac{375}{x-y}$ sec.

$\therefore\ \frac{375}{x-y} = \frac{75}{2}$

$\Rightarrow x - y = 10$ ...(*ii*)

Now, $x + y = 50$

$x - y = 10$

$2x = 60$

$\Rightarrow x = 30$

Putting this value in equation (*i*), we have

$y = 50 - 30 = 20$

$\therefore$ Speed of trains = 30 m per sec.

$= 30\times\frac{18}{5} = 108$ km per hr.

and 20 m per sec. $= 20\times\frac{18}{5}$

= 72 km per hr.

47. (3) Trains are running in opposite direction.

$\therefore$ Relative speed of the two trains = 90 + 60 = 150 km per hr.

Distance travelled in $4\frac{1}{2}$ seconds with speed of 150 km per hr. $= 150\times\frac{5}{18}$ m per sec.

$= 150\times\frac{5}{18}\times\frac{9}{2} = \frac{375}{2}$ metres

Let the length of the first train be x metres.

Then the length of the second train be $\frac{x}{2}$ metres

$\therefore\ x + \frac{x}{2} = \frac{375}{2}$

$\Rightarrow \frac{3x}{2} = \frac{375}{2}$

$\Rightarrow 3x = 375$

$\Rightarrow x = 125$ metres

Hence, the length of the first train = 125 metres

Speed of the first train = 60 km per hr.

$= 60\times\frac{5}{18} = \frac{50}{3}$ m per sec.

Time taken by the first train to cross the tunnel = 4 minutes and $37\frac{1}{2}$ sec.

$= 240 + \frac{75}{2}$ sec. $= \frac{480+75}{2}$

$= \frac{555}{2}$ sec.

Speed of first train

$= \frac{50}{3}$ m per sec.

$\therefore$ Distance covered by it in $\frac{555}{2}$ sec.

$= \frac{50}{3}\times\frac{555}{2} = 4625$ metres

Hence, length of tunnel

= 4625 – 125 = 4500 metres

= 4.5 km

48. (4) Let the length of the train be x km and its speed y km per hr.

Case I : When it passes the man walking at 2 km per hr. in the same direction

Relative speed of train

= $(y - 2)$ km per hr.

$\therefore\ \frac{x}{y-2} = 9$ seconds

$= \frac{9}{3600} = \frac{1}{400}$ hour ..(*i*)

Case II : When the train crosses the man walking at 4 km per hr. in the same direction.

Relative speed of train= (y – 4) km per hr.

$\therefore\ \frac{x}{y-4} = 10$ sec.

$\Rightarrow \frac{x}{y-4} = \frac{10}{3600}$ hrs.

$\Rightarrow \frac{x}{y-4} = \frac{1}{360}$ hrs. ..(*ii*)

On dividing equation (*i*) by (*ii*), we have

$$\frac{y-4}{y-2} = \frac{\frac{1}{400}}{\frac{1}{360}} = \frac{360}{400} = \frac{9}{10}$$

$\Rightarrow 10y - 40 = 9y - 18$

$\Rightarrow 10y - 9y = 40 - 18$

$\Rightarrow y = 22$ km per hr.

$\therefore$ From equaton (*i*), we have

$$\frac{x}{22-2} = \frac{1}{400}$$

$$\Rightarrow x = \frac{1}{20} \text{ km}$$

$$= \frac{1000}{20} = 50 \text{ metres.}$$

49. (1) Let the length of the train be x metres

Then, in 18 sec. the train travels $(x + 162)$ metres ...(*i*)

and in 15 sec. the train travels $(x + 120)$ metres

$\therefore$ In $(18 - 15) = 3$ sec. the train travels $(x + 162)$

$- (x + 120) = 42$m.

$\therefore$ In 1 sec the train travels $= \frac{42}{3} = 14$ metres ...(*ii*)

$\therefore$ In 18 sec. the train travels $= 14 \times 18 = 252$ metres ...(*iii*)

From equations (*i*) and (*iii*)

$\therefore x + 162 = 252$

$\Rightarrow x = 252 - 162 = 90$

$\therefore$ Length of the train = 90 metres

Also, from equation (*ii*) we see that in 1hr. the train travels

$= 14 \times 60 \times 60$ metres

$$= \frac{14 \times 60 \times 60}{1000} \text{ km} = 50.4 \text{ km}$$

$\therefore$ The speed of the train

= 50.4 km per hr.

50. (2) Let the length of trains be x m and $(x + 50)$m and the speed of other train be y m per sec.

The speed of the first train

= 90 km per hr.

$$= 90 \times \frac{5}{18} = 25 \text{ m per sec.}$$

Case I : Opposite direction,

Their relative speed

$= (y + 25)$m per sec.

Distance covered $= x + x + 50$

$= 2x + 50$ metres

$$\therefore \text{Time taken} = \frac{2x+50}{y+25} = 10$$

$\Rightarrow 2x + 50 = 10y + 250$ ...(*i*)

Case II. Direction is Same

Their relative speed

$= (25 - y)$ m per sec.

Distance covered $= x + x + 50$

$= 2x + 50$m

$$\therefore \text{Time taken} = \frac{2x+50}{25-y} = 90$$

$\Rightarrow 2x + 50 = 90\ (25 - y)$ ...(*ii*)

From equations (*i*) and (*ii*)

$10y + 250 = 2250 - 90y$

$\Rightarrow 10y + 90y = 2250 - 250$

$$\Rightarrow y = \frac{2000}{100} = 20$$

Putting $y = 20$ in equation (*i*), we have

$2x + 50 = 10 \times 20 + 250 = 450$

$\Rightarrow 2x = 450 - 50 = 400$

$$\Rightarrow x = \frac{400}{2} = 200$$

$\therefore x + 50 = 200 + 50$

= 250 metres.

Hence,

The length of the 1st train = 200 metres.

The length of the 2nd train

= 250 metres.

The speed of the 2nd train

= 20 m per sec.

51. (1) Let the length of the train be x m and its speed y m/sec.

Distance covered in crossing the platform

$= 170 + x$ metres

and time taken = 21 seconds

$$\therefore \text{Speed } y = \frac{170+x}{21} \quad ...(i)$$

Distance covered to cross the man = x metres

and time taken $= 7\frac{1}{2} = \frac{15}{2}$ seconds

$$\therefore \text{Speed } y = \frac{x}{\frac{15}{2}} = \frac{2x}{15} \quad ...(ii)$$

From equations (*i*) and (*ii*),

$$\frac{170+x}{21} = \frac{2x}{15}$$

$\Rightarrow 2550 + 15x = 42x$

$\Rightarrow 42x - 15x = 2550$

$\Rightarrow 27x = 2550$

$$\Rightarrow x = \frac{2550}{27} = 94\frac{4}{9} \text{ metres}$$

From equation (*ii*),

$$y = \frac{2 \times 2550}{15 \times 27}$$

$$= \frac{340}{27} = 12\frac{16}{27} \text{ m per sec.}$$

$$\text{Hence, speed} = 12\frac{16}{27} \text{ m per sec}$$

52. (2) The goods train leaves Delhi at 6 am and mail train at 12 noon, hence after 6 hours

The distance covered by the goods train in 6 hours at 32 km per hr. $= 32 \times 6 = 192$ kms

The relative velocity of mail train with respect to goods train = 80 – 32 = 48 km per hr.

To completely cross the goods train, the mail train will have to cover a distance

= 192 km + 158m + 130m

= 192km + 0.158 km + 0.130 km

= 192.288 km more

Since, the mail train goes 48 kms more in 1 hour.

$\therefore$ The mail train goes 192.288 kms more in

$$= \frac{192288}{1000} \times \frac{1}{48} = \frac{2003}{500}$$

= 4 hours 21.6 sec.

53. (3) Let the speed of the motorboat in still water be Z km per hr.

Downstream speed= $(Z + 3)$ km per hr.

Upstream speed

$= (Z - 3)$ km per hr.

Total journey time

$= 30$ minutes $= \frac{30}{60}$ hr. $= \frac{1}{2}$ hour

We can write,

$$\frac{2}{Z-3}+\frac{2}{Z+3}=\frac{1}{2}$$

or, $2\left[\frac{(Z+3)+(Z-3)}{(Z-3)(Z-3)}\right]=\frac{1}{2}$

or, $\frac{2Z}{Z^2-9}=\frac{1}{4}$

or, $Z^2 - 9 = 8Z$

or, $Z^2 - 8Z - 9 = 0$

or, $Z^2 + Z - 9Z - 9 = 0$

or, $Z(Z + 1) - 9(Z + 1) = 0$

or, $(Z + 1)(Z - 9) = 0$

$\therefore$ $Z = -1$ or 9.

Since speed can't be negative

Therefore, the speed of the motor-boat in still water = 9 km per hr.

54. (4) Let the upstream speed be x km per hr. and downstream speed be y km per hr.

Then, we can write,

$$\frac{32}{x}+\frac{60}{y}=9$$

and, $\frac{40}{x}+\frac{84}{y}=12$

Let $\frac{1}{x}=m$ and $\frac{1}{y}=n$

The above two equations can now be written as

$32m + 60n = 9$ ...(*i*)

and, $40m + 84n = 12$ ...(*ii*)

$7 \times$ (*i*) $- 5 \times$ (*ii*) gives $24m = 3$

or $m=\frac{1}{8}$ or $x = 8$ km per hr.

$4 \times$ (*ii*) $- 5 \times$ (*i*) gives $36n = 3$

or, $n=\frac{1}{12}$ or $y = 12$ km per hr.

Rate of current

$$=\frac{y-x}{2}=\frac{12-8}{2}=2 \text{ km. per hr.}$$

55. (1) Let the speed of boat and river be x km per hr. and y km per hr. respectively. Then,

The speed of boatman downstream = $(x + y)$ km per hr.

and the speed of boatman upstream = $(x - y)$ km per hr.

Time taken by boatman in going 21 km downstream

$$=\frac{21}{x+y} \text{ hours}$$

Time taken by boatman in going 21 km upstream $=\frac{21}{x-y}$ hrs.

According to the question,

$$\frac{21}{x+y}+\frac{21}{x-y}=10 \quad ..(i)$$

Now, time taken for 7 kms downstream $=\frac{7}{x+y}$ hrs.

and time taken for 3 kms upstream $=\frac{3}{x-y}$ hrs.

According to the question

$$\frac{7}{x+y}-\frac{3}{x-y}=0 \quad ...(ii)$$

By (*ii*) $\times 7 +$ (*i*)

$$\frac{49}{x+y}-\frac{21}{x-y}+\frac{21}{x+y}+\frac{21}{x-y}=10$$

$$\Rightarrow \frac{70}{x+y}=10$$

$\Rightarrow x + y = 7$ ...(*iii*)

Putting $x + y = 7$ in equation (*ii*) we have

$$\frac{7}{7}-\frac{3}{x-y}=0$$

$$\Rightarrow 1-\frac{3}{x-y}=0$$

$\Rightarrow x - y = 3$ ..(*iv*)

On adding (*iii*) and (*iv*), we have $2x = 10$

$\Rightarrow x = 5$

$\therefore y = 7 - x = 7 - 5 = 2$

$\therefore$ Speed of river = 2 km per hr.

56. (2) Let the speed of the cyclist be x km per hr.

Speed of the motorist= $(x + 15)$ km per hr.

Time taken by the motorist to cover half of the distance

$$=\frac{18}{2\times(x+15)}=\frac{9}{x+15} \text{ hrs.}$$

After covering 9 kms, the speed of motorist gets reduced by 20%

$$\therefore \text{ New speed } = (x+15)\times\frac{80}{100}$$

$$=\frac{4(x+15)}{5} \text{ km per hr.}$$

Time taken by the motorist to cover the remaining half distance

$$=\frac{9\times5}{4(x+15)}=\frac{45}{4(x+15)} \text{ hrs.}$$

Total time taken by the motorist

$$=\frac{9}{x+15}+\frac{1}{2}+\frac{45}{4(x+15)} \text{ hrs.}$$

Total time taken by the cyclist

$$=\frac{18}{x} \text{ hrs.}$$

Motorist reaches 15 minutes, i.e., $\frac{1}{4}$ hr. earlier.

$$\therefore \frac{18}{x}-\frac{9}{x+15}-\frac{1}{2}-\frac{45}{4(x+15)}=\frac{1}{4}$$

$$\Rightarrow \frac{18\times4(x+15)-36x-2x(x+15)-45x}{4x(x+15)}=\frac{1}{4}$$

$\Rightarrow 72x + 1080 - 36x - 2x^2 - 30x - 45x = x^2 + 15x$

$\Rightarrow 3x^2 + 54x - 1080 = 0$

$\Rightarrow x^2 + 18x - 360 = 0$

$\Rightarrow x^2 + 30x - 12x - 360 = 0$

$\Rightarrow x(x + 30) - 12(x + 30) = 0$

$\Rightarrow (x + 30)(x - 12) = 0$

$\Rightarrow x = -30, 12$

The speed cannot be negative.

$\therefore$ The speed of the cyclist = 12 km per hr.

57. (3) Total distance travelled
= 3990 km
Distance = Time × Speed
Ratio of time spent = 1 : 16 : 2
Ratio of speed = 20 : 1 : 3
∴ Ratio of time × speed
= 20 × 1 : 16 × 1 : 2 × 3
= 20 : 16 : 6
Sum of the ratios
= 20 + 16 + 6 = 42
∴ Distance covered by sea

$= \frac{3990}{42} \times 16 = 1520$ kms

58. (4) Relative speed of insect
= 30 + 42 = 72 km per hr.
Distance between railway engine and insect = 20 km.
Engine and insect will meet for the first time after $= \frac{20}{72}$ hr.
Distance covered in this period

$= \frac{20}{72} \times 42 = \frac{35}{3}$ km

The insect will cover $\frac{35}{3}$ km in returning to A.
The distance covered by engine in this period

$= \frac{20}{72} \times 30 = \frac{25}{3}$ km

Since, the insect when reaches *A*, the engine will cover $\frac{25}{3}$ km to *A*.
∴ Remaining distance between *A* and engine

$= 20 - \left(\frac{25}{3} + \frac{25}{3}\right)$

$= 20 - \frac{50}{3} = \frac{10}{3}$ km.

Again, engine and insect will meet after $\frac{10}{3 \times 72} = \frac{5}{108}$ hr.
The distance covered by the insect in this period

$= \frac{5}{108} \times 42 = \frac{35}{18}$ km

and again the insect will cover $\frac{35}{18}$ km in returning.
∴ Total distance covered by the insect $= \frac{70}{3} + \frac{70}{18} + \ldots\ldots$

$\left[\frac{35}{3} + \frac{35}{3} = \frac{70}{3} \text{ and } \frac{35}{18} + \frac{35}{18} = \frac{70}{18} \text{ and so on}\right]$

$= \frac{70}{3}\left[1 + \frac{1}{6} + \ldots\ldots\infty\right]$

It is a Geometric Progression to infinity with common ratio $\frac{1}{6}$.

$= \frac{70}{3}\left[\frac{1}{1-\frac{1}{6}}\right] \quad \left[\because S_\infty = \frac{a}{1-r}\right]$

$= \frac{70}{3} \times \frac{1}{\frac{5}{6}} = \frac{70}{3} \times \frac{6}{5} = 28$ km

59. (1)

Distance covered by *P* till 11.30 a.m.
= (11.30 a.m. – 8 a.m.) × 25km

$= 3\frac{1}{2} \times 25 = 87.5$ km.

Distance covered by *Q* till 11.30 a.m.
= (11.30 – 9.51 am) × 20

$= 1\frac{39}{60}$ hrs. × 20 = 33 km

So, at 11.30 a.m. the three trains will be at positions shown below :

P gains 5 km every hour over *Q*.
Relative speed of *P* w.r.t. *R*
= 20 + 30 = 50 km per hr
Let *P* be at equal distance from *Q* and *R* after *t* hours.
∴ (87.5 – 33) + 5*t*
= 132.5 –55t
or, 54.5 + 5*t* = 132.5 – 55t
or, 60 *t* = 78

or, $t = \frac{78}{60}$ hrs.

= 1 hr 18 minutes
11.30 am + 1 hr. 18 min.
= 12.48 pm
At 12.48 pm, *P* would have covered a distance
= (12.48 pm – 8 am) × 25
= 120 km
Therefore, *P* will be at equal distance from *Q* and *R* at 12.48 pm

60. (2) Let the original speed of the person be *x* km/hr. and the distance be y km.

Case I : $\frac{y}{x} - \frac{y}{x+3} = 40$ minutes

or $\frac{40}{60}$ hr

or, $\frac{y}{x} - \frac{y}{x+3} = \frac{40}{60} = \frac{2}{3}$

or, $y\left[\frac{1}{x} - \frac{1}{(x+3)}\right] = \frac{2}{3}$

or, $y\left[\frac{x+3-x}{x(x+3)}\right] = \frac{2}{3}$

or, $\frac{3y}{x(x+3)} = \frac{2}{3}$

or, 2 *x* (*x* + 3) = 9*y* ...(i)

Case II : $\frac{y}{x-2} - \frac{y}{x} = \frac{40}{60}$

or, $y\left(\frac{1}{x-2} - \frac{1}{x}\right) = \frac{2}{3}$

or, $y\left[\frac{x-x+2}{x(x-2)}\right] = \frac{2}{3}$

or, $\frac{2y}{x(x-2)} = \frac{2}{3}$

or, *x* (*x* – 2) = 3*y* ... (ii)
On dividing equation (i) by (ii) we have,

$$\frac{2x(x+3)}{x(x-2)} = \frac{9y}{3y}$$

or, $\frac{2(x+3)}{(x-2)} = 3$

or, $2x + 6 = 3x - 6$

or, $3x - 2x = 6 + 6 = 12$

or, $x = 12$ km/hr.

$\therefore$ Original speed of the person = 12 km/hr.

Putting the value of x in equation (ii)

$12\ (12 - 2) = 3y$

or, $3y = 12 \times 10$

or, $y = \frac{12 \times 10}{3} = 40$

$\therefore$ The required distance = 40km.

61. (3) Let the speed of steamer in still water = x kmph

$\therefore$ Rate downstream = $(x + 2)$ kmph

Rate upstream = $(x - 2)$ kmph

Obviously, distance covered downstream and upstream are equal

$\Rightarrow 4\ (x + 2) = 5\ (x - 2)$

$\Rightarrow 4x + 8 = 5x - 10$

$\Rightarrow 5x - 4x = 10 + 8 \Rightarrow x = 18$

$\therefore$ Rate downstream = 18 + 2 = 20 kmph

Therefore, the required distance = Speed downstream × Time = 20 × 4 = 80 km.

62. (2) According to the question, when A covers the distance of 200 metres, B covers only 200–20 = 180 metres

Again, in 100 metre race, B beats C by 5 metres.

Hence, if B runs 100 metres, C runs 100–5 = 95 metres

$\because$ If B runs 100 m, C runs = 95 m

$\therefore$ If B runs 180 m, C runs

$= \frac{95 \times 180}{100} = 171$ m

$\therefore$ A : B : C = 200 : 180 : 171

Hence, A will beat C by = 200–171 = 29 m in 200 m race. i.e., 29 × 5 = 145 m in 1 km race.

63. (3) **Case I :** When the cars are moving in the same direction.

Let A and B be two places and C be the place of meeting.

Let the speed of car starting from A be x kmph, and that of car starting from B be y kmph.

Relative speed = $(x - y)$ kmph

According to the question.

$(x - y) \times 8 = 80$

$\Rightarrow x - y = 10$ ...(i)

Case II : When the cars are moving in the opposite directions and they meet at point C.

Relative speed = $(x + y)$ kmph

Time taken = 1 hour 20 minutes

$= 1 + \frac{1}{3} = \frac{4}{3}$ hours

$\therefore (x + y) \times \frac{4}{3} = 80$

$\Rightarrow x + y = \frac{80 \times 3}{4}$

$\Rightarrow x + y = 60$ ...(ii)

Adding equations (i) and (ii),

$2x = 70$

$\Rightarrow x = 35$

From equation (ii),

$x + y = 60$

$\Rightarrow 35 + y = 60$

$\Rightarrow y = 60 - 35 = 25$

$\therefore$ Speed of the faster car = 35 kmph

64. (4) Let B take x seconds to run 1000 m.

$\therefore$ Time taken by C = $(x + 15)$ seconds

$\therefore \frac{x}{x+15} = \frac{900}{1000} = \frac{9}{10}$

$\Rightarrow 10x = 9x + 135$

$\Rightarrow x = 135$ seconds

Now in a one kilometre race, A beats B by 15 seconds.

It means A covers 1000 m in 135 – 15 = 120 seconds

$\therefore$ Speed of A

$= \frac{1000}{120} = \frac{25}{3}$ m/sec

= 8.3 m/sec.

65. (1) Trains are running in opposite directions.

$\therefore$ Relative speed = 72 + 90 = 162 kmph

$= 162 \times \frac{5}{18} = 45$ m/sec

Let the length of the first train be = x metre.

$\therefore$ Length of the second train $= \frac{3}{4}x$ meter.

Now,

distance travelled in $3\frac{1}{2}$ seconds at 45 m/sec

$= 45 \times \frac{7}{2} = \frac{315}{2}$ metre

This distance is equal to sum of the lengths of trains.

$\therefore x + \frac{3x}{4} = \frac{315}{2}$

$\Rightarrow \frac{4x + 3x}{4} = \frac{315}{2}$

$\Rightarrow \frac{7x}{4} = \frac{315}{2}$

$\Rightarrow x = \frac{315}{2} \times \frac{4}{7} = 90$

Hence, the length of the first train = 90 metre.

Speed of first train = 72 kmph

$= 72 \times \frac{5}{18} = 20$ m/sec

Time taken by the first train to cross the tunnel = 3 minutes = 180 seconds

$\therefore$ Distance covered by it in 180 seconds = 180 × 20 = 3600 metre

$\therefore$ Length of (first train + tunnel) = 3600 metre

$\therefore$ Length of tunnel = 3600 – 90 = 3510 metre

□□□

15 BOATS AND STREAMS

Importance : 'Boats and Streams' questions are special type of 'Time & distance' questions but as there are special 'tricks' and 'methods' to solve these questions hence it is easy and convenient to study them in separate chapter. Questions from this chapter have been asked in different competitive examinations.

Scope of questions : Questions specifically based on still water, down stream and upstream conditions are asked to calculate speed of boat/current swimmer, time in crossing and distance between two places.

Way to success : Ensure that you have understood the concept of downstream and upstream and also got expertise in solving questions from different 'formulae' and 'rules'.

SOME POINTS

If the speed of certain swimmer (or boat or ship) in still water is v km/h and the speed of stream is u km/h., then

(i) The speed of swimmer or boat or ship in the direction of stream (down stream) = (u + v) km/h.

(ii) The speed of swimmer or boat or ship in the opposite direction of stream (upstream)

=(v – u) km/h.

RULE 1 : If the speed of a swimmer/boat/ship in the direction of stream (downstream) is x km/h and in the opposite direction of stream (upstream) is y km/h, then,

(i) Speed of swimmer/boat/ship = $\frac{x+y}{2}$ km/h

(ii) Speed of stream = $\frac{x-y}{2}$ km/h

RULE 2 : Let the speed of boat is x km/h and speed of stream is y km/h. To travel d_1 km downstream and d_2 km upstream, the time taken is 't' hours, then

$$\frac{d_1}{x+y}+\frac{d_2}{x-y}=t$$

RULE 3 : Let the speed of stream be y km/h and speed of boat be x km/h. A boat travels equal distance upstream as well as down stream in 't' hours, then

$\frac{d}{x+y}+\frac{d}{x-y}=t$, d is the fixed distance or, $d=\frac{t(x^2-y^2)}{2x}$

RULE 4 : If a boat travels in downstream and upstream, then,

$$\text{Speed of boat} = \frac{\text{Sum of distances}}{2\times\text{time}}$$

$$= \frac{d_1+d_2}{2\times\text{time}} \text{ and}$$

$$\text{Speed of stream} = \frac{\text{Difference of distances}}{2\times\text{time}}$$

$$= \frac{d_1-d_2}{2\times\text{time}}$$

RULE 5 : A swimmer or a boat travels a certain distance upstream in t_1 hours, while it takes t_2 hours to travel same distance down stream, then,

$$\frac{\text{Speed of swimmer}}{\text{Speed of stream}} = \frac{t_1+t_2}{t_1-t_2}$$

RULE 6 : If a swimmer takes same time to travel d_1 km downstream and d_2 km upstream, then,

$$\frac{\text{Speed of swimmer or boat}}{\text{Speed of stream}} = \frac{d_1+d_2}{d_1-d_2}$$

RULE 7 : If a man or a boat covers x km distance in t_1 hours along the direction of stream (downstream) and covers the same distance in t_2 hours against the stream i.e. upstream, then

$$\text{speed of man/boat} = \frac{x}{2}\left(\frac{1}{t_1}+\frac{1}{t_2}\right) \text{ km/hr}$$

$$\text{speed of stream} = \frac{x}{2}\left(\frac{1}{t_1}-\frac{1}{t_2}\right) \text{ km/hr}$$

RULE 8 : If the speed of a boat or swimmer in still water is a km/hr and river is flowing with a speed of b km/hr, then average speed in going to a certain place and coming back to starting point is given by = $\frac{(a+b)(a-b)}{a}$ km/hr

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. A man rows a boat 18 kilometres in 4 hours downstream and returns upstream in 12 hours. The speed of the stream (in km per hour) is :

(1) 1 (2) 1.5
(3) 2 (4) 1.75

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting) & (SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

2. A motorboat in still water travels at a speed of 36 kmph. It goes 56 km upstream in 1 hour 45 minutes. The time taken by it to cover the same distance down the stream will be :

(1) 2 hours 25 minutes
(2) 3 hours
(3) 1 hour 24 minutes
(4) 2 hours 21 minutes

(SSC CPO S.I. Exam. 16.12.2007)

3. A boat running downstream covers a distance of 20km in 2 hrs while it covers the same distance upstream in 5 hrs. Then speed of the boat in still water is

(1) 7 km/hr (2) 8 km/hr
(3) 9 km/hr (4) 10 km/hr

(SSC CPO S.I. Exam. 06.09.2009)

4. A boatman rows 1 km in 5 minutes, along the stream and 6 km in 1 hour against the stream. The speed of the stream is

(1) 3 kmph (2) 6 kmph
(3) 10 kmph (4) 12 kmph

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

5. A boat covers 24 km upstream and 36 km downstream in 6 hours, while it covers 36 km upstream and 24 km downstream in $6\frac{1}{2}$ hours. The speed of the current is

(1) 1 km/hr (2) 2 km/hr
(3) 1.5 km/hr (4) 2.5 km/hr

(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

6. The speed of a boat in still water is 10 km/hr. It covers (upstream) a distance of 45 km in 6 hours. The speed (in km/hr) of the stream is

(1) 2.5 (2) 3
(3) 3.5 (4) 4

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

7. A man rows 40 km upstream in 8 hours and a distancec of 36 km downstream in 6 hours. Then speed of stream is

(1) 0.5 km/hr (2) 1.5 km/hr
(3) 1 km/hr (4) 3 km/hr

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

8. A boat travels 24 km upstream in 6 hours and 20 km downstream in 4 hours. Then the speed of boat in still water and the speed of water current are respectively

(1) 4 kmph and 3 kmph
(2) 4.5 kmph and 0.5 kmph
(3) 4 kmph and 2 kmph
(4) 5 kmph and 2 kmph

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

9. If a boat goes 100 km downstream in 10 hours and 75 km upstream in 15 hours, then the speed of the stream is

(1) 2 km/hour (2) 2·5 km/hour
(3) 3 km/hour (4) 3·5 km/hour

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

10. A boat covers 12 km upstream and 18 km downstream in 3 hours, while it covers 36 km upstream and 24 km downstream in $6\frac{1}{2}$ hours. What is the speed of the current ?

(1) 1.5 km/hr (2) 1 km/hr
(3) 2 km/hr (4) 2.5 km/hr

(SSC Graduate Level Tier-II Exam.16.09.2012)

11. A boy can swim in still water at a speed of 10 km/hr. If the speed of the current would have been 5 kmph, then the boy could swim 60km

(1) upstream in 4 hour
(2) downstream in 12 hours
(3) upstream in 6 hours
(4) downstream in 4 hours

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

12. A man can swim at the rate of 4 km/hr in still water. If the speed of the water is 2 km/hr, then the time taken by him to swim 10 km upstream is

(1) $2\frac{1}{2}$ hrs (2) $3\frac{1}{2}$ hrs
(3) 5 hrs (4) 4 hrs

(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

13. Speed of a boat along and against the current are 12 km/hr and 8 km/hr respectively. Then the speed of the current in km/hr is

(1) 5 (2) 4
(3) 3 (4) 2

(SSC Multi-Tasking Staff Exam. 17.03.2013 (Kolkata Region)

14. A man can swim 3 km/hr. in still water. If the velocity of the stream is 2 km/hr., the time taken by him to swim to a place 10 km upstream and back is :

(1) $9\frac{1}{3}$ hr. (2) 10 hr.
(3) 12 hr. (4) $8\frac{1}{3}$ hr

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

15. A swimmer swims from a point A against a current for 5 minutes and then swims backwards in favour of the current for next 5 minutes and comes to the point B. If AB is 100 metres, the speed of the current (in km per hour) is :

(1) 0.4 (2) 0.2
(3) 1 (4) 0.6

(SSC Graduate Level Tier-I Exam. 21.04.2013)

16. A person can row a distance of one km upstream in ten minutes and downstream in four minutes. What is the speed of the stream ?

(1) 4.5 km/h (2) 4 km/h
(3) 9 km/h (4) 5.6 km/h

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

17. A boat goes 20 km downstream in one hour and the same distance upstream in two hours. The speed of the boat in still water is

(1) 15 km/hr. (2) 10 km/hr.
(3) 5 km/hr. (4) 7.5 km/hr.

(SSC CPO S.I. Exam. 12.01.2003

18. A man rows 750 m in 675 seconds against the stream and returns in $7\frac{1}{2}$ minutes. Find his rowing speed in still water.
(1) 3 kmph (2) 4 kmph
(3) 5 kmph (4) 6 kmph
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

19. A boat goes 40 km upstream in 8 hours and 36 km downstream in 6 hours. The speed of the boat in still water is :
(1) 6.5 km/hour (2) 5.5 km/hour
(3) 6 km/hour (4) 5 km/hour
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

20. A boat goes 12 km downstream and comes back to the starting point in 3 hours. If the speed of the current is 3 km/hr, then the speed (in km/hr) of the boat in still water is
(1) 12 (2) 9
(3) 8 (4) 6
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

21. The speed of the current is 5 km/hour. A motorboat goes 10 km upstream and back again to the starting point in 50 minutes. The speed (in km/hour) of the motorboat in still water is
(1) 20 (2) 26
(3) 25 (4) 28
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

22. A man can row 15km/ hr downstream and 9 km/hr upstream. The speed of the boat in still water is
(1) 8 km/hr. (2) 10 km/hr.
(3) 15 km/hr. (4) 12 km/ hr.
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

23. A sailor goes 12 km downstream in 48 minutes and returns in 1 hour 20 minutes. The speed of the sailor in still water is :
(1) 12 km/hr (2) 12.5 km/ hr
(3) 13 km/hr (4) 15 km/hr
(SSC CHSL DEO & LDC Exam. 27.11.2010)

24. The current of a stream runs at the rate of 4 km an hour. A boat goes 6 km and comes back to the starting point in 2 hours. The speed of the boat in still water is
(1) 6 km/hour (2) 8 km/hour
(3) 7.5 km/hour
(4) 6·8 km/hour
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

25. A man swims downstream a distance of 15 km in 1 hour. If the speed of the current is 5 km/hour, the time taken by the man to swim the same distance upstream is
(1) 1 hour 30 minutes
(2) 45 minutes
(3) 2 hours 30 minutes
(4) 3 hours
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

26. The speed of a stream is 3 km/hr. and the speed of a man in still water is 5 km/hr. The time taken by the man to swim 26 km downstream is :
(1) $8\frac{2}{3}$ hrs. (2) $3\frac{1}{4}$ hrs.
(3) 13 hrs. (4) $5\frac{1}{5}$ hrs.
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

27. A man rows down a river 15 km in 3 hrs. with the stream and returns in $7\frac{1}{2}$ hrs, The rate at which he rows in still water is
(1) 2.5 km/hr (2) 1.5 km/hr
(3) 3.5 km/hr (4) 4.5 km/hr
(SSC Graduate Level Tier-I Exam. 21.04.2013)

28. A boat takes half time in moving a certain distance downstream than upstream. The ratio of the speed of the boat in still water and that of the current is
(1) 2 : 1 (2) 1 : 2
(3) 4 : 3 (4) 3 : 1
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

29. A man rows upstream 36 km and downstream 48 km taking 6 hours each time. The speed of the current is
(1) 0.5 kmph (2) 2 kmph
(3) 1 kmph (4) 1.5 kmph
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

30. A man rows 750 m in 600 seconds against the stream and returns in $7\frac{1}{2}$ minutes. Its rowing speed in still water is (in km/hr).
(1) 5.5 (2) 5.75
(3) 5 (4) 5.25
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

31. A boat moves downstream at the rate of 1 km in $7\frac{1}{2}$ minutes and upstream at the rate of 5 km an hour. What is the speed of the boat in the still water?
(1) $3\frac{1}{2}$ km/hour
(2) $6\frac{1}{2}$ km/hour
(3) 4 km/hour
(4) 8 km/hour
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

32. A boat goes 75 km upstream in 3 hours and 60 km downstream in 1.5 hours. The speed of the boat in still water is :
(1) 32.5 kmph (2) 30 kmph
(3) 65 kmph (4) 60 kmph
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

33. A man rows to a place 35 km in distant and back in 10 hours 30 minutes. He found that he could row 5 km with the stream in the same time as he can row 4 km against the stream. Find the rate of flow of the stream.:
(1) 1 km/hr (2) 0.5 km/hr
(3) 0.75 km/hr (4) 1.5 km/hr
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

34. A man can row upstream at 12 km/hr and downstream at 18 km/hr. The man's rowing speed in still water is
(1) 15 km/hr (2) 5 km/hr
(3) 3 km/hr (4) 10 km/hr
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

35. A boat moves downstream at the rate of 8 km per hour and upstream at 4 km per hour. The speed of the boat in still waters is :
(1) 4.5 km per hour
(2) 5 km per hour
(3) 6 km per hour
(4) 6.4 km per hour
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

TYPE–II

1. A boat goes 6 km an hour in still water, but takes thrice as much time in going the same distance against the current. The speed of the current (in km/hour) is :
(1) 4 (2) 5
(3) 3 (4) 2
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

2. In a fixed time, a boy swims double the distance along the current that he swims against the current. If the speed of the current is 3 km/hr, the speed of the boy in still water is
(1) 6 km/hr (2) 9 km/hr
(3) 10 km/hr (4) 12 km/hr
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

3. A man can row 30 km downstream and return in a total of 8 hours. If the speed of the boat in still water is four times the speed of the current, then the speed of the current is
(1) 1 km/hour (2) 2 km/hour
(3) 4 km/hour (4) 3 km/hour
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

4. A person can row $7\frac{1}{2}$ km an hour in still water and he finds that it takes him twice as long to row up as to row down the river. The speed of the stream is :
(1) 2 km/hr (2) 3 km/hr
(3) $2\frac{1}{2}$ km/hr (4) $3\frac{1}{2}$ km/hr
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

5. A man can row at a speed of $4\frac{1}{2}$ km/hr in still water. If he takes 2 times as long to row a distance upstream as to row the same distance downstream, then, the speed of stream (in km/hr) is
(1) 1 (2) 1.5
(3) 2 (4) 2.5
(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting) and SSC CGL Prelim Exam. 27.07.2008)

6. A boat can travel with a speed of 13 km/hr in still water. If the speed of stream is 4 km/hr in the same direction, time taken by boat to go 63 km in opposite direction is
(1) 9 hrs (2) 4 hrs
(3) 7 hrs (4) $3\frac{9}{17}$ hrs
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

7. The speed of a boat in still water is 6 kmph and the speed of the stream is 1.5 kmph. A man rows to a place at a distance of 22.5 km and comes back to the starting point. The total time taken by him is :
(1) 10 hours
(2) 4 hours 10 minutes
(3) 6 hours 10 minutes
(4) 8 hours
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

8. A motor boat covers a certain distance downstream in a river in 3 hours. It covers the same distance upstream in 3 hours and a half. If the speed of water is 1.5 km/h, then the speed of the boat in still water is :
(1) 17 km/h (2) 19.5 km/h
(3) 17.5 km/h (4) 19 km/h
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

TYPE–III

1. A man can row at 5 kmph. in still water. If the velocity of current is 1 kmph. and it takes him 1 hour to row to a place and come back, how far is the place ?
(1) 2.5 km (2) 3 km
(3) 2.4 km (4) 3.6 km
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

2. The speed of a motor-boat is that of the current of water as 36 : 5. The boat goes along with the current in 5 hours 10 minutes. It will come back in
(1) 5 hours 50 minutes
(2) 6 hours
(3) 6 hours 50 minutes
(4) 12 hours 10 minutes
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

3. A man goes downstream with a boat to some destination and returns upstream to his original place in 5 hours. If the speed of the boat in still water and the stream are 10 km/hr and 4 km/hr respectively, the distance of the destination from the starting place is
(1) 16 km (2) 18 km
(3) 21 km (4) 25 km
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

4. Two boats A and B start towards each other from two places, 108 km apart. Speed of the boat A and B in still water are 12km/hr and 15km/hr respectively. If A proceeds down and B up the stream, they will meet after.
(1) 4.5 hours (2) 4 hours
(3) 5.4 hours (4) 6 hours
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

5. A man can row 6 km/h in still water. If the speed of the current is 2 km/h, it takes 3 hours more in upstream than in the downstream for the same distance. The distance is
(1) 30 km (2) 24 km
(3) 20 km (4) 32 km
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

6. Speed of motorboat in still water is 45kmph. If the motorboat travels 80 km along the stream in 1 hour 20 minutes, then the time taken by it to cover the same distance against the stream will be
(1) 3 hours
(2) 1 hour 20 minutes
(3) 2 hours 40 minutes
(4) 2 hours 55 minutes
(SSC CPO S.I. Exam. 09.11.2008)

7. Speed of a boat is 5 km per hour in still water and the speed of the stream is 3 km per hour. If the boat takes 3 hours to go to a place and come back, the distance of the place is :
(1) 3.75 km (2) 4 km
(3) 4.8 km (4) 4.25 km
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

8. The speed of a boat along the stream is 12 km/h and against the stream is 8 km/h. The time taken by the boat to sail 24 km in still water is
(1) 2 hours (2) 3 hours
(3) 2.4 hours (4) 1.2 hours
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

9. On a river, Q is the mid-point between two points P and R on the same bank of the river. A boat can go from P to Q and back in 12 hours, and from P to R in 16 hours 40 minutes. How long would it take to go from R to P ?
(1) $3\frac{1}{3}$ hours (2) 5 hours
(3) $6\frac{2}{3}$ hours (4) $7\frac{1}{3}$ hours
(SSC CGL Tier-II Online Exam.01.12.2016)

10. A boat goes at 14 kmph along the stream and 8 kmph against the stream. The speed of the boat (in kmph) in still water is :
(1) 12 kmph (2) 11 kmph
(3) 10 kmph (4) 8 kmph
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

11. Speed of a boat along and against the current are 14 kms/hr and 8 kms/hr respectively. The speed of the current is
(1) 11 km/hr (2) 6 km/hr
(3) 5.5 km/hr (4) 3 km/hr
(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

12. If the speed of a boat in still water is 20 km/hr and the speed of the current is 5 km/hr, then the time taken by the boat to travel 100 km with the current is :
(1) 2 hours (2) 3 hours
(3) 4 hours (4) 7 hours
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

SHORT ANSWERS

TYPE-I

1. (2)	**2.** (3)	**3.** (1)	**4.** (1)
5. (2)	**6.** (1)	**7.** (1)	**8.** (2)
9. (2)	**10.** (3)	**11.** (4)	**12.** (3)
13. (4)	**14.** (3)	**15.** (4)	**16.** (1)
17. (1)	**18.** (3)	**19.** (2)	**20.** (2)
21. (3)	**22.** (4)	**23.** (1)	**24.** (2)
25. (4)	**26.** (2)	**27.** (3)	**28.** (4)
29. (3)	**30.** (4)	**31.** (2)	**32.** (1)
33. (3)	**34.** (1)	**35.** (3)	

TYPE-II

1. (1)	**2.** (2)	**3.** (2)	**4.** (3)
5. (2)	**6.** (3)	**7.** (4)	**8.** (2)

TYPE-III

1. (3)	**2.** (3)	**3.** (3)	**4.** (2)
5. (2)	**6.** (3)	**7.** (3)	**8.** (3)
9. (4)	**10.** (2)	**11.** (4)	**12.** (3)

EXPLANATIONS

TYPE-I

1. (2) Tricky Approach

Rate downstream

$= \frac{18}{4} = \frac{9}{2}$ kmph

Rate upstream $= \frac{18}{12} = \frac{3}{2}$ kmph.

Now, speed of the stream

$= \frac{\text{Rate downstream} - \text{Rate upstream}}{2}$

$= \frac{\frac{9}{2} - \frac{3}{2}}{2} = \frac{6}{4} = \frac{3}{2} = 1.5$ kmph.

Aliter : Using Rule 7,

Here, x = 18, t_1 = 4, t_2 = 12

Speed of stream $= \frac{x}{2}\left(\frac{1}{t_1} - \frac{1}{t_2}\right)$

$= \frac{18}{2}\left(\frac{1}{4} - \frac{1}{12}\right)$

$= 9\left(\frac{3-1}{12}\right)$

= 1.5 km/hr

2. (3) Speed of the motorboat upstream

$= \frac{56\text{ km}}{1\frac{3}{4}\text{ hours}} = \frac{56 \times 4}{7} = 32$ kmph

Let the speed of the current be x kmph

$\therefore$ 36 – x = 32

$\Rightarrow$ x = 36 – 32 = 4 kmph

Speed of motor boat downstream = 36 + 4 = 40 kmph

$\therefore$ Time taken to cover 56 km at 40 kmph $= \frac{56}{40} = \frac{7}{5}$ hours

or 1 hour 24 minutes

3. (1) Let the speed of boat in still water be x kmph and that of stream be y kmph.

$\therefore \frac{20}{x+y} = 2$

$\Rightarrow x + y = 10$ ...(i)

$\frac{20}{x-y} = 5$

$\Rightarrow x - y = 4$ ...(ii)

On adding, $2x$ = 14 kmph

= 7 kmph

Aliter : Using Rule 7,

Here, x = 20, t_1 = 2, t_2 = 5

Speed of Boat $= \frac{x}{2}\left(\frac{1}{t_1} + \frac{1}{t_2}\right)$

$= \frac{20}{2}\left(\frac{1}{2} + \frac{1}{5}\right) = 7$ km/hr

4. (1) Tricky Approach

Speed of current

$= \frac{1}{2}$ (Rate downstream – Rate upstream) $= \frac{1}{2}$ (12 – 6) kmph

= 3 kmph [Rate downstream $= \frac{1}{5} \times 60 = 12$ kmph]

Aliter : Using Rule 1,

Here, x $= \frac{1}{5} \times 60 = 12$ km/hr

y = 6 km/hr

Speed of Stream $= \left(\frac{x-y}{2}\right)$

$= \left(\frac{12-6}{2}\right)$

= 3km/hr

5. (2) Let speed of boat in still water = x kmph

and speed of current = y kmph

$\therefore \frac{24}{x-y} + \frac{36}{x+y} = 6$ .....(i)

and, $\frac{24}{x+y}+\frac{36}{x-y}=\frac{13}{2}$ .....(ii)

By equation (i) × 2 – equation (ii) × 3, we have

$\frac{48}{x-y}-\frac{108}{x-y}=12-\frac{39}{2}$

$\Rightarrow \frac{60}{x-y}=\frac{15}{2}$

$\Rightarrow x-y=8$ ..... (iii)

By equation (i) × 3 – equation (ii) × 2, we have

$\frac{108}{x+y}-\frac{48}{x+y}=18-13$

$\Rightarrow \frac{60}{x+y}=5$

$\Rightarrow x+y=12$ ..... (iv)

From equation (iv) – (iii), we have

$x+y-x+y=12-8$

$\Rightarrow 2y=4 \Rightarrow y=2$ kmph

6. (1) Upstream speed of boat

$=\frac{\text{Distance}}{\text{Time}}=\frac{45}{6}=\frac{15}{2}$

=7.5 kmph

∴ Speed of current = 10 – 7.5

= 2.5 kmph

Aliter : Using Rule 1,

Speed of Boat = 10 km/hr

Let, x = Speed of Boat (Down Stream)

y = Speed of Boat (Up Stream)

$=\frac{45}{6}$ km/hr

Speed of Boat = $\frac{x+y}{2}$

$10=\frac{x+\frac{45}{6}}{2}$

120 = 6x + 45

6x = 75

$x=\frac{75}{6}=\frac{25}{2}$ km/hr

Speed of Stream = $\frac{x-y}{2}$

$=\frac{1}{2}\left[\frac{25}{2}-\frac{45}{6}\right]$

$=\frac{1}{2}\left[\frac{75-45}{6}\right]$

= 2.5 km/hr

7. (1) Speed of stream

$=\frac{1}{2}\left(\frac{36}{6}-\frac{40}{8}\right)$

$=\frac{1}{2}=0.5$ kmph

Aliter : Using Rule 1,

Here, $x=\frac{36}{6}=6$ km/hr

$y=\frac{40}{8}=5$ km/hr

Speed of Stream

$=\frac{x-y}{2}=\frac{6-5}{2}$

= 0.5 km/hr

8. (2) Rate upstream = 4 kmph

Rate downstream = 5 kmph

∴ Speed of boat in still water

$=\frac{1}{2}(4+5)$

= 4.5 kmph

Speed of current = $\frac{1}{2}(5-4)$

= 0.5 kmph

Aliter : Using Rule 1,

Here, $x=\frac{20}{4}=5$ km/hr

$y=\frac{24}{6}=4$ km/hr

Speed of Boat = $\frac{x+y}{2}=\frac{5+4}{2}$

= 4.5 km/hr

Speed of Stream= $\frac{x-y}{2}=\frac{5-4}{2}$

= 0.5 km/hr

9. (2) Rate downstream = 10 kmph

Rate upstream = 5 kmph

∴ Speed of current

$=\frac{1}{2}(10-5)$ kmph

= 2.5 kmph

Aliter : Using Rule 1,

Here, $x=\frac{100}{10}=10$ km/hr

$y=\frac{75}{15}=5$ km/hr

Speed of Stream

$=\left(\frac{x-y}{2}\right)=\left(\frac{10-5}{2}\right)$

= 2.5 km/hr

10. (3) Let the speed of boat in still water be x kmph and that of current be y kmph, then

$\frac{12}{x-y}+\frac{18}{x+y}=3$ ....(i)

$\frac{36}{x-y}+\frac{24}{x+y}=\frac{13}{2}$ .....(ii)

By equation (i) × 3 – equation (ii),

$\frac{54}{x+y}-\frac{24}{x+y}=9-\frac{13}{2}$

$\Rightarrow \frac{30}{x+y}=\frac{5}{2} \Rightarrow x+y=12$... (iii)

From equation (i),

$\frac{12}{x-y}+\frac{18}{12}=3$

$\Rightarrow \frac{12}{x-y}=3-\frac{3}{2}=\frac{3}{2}$

$\Rightarrow x-y=\frac{12\times 2}{3}=8$ ..... (iii)

∴ Speed of current = $\frac{1}{2}(12-8)$

= 2 kmph

11. (4) Rate downstream

= 10 + 5 = 15 kmph

Rate upstream = 10 – 5 = 5 kmph

Time taken in swimming 60km downstream

$=\frac{60}{15}=4$ hours

Time taken in swimming 60km upstream

$=\frac{60}{5}=12$ hours

From, given options, boy can swim 60km downstream in 4 hrs.

12. (3) Rate upstream
= 4 – 2 = 2 kmph

$\therefore$ Required time $= \frac{10}{2}$ = 5 hours

13. (4) Using Rule 1,
Speed of current

$= \frac{1}{2}$ (Rate downstream – rate upstream)

$= \frac{1}{2}(12-8) = 2$ kmph

14. (3) Rate downstream = 5 kmph
Rate upstream = 1 kmph
$\therefore$ Required time

$= \frac{10}{5} + \frac{10}{1} = 12$ hours

15. (4)

The distance covered upstream
= AC = d
AB = 100
BC = 100 + d
Rate upstream
= $(x - y)$ m/minute
Rate downstream
= $(x + y)$ m/minute

$\therefore \frac{d}{x-y} = 5$

$\Rightarrow d = 5(x - y)$ ....(i)
Again,

$\frac{100+d}{x+y} = 5$

$\Rightarrow \frac{100+5(x-y)}{x+y} = 5$ (By (i))

$\Rightarrow 100 + 5x - 5y = 5x + 5y$
$\Rightarrow 10y = 100$
$\Rightarrow y = 10$ m/minute

$= \frac{10}{1000} \times 60$ kmph
= 0.6kmph

16. (1) Using Rule 1,
Speed in still water = x km/h
Speed of current = y km/h

$\therefore x + y = \frac{1}{\frac{4}{60}} = 15$

$x - y = \frac{1}{\frac{10}{60}} = 6$

$\therefore$ Speed of current

$= \frac{1}{2}[(x+y)-(x-y)]$

$= \frac{1}{2}(15-6) = \frac{9}{2} = 4.5$ km/h

17. (1) Let the speed of boat in still water be x kmph and the rate of stream be y kmph.
$\therefore$ Downstream rate
= (x + y) kmph and upstream rate
= (x – y) kmph.

Now, $\frac{20}{x+y} = 1$

$\Rightarrow x + y = 20$ ..(i)

and $\frac{20}{x-y} = 2$

$\Rightarrow x - y = 10$ ...(ii)
From (i) and (ii) we have
x = 15 kmph.

Aliter : Using Rule 7,

Here, x = 20, t_1 = 1, t_2 = 2

Speed of Boat $= \frac{x}{2}\left(\frac{1}{t_1} + \frac{1}{t_2}\right)$

$= \frac{20}{2}\left(\frac{1}{1} + \frac{1}{2}\right)$

= 15 km/hr

18. (3) Let the speed of man in still water be x kmph and rate of stream be y kmph

$\therefore$ Distance $= \frac{750}{1000}$ km $= \frac{3}{4}$ km.
Time = 675 seconds

$= \frac{675}{60} = 11\frac{1}{4}$ minutes

$\therefore x - y = \frac{\frac{3}{4}}{\frac{45}{4}} = \frac{3}{45} = \frac{1}{15}$km/min

and $x + y = \frac{\frac{3}{4}}{\frac{15}{2}}$

$= \frac{3}{4} \times \frac{2}{15} = \frac{1}{10}$ km/min

$\therefore$ Speed in still water

$= \frac{1}{2}\left(\frac{1}{10} + \frac{1}{15}\right) = \frac{1}{2}\left(\frac{3+2}{30}\right)$

$= \frac{1}{12}$ km/min

$= \frac{1}{12} \times 60$ kmph = 5 kmph

Aliter : Using Rule 1,

Here, x $= \frac{750\text{m}}{\frac{15}{2}\text{min}}$

$= \frac{750}{1000} \times \frac{2 \times 60}{15}$

= 6 km/hr

y $= \frac{750\text{m}}{675\text{min}}$

$= \frac{750}{1000} \times \frac{3600}{675}$ = 4hrs

Speed of Boat $= \frac{1}{2}(x+y)$

$= \frac{1}{2}(6+4)$ = 5km/hrs

19. (2) Speed upstream $= \frac{40}{8}$
= 5 kmph

Speed downstream $= \frac{36}{6}$
= 6 kmph
$\therefore$ Speed of boat in still water

$= \frac{1}{2}(5+6)$ = 5.5 kmph

Aliter : Using Rule 1,

Here, x $= \frac{36}{6}$ = 6 km/hr

y $= \frac{40}{8}$ = 5 km/hr

Speed of Boat $= \frac{1}{2}(x+y)$

$= \frac{1}{2}(6+5)$ = 5.5 km/hr

20. (2) Using Rule 3,

Tricky Approach

Let the speed of boat in still water be x kmph, then

$\frac{12}{x+3} + \frac{12}{x-3} = 3$

$\Rightarrow 12\left(\frac{x-3+x+3}{(x+3)(x-3)}\right) = 3$

$\Rightarrow 4 \times 2x = x^2 - 9$
$\Rightarrow x^2 - 8x - 9 = 0$
$\Rightarrow x^2 - 9x + x - 9 = 0$

$\Rightarrow x(x-9)+1(x-9)=0$
$\Rightarrow (x-9)(x+1)=0$
$\Rightarrow x=9$ because $x \neq -1$
$\therefore$ Speed can't be negetive.
Hence, speed of boat in still water = 9 kmph

21. (3) Using Rule 3,
Let the speed of motorboat in still water be x kmph.

$$\therefore \frac{10}{x-5}+\frac{10}{x+5}=\frac{50}{60}$$

$$\Rightarrow 10\left(\frac{x+5+x-5}{(x+5)(x-5)}\right)=\frac{5}{6}$$

$\Rightarrow 20x \times 6 = (x^2-25) \times 5$
$\Rightarrow x^2-24x-25=0$
$\Rightarrow x^2-25x+x-25=0$
$\Rightarrow x(x-25)+1(x-25)=0$
$\Rightarrow (x-25)(x+1)=0$
$\Rightarrow x=25$ because $x \neq -1$
Speed of motorboat in still water = 25 kmph

22. (4) Using Rule 1,
Speed of boat in still water

$= \frac{1}{2}$ (Rate downstream + Rate upstream) $= \frac{1}{2}(15+9)$

$= \frac{1}{2} \times 24 = 12$ kmph

23. (1) Let the speed of sailor in still water be x kmph.
and Speed of current = y kmph

$$\therefore x+y=\frac{12}{\frac{48}{60}}=\frac{12}{48}\times 60=15 \text{ kmph}$$

$$\text{and, } x-y=\frac{12}{\frac{80}{60}}=\frac{12\times 60}{80}$$

= 9 kmph
Adding these equations,
$2x = 15 + 9 = 24$
$\Rightarrow x = 12$ kmph
Aliter : Using Rule 1,

Here, $x = \frac{12}{48}\times 60$ km/hr

= 15 km/hr

$$y = \frac{12}{1\frac{1}{3}} = 9 \text{ km/hr}$$

Speed of Boat $= \frac{1}{2}(x+y)$

$= \frac{1}{2}(15+9) = 12$ km/hr

24. (2) Using Rule 3,
Let the speed of boat in still water be x kmph.

$$\therefore \frac{6}{x+4}+\frac{6}{x-4}=2$$

$$\Rightarrow 6\left(\frac{x-4+x+4}{(x+4)(x-4)}\right)=2$$

$\Rightarrow 6x = x^2 - 16$
$\Rightarrow x^2 - 6x - 16 = 0$
$\Rightarrow x^2 - 8x + 2x - 16 = 0$
$\Rightarrow x(x-8)+2(x-8)=0$
$\Rightarrow (x+2)(x-8)=0$
$\Rightarrow x = 8$ kmph and $x \neq -2$ kmph

25. (4) Let the speed of man in still water be x kmph.

$$\therefore \frac{15}{x+5}=1$$

$\Rightarrow x+5=15 \Rightarrow x=10$ kmph
$\therefore$ Time taken in swimming upstream

$$= \frac{15}{10-5} = 3 \text{ hours}$$

26. (2) Time $= \frac{\text{Distance}}{\text{Rate downstream}}$

$$= \frac{26}{5+3} = \frac{13}{4} = 3\frac{1}{4} \text{ hours}$$

27. (3) Let speed of person in still water = x kmph and speed of current = y kmph

$$\therefore x+y = \frac{15}{3} = 5 \text{ kmph}$$

$$\& \; x-y = \frac{15}{\frac{15}{2}} = 2 \text{ kmph}$$

On adding,

$$2x = 7 \Rightarrow x = \frac{7}{2} = 3.5 \text{ kmph}$$

Aliter : Using Rule 1,

Here, $x = \frac{15}{3} = 5$ km/hr

$$y = \frac{15}{\frac{15}{2}} = 2 \text{ km/hr}$$

Speed of Boat $= \frac{1}{2}(x+y)$

$= \frac{1}{2}(5+2) = 3.5$ km/hr

28. (4) Speed of boat in still water = x kmph (let)
Speed of current = y kmph
Rate downstream = $(x+y)$ kmph
Rate upstream = $(x-y)$ kmph
Distance = Speed × Time
$\therefore (x-y) \times 2t = (x+y) \times t$
$\Rightarrow 2x - 2y = x + y$
$\Rightarrow 2x - x = 2y + y \Rightarrow x = 3y$

$$\Rightarrow \frac{x}{y} = \frac{3}{1} = 3:1$$

29. (3) Rate downstream of boat

$$= \frac{48}{6} = 8 \text{ kmph}$$

Rate upstream $= \frac{36}{6} = 6$ kmph

$\therefore$ Speed of current $= \frac{1}{2}$ (Rate down stream – rate upstream)

$= \frac{1}{2}(8-6) = 1$ kmph

Aliter : Using Rule 1,

Here, $x = \frac{48}{6} = 8$ km/hr

$y = \frac{36}{6} = 6$ km/hr

Speed of Current $= \frac{1}{2}(x-y)$

$= \frac{1}{2}(8-6) = 1$ km/hr

30. (4) Rate downstream

$$= \left(\frac{750}{\frac{15}{2}}\right) \text{m/minute}$$

= 100 m/minute

$$= \frac{100\times 60}{1000} \text{ kmph} = 6 \text{ kmph}$$

Rate upstream

$$= \left(\frac{750}{600}\times\frac{18}{5}\right) \text{ kmph}$$

= 4.5 kmph
$\therefore$ Rowing speed in still water

$$= \frac{1}{2}(6+4.5) = \frac{10.5}{2}$$

= 5.25 kmph

Aliter : Using Rule 1,

Here, $x = \dfrac{750\,m}{\frac{15}{2}\,min}$

$= \dfrac{750 \times 2 \times 60}{1000 \times 15} = 6$ km/hr

$y = \dfrac{750\,m}{600\,s} = \dfrac{750 \times 3600}{1000 \times 600}$

$= 4.5$ km/hr

Speed of Boat $= \dfrac{1}{2}(x + y)$

$= \dfrac{1}{2}(6 + 4.5)$

$= 5.25$ km/hr

31. (2) Rate downstream of boat

$= \left(\dfrac{1}{\frac{15}{2 \times 60}}\right)$ kmph

$= \dfrac{2 \times 60}{15} = 8$ kmph

Rate upstream of boat

$= 5$ kmph

$\therefore$ Speed of boat in still water

$= \dfrac{1}{2}$ (Rate downstream + Rate upstream)

$= \dfrac{1}{2}(8 + 5) = \dfrac{13}{2}$ kmph

$= 6\dfrac{1}{2}$ kmph

Aliter : Using Rule 1,

Here, $x = \dfrac{1\,km}{\frac{15}{2}\,min}$

$= \dfrac{2 \times 60}{15}$ km/hr

$= 8$ km/hr

$y = 5$ km/hr

Speed of Boat $= \dfrac{1}{2}(x + y)$

$= \dfrac{1}{2}(8 + 5)$

$= 6\dfrac{1}{2}$ km/hr

32. (1) Rate upstream of boat

$= \dfrac{75}{3} = 25$ kmph

Rate downstream of boat

$= \dfrac{60}{1.5} = 40$ kmph

$\therefore$ Speed of boat in still water

$= \dfrac{1}{2}(25 + 40)$

$= \left(\dfrac{1}{2} \times 65\right)$ kmph

$= 32.5$ kmph

33. (3) Speed of man in still water = x kmph.

Speed of current = y kmph

Rate downstream

$= (x + y)$ kmph

Rate upstream = $(x - y)$ kmph

According to the question,

$\dfrac{5}{x+y} = \dfrac{4}{x-y}$

$\Rightarrow 5x - 5y = 4x + 4y$

$\Rightarrow x = 5y + 4y = 9y$

Again, $\dfrac{35}{x+y} + \dfrac{35}{x-y} = 10\dfrac{1}{2} = \dfrac{21}{2}$

$\Rightarrow \dfrac{35}{9y+y} + \dfrac{35}{9y-y} = \dfrac{21}{2}$

$\Rightarrow \dfrac{5}{10y} + \dfrac{5}{8y} = \dfrac{3}{2}$

$\Rightarrow \dfrac{1}{y} + \dfrac{5}{4y} = 3$

$\Rightarrow \dfrac{4+5}{4y} = 3$

$\Rightarrow 9 = 12y$

$\Rightarrow y = \dfrac{9}{12} = \dfrac{3}{4}$ kmph

34. (1) Rate downstream

$= 18$ kmph

Rate upstream $= 12$ kmph

$\therefore$ Speed of boat in still water

$= \dfrac{1}{2}$ (rate downstream + rate upstream)

$= \dfrac{1}{2}(18 + 12) = 15$ kmph

35. (3) Speed of boat in still water = $\dfrac{1}{2}$ (Rate downstream + rate upstream)

$= \dfrac{1}{2}(8 + 4)$ kmph $= \left(\dfrac{12}{2}\right)$ kmph

$= 6$ kmph

TYPE-II

1. (1) Let the speed of the current be x kmph.

According to the question,

$\dfrac{6}{6-x} = 3$

$\Rightarrow 18 - 3x = 6 \Rightarrow 3x = 18 - 6$

$\Rightarrow x = \dfrac{12}{3} = 4$ kmph.

Aliter : Using Rule 5,

Here, Speed of boat = 6 km/hr

$t_1 = 3x$, $t_2 = x$

$\dfrac{\text{Speed of Boat}}{\text{Speed of Stream}} = \dfrac{t_1 + t_2}{t_1 - t_2}$

$\dfrac{6}{\text{Speed of Stream}} = \dfrac{3x + x}{3x - x}$

Speed of current = 3 km/hr

2. (2) Let the rate of swimming in still water be x kmph

$\therefore$ Rate down-stream

$= (x + 3)$ kmph

$\therefore$ Rate up-stream $= (x - 3)$ kmph

According to the question,

$(x + 3)\,t = 2\,(x - 3) \times t$

$\Rightarrow x + 3 = 2x - 6$

$\Rightarrow x = 9$ kmph

Aliter : Using Rule 5,

Here, $t_1 = 2x$, $t_2 = x$

Speed of Stream = 3 km/hr

$\dfrac{\text{Speed of Boat}}{\text{Speed of Stream}} = \dfrac{t_1 + t_2}{t_1 - t_2}$

$\dfrac{\text{Speed of Boat}}{3} = \dfrac{2x + x}{2x - x}$

Speed of Boy = 9 km/hr

3. (2) Let the speed of stream be x kmph, then speed of boat in still water = $4x$ kmph

$\therefore$ Rate downstream

$= 4x + x = 5x$ kmph

Rate upstream $= 4x - x$

$= 3x$ kmph

$\therefore \dfrac{30}{3x} + \dfrac{30}{5x} = 8 \Rightarrow \dfrac{10}{x} + \dfrac{6}{x} = 8$

$\Rightarrow \dfrac{16}{x} = 8 \Rightarrow x = \dfrac{16}{8} = 2$ kmph

4. (3) Let the speed of current be x kmph.

$\therefore\ 2\left(\frac{15}{2}-x\right)=\frac{15}{2}+x$

$\Rightarrow 15-2x=\frac{15}{2}+x$

$\Rightarrow 3x=15-\frac{15}{2}=\frac{15}{2}$

$\Rightarrow x=\frac{5}{2}=2\frac{1}{2}$ kmph

Aliter : Using Rule 5,

Here, Speed of Boat= $\frac{15}{2}$ km/hr

$t_1 = 2x,\ t_2 = x$

$\frac{\text{Speed of Boat}}{\text{Speed of Stream}}=\frac{t_1+t_2}{t_1-t_2}$

$\left(\frac{15}{2}\right)$ Speed of Stream

$=\frac{2x+x}{2x-x}$

Speed of Stream = 2.5 km/hr

5. (2) Let the speed of stream be x kmph

$\therefore$ Rate upstream $=\frac{9}{2}-x$

Rate downstream $=\frac{9}{2}+x$

Then,

$\frac{2}{\frac{9}{2}+x}=\frac{1}{\frac{9}{2}-x}$

$\Rightarrow 9-2x=\frac{9}{2}+x$

$\Rightarrow 3x=9-\frac{9}{2}=\frac{9}{2}$

$\Rightarrow x=\frac{9}{2\times 3}=\frac{3}{2}$ = 1.5 kmph

Aliter : Using Rule 5,

Here, Speed of Boat= $\frac{9}{2}$ km/hr

$t_1 = 2x,\ t_2 = x$

$\frac{\text{Speed of Boat}}{\text{Speed of Stream}}=\frac{t_1+t_2}{t_1-t_2}$

$\frac{9}{2\times\text{Speed of stream}}=\frac{2x+x}{2x-x}$

Speed of Stream = 1.5 km/hr

6. (3) Rate upstream of boat = 13 – 4 = 9 kmph

$\therefore$ Required time = $\frac{\text{Distance}}{\text{Speed}}$

$=\frac{63}{9}$ = 7 hours

Aliter : Using Basic Formula,

Speed = $\frac{\text{Distance}}{\text{Time}}$

7. (4) Rate downstream = (6 + 1.5) kmph = 7.5 kmph

Rate upstream = (6 – 1.5) kmph = 4.5 kmph

According to the question,

Time = $\frac{\text{Distance}}{\text{Speed}}$

$\therefore$ Required time = $\frac{22.5}{7.5}+\frac{22.5}{4.5}$

= 3 + 5 = 8 hours.

Aliter : Using Basic Formula,

Time = $\frac{\text{Distance}}{\text{Speed}}$

8. (2) Let the speed of boat in still water be x kmph and the distance be y km.

$\therefore$ Rate downstream = $(x + 1.5)$ kmph

Rate upstream = $(x - 1.5)$ kmph

According to the question,

$\frac{y}{x+1.5}=3$ --- (i)

$\frac{y}{x-1.5}=\frac{7}{2}$ --- (ii)

On dividing equation (i) by (ii),

$\frac{x-1.5}{x+1.5}=\frac{3\times 2}{7}=\frac{6}{7}$

$\Rightarrow 7x - 10.5 = 6x + 9$

$\Rightarrow x = 10.5 + 9 = 19.5$ kmph.

Aliter : Using Rule 5,

Here, $t_1 = 3.5,\ t_2 = 3$

Speed of Stream = 1.5 km/hr

$\frac{\text{Speed of Boat}}{\text{Speed of Stream}}=\frac{t_1+t_2}{t_1-t_2}$

$\frac{\text{Speed of Boat}}{1.5}=\frac{3.5+3}{3.5-3}$

Speed of Boat $=\frac{6.5\times 1.5}{0.5}$

= 19.5 km/hr

TYPE-III

1. (3) Let the distance be x km.

Speed upstream = 5 – 1 = 4 kmph

Speed downstream = 5 + 1 = 6 kmph

$\therefore \frac{x}{6}+\frac{x}{4}=1$

$\Rightarrow \frac{2x+3x}{12}=1$

$\Rightarrow 5x = 12$

$\Rightarrow x=\frac{12}{5}=2.4$ km

Aliter : Using Rule 8,

Here, a = 5, b = 1

Average Speed $=\frac{(a+b)(a-b)}{a}$

$=\frac{(5+1)(5-1)}{5}$

$=\frac{24}{5}$ = 4.8 km/hr

Distance = $\frac{1}{2}\times 4.8$ = 2.4 km

2. (3) Let the speed of motor-boat be 36 x kmph and

and Speed of current = 5x kmph

The boat goes along with the current in 5 hours 10 minutes i.e. $\frac{31}{6}$ hours.

$\therefore$ Distance = $\frac{31}{6}\times(36x+5x)$

$=\frac{41x\times 31}{6}$ km.

Rate upstream = 36x – 5x = 31x kmph

$\therefore$ Time taken $=\frac{41x\times\frac{31}{6}}{31x}$

$=\frac{41}{6}$ hours

or 6 hours 50 minutes

3. (3) Let the distance of the destination from the starting point be x km.

Rate downstream= (10 + 4) kmph = 14 kmph

Rate upstream = (10 – 4) kmph = 6 kmph

According to the question,

$$\frac{x}{14}+\frac{x}{6}=5$$

$$\Rightarrow \frac{3x+7x}{42}=5$$

$\Rightarrow 10x = 42 \times 5$

$$\Rightarrow x=\frac{42\times 5}{10}=21\text{ km}$$

Aliter : Using Rule 3,
Here, x = 10, y = 4, t = 5

$$d = \frac{t(x^2-y^2)}{2x}$$

$$= \frac{5(10^2-4^2)}{2\times 10}$$

$$= \frac{84}{4} = 21\text{ km}$$

4. (2) Let the speed of the stream be x kmph and both the boats meet after t hours
According to the question ,
$(12 + x)\ t + (15 - x)\ t = 108$
$\Rightarrow 12t + 15t = 108$
$\Rightarrow 27t = 108$

$$\Rightarrow t=\frac{108}{27} = 4\text{ hours}$$

5. (2) Let the required distance be x km.

$$\therefore \frac{x}{6-2}-\frac{x}{6+2}=3$$

$$\Rightarrow \frac{x}{4}-\frac{x}{8}=3$$

$$\Rightarrow \frac{2x-x}{8}=3$$

$\Rightarrow x = 3 \times 8 = 24$ km.

Aliter : Using Rule 5,
Here, Speed of Boat = 6 km/hr
Speed of Current = 2 km/hr

$$t_1 = 3 + t_2$$

$$\frac{\text{Speed of Boat}}{\text{Speed of Current}} = \frac{t_1+t_2}{t_1-t_2}$$

$$\frac{6}{2} = \frac{3+2t_2}{3}$$

$$9 = 3 + 2t_2$$

$$t_2 = 3\text{ hrs}$$

Distance = Speed × time
= (6 + 2) × 3 = 24 km

6. (3) Let the speed of the current be x kmph
∴ Rate downstream
= $(x + 45)$ kmph.
According to the question,

$$\frac{80}{x+45} = 1\text{ hour 20 minutes}$$

$$= \frac{4}{3}\text{ hours}$$

$\Rightarrow 4x + 180 = 240$
$\Rightarrow 4x = 240 - 180 = 60$

$$\Rightarrow x=\frac{60}{4}\text{ kmph} = 15\text{ kmph}$$

Rate upstream
= 45 – 15 = 30 kmph

$$\therefore \text{Required time} = \frac{80}{30}\text{ hours}$$

$$= \frac{8}{3} = 2\text{ hours 40 minutes}$$

7. (3) Let the required distance be x km, then

$$\frac{x}{5+3}+\frac{x}{5-3}=3$$

$$\Rightarrow \frac{x}{8}+\frac{x}{2}=3$$

$$\Rightarrow \frac{x+4x}{8}=3$$

$\Rightarrow 5x = 24$

$$\Rightarrow x=\frac{24}{5} = 4.8\text{ km}$$

Aliter : Using Rule 3,
Here, x = 5, y = 3, t = 3

$$d = \frac{t(x^2-y^2)}{2x}$$

$$= \frac{3(5^2-3^2)}{2\times 5} = \frac{3\times 16}{10}$$

= 4.8 km

8. (3) Let the speed of boat in still water be x kmph and that of current be y kmph., then
$x + y = 12$
$x - y = 8$

$\Rightarrow 2x = 20$
$\Rightarrow x = 10$ kmph.

$$\therefore \text{Required time} = \frac{24}{10} = 2.4\text{ hours}$$

Aliter : Using Rule 1,
Here, x = 12, y = 8

$$\text{Speed of Boat} = \left(\frac{x+y}{2}\right)$$

$$= \left(\frac{12+8}{2}\right) = 10\text{ km/hr}$$

$$\text{Time taken} = \frac{\text{Distance}}{\text{Speed}}$$

$$= \frac{24}{10} = 2.4\text{ hrs.}$$

9. (4) Let PQ = QR = z km.
Let speed of boat in still water be x kmph. and speed of current be y kmph.
According to the question,

$$\frac{z}{x+y}+\frac{z}{x-y} = 12 \quad \text{... (i)}$$

$$\text{and } \frac{2z}{x-y} = 16\frac{40}{60}$$

$$\Rightarrow \frac{2z}{x-y} = 16\frac{2}{3} = \frac{50}{3} \quad \text{..(ii)}$$

By equation (i) × 2 – (ii),

$$\frac{2z}{x+y}+\frac{2z}{x-y}-\frac{2z}{x-y}$$

$$= 24 - \frac{50}{3}$$

$$\Rightarrow \frac{2z}{x+y} = \frac{72-50}{3}$$

$$= \frac{22}{3} = 7\frac{1}{3}\text{ hours}$$

10. (2) Speed of boat in still water = $\frac{1}{2}$ (rate downstream + rate upstream)

$$= \frac{1}{2}(14 + 8) = 11\text{ kmph.}$$

11. (4) Speed of current

$= \frac{1}{2}$ (rate downstream – rate upstream)

$$= \frac{1}{2}(14 - 8)\text{ kmph} = 3\text{ kmph}$$

12. (3) Rate downstream of boat
= (20 + 5) kmph
= 25 kmph

$$\text{Required time} = \frac{100}{25} = 4\text{ hours}$$

TEST YOURSELF

1. A boat covers 12 km upstream and 18 km downstream in 3 hours, while it covers 36 km upstream and 24 km downstream in $6\frac{1}{2}$ hours. What is the speed of the current ?
(1) 1.5 km/hr (2) 1 km/hr
(3) 2 km/hr (4) 2.5 km/hr

2. A boat running downstream covers a distance of 30 km in 2 hours. While coming back the boat takes 6 hours to cover the same distance. If the speed of the current is half of that of the boat, then what is the speed of the boat in kmph?
(1) 15 kmph
(2) 5 kmph
(3) 10 kmph
(4) cannot be determined

3. A boat covers 20 km in 4 hours along the current and 9 km in 3 hours against the current. What is the speed of the current ?
(1) 2 kmph (2) 1 kmph
(3) 1.5 kmph (4) 1.75 kmph

4. A boat running down stream covers a distance of 16 km in 2 hours while for covering the same distance upstream it takes 4 hours. What is the speed of the boat in still water ?
(1) 4 kmph
(2) 6 kmph
(3) 8 kmph
(4) Data inadequate

5. River is running at 2 kmph. It took a man twice as long to row up as to row down the river. The rate (in km ph) of the man in still water is :
(1) 8 (2) 10
(3) 4 (4) 6

6. A person can row a boat d km upstream and the same distance downstream in $5\frac{1}{4}$ hours. Also he can row the boat $2d$ km upstream in 7 hours. He will row the same distance downstream in
(1) $3\frac{1}{2}$ hours (2) $3\frac{1}{4}$ hours
(3) $4\frac{1}{4}$ hours (4) 4 hours

SHORT ANSWERS

1. (3)	**2.** (3)	**3.** (2)	**4.** (2)
5. (4)	**6.** (1)		

EXPLANATIONS

1. (3) Using Rule 2,
Let the speed of boat in still water be x kmph and that of current be y kmph, then

$$\frac{12}{x-y}+\frac{18}{x+y}=3 \quad ....(i)$$

$$\frac{36}{x-y}+\frac{24}{x+y}=\frac{13}{2} \quad .....(ii)$$

By equation (i) × 3 – equation (ii),

$$\frac{54}{x+y}-\frac{24}{x+y}=9-\frac{13}{2}$$

$$\Rightarrow \frac{30}{x+y}=\frac{5}{2} \Rightarrow x+y=12 \ ... \text{(iii)}$$

From equation (i),

$$\frac{12}{x-y}+\frac{18}{12}=3$$

$$\Rightarrow \frac{12}{x-y}=3-\frac{3}{2}=\frac{3}{2}$$

$$\Rightarrow x-y=\frac{12\times 2}{3}=8 \quad ..... \text{(iii)}$$

$\therefore$ Speed of current $=\frac{1}{2}(12-8)$
$= 2$ kmph

2. (3) Using Rule 1,
Downstream speed
= 30/2 = 15 kmph
Upstream speed = 30/6 = 5 kmph
Let speed of the boat be x, then speed of the current = $x/2$.

$$x+\frac{x}{2}=15 \quad ...(1)$$

$$x-\frac{x}{2}=5 \quad ...(2)$$

From either of the two equations, we can find the value of x, $x = 10$ kmph
Another set of formula which can serve as **shortcut** in above case is
Speed of the boat =

$$\frac{\text{Downstream Speed} + \text{Upstream Speed}}{2}$$

Speed of the stream =

$$\frac{\text{Downstream Speed} - \text{Upstream Speed}}{2}$$

Putting these in the above example,
Speed of the boat

$$=\frac{15+5}{2}=10 \text{ kmph}$$

& Speed of the stream

$$=\frac{15-5}{2}=5 \text{ kmph}$$

3. (2) Using Rule 1,
Rate downstream

$$=\frac{20}{4}=5 \text{ kmph}$$

Rate upstream $=\frac{9}{3}=3$ kmph

$\therefore$ Speed of current

$$=\frac{1}{2}(5-3)=1 \text{ kmph}$$

4. (2) Using Rule 1,
Rate upstream

$$=\frac{16}{2} \text{ kmph} = 8 \text{ kmph}$$

Rate downs tream $=\frac{16}{4}$
= 4 kmph
$\therefore$ Rate in still water

$$=\frac{1}{2}(8+4) \text{ kmph} = 6 \text{ kmph}$$

5. (4) Using Rule 1,
Let rate upstream be x kmph.
Then, rate downstream
= $2x$ kmph
$\therefore$ Rate of current

$$\frac{1}{2}(2x-x)=\frac{x}{2} \text{ kmph}$$

$$\therefore \frac{x}{2}=2 \Rightarrow x=4$$

$\therefore$ Rate upstream = 4 kmph
Rate downstream = 8 kmph
$\therefore$ Rate in still water

$$=\frac{1}{2}(8+4)=6 \text{ kmph}$$

6. (1) Using Rule 3,
Let the speed of boat in still water be x kmph and that of current by y kmph.
According to the question,

$$\therefore \frac{d}{x+y}+\frac{d}{x-y}=\frac{21}{4} \quad .....(i)$$

and,

$$\frac{2d}{x-y}=7 \Rightarrow \frac{d}{x-y}=\frac{7}{2} \quad ....(ii)$$

By equation (ii) – (i),

$$\frac{d}{x+y}=\frac{21}{4}-\frac{7}{2}=\frac{21-14}{4}=\frac{7}{4}$$

$$\Rightarrow \frac{2d}{x+y}=\frac{7}{2}=3\frac{1}{2} \text{ hours.}$$

16 SEQUENCE AND SERIES

Importance : In all competitive examinations 2-3 questions from this chapter are asked. The difficulty level depends on level of examination.

Scope of questions : Mixed series mainly involve mixture of Arithmetic or Geometric series and rarely Harmonic series.

Way to success : Main step is to identify and dis-associate the mixed terms to find out Arithmetic & Geometric series.

Sequence : Succession of numbers arranged in a definite order forming a definite pattern is known as sequence.

Series : If $a_1, a_2, a_3, a_4, ..., a_n, ...$ is a sequence, then the expression $a_1 + a_2 + a_3 + a_4 + ... + a_n + ...$ is a series.

A series is finite or infinite according to as the number of terms in the corresponding sequence is finite or infinite.

Progressions : Those sequences whose terms follow certain patterns are called progressions.

Arithmetic Progression (A.P.) : A sequence is called an Arithmetic Progression if the difference between two consecutive terms is always same. i.e., $a_{n+1} - a_n$ = constant (= d) for all $n \in N$

The constant difference, generally denoted by 'd' is called the common difference.

a_n is called the nth or last term of an A.P.

$a_n = l = a + (n - 1)d$

(i) Three consecutive, terms in an A.P are taken as $a - d, a, a + d$.

(ii) Four consecutive terms in an A.P taken as $a - 3d, a - d, a + d, a + 3d$.

Note : If each term of an A.P. is (increased/decreased) by K then A.M. is also (increased/decreased) by K.

If each term of an A.P. is (multiplied/Divided) by K, then A.M is also (multiplied/Divided) by same number K.

Rule 1. Let a be the first term and d be the common difference of an A.P. Then its nth term is a + (n – 1)d i.e., $\boxed{a_n = a + (n-1)d}$.

Rule 2. The sum S_n of n terms of an A.P. with first term is 'a' and common difference is 'd' is

$$\boxed{S_n = \frac{n}{2}\left[2a + (n-1)d\right]} \text{ or } \boxed{S_n = \frac{n}{2}\left[a + l\right]},$$

where l = last term = a + (n – 1)d.

Rule 3. Three numbers a, b, c are in A.P. if $2b = a + c$ OR $b = \frac{a+c}{2}$ or vice versa. Here b is called Arithmetic Mean of a and c.

Arithmetic Mean : If between two given quantities a and b we have inserted n quantities $A_1, A_2, A_3, ... A_n$ such that $a, A_1, A_2, ... A_n$ to form A.P., then we say that $A_1, A_2, A_3 .... A_n$ are arithmetic means between a and b.

Insertion of 'n' Arithmetic Means between a and b :

Let $A_1, A_2, ... A_n$ be n Arithmetic Means between two quantities a and b. Such that,

$$a, A_1, A_2 ... A_n, b \text{ are in A.P. then } d = \left(\frac{b-a}{n+1}\right)$$

$$A_1 = \left(a + \frac{b-a}{n+1}\right), A_2 = \left[a + \frac{2(b-a)}{n+1}\right] ... \boxed{A_n = a + \frac{n(b-a)}{(n+1)}}$$

These are the required Arithmetic Means between a and b.

Note : Let A be the Arithmetic Mean between a and b, then a, A, b are in A.P. Such that

$$2A = a + b$$

$$\Rightarrow \quad A = \frac{a+b}{2}$$

Rule 4.

(i) $1 + 2 + 3 + ... + n = \frac{n(n+1)}{2}$

(ii) $1^2 + 2^2 + 3^2 + ... + n^2 = \frac{n(n+1)(2n+1)}{6}$

(iii) $1^3 + 2^3 + 3^3 + ... + n^3 = \left[\frac{n(n+1)}{2}\right]^2$

Note that : (ii) and (iii) are not AP's.

Geometric Progression : A sequence of non-zero numbers is called a Geometric Progression (abbreviated as G.P.) if the ratio of a term and the term preceding to it is always same.

The constant ratio is called the common ratio (r) of the G.P.

In other words, a sequence $a_1, a_2, a_3, ... a_n$ is called a Geometric Progression if

$\frac{a_{n+1}}{a_n}$ =constant for all $n \in N$.

Three numbers in G.P is taken as a, ar, ar^2 or $\frac{a}{r}$, a, ar

Geometric Series : If a_1, a_2, a_3, ... a_n, ... is a G.P., then the expression $a_1 + a_2 + a_3 + ... + a_n + ...$ is called a geometric series.

Rule 5. The nth term of a G.P. with first term a and common ratio r is given by $\boxed{a_n = ar^{n-1}}$.

Rule 6. The sum of n terms of a G.P. with first term 'a' and common ratio 'r'. is given by

$\boxed{S_n = a\left(\frac{1-r^n}{1-r}\right)}$ for $r < 1$ and $\boxed{S_n = a\left(\frac{r^n-1}{r-1}\right)}$ for $r > 1$

In fact these two are exactly identical. The only thing which must be noted is that the above formulas do not hold for r = 1, the sum of n terms of the G.P. is S_n = na. where r = 1.

Rule 7. The sum of an infinite G.P. with 1st term is 'a' and common ratio is r($-1 < r < 1$ i.e., $|r| < 1$) is given by

$$S_\infty = \frac{a}{1-r}.$$

Rule 8. Three non-zero numbers a, b, c are in G.P. if $b^2 = ac$ or $\boxed{b = \sqrt{ac}}$. Here, b is known as the Geometric Mean of a and c.

Note : Let a and b be two given numbers. If 'n' numbers G_1, G_2, ..., G_n are inserted between a and b such that the sequence a, G_1, G_2, ... G_n, b is a G.P. Then the numbers G_1, G_2, ... G_n are known as n Geometric Means (G.M's) between a and b.

Rule 9. Geometric mean : If a single geometric mean G is inserted between two given numbers a and b, then G is known as the Geometric Mean between a and b. Thus, G is the G.M. between a and b.

$\therefore$ a, G, b are in G.P.

$\Leftrightarrow G^2 = ab$

$\Rightarrow \boxed{G = \sqrt{ab}}$

Rule 10. Insertion of n Geometric Means between two given numbers a and b : Let G_1, G_2, ..., G_n be n Geometric Means between two given numbers a and b. Then a, G_1, G_2, ... G_n, b is a G.P. consisting of (n + 2) terms. Let r be the common ratio of this G.P., then

$$b = (n + 2)\text{th term} = ar^{n+1}$$

$$\Rightarrow \quad r = \left(\frac{b}{a}\right)^{\frac{1}{n+1}}$$

$$\therefore \quad G_1 = ar = a\left(\frac{b}{a}\right)^{\frac{1}{n+1}}$$

$$G_2 = ar^2 = a\left(\frac{b}{a}\right)^{\frac{2}{n+1}}$$

$$\boxed{G_n = ar^n = a\left(\frac{b}{a}\right)^{\frac{n}{n+1}}}$$

Rule 11. If 'n' Geometric Means are inserted between two quantities, then the product of n geometric means is the nth power of the single geometric mean between the two quantities, i.e., – $G_1G_2G_3$ ... G_n = $\left(\sqrt{ab}\right)^n = G^n$. where, $\sqrt{ab} = G$ is the single Geometric Mean between a and b.

Harmonic Progression :

If a, b, c, d, are in H.P. then,

$\frac{1}{a}, \frac{1}{b}, \frac{1}{c}, \frac{1}{d}$ will form an A.P.

and then we can apply all rules of A.P.

- **Harmonic Mean (H.M.) :** H will be called Harmonic Mean between a and b if a, H, b are in H.P. Then

$$\boxed{H = \frac{2ab}{a+b}}$$

For two numbers a and b, A.M. = $\frac{a+b}{2}$;

$$G.M. = \sqrt{ab};\ H.M. = \frac{2ab}{a+b}$$

Relation among A.M., G.M. and H.M. : For two numbers a and b, A.M. $= \frac{a+b}{2}$; $G.M. = \sqrt{ab}$;

$$H.M. = \frac{2ab}{a+b}$$

$$\because \frac{a+b}{2} \geq \sqrt{ab} \geq \frac{2ab}{a+b}$$

$$\therefore \boxed{A.M. \geq G.M. \geq H.M.}.$$

They will be equal if both numbers are equal to each other.

Now, A.M. × H.M.

$$= \frac{a+b}{2} \times \frac{2ab}{a+b}\ A.M. \times H.M. = ab = (G.M.)^2$$

or, $\boxed{G.M. = \sqrt{(A.M.) \times (H.M.)}}$

■ ■

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. The next number of the sequence 3, 5, 9, 17, 33 ..... is :
(1) 65 (2) 60
(3) 50 (4) 49
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting) & (SSC CPO S.I. Exam. 05.09.2004)

2. The next term of the sequence $\frac{1}{2}, 3\frac{1}{4}, 6, 8\frac{3}{4}$ ..... is :
(1) $10\frac{1}{4}$ (2) $10\frac{3}{4}$
(3) $11\frac{1}{4}$ (4) $11\frac{1}{2}$
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

3. Find the missing number of the sequence :
" 3, 14, 25, 36, 47, ?"
(1) 1114 (2) 1111
(3) 1113
(4) None of these
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. The next term of the sequence 1, 2, 5, 26, ... is :
(1) 677 (2) 47
(3) 50 (4) 152
(SSC CGLPrelim Exam. 27.02.2000 (Second Sitting)

5. The missing term in the sequence 0, 3, 8, 15, 24, ..,.., 48 is
(1) 35 (2) 30
(3) 36 (4) 39
(SSC CPO S.I. Exam. 07.09.2003)

6. In the sequence of numbers 5, 8, 15, 20, 29, 40, 53, one number is wrong. The wrong number is
(1) 15 (2) 20
(3) 29 (4) 40
(SSC CPO S.I. Exam. 07.09.2003)

7. 1 + 2 + 3 + ... + 49 + 50 + 49 + 48 + ... + 3 + 2 + 1 is equal to
(1) 1250 (2) 2500
(3) 2525 (4) 5000
(SSC CPO S.I. Exam. 07.09.2003)

8. The next number in the sequence 2, 8, 18, 32, 50, ... is :
(1) 68 (2) 72
(3) 76 (4) 80
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

9. Next term of the sequence 8, 12, 9, 13, 10, 14, ..., is
(1) 11 (2) 15
(3) 16 (4) 17
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

10. The number of terms in the series 1 + 3 + 5 + 7 ...+ 73 + 75 is
(1) 28 (2) 30
(3) 36 (4) 38
(SSC CPO S.I. Exam. 05.09.2004)

11. In the sequence of number 0, 7, 26, 63, ..., 215, 342 the missing term is
(1) 115 (2) 124
(3) 125 (4) 135
(SSC CPO S.I. Exam. 05.09.2004)

12. What will come in the place of question-mark (?) in the series "2, 7, 14, 23, ?, 47" ?
(1) 28 (2) 34
(3) 31 (4) 38
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

13. The missing number of the sequence 0, 2, 8, 18, —, 50 is :
(1) 28 (2) 30
(3) 32 (4) 36
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

14. The next number of the sequence 2, 5, 10, 14, 18, 23, 26, 32, ... is :
(1) 33 (2) 34
(3) 36 (4) 37
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

15. The next term in the sequence – 1, 6, 25, 62, 123, 214, ... is
(1) 343 (2) 342
(3) 341
(4) None of these
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

16. The wrong term in the sequence 7, 28, 63, 124, 215, 342, 511 is
(1) 7 (2) 28
(3) 124 (4) 215
(SSC CPO S.I. Exam. 03.09.2006)

17. The sixth term of the sequence 11, 13, 17, 19, 23, –, 29 is
(1) 24 (2) 19
(3) 25 (4) 22
(SSC CPO S.I. Exam. 03.09.2006)

18. Given below is a finite sequence of numbers with an unknown x :
0, 1, 1, 2, 3, 5, 8, 13, x, 34,
The value of x is
(1) 21 (2) 20
(3) 19 (4) 17
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

19. The next number of the sequence 2, 6, 12, 20, 30, 42, 56, ___ is
(1) 60 (2) 64
(3) 70 (4) 72
(SSC CGL Prelim Exam. 04.02.2007 & 27.07.2008 (First Sitting)

20. The value of in the sequence 27, 9, 3, , $\frac{1}{3}, \frac{1}{9}, \frac{1}{27}$ is
(1) 0 (2) 1
(3) – 1 (4) –3
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

21. The value of x in the sequence 1, 2, 6, 24, x is
(1) 46 (2) 56
(3) 96 (4) 120
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

22. The missing term of the sequence 9, 12, 11, 14, 13, __, 15 is
(1) 12 (2) 16
(3) 10 (4) 17
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

23. Which number in the sequence 8, 27, 64,100, 125, 216, 343 is wrongly written?
(1) 27 (2) 100
(3) 125 (4) 343
(SSC CPO S.I. Exam.16.12.2007)

24. The numbers of the sequence 56, 72, 90,110, 132, 154, form a pattern. Which of them is a misfit in the pattern?
(1) 72 (2) 110
(3) 132 (4) 154
(SSC CPO S.I. Exam.16.12.2007)

25. The wrong number in the sequence 3, 5, 7, 9, 13, 17, 19 is
(1) 17 (2) 13
(3) 9 (4) 7
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

26. The wrong number in the sequence 1, 8, 27, 84, 125, 216, 343 is
(1) 1 (2) 27
(3) 84 (4) 216
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

27. The next number of the sequence 5, 10, 13, 26, 29, 58, 61,... is
(1) 122 (2) 120
(3) 93 (4) 64
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

28. Which number in the sequence 41, 43, 47, 53, 61, 71, 73, 81 is wrongly written ?
(1) 61 (2) 71
(3) 73 (4) 81
(SSC CPO S.I. Exam. 09.11.2008)

29. The numbers of the sequence 52, 51, 48, 43, 34, 27, 16 form a pattern. Which of them is misfit in the pattern ?
(1) 27 (2) 34
(3) 43 (4) 485
(SSC CPO S.I. Exam. 09.11.2008)

30. The next term of the sequence 1, 9, 28, 65, 126, ... is
(1) 199 (2) 205
(3) 216 (4) 217
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

31. The wrong number of the sequence 36, 81, 144, 225, 256, 441 is
(1) 36 (2) 81
(3) 225 (4) 256
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

32. The next term of the sequence 2, 3, 6, 7, 14, ... is
(1) 15 (2) 17
(3) 18 (4) 20
(SSC (South Zone) Investigator Exam. 12.09.2010)

33. The next number of the sequence 3, 7, 15, 31, 63, ? is
(1) 95 (2) 111
(3) 123 (4) 127
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

34. The wrong number of the sequence
4, 9, 25, 49, 121, 144 is
(1) 144 (2) 121
(3) 49 (4) 4
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

35. The next number of the sequence 0, 3, 8, 15, 24, 35, ... is :
(1) 46 (2) 47
(3) 48 (4) 50
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

36. The next number of the sequence 2, 3, 5, 8, 13, 21,.... is
(1) 31 (2) 34
(3) 23 (4) 25
(SSC Data Entry Operator Exam. 31.08.2008)

37. The missing number in the sequence
5, 6, 15, _?_, 89, 170, 291 is
(1) 50 (2) 40
(3) 42 (4) 32
(SSC Data Entry Operator Exam. 02.08.2009)

38. Next number of the sequence
2, 9, 28, 65, 126, ____ is :
(1) 195 (2) 199
(3) 208 (4) 217
(SSC CHSL DEO & LDC Exam. 27.11.2010)

39. The wrong (misfit) number of the sequence 5, 15, 45, 135, 395, 1215, 3645 is :
(1) 395 (2) 135
(3) 45 (4) 5
(SSC CHSL DEO & LDC Exam. 27.11.2010)

40. The next number of the sequence 51, 52, 56, 65,_____is :
(1) 75 (2) 78
(3) 79 (4) 81
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

41. The wrong number of the sequence 4,9,19,39,79,169,319 is
(1) 169 (2) 79
(3) 39 (4) 9
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

42. Find out the wrong number in the sequence
169, 144, 121, 100, 82, 64, 49
(1) 144 (2) 49
(3) 64 (4) 82
(SSC CISF Constable (GD) Exam. 05.06.2011)

43. Insert the missing number
3, 18, 12, 72, 66, 396
(1) 300 (2) 380
(3) 350 (4) 390
(SSC Graduate Level Tier-II Exam.16.09.2012)

44. The wrong number in the series 2, 9, 28, 65, 126, 216, 344 is
(1) 65 (2) 216
(3) 9 (4) None of these
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

45. The odd term in the sequence 0, 7, 26, 63, 124, 217 is
(1) 217 (2) 7
(3) 26 (4) 63
(SSC Graduate Level Tier-II Exam. 29.09.2013)

46. What will come in place of the question mark (?) in the series?
3, 8, 27, 112, (?), 3396
(1) 565 (2) 452
(3) 560 (4) 678
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

47. In the following number series a wrong number is given. Find out that number.
8, 18, 40, 86, 178, 370, 752
(1) 178 (2) 180
(3) 128 (4) 156
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

48. The odd one out from the sequence of numbers
19, 23, 29, 37, 43, 46, 47 is
(1) 23 (2) 46
(3) 37 (4) 19
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

49. The next number of the sequence
$\frac{1}{2}, \frac{3}{4}, \frac{5}{8}, \frac{7}{16}$, ... is
(1) $\frac{10}{24}$ (2) $\frac{11}{32}$
(3) $\frac{9}{24}$ (4) $\frac{9}{32}$
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

50. The next number of the sequence 3, 5, 9, 17, 33, ... is
(1) 65 (2) 60
(3) 50 (4) 49
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

51. Find out the wrong number in the sequence :
40960, 10240, 2560, 640, 200, 40, 10
(1) 2560 (2) 200
(3) 640 (4) 40
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

52. Find out the wrong number in the series.
190 166 145 128 112 100 91
(1) 100 (2) 166
(3) 145 (4) 128
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

53. Find the wrong number in the following number series.
3 7 16 35 70 153
(1) 70 (2) 16
(3) 153 (4) 35
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

TYPE–II

1. The sum (101 + 102 + 103 + ... + 200) is equal to :
(1) 15000 (2) 15025
(3) 15050 (4) 25000
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. Which term of the series 72, 63, 54, ... is zero?
(1) 11th (2) 10th
(3) 9th (4) 8th
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. The sum 9 + 16 + 25 + 36 + ... + 100 is equal to :
(1) 350 (2) 380
(3) 400 (4) 420
(SSC CGLPrelim Exam. 27.02.2000 (Second Sitting)

4. What is the 507th term of the sequence
1, –1, 2, –2, 1, –1, 2, – 2, 1, ...?
(1) –1 (2) 1
(3) –2 (4) 2
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

5. If the 4th term of an arithmetic progression is 14 and the 12th term is 70, then the first term is :
(1) – 10 (2) – 7
(3) + 7 (4) + 10
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

6. By adding the same constant to each of 31, 7, – 1 a geometric progression results. The common ratio is :
(1) 13 (2) $2\frac{1}{3}$
(3) – 12 (4) None of these
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

7. The sum of the first 8 terms of a geometric progression is 6560 and the common ratio is 3. The first term is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CPO S.I. Exam. 07.09.2003)

8. How many terms of the series "1 + 2 + 3 ....." add upto 5050?
(1) 50 (2) 51
(3) 100 (4) 101
(SSC CPO S.I. Exam. 05.09.2004)

9. The seventh term of the sequence 1, 3, 6, 10, ... is :
(1) 20 (2) 26
(3) 28 (4) 32
(SSC CPO S.I. Exam. 26.05.2005)

10. If the 10th term of the sequence a, $a - b$, $a - 2b$, $a - 3b$, ... is 20 and the 20th term is 10, then the xth term of the series is
(1) $10 - x$ (2) $20 - x$
(3) $29 - x$ (4) $30 - x$
(SSC CPO S.I. Exam. 03.09.2006)

11. When simplified, the sum
$$\frac{1}{2}+\frac{1}{6}+\frac{1}{12}+\frac{1}{20}+\frac{1}{30}+\ldots+\frac{1}{n(n+1)}$$
is equal to
(1) $\frac{1}{n}$ (2) $\frac{1}{n+1}$
(3) $\frac{2(n-1)}{n}$ (4) $\frac{n}{n+1}$
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

12. (1 + 3 + 5 + 7 + 9 + ... + 99) is equal to
(1) 2050 (2) 2500
(3) 2005 (4) 2002
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

13. The nth term of the sequence
$$\frac{1}{n},\frac{n+1}{n},\frac{2n+1}{n},\ldots.$$ is
(1) $\frac{n^2+1}{n}$ (2) $\frac{n^2-n+1}{n}$
(3) $n + 1$ (4) 2
(SSC CPO S.I. Exam. 16.12.2007)

14. If $1+10+10^2+\ldots\ldots$ upto n terms $= \frac{10^n-1}{9}$, then the sum of the series
4 + 44 + 444 + ... upto n term is
(1) $\frac{4}{9}(10^n-1)-\frac{4n}{9}$
(2) $\frac{4}{81}(10^n-1)-\frac{4n}{9}$
(3) $\frac{40}{81}(10^n-1)-\frac{4n}{9}$
(4) $\frac{40}{9}(10^n-1)-\frac{4n}{9}$
(SSC CPO S.I. Exam. 16.12.2007)

15. Which term of the sequence
$$\frac{1}{2},-\frac{1}{4},\frac{1}{8},-\frac{1}{16},\ldots\ldots \text{is} -\frac{1}{256}\ ?$$
(1) 9th (2) 8th
(3) 7th (4) 5th
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

16. The first odd number is 1, the second odd number is 3, the third odd number is 5 and so on. The 200th odd number is
(1) 399 (2) 421
(3) 357 (4) 599
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

17. Only two entries are known of the following Arithmetic progression :
—, 5, —, —, 14, —, ---
What should be the number just after 14 ?
(1) 17 (2) 18
(3) 19 (4) 20
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

18. Which term of the sequence 7, 10, 13, ... is 151 ?
(1) 29th (2) 19th
(3) 59th (4) 49th
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

19. The sum of the first 20 terms of the series
$$\frac{1}{5\times6}+\frac{1}{6\times7}+\frac{1}{7\times8}+\ldots\ldots \text{is}$$
(1) 0.16 (2) 1.6
(3) 16 (4) 0.016
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

20. Which term of the sequence 6, 13, 20, 27, ... is 98 more than its 24th term ?
(1) 36th (2) 38th
(3) 35th (4) 48th
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

21. The sum of series 1 + 2 + 3 + 4 + ... + 998 + 999 + 1000 is
(1) 5050 (2) 500500
(3) 550000 (4) 55000
(SSC CPO S.I. Exam. 09.11.2008)

22. The sum of n terms the series

$1+\frac{1}{2}+\frac{1}{2^2}+\frac{1}{2^3}$..... is

(1) $\frac{2^n-1}{2^{n-1}}$ (2) $\frac{2^{n-1}-1}{2^{n-2}}$

(3) $2-2^n$ (4) $\frac{2^n-1}{2^n}$

(SSC CPO S.I. Exam. 09.11.2008)

23. The ninth term of the sequence 0, 3, 8, 15, 24, 35, ... is

(1) 63 (2) 70
(3) 80 (4) 99

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

24. The sixth term of the sequence 2, 6, 11, 17, ... is

(1) 24 (2) 30
(3) 32 (4) 36

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

25. The ratio of the fifth and sixth terms of the sequence 1, 3, 6, 10, ... is

(1) 5 : 6 (2) 5 : 7
(3) 7 : 5 (4) 6 : 5

(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

26. The middle term(s) of the following series 2 + 4 + 6 + ... + 198 is

(1) 98 (2) 96
(3) 94 (4) 100

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

27. If p, q, r are in Geometric Progression, then which is true among the following ?

(1) $q=\frac{p+r}{2}$ (2) $p^2=qr$

(3) $q=\sqrt{pr}$ (4) $\frac{p}{r}=\frac{r}{q}$

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

28. Terms a, 1, b are in Arithmetic Progression and terms 1, a, b are in Geometric Progression. Find 'a' and 'b' given $a \neq b$.

(1) 2,4 (2) –2, 1
(3) 4,1 (4) –2, 4

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

29. The fifth term of the sequence for which $t_1 = 1$, $t_2 = 2$ and $t_{n+2} = t_n + t_{n+1}$, is

(1) 5 (2) 10
(3) 6 (4) 8

(SSC Graduate Level Tier-I Exam. 21.04.2013)

30. $1 + (3 + 1)(3^2 + 1)(3^4 + 1)(3^8 + 1)(3^{16} + 1)(3^{32} + 1)$ is equal to

(1) $\frac{3^{64}-1}{2}$ (2) $\frac{3^{64}+1}{2}$

(3) $3^{64} - 1$ (4) $3^{64} + 1$

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

31. The sum '5 + 6 + 7 + 8 + ... + 19' is equal to :

(1) 150 (2) 170
(3) 180 (4) 190

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

32. Given that $1^2 + 2^2 + 3^2 + ... + 20^2 = 2870$, the value of $(2^2 + 4^2 + 6^2 + ... + 40^2)$ is :

(1) 11480 (2) 5740
(3) 28700 (4) 2870

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

33. Given $1^3 + 2^3 + 3^3 + ... + 10^3 = 3025$ then $2^3 + 4^3 + 6^3 + ...+ 20^3$ is equal to

(1) 6050 (2) 9075
(3) 12100 (4) 24200

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

34. (45 + 46 + 47 + ... + 113 + 114 + 115) is equal to

(1) 5600 (2) 5656
(3) 5680 (4) 4000

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

35. The 12th term of the series

$\frac{1}{x}+\frac{x+1}{x}+\frac{2x+1}{x}+....$

(1) $\frac{11x+1}{x}$ (2) $\frac{12x+1}{x}$

(3) $\frac{x+12}{x}$ (4) $\frac{x+11}{x}$

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

36. The first term of an Arithmetic Progression is 22 and the last term is – 11. If the sum is 66, the number of terms in the sequence is

(1) 10 (2) 12
(3) 9 (4) 8

(SSC CHSL DEO & LDC Exam. 9.11.2014)

37. The 30th term of the series 30, $25\frac{1}{2}$, 21, $16\frac{1}{2}$,..... is

(1) 0 (2) $-100\frac{1}{2}$

(3) –183 (4) $-133\frac{1}{2}$

(SSC CHSL DEO & LDC Exam. 16.11.2014)

38. Find the nth term of the following sequence :

5 + 55 + 555 + ... T_n

(1) $5(10^n - 1)$ (2) $5^n(10^n - 1)$

(3) $\frac{5}{9}(10^n - 1)$ (4) $\left(\frac{5}{9}\right)^n(10^n-1)$

(SSC CHSL DEO & LDC Exam. 16.11.2014)

39. Find the sum of first five terms of the following series :

$\frac{1}{1\times 4}+\frac{1}{4\times 7}+\frac{1}{7\times 10}+$ .....+ .....

(1) $\frac{9}{32}$ (2) $\frac{7}{16}$

(3) $\frac{5}{16}$ (4) $\frac{1}{210}$

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

40. The least value of n, such that $(1 + 3 + 3^2 + ... + 3^n)$ exceeds 2000, is

(1) 5 (2) 6
(3) 7 (4) 8

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

41. The next term of the sequence,

$\left(1+\frac{1}{2}\right);\left(1+\frac{1}{2}\right)\left(1+\frac{1}{3}\right);$

$\left(1+\frac{1}{2}\right)\left(1+\frac{1}{3}\right)\left(1+\frac{1}{4}\right);$ ___ is

(1) 3 (2) $\left(1+\frac{1}{5}\right)$

(3) 5 (4) $\left(1+\frac{1}{2}\right)\left(1+\frac{1}{5}\right)$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

42. The sum of 10 terms of the arithmetic series is 390. If the third term of the series is 19, find the first term

(1) 3 (2) 5
(3) 7 (4) 8

(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

43. Given $2^2 + 4^2 + 6^2 + ...+40^2 = 11480$, then the value of $1^2 + 2^2 + 3^2 + ...+20^2$ is :

(1) 2870 (2) 2868
(3) 2867 (4) 2869

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

44. If $1^2 + 2^2 + 3^2 + ... + p^2 = \frac{p(p+1)(2p+1)}{6}$, then $1^2 + 3^2 + 5^2 + ... + 17^2$ is equal to :
(1) 1785 (2) 1700
(3) 980 (4) 969
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

45. If 7 times the seventh term of an Arithmetic Progression (AP) is equal to 11 times its eleventh term, then the 18th term of the AP will be
(1) 1 (2) 0
(3) 2 (4) –1
(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

TYPE–III

1. If 1 × 2 × 3 × ..... × n is denoted by $\lfloor n$,then $(\lfloor 8 - \lfloor 7 - \lfloor 6)$ is equal to :
(1) $6 \times 8 \times \lfloor 6$ (2) $7 \times 8 \times \lfloor 6$
(3) $6 \times 7 \times \lfloor 8$ (4) $7 \times 8 \times \lfloor 7$
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. Find the sum of the first five terms of the following series.
$$\frac{1}{1\times 4}+\frac{1}{4\times 7}+\frac{1}{7\times 10}+.....+.....$$
(1) $\frac{9}{32}$ (2) $\frac{7}{16}$
(3) $\frac{5}{16}$ (4) $\frac{1}{210}$
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

3. If $(10^{12} + 25)^2 - (10^{12} - 25)^2 = 10^n$, then the value of n is
(1) 20 (2) 14
(3) 10 (4) 5
(SSC CPO S.I. Exam. 07.09.2003)

4. Given 1 + 2 + 3 + 4 + ... + 10 = 55, then the sum 6 + 12 + 18 + 24 + ... + 60 is equal to :
(1) 300 (2) 655
(3) 330 (4) 455
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

5. When simplified the product
$$\left(1-\frac{1}{2}\right)\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)....\left(1-\frac{1}{n}\right)$$
gives :
(1) $\frac{1}{n}$ (2) $\frac{2}{n}$
(3) $\frac{2(n-1)}{n}$ (4) $\frac{2}{n(n+1)}$
(SSC CGL Prelim Exam. 08.02.2004 (Ist Sitting) & (SSC CGL Prelim Exam. 27.07.2008)

6. The value of
$$\frac{3}{1^2.2^2}+\frac{5}{2^2.3^2}+\frac{7}{3^2.4^2}+\frac{9}{4^2.5^2}+\frac{11}{5^2.6^2}+\frac{13}{6^2.7^2}+\frac{15}{7^2.8^2}+\frac{17}{8^2.9^2}+\frac{19}{9^2.10^2}$$ is
(1) $\frac{1}{100}$ (2) $\frac{99}{100}$
(3) $\frac{101}{100}$ (4) 1
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

7. The value of
$$1-\frac{1}{20}+\frac{1}{20^2}-\frac{1}{20^3}+.....$$
correct to 5 places of decimal is :
(1) 1.05 (2) 0.95238
(3) 0.95239 (4) 10.5
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

8. For all integral values of *n, the* largest number that exactly divides each number of the sequence
(n–1) n(n+1), n(n+1)(n+2), (n+1)(n+2)(n+3),.... is
(1) 12 (2) 6
(3) 3 (4) 2
(SSC CPO S.I. Exam. 03.09.2006)

9. Given that
$$1+2+3+....+x=\frac{x(x+1)}{2}$$ then 1 + 3 + 5 + ...+ 99 is equal to
(1) 2250 (2) 2500
(3) 2525 (4) 3775
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

10. $\left(1-\frac{1}{5}\right)\left(1-\frac{1}{6}\right)\left(1-\frac{1}{7}\right).....\left(1-\frac{1}{100}\right)$ is equal to
(1) 0 (2) $\frac{1}{25}$
(3) $\frac{1}{100}$ (4) $\frac{1}{50}$
(SSC CPO S.I. Exam. 09.11.2008)

11. The sum of the series (1 + 0.6 + 0.06 + 0.006 + 0.0006 + ...) is
(1) $1\frac{2}{3}$ (2) $1\frac{1}{3}$
(3) $2\frac{1}{3}$ (4) $2\frac{2}{3}$
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

12. $\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\left(1-\frac{1}{5}\right).....\left(1-\frac{1}{25}\right)$ is equal to
(1) $\frac{2}{25}$ (2) $\frac{1}{25}$
(3) $1\frac{19}{25}$ (4) $\frac{1}{325}$
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

TYPE–IV

1. The sum $(5^3 + 6^3 + ... 10^3)$ is equal to :
(1) 2295 (2) 2425
(3) 2495 (4) 2925
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. If $1^3 + 2^3 + 3^3 + ... + 10^3 = 3025$, then find the value of $2^3 + 4^3 + 6^3 + ... + 20^3$
(1) 6050 (2) 9075
(3) 12100 (4) 24200
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

3. If $1^3 + 2^3 + ... + 10^3 = 3025$, then 4 + 32 + 108 + ... + 4000 is equal to :
(1) 12000 (2) 12100
(3) 12200 (4) 12400
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. If $1^3 + 2^3 + 3^3 + 4^3 + 5^3 + 6^3 = 441$ then find the value of $2^3 + 4^3 + 6^3 + 8^3 + 10^3 + 12^3$
(1) 882 (2) 1323
(3) 1764 (4) 3528
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

5. If $1^2 + 2^2 + 3^2 ..... + x^2 = \frac{x(x+1)(2x+1)}{6}$ then $1^2 + 3^2 + 5^2 + ... 19^2$ is equal to
(1) 1330 (2) 2100
(3) 2485 (4) 2500
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

6. If $1^3 + 2^3 + ... + 9^3 = 2025$, then the value of $(0.11)^3 + (0.22)^3 + ... + (0.99)^3$ is close to

(1) 0.2695 (2) 2.695
(3) 3.695 (4) 0.3695

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

7. The value of $5^2 + 6^2 + ... + 10^2 + 20^2$ is

(1) 755 (2) 760
(3) 765 (4) 770

(SSC CPO S.I. Exam. 07.09.2003)

8. $1^2 - 2^2 + 3^2 - 4^2 + ... - 10^2$ is equal to

(1) 45 (2) –45
(3) –54 (4) –55

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (IInd Sitting) & (SSC Investigator Exam. 12.09.2010 (South Zone)

9. Given that $1^2 + 2^2 + 3^2 + ... + n^2 = \frac{n}{6}(n + 1)(2n + 1)$, then $10^2 + 11^2 + 12^2 + ... + 20^2$ is equal to

(1) 2616 (2) 2585
(3) 3747 (4) 2555

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

10. $(1^2 + 2^2 + 3^2 + ... + 10^2)$ is equal to

(1) 380 (2) 385
(3) 390 (4) 392

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

11. $(5^2 + 6^2 + 7^2 + ... + 10^2)$ is equal to

(1) 330 (2) 345
(3) 355 (4) 360

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

12. $[2^2 + 3^2 + 4^2 + 5^2 + 6^2 + 7^2 + 8^2 + 9^2 + 10^2]$ is equal to

(1) 385 (2) 2916
(3) 540 (4) 384

(SSC Data Entry Operator Exam. 31.08.2008)

13. $[1^3 + 2^3 + 3^3 + ... + 9^3 + 10^3]$ is equal to

(1) 3575 (2) 2525
(3) 5075 (4) 3025

(SSC Data Entry Operator Exam. 02.08.2009)

14. Given that $1^2 + 2^2 + 3^2 + ... + 10^2 = 385$, the value of $2^2 + 4^2 + 6^2 + ... + 20^2 =$

(1) 770 (2) 1540
(3) 1155 (4) $(385)^2$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

SHORT ANSWERS

TYPE-I

1. (1)	**2.** (4)	**3.** (4)	**4.** (1)
5. (1)	**6.** (1)	**7.** (2)	**8.** (2)
9. (1)	**10.** (4)	**11.** (2)	**12.** (2)
13. (3)	**14.** (2)	**15.** (3)	**16.** (2)
17. (3)	**18.** (1)	**19.** (4)	**20.** (2)
21. (4)	**22.** (2)	**23.** (2)	**24.** (4)
25. (3)	**26.** (3)	**27.** (1)	**28.** (4)
29. (2)	**30.** (4)	**31.** (4)	**32.** (1)
33. (4)	**34.** (1)	**35.** (3)	**36.** (2)
37. (2)	**38.** (4)	**39.** (1)	**40.** (4)
41. (1)	**42.** (4)	**43.** (4)	**44.** (2)
45. (1)	**46.** (1)	**47.** (1)	**48.** (2)
49. (4)	**50.** (1)	**51.** (2)	**52.** (4)
53. (1)			

TYPE-II

1. (3)	**2.** (3)	**3.** (2)	**4.** (4)
5. (2)	**6.** (4)	**7.** (2)	**8.** (3)
9. (3)	**10.** (4)	**11.** (4)	**12.** (2)
13. (2)	**14.** (3)	**15.** (2)	**16.** (1)
17. (1)	**18.** (4)	**19.** (1)	**20.** (2)
21. (2)	**22.** (1)	**23.** (3)	**24.** (3)
25. (2)	**26.** (4)	**27.** (3)	**28.** (4)
29. (4)	**30.** (2)	**31.** (3)	**32.** (1)
33. (4)	**34.** (3)	**35.** (1)	**36.** (2)
37. (2)	**38.** (3)	**39.** (3)	**40.** (3)
41. (1)	**42.** (1)	**43.** (1)	**44.** (4)
45. (2)			

TYPE-III

1. (1)	**2.** (3)	**3.** (2)	**4.** (3)
5. (1)	**6.** (2)	**7.** (2)	**8.** (2)
9. (4)	**10.** (2)	**11.** (1)	**12.** (1)

TYPE-IV

1. (4)	**2.** (4)	**3.** (2)	**4.** (4)
5. (1)	**6.** (2)	**7.** (1)	**8.** (4)
9. (2)	**10.** (2)	**11.** (3)	**12.** (4)
13. (4)	**14.** (2)		

EXPLANATIONS

TYPE-I

1. (1) Using Rule 1,

3, 5, 9, 17, 33, ...

+2 +4=2^2 +8=2^3 +16=2^4

∴ The next term in the sequence will be 65

2. (4) $\frac{1}{2}, 3\frac{1}{4}, 6, 8\frac{3}{4}, ...$

= 0.5, 3.25, 6, 8.75, ...

+2.75 +2.75 +2.75

∴ Next term of the sequence

$= 8.75 + 2.75 = 11.5 = 11\frac{1}{2}$

3. (4) 3, 14, 25, 36, 47, 58

+11 +11 +11 +11 +11

∴ Missing number in the sequence = 58

4. (1) The series is based on following pattern :

$(1)^2 + 1 = 2$
$(2)^2 + 1 = 5$
$(5)^2 + 1 = 26$

$(26)^2 + 1 = \boxed{677}$

Therefore, the next number of the series will be 677.

5. (1)

0 3 8 15 24 [35] 48

+3 +5 +7 +9 +11 +13

Missing no. = 35

6. (1)

5 8 [13] 15 20 29 40 53

+3 +5 +7 +9 +11 +13

Incorrect no. = 15

7. (2) Required sum

$= 2\left(\frac{x(x+1)}{2}\right) + 50$

$= \frac{2 \times 49 \times 50}{2} + 50 = 2500$

8. (2) The given sequence is based on the following pattern :

2 8 18 32 50 [72]

+6 +10 +14 +18 +22

Hence, 72 will be the next number.

9. (1) The pattern of the sequence is :

8 + 4 = 12

$12 - 3 = 9$
$9 + 4 = 13$
$13 - 3 = 10$
$10 + 4 = 14$

$14 - 3 = \boxed{11}$

10. (4) Let the number of terms be n. It is an Arithmetic Series whose first term, $a = 1$ and common difference $d = 2$.
$\therefore$ n^{th} term $= a + (n-1)d$
$\Rightarrow 75 = 1 + (n-1)2$
$\Rightarrow 2(n-1) = 74$
$\Rightarrow n-1 = \frac{74}{2} = 37$
$\Rightarrow n = 37 + 1 = 38$

11. (2) The given series is based on the following pattern :
$1^3 - 1 = 0$ $\quad 2^3 - 1 = 7$
$3^3 - 1 = 26$ $\quad 4^3 - 1 = 63$
$5^3 - 1 = \boxed{124}$ $\quad 6^3 - 1 = 215$
$7^3 - 1 = 352$
Hence, the missing term is 124.

12. (2)

$\therefore$? = 34

13. (3) The sequence is based on the following pattern :
$2 \times 0^2 = 0$
$2 \times 1^2 = 2$
$2 \times 2^2 = 8$
$2 \times 3^2 = 18$

$2 \times 4^2 = \boxed{32}$

14. (2) The twin sequence is based on the following pattern :

Hence, the required number is 34.

15. (3) The sequence is based on the following pattern :
$1^3 - 2 = 1 - 2 = -1$
$2^3 - 2 = 8 - 2 = 6$
$3^3 - 2 = 27 - 2 = 25$
$4^3 - 2 = 64 - 2 = 62$
$5^3 - 2 = 125 - 2 = 123$
$6^3 - 2 = 216 - 2 = 214$

$7^3 - 2 = 343 - 2 = \boxed{341}$

16. (2) The given sequence is based on the following Pattern:
$2^3 - 1 = 7$

$3^3 - 1 = 26$ not $\boxed{28}$

$4^3 - 1 = 63$
$5^3 - 1 = 124$
$6^3 - 1 = 215$ and so on.
$\therefore$ The wrong term = 28

17. (3) The sequence is based on the following rule:

Hence, the sixth term is 25

18. (1) In the given sequence, (starting from the third number) the succeeding number is sum of two just preceding numbers. i.e.,
$1 = 0 + 1$
$2 = 1 + 1$
$3 = 1 + 2$

$\therefore$ $x = 8 + 13 = \boxed{21}$

19. (4) The given sequence is based on the following pattern :

$\therefore$Required number = 72

20. (2) The given sequence is based on the following pattern :

$\therefore$ The value of is 1.

21. (4) The given sequence is based on the following pattern:

Hence, 120 will replace x.

22. (2) The given sequence is based on the following pattern:

23. (2) In the given sequence all the numbers except 100 are perfect cubes of natural numbers. As, $8 = 2^3$, $27 = 3^3$, $64 = 4^3$ etc.

24. (4) The given sequence is based on the following pattern :
$7 \times 8 = 56$
$8 \times 9 = 72$
$9 \times 10 = 90$
$10 \times 11 = 110$
$11 \times 12 = 132$
$12 \times 13 \neq 154$, but 156
$\therefore$ 154 is the wrong number.

25. (3) The numbers of the sequence are the consecutive prime numbers starting from 3.
Since, 9 is not a prime number, it should be replaced by 11.

26. (3) The given sequence is :
$1^3, 2^3, 3^3, 4^3, 5^3, 6^3, 7^3$
Clearly, 84 is the wrong number.

27. (1) The given sequence is based on the following pattern :

28. (4) All the numbers except 81 are prime numbers.

29. (2) The given sequence is based on the following pattern :
$52 - 1 = 51$
$51 - 3 = 48$
$48 - 5 = 43$

$43 - 7 = 36 \neq \boxed{34}$

$36 - 9 = 27$
$27 - 11 = 16$
Hence, 34 is the wrong number.

30. (4) The pattern of the sequence is :
$1 + 2^3 = 9$
$1 + 3^3 = 28$
$1 + 4^3 = 65$
$1 + 5^3 = 126$

$1 + 6^3 = \boxed{217}$

31. (4) The pattern of the sequence is :
$6^2 = 36$
$9^2 = 81$
$12^2 = 144$
$15^2 = 225$

$18^2 = 324 \neq \boxed{256}$

$21^2 = 441$

32. (1) The pattern of the sequence is :

Required no. = 15

33. (4) The pattern of the sequence is:
$3 + 4 = 7$
$7 + 8 = 15$
$15 + 16 = 31$
$31 + 32 = 63$

$63 + 64 = \boxed{127}$

34. (1) The pattern of the sequence is:
$2^2, 3^2, 5^2, 7^2, 11^2, 13^2$ or, squares of first 6 consecutive prime numbers. Hence, 144 should be replaced by 169.

35. (3) The series is based on following pattern :
$0 + 3 = 3$
$3 + 5 = 8$
$8 + 7 = 15$
$15 + 9 = 24$
$24 + 11 = 35$

$35 + 13 = \boxed{48}$

Therefore, the required answer is 48.

36. (2) The pattern is :
$2 + 3 = 5$; $5 + 3 = 8$
$8 + 5 = 13$; $13 + 8 = 21$

$21 + 13 = \boxed{34}$

37. (2) The pattern of the given number series is :
$5 + 1^2 = 6$
$6 + 3^2 = 15$

$15 + 5^2 = \boxed{40}$

$40 + 7^2 = 89$

$89 + 9^2 = 170$

38. (4) The pattern of the sequence is :
$1^3 + 1 = 2$
$2^3 + 1 = 9$
$3^3 + 1 = 28$
$4^3 + 1 = 65$
$5^3 + 1 = 126$

$6^3 + 1 = 216 + 1 = \boxed{217}$

39. (1) The pattern of the sequence is :
$5 \times 3 = 15$
$15 \times 3 = 45$
$45 \times 3 = 135$

$135 \times 3 = 405 \neq \boxed{395}$

$405 \times 3 = 1215$

40. (4) The pattern of the sequence is :
$51 + 1^2 = 52$
$52 + 2^2 = 56$
$56 + 3^2 = 65$

$65 + 4^2 = 65 + 16 = \boxed{81}$

41. (1) The pattern of the sequence is :
$4 \times 2 + 1 = 9$
$9 \times 2 + 1 = 19$
$19 \times 2 + 1 = 39$
$39 \times 2 + 1 = 79$

$79 \times 2 + 1 = 159 \neq \boxed{169}$

42. (4) The pattern of the sequence is :
$169 = 13^2$
$144 = 12^2$
$121 = 11^2$
$100 = 10^2$

$81 = 9^2 \neq \boxed{82}$

43. (4) The pattern is :
$3 \times 6 = 18$
$18 - 6 = 12$
$12 \times 6 = 72$
$72 - 6 = 66$
$66 \times 6 = 396$

$396 - 6 = \boxed{390}$

44. (2) The pattern is :
$1^3 + 1 = 1 + 1 = 2$
$2^3 + 1 = 8 + 1 = 9$
$3^3 + 1 = 27 + 1 = 28$
$4^3 + 1 = 64 + 1 = 65$
$5^3 + 1 = 125 + 1 = 126$

$6^3 + 1 = 216 + 1 = 217 \neq \boxed{216}$

45. (1) The pattern is :
$1^3 - 1 = 1 - 1 = 0$
$2^3 - 1 = 8 - 1 = 7$
$3^3 - 1 = 27 - 1 = 26$
$4^3 - 1 = 64 - 1 = 63$
$5^3 - 1 = 125 - 1 = 124$

$6^3 - 1 = 216 - 1 = 215 \neq \boxed{217}$

46. (1) The pattern is :
$3 \times 2 + 2 = 6 + 2 = 8$
$8 \times 3 + 3 = 24 + 3 = 27$
$27 \times 4 + 4 = 108 + 4 = 112$

$112 \times 5 + 5 = 560 + 5 = \boxed{565}$

47. (1) The pattern is :
$8 \times 2 + 2 = 16 + 2 = 18$
$18 \times 2 + 4 = 36 + 4 = 40$
$40 \times 2 + 6 = 80 + 6 = 86$
$86 \times 2 + 8 = 172 + 8$

$= 180 \neq \boxed{178}$

$180 \times 2 + 10 = 360 + 10 = 370$

48. (2) Except 46, all others are prime numbers.
$46 = 2 \times 23$

49. (4) Sequence of numerators
$\Rightarrow$ 1, 3, 5, 7, 9
Sequence of denominators
$\Rightarrow$ 2, 4, 8, 16, 32

$\therefore$ Next fraction $= \frac{9}{32}$

50. (1) The pattern is :
$3 + 2 = 5$
$5 + 2 \times 2 = 5 + 4 = 9$
$9 + 2 \times 4 = 9 + 8 = 17$
$17 + 2 \times 8 = 17 + 16 = 33$

$33 + 2 \times 16 = 33 + 32 = \boxed{65}$

51. (2) The pattern is :
$40960 \div 4 = 10240$
$10240 \div 4 = 2560$
$2560 \div 4 = 640$

$640 \div 4 = 160 \neq \boxed{200}$

$160 \div 4 = 40$
$40 \div 4 = 10$

52. (4) The pattern is :
$190 - 24 = 166$
$166 - 21 = 145$

$145 - 18 = 127 \neq \boxed{128}$

$127 - 15 = 112$
$112 - 12 = 100$
$100 - 9 = 91$

53. (1) The pattern is :
$3 \times 2 + 1 = 6 + 1 = 7$
$7 \times 2 + 2 = 14 + 2 = 16$
$16 \times 2 + 3 = 32 + 3 = 35$
$35 \times 2 + 4 = 70 + 4 = 74$

$\neq \boxed{70}$

$74 \times 2 + 5 = 148 + 5 = 153$

TYPE-II

1. (3) $101 + 102 + 103 + ... + 200$
$S = (100 + 1) + (100 + 2) + (100 + 3) + ...+ (100 + 100)$
Thus, it consists of 100 terms.
$= (100 + 100 + 100 + ... 100 \text{ times}) + (1 + 2 + 3 + ... + 100)$
$= (100 \times 100) + (1 + 2 + 3 + ... + 100)$
$= (10000) + (1+ 2 + 3 + ... + 100)$

$= 10000 + \frac{100 \times (100+1)}{2}$

$= 10000 + 5050 = 15050$

Aliter : Using Rule 1 & 2,
Here, $a = 101$, $d = 102-101 = 1$
$l = 200$
$a_n = a + (n - 1)d$
$200 = 101 + (n - 1)1$
$n - 1 = 99$

$\boxed{n = 100}$

$Sn = \frac{n}{2}[a + l]$

$= \frac{100}{2}[101 + 200]$

$= 50 \times 301 = 15050$

2. (3) Using Rule 1,
Here, $a=72$,
$d = 63-72 = -9$
$a_n = 0$
$\therefore a_n = a + (n-1)d$
$\Rightarrow 0 = 72 + (n-1) \times -9$
$\Rightarrow 72 = 9 (7 - 1) \Rightarrow n-1 = 8$
$\Rightarrow n = 9$

3. (2) ? $= 9 + 16 + 25 + 36 + 49 + 64 + 81 + 100 = 380$
Aliter : Using Rule 4 (ii),
$S_n = 9 + 16 + 25 + ... + 100$
$= 3^2 + 4^2 + 5^2 + ... + 10^2$
$= (1^2 + 2^2 + 3^2 + 4^2 + ... + 10^2) - 1^2 - 2^2$

$= \frac{n(n+1)(2n+1)}{6} - 5$

$= \frac{10(10+1)(2 \times 10+1)}{6} - 5$

$= \frac{10 \times 11 \times 21}{6} - 5$

$= 55 \times 7 - 5$

$= 385 - 5 = 380$

4. (4) Clearly, repetition takes place for each set of four terms.
Hence, 507th term will be 2
507, when divided by 4, gives 3 as remainder and 3rd term is 2.

5. (2) Using Rule 1,
$a_4 = a_1 + (4 - 1) \times d$
$14 = a_1 + 3d \Rightarrow a_1$
$= 14 - 3d$ ....(i)
$70 = a_1 + 11d$ ....(ii)
After putting the value of a_1 in equation (i)
$14 - 3d + 11d = 70$
$8d = 70 - 14$
$\therefore d = 7$
$\therefore a_1 = 14 - 21 = -7$

6. (4) A sequence is said to be in G.P if the ratio of a term to its precedding term is constant.
In 31, 7, –1, if we add 5, the sequence formed is 36, 12, 4 which is in G.P.

$\therefore$ Common ratio $= \frac{12}{36} = \frac{4}{12}$

$= \frac{1}{3}$

7. (2) Using Rule 6,
Sum of x terms of a GP

$= \frac{a(r^n - 1)}{r - 1}$ *(when r > 1)*

$\therefore 6560 = \frac{a(3^8 - 1)}{3 - 1}$

$\Rightarrow 6560 = \frac{a(6561 - 1)}{2}$

$\Rightarrow a = \frac{6560 \times 2}{6560} \Rightarrow a = 2$

8. (3) Using Rule 4 (i),
Let the number of terms be n.
$\therefore 1 + 2 + 3 + ... + n = 5050$

$\Rightarrow \frac{n(n+1)}{2} = 5050$

$\Rightarrow n(n + 1) = 10100$ [or use splitting middle term method]
$= 100 \times 101$
$\Rightarrow n(n + 1) = 100(100 + 1)$
$\Rightarrow n = 100$

9. (3) The given series is based on the following pattern :

1 3 6 10 15 21 $\boxed{28}$
+2 +3 +4 +5 +6 +7

Hence, the seventh term of the series will be 28.

10. (4) Using Rule 1,
$a, a - b, a - 2b$ ..... is an AP with first term = a and common difference = $-b$
Now, $t_{10} = a + (10-1) \times (-b)$
$\Rightarrow 20 = a - 9b$ .... (i)
$t_{20} = a + (20 - 1)(-b)$
$\Rightarrow 10 = a - 19b$ ... (ii)
From equation (i) – (ii),
$20 - 10 = a - 9b - a + 19b$
$\Rightarrow 10b = 10 \Rightarrow b = 1$
From equation (i),
$20 = a - 9 \Rightarrow a = 29$
$\therefore t_x = 29 + (x - 1) \times -1$
$= 29 - x + 1 = 30 - x$

11. (4) Expression

$= \frac{1}{2} + \frac{1}{6} + \frac{1}{12} + \frac{1}{20} + ... + \frac{1}{n(n+1)}$

$= \frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \frac{1}{4 \times 5} + ... + \frac{1}{n(n+1)}$

$= 1 - \frac{1}{2} + \frac{1}{2} - \frac{1}{3} + \frac{1}{3} - \frac{1}{4} + \frac{1}{4} - \frac{1}{5} ..... + \frac{1}{n} - \frac{1}{n+1}$

$= 1 - \frac{1}{n+1} = \frac{n+1-1}{n+1} = \frac{n}{n+1}$

12. (2) Using Rule 4,
$1 + 3 + 5 + ... + 99$
$= (1 + 2 + 3 + 4 + ... + 100)$
$- (2 + 4 + 6 ..... + 100)$
$= (1 + 2 + 3 + 4 + ... + 100)$
$- 2(1 + 2 + 3 ..... + 50)$

$= \frac{100(100+1)}{2} - \frac{2 \times 50(50+1)}{2}$

$\left[\because 1 + 2 + 3 + ... + n = \frac{n(n+1)}{2}\right]$

$= 50 \times 101 - 50 \times 51$
$= 50(101 - 51) = 50 \times 50$
$= 2500$

13. (2) Using Rule 1,

First term, $a = \frac{1}{n}$

Common difference,

$d = \frac{n+1}{n} - \frac{1}{n} = \frac{n+1-1}{n} = 1$

$\therefore$ nth term $= a + (n - 1)d$

$= \frac{1}{n} + (n - 1) \cdot 1$

$= \frac{1 + n^2 - n}{n} = \frac{n^2 - n + 1}{n}$

14. (3) Using Rule 6,
Tricky Approach
Expression
$= 4 + 44 + 444 + ...$ to n terms
$= 4(1 + 11 + 111 + ...$ to n terms)

$= \frac{4}{9}(9 + 99 + 999 + ...$ to n terms)

$= \frac{4}{9}[(10 - 1) + (100 - 1) + (1000 - 1) + ...$ to n terms]

$= \frac{4}{9}[(10 + 10^2 + 10^3 + ...$ to n terms) $- n]$ [$\because$ 1 has been added n times]

$= \frac{4}{9}[10(1 + 10 + 10^2 + ...$ to n terms) $- n]$

$= \frac{40}{9} \cdot \frac{(10^n - 1)}{9} - \frac{4}{9}n$

[$\because 1 + 10 + 10^2 + ...$ to n terms $= \frac{10^n - 1}{9}$]

$= \frac{40}{81}(10^n - 1) - \frac{4}{9}n$

15. (2) Using Rule 5,
The sequence is :

$\frac{1}{2}, -\frac{1}{2^2}, \frac{1}{2^3}, -\frac{1}{2^4}, ... \frac{1}{-2^8}$

It is a G.P. with common ratio

$= \frac{-1}{2}$

$\therefore a_n = ar^{n-1}$

$\Rightarrow -\frac{1}{256} = \frac{1}{2} \cdot \frac{1}{(-2)^{n-1}}$

$\Rightarrow \frac{1}{-2^7} = \frac{1}{(-2)^{n-1}}$

$\Rightarrow n - 1 = 7 \Rightarrow n = 8$

16. (1) First odd number = 1
Second odd number = 3
Third odd number = 5
$\therefore$ n th odd number
$= 1 + (n - 1)2 = 2n - 1$
$\therefore$ 200th odd number
$= 2 \times 200 - 1 = 400 - 1 = 399$

17. (1) Using Rule 1,
For an arithmetic sequence,
$t_n = a + (n - 1)d$
$\therefore 5 = a + (2 - 1)d$
$\Rightarrow 5 = a + d$ .....(i)
and $14 = a + 4d$ .....(ii)
By subtracting equation (i) from (ii),

$$\begin{array}{rcl} 14 & = & a + 4d \\ 5 & = & a + d \\ \hline 9 & = & 3d \end{array}$$

$\therefore d = \frac{9}{3} = 3$

From equation (i),
$5 = a + 3 \Rightarrow a = 5 - 3 = 2$
$\therefore t_6 = 2 + (6 - 1) \times 3$
$= 2 + 15 = 17$

18. (4) Using Rule 1,
Let the n th term = 151
Here, first term = a = 7
common difference = d = 3
$\therefore t_n = a + (n - 1) d$
$\Rightarrow 151 = 7 + (n - 1) \times 3$
$\Rightarrow (n - 1) \times 3 = 144$
$\Rightarrow n - 1 = \frac{144}{3} = 48$
$\Rightarrow n = 49$

19. (1) First term = $\frac{1}{5 \times 6} = \frac{1}{5} - \frac{1}{6}$

Second term = $\frac{1}{6 \times 7} = \frac{1}{6} - \frac{1}{7}$

20th term = $\frac{1}{24 \times 25} = \frac{1}{24} - \frac{1}{25}$

$\therefore$ Required sum =

$\frac{1}{5} - \frac{1}{6} + \frac{1}{6} - \frac{1}{7} + ... + \frac{1}{24} - \frac{1}{25}$

$= \frac{1}{5} - \frac{1}{25} = \frac{5-1}{25} = \frac{4}{25}$
$= 0.16$

20. (2) Using Rule 1,
The 24th term of the sequence
6,13,20, 27.....
$t_{24} = 6 + (24 - 1) 7$
$= 6 + 23 \times 7 = 6 + 161 = 167$
let the required nth term = 265
$\therefore 265 = 6 + (n - 1) 7$
$\Rightarrow (n-1) 7 = 265 - 6 = 259$
$\Rightarrow n - 1 = \frac{259}{7} = 37$
$\Rightarrow n = 38$

21. (2) Using Rule 4 (i),
We know that
$1 + 2 + 3 + 4 + ... + n$
$= \frac{n(n+1)}{2}$
$\therefore 1 + 2 + 3 + 4 + ... + 1000$
$= \frac{1000(1000+1)}{2}$
$= \frac{1000 \times 1001}{2} = 500500$

22. (1) Using Rule 6,
$1 + \frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + ... n$ to n terms
is a Geometric series whose first term (a) is 1 and the common ratio (r) is $\frac{1}{2}$.

$S_n = \frac{a(1 - r^n)}{1 - r}$

$= 1.\frac{\left(1 - \frac{1}{2^n}\right)}{1 - \frac{1}{2}} = \frac{\left(\frac{2^n - 1}{2^n}\right)}{\frac{1}{2}}$

$= 2.\left(\frac{2^n - 1}{2^n}\right) = \frac{2^n - 1}{2^{n-1}}$

23. (3) 0 + 3 = 3
3 + 5 = 8
8 + 7 = 15
15 + 9 = 24
24 + 11 = 35
35 + 13 = 48
48 + 15 = 63
63 + 17 = $\boxed{80}$

24. (3) 2 + 4 = 6
6 + 5 = 11
11 + 6 = 17
17 + 7 = 24
24 + 8 = $\boxed{32}$

25. (2) The pattern of the sequence is:
1 +2 = 3
3 + 3 = 6
6 + 4 = 10
10 + 5 = 15
15 + 6 = 21
$\therefore$ Required ratio
= 15 : 21 = 5 : 7

26. (4) Using Rule 1,
2 + 4 + 6 + 8 + ... + 198
= 2 (1 + 2 + 3 + ... + 99)
$\therefore$ Number of terms = 99
Middle term
$= \frac{99+1}{2}$ = 50th term
= 100

Second Method
It is an arithmetic series.
$a = 2$, $a_n = 198$, d = common difference = 2
Number of terms = n
$\therefore a_n = a + (n - 1)d$
$\Rightarrow 198 = 2 + (n - 1)2$
$\Rightarrow (n - 1)2 = 198 - 2 = 196$
$\Rightarrow n - 1 = \frac{196}{2} = 98$
$\Rightarrow n = 99$
Middle term
$= \frac{99+1}{2}$ = 50th term
$\therefore a_{50} = 2 + (50 - 1)2$
$= 2 + 98 = 100$

27. (3) Using Basic concept of G.P., p, q, r are in geometric progression.
$\therefore \frac{q}{p} = \frac{r}{q} \Rightarrow q^2 = pr$
$\Rightarrow q = \sqrt{pr}$

28. (4) a, 1, b are in A.P.
$\therefore 1 = \frac{a+b}{2}$
$\Rightarrow a + b = 2$ ....(i)
Again, 1, a, b are in G.P.
$\therefore a^2 = b$ .....(ii)
$\therefore a + a^2 = 2$
$\Rightarrow a^2 + a - 2 = 0$
$\Rightarrow a^2 + 2a - a - 2 = 0$
$\Rightarrow a (a + 2) - 1 (a + 2) = 0$
$\Rightarrow (a - 1) (a + 2) = 0$
$\Rightarrow a = -2, 1b = 4, 1$
$\therefore b = 4$ since $a \neq b$

29. (4) Using Rule 1,
$t_{n+2} = t_n + t_{n+1}$
$t_3 = t_1 + t_2 = 3$
$t_4 = t_3 + t_2 = 3 + 2 = 5$
$t_5 = t_4 + t_3 = 3 + 5 = 8$

30. (2) $1 + (3+1)(3^2+1)(3^4+1)(3^8+1)(3^{16}+1)(3^{32}+1)$

$= 1 + \frac{(3-1)(3+1)}{3-1} (3^2+1) (3^4+1)...(3^{32}+1)$

$= 1 + \frac{(3^2-1)(3^2+1)(3^4+1)...(3^{32}+1)}{2}$

$= 1 + \frac{(3^4-1)(3^4+1)(3^8+1)...(3^{32}+1)}{2}$

$= 1 + \frac{(3^8-1)(3^8+1)(3^{16}+1)(3^{32}+1)}{2}$

$= 1 + \frac{(3^{16}-1)(3^{16}+1)(3^{32}+1)}{2}$

$= 1 + \frac{(3^{32}-1)(3^{32}+1)}{2}$

$= 1 + \frac{3^{64}-1}{2} = \frac{3^{64}+1}{2}$

31. (3) Using Rule 4(i),
$1 + 2 + 3 + ... + n = \frac{n(n+1)}{2}$
$\therefore 5 + 6 + 7 + ... + 19$
$= (1 + 2 + 3 + ... + 19) - (1 + 2 + 3 + 4)$
$= \frac{19(19+1)}{2} - 10 = 180$

32. (1) Using Rule 4(ii),
$2^2 + 4^2 + 6^2 + ... + 40^2$
$= 2^2 (1^2 + 2^2 + 3^2 + ... + 20^2)$
$= 4 \times 2870 = 11480$

33. (4) Using Rule 4(iii),
It is given,
$1^3 + 2^3 + 3^3 + ... + 10^3 = 3025$
Now,
$2^3 + 4^3 + 6^3 + ... + 20^3$
$= (1 \times 2)^3 + (2 \times 2)^3 + (2 \times 3)^3 + ... + (2 \times 10)^3$
$= 2^3 [1^3 + 2^3 + 3^3 + ... + 10^3]$
$= 8 \times 3025 = 24200$

34. (3) Using Rule 4(i),
$(45 + 46 + 47 + ... + 114 + 115)$
$= (1 + 2 + 3 + ... + 115) - (1 + 2 + 3 + ... + 44)$

$$= \frac{115 \times (115+1)}{2} - \frac{44 \times (44+1)}{2}$$

$$\left[\because 1+2+3+.....+n = \frac{n(n+1)}{2}\right]$$

$$= \frac{115 \times 116}{2} - \frac{44 \times 45}{2}$$

$= 115 \times 58 - 22 \times 45$
$= 6670 - 990 = 5680$

35. (1) First term $= \dfrac{x \times 0 + 1}{x}$

$$= \frac{x(1-1)+1}{x}$$

Second term $= \dfrac{x \times 1 + 1}{x}$

$$= \frac{x(2-1)+1}{x}$$

Third term $= \dfrac{x \times 2 + 1}{x}$

$$= \frac{x(3-1)+1}{x}$$

$\therefore$ 12th term $= \dfrac{x(12-1)+1}{x}$

$$= \frac{11x+1}{x}$$

36. (2) Using Rule 2,
First term $(a) = 22$
Last term $(l) = -11$
Sum (S) = 66
Number of terms $= n$ (let)

$$\therefore S = \frac{n}{2}(a + l)$$

$$\Rightarrow 66 = \frac{n}{2}(22 - 11)$$

$$\Rightarrow 66 = \frac{11n}{2}$$

$\Rightarrow 11n = 66 \times 2$

$$\Rightarrow n = \frac{66 \times 2}{11} = 12$$

37. (2) Using Rule 1,
First term $= a = 30$
Common difference (d)

$$= 25\frac{1}{2} - 30 = -4\frac{1}{2} = \frac{-9}{2}$$

Number of terms $= n = 30$
$t_n = a + (n - 1)d$

$$\Rightarrow t_{30} = 30 + (30 - 1) \times \frac{-9}{2}$$

$$= 30 - \frac{29 \times 9}{2}$$

$$= 30 - \frac{261}{2}$$

$$= \frac{60 - 261}{2}$$

$$= \frac{-201}{2} = -100\frac{1}{2}$$

38. (3) Using Rule 6,
Series $= 5 + 55 + 555 + ... + T_n$
$= 5(1 + 11 + 111 + ... \text{ to } n \text{ terms})$

$$= \frac{5}{9}(9 + 99 + 999 + ... \text{ to } n \text{ terms})$$

$$= \frac{5}{9}\{(10 - 1) + (10^2 - 1) + ... + (10^n - 1)\}$$

$$\therefore n\text{th term} = \frac{5}{9}(10^n - 1)$$

39. (3) Expression

$$= \frac{1}{1 \times 4} + \frac{1}{4 \times 7} + \frac{1}{7 \times 10} + \frac{1}{10 \times 13} + \frac{1}{13 \times 16}$$

$$= \frac{1}{3}\left(1 - \frac{1}{4}\right) + \frac{1}{3}\left(\frac{1}{4} - \frac{1}{7}\right) + ... + \frac{1}{3}\left(\frac{1}{13} - \frac{1}{16}\right)$$

$$= \frac{1}{3}\left(1 - \frac{1}{4} + \frac{1}{4} - \frac{1}{7} + \frac{1}{7} - \frac{1}{10} + \frac{1}{10} - \frac{1}{13} + \frac{1}{13} - \frac{1}{16}\right)$$

$$= \frac{1}{3}\left(1 - \frac{1}{16}\right) = \frac{1}{3} \times \frac{15}{16} = \frac{5}{16}$$

40. (3) Using Rule 6,
Series $\Rightarrow 1 + 3 + 3^2 + ... + 3^n$
It is a geometric series whose common ratio is 3.
$a + ar + ar^2 + ... + ar^{n-1}$

$$= \frac{a(r^n - 1)}{r - 1}$$

$\therefore 1 + 3 + 3^2 + ... + 3^n$

$$= \frac{1(3^{n+1} - 1)}{3 - 1}$$

$$= \frac{3^{n+1} - 1}{2}$$

According to question,

$$\frac{3^{n+1} - 1}{2} > 2000$$

$\Rightarrow 3^{n+1} - 1 > 4000$
$\Rightarrow 3^{n+1} > 4000 + 1 = 4001$
For $n = 7$.
$3^8 = 6561 > 4001$

41. (1) First term $\Rightarrow 1 + \dfrac{1}{2} = \dfrac{3}{2}$

Second term $\Rightarrow \left(1 + \dfrac{1}{2}\right)\left(1 + \dfrac{1}{3}\right)$

$$= \frac{3}{2} \times \frac{4}{3} = 2$$

Third term

$$\Rightarrow \left(1 + \frac{1}{2}\right)\left(1 + \frac{1}{3}\right)\left(1 + \frac{1}{4}\right)$$

$$= \frac{3}{2} \times \frac{4}{3} \times \frac{5}{4} = \frac{5}{2}$$

$\therefore$ Fourth term

$$= \left(1 + \frac{1}{2}\right)\left(1 + \frac{1}{3}\right)\left(1 + \frac{1}{4}\right)\left(1 + \frac{1}{5}\right)$$

$$= \frac{3}{2} \times \frac{4}{3} \times \frac{5}{4} \times \frac{6}{5} = \frac{6}{2} = 3$$

The solution of question 42 to 45 is at the page

42. (1) Let the first term of A.P. be 'a' and the common difference be 'd'.

$$\therefore S_n = \frac{n}{2}[2a + (n - 1)d]$$

$$\Rightarrow 390 = \frac{10}{2}[2a + (10 - 1)d]$$

$\Rightarrow 390 = 5(2a + 9d)$

$\Rightarrow 2a + 9d = \frac{390}{5} = 78$ ... (i)

Again, third term = 19

$[t_n = a + (n-1)d]$

$\Rightarrow a + 2d = 19$ .... (ii)

By equation (i) – 2 × (ii),

$2a + 9d - 2a - 4d = 78 - 38$

$\Rightarrow 5d = 40$

$\Rightarrow d = \frac{40}{5} = 8$

From equation (ii),

$a + 2 \times 8 = 19$

$\Rightarrow a = 19 - 16 = 3$

43. (1) $2^2 + 4^2 + 6^2 + ... + 40^2$

$= 11480$

$\Rightarrow 1^2.2^2 + 2^2.2^2 + 3^2.2^2 + ...+ 20^2.2^2 = 11480$

$\Rightarrow 2^2 (1^2 + 2^2 + 3^2 + ... + 20^2) = 11480$

$= 1^2 + 2^2 + 3^2 + ... + 20^2$

$= \frac{11480}{4} = 2870$

44. (4) $1^2 + 2^2 + 3^2 + ... + p^2$

$= \frac{p(p+1)(2p+1)}{6}$

$\therefore 1^2 + 3^2 + 5^2 + ... + 17^2$

$= (1^2 + 2^2 + 3^2 + ... + 17^2) - (2^2 + 4^2 + ...+16^2)$

$= (1^2 + 2^2 + 3^2 + ... + 17^2) - 4 (1^2 + 2^2 + ... + 8^2)$

$= \frac{17(17+1)(34+1)}{6}$

$- \frac{4 \times 8(8+1)(16+1)}{6}$

$= \frac{17 \times 18 \times 35}{6}$

$- \frac{4 \times 8 \times 9 \times 17}{6}$

$= 1785 - 816 = 969$

45. (2) nth term of an arithmetic progression :

$a_n = a + (n-1)\, d$

$\therefore a_7 = a + (7-1)\, d = a + 6d$

$a_{11} = a + (11-1)\, d = a + 10d$

According to the question,

$7\, a_7 = 11\, a_{11}$

$\Rightarrow 7\,(a + 6d) = 11\,(a + 10d)$

$\Rightarrow 7a + 42d = 11a + 110\, d$

$\Rightarrow 11a - 7a = 42d - 110d$

$\Rightarrow 4a = -68d$

$\Rightarrow a = -17d$ .... (i)

$\therefore a_{18} = a + (18-1)d = a + 17d$

$= -17d + 17d = 0$

TYPE-III

1. (1) $\lfloor n = 1 \times 2 \times 3 \times .....\times n$

$\therefore \lfloor 8 - \lfloor 7 - \lfloor 6$

$= (8 \times 7 \times \lfloor 6) - (7 \times \lfloor 6) - \lfloor 6$

$= 56 \lfloor 6 - 7 \lfloor 6 - \lfloor 6$

$= (56 - 7 - 1) \lfloor 6$

$= 48 \lfloor 6 = 6 \times 8 \times \lfloor 6$

2. (3)

$$\frac{1}{1\times4}+\frac{1}{4\times7}+\frac{1}{7\times10}+\frac{1}{10\times13}+\frac{1}{13\times16}$$

$$= \left(1-\frac{1}{4}+\frac{1}{4}-\frac{1}{7}+\frac{1}{7}-\frac{1}{10}+\frac{1}{10}-\frac{1}{13}+\frac{1}{13}-\frac{1}{16}\right)\times\frac{1}{3}$$

$$= \frac{15}{16}\times\frac{1}{3} = \frac{5}{16}$$

3. (2) $\because (a+b)^2 - (a-b)^2 = 4ab$

$\therefore \left(10^{12}+25\right)^2 - \left(10^{12}-25\right)^2$

$= 4 \times 10^{12} \times 25 = 10^{14}$

$\Rightarrow 10^{14} = 10^n$

$\Rightarrow n = 14$

4. (3) 1 + 2 + 3 + 4 + ... + 10 = 55.

Then,

6 + 12 + 18 + 24 + ... + 60

= 6 (1 + 2 + 3 + 4 + ... + 10) = 6 × 55 = 330

5. (1) Expression

$= \frac{1}{2}\times\frac{2}{3}\times\frac{3}{4}\times....\frac{n-1}{n} = \frac{1}{n}$

6. (2) Expression

$$= \frac{3}{1^2.2^2}+\frac{5}{2^2.3^2}+\frac{7}{3^2.4^2}+.....$$

$$+\frac{17}{8^2.9^2}+\frac{19}{9^2.10^2}$$

$$\frac{2^2-1^2}{1^2.2^2}+\frac{3^2-2^2}{2^2.3^2}+\frac{4^2-3^2}{3^2.4^2}+...$$

$$=\left(\frac{1}{1^2}-\frac{1}{2^2}\right)+\left(\frac{1}{2^2}-\frac{1}{3^2}\right)+\left(\frac{1}{3^2}-\frac{1}{4^2}\right)$$

$$.....+\left(\frac{1}{8^2}-\frac{1}{9^2}\right)+\left(\frac{1}{9^2}-\frac{1}{10^2}\right)$$

$$= \frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{2^2}-\frac{1}{3^2}+\frac{1}{3^2}-\frac{1}{4^2}+.....$$

$$+\frac{1}{8^2}-\frac{1}{9^2}+\frac{1}{9^2}-\frac{1}{10^2}$$

$$= 1-\frac{1}{10^2}$$

$$= 1-\frac{1}{100} = \frac{100-1}{100}$$

$$= \frac{99}{100}$$

7. (2) Using Rule 7,

Let S

$$= 1 - \frac{1}{20}+\frac{1}{20^2}-\frac{1}{20^3}+.....$$

It is a geometric series to infinity with first term, $a = 1$ and common ratio,

$$r = -\frac{1}{20}$$

$$\therefore S_\infty = \frac{a}{1-r}$$

$$= \frac{1}{1-\left(-\frac{1}{20}\right)}$$

$$= \frac{1}{1+\frac{1}{20}} = \frac{20}{21} = 0.9523809$$

$\therefore$ The value correct to 5 places of decimal

= 0.95238

8. (2) The largest number will be 6.

For $n = 2$

$(n-1)\, n(n+1) = 6$,

for $n = 3$, $(n-1)\,(n)\,(n+1) = 24$ etc.

9. (4) Using Rule 1,

$1 + 2 + 3 + ... + x = \frac{x(x+1)}{2}$

$\therefore 1 + 3 + 5 + ... + 99$

$= (1 + 2 + 3 + 4 + 5 + ...100) - (2 + 4 + 6 + ...100)$

$= \frac{100 \times (100+1)}{2} - \frac{50 \times (50+1)}{2}$

$= 5050 - 1275 = 3775$

10. (2) Expression,

$$=\left(1-\frac{1}{5}\right)\left(1-\frac{1}{6}\right)\left(1-\frac{1}{7}\right)....\left(1-\frac{1}{100}\right)$$

$$=\left(\frac{5-1}{5}\right)\left(\frac{6-1}{6}\right)\left(\frac{7-1}{7}\right)...\left(\frac{99-1}{99}\right)\left(\frac{100-1}{100}\right)$$

$$= \frac{4}{5}\times\frac{5}{6}\times\frac{6}{7}\times....\times\frac{98}{99}\times\frac{99}{100}$$

$$= \frac{4}{100} = \frac{1}{25}$$

11. (1) Tricky approach

$1 + 0.6 + 0.06 + 0.006 + 0.0006 + ... = 1.666 .... = 1.\overline{6}$

$= 1\frac{6}{9} = 1\frac{2}{3}$

12. (1) $\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\left(1-\frac{1}{5}\right) .....$

$\left(1-\frac{1}{24}\right)\left(1-\frac{1}{25}\right)$

$= \frac{2}{3}\times\frac{3}{4}\times\frac{4}{5}.....\times\frac{23}{24}\times\frac{24}{25} = \frac{2}{25}$

TYPE-IV

1. (4) ? = 125 + 216 + 343 + 512 + 729 + 1000 = 2925

Aliter : Using Rule 4(iii),

$S_n = (5^3 + 6^3 + ... 10^3)$

$= (1^3 + 2^3 + 3^3 + 4^3 + 5^3 + ... 10^3) - (1^3 + 2^3 + 3^3 + 4^3)$

$= \left[\frac{n(n+1)}{2}\right]^2 - (1+8+27+64)$

$= \left[\frac{10(10+1)}{2}\right]^2 - 100$

$= (55)^2 - 100 = 3025 - 100 = 2925$

2. (4) $2^3 + 4^3 + 6^3 + ... + 20^3$

$= (2 \times 1)^3 + (2 \times 2)^3 + (2 \times 3)^3 + ... + (2 \times 10)^3$

$= 8 \times 1^3 + 8 \times 2^3 + 8 \times 3^3 .... + 8 \times 10^3$

$= 8 \times [1^3 + 2^3 + 3^3 + 4^3 + ... + 10^3]$

$= 8 \times 3025 = 24200$

[$\because$ $1^3 + 2^3 + 3^3 + ... + 10^3 = 3025$ (given)]

3. (2) Here, $1^3 + 2^3 + ... + 10^3 = 3025$

Now, $4 + 32 + 108 + ... + 4000$

$= 4\ (1 + 8 + 27 + ... + 4000)$

$= 4\ (1^3 + 2^3 + 3^3 + ... + 10^3)$

$= 4 \times 3025 = 12100$

4. (4) $1^3 + 2^3 + 3^3 + 4^3 + 5^3 + 6^3 = 441$ (Given)

$2^3 + 4^3 + 6^3 + 8^3 + 10^3 + 12^3$

$= 8\ (1^3 + 2^3 + 3^3 + 4^3 + 5^3 + 6^3)$

$= 8 \times 441 = 3528$

5. (1) Using Rule 4(ii),

$1^2 + 2^2 + 3^2 + ... + n^2$

$= \frac{n(n+1)(2n+1)}{6}$

$\therefore\ 1^2 + 3^2 + 5^2 + ... + 19^2$

$= (1^2 + 2^2 + 3^2 + ... + 20^2) - (2^2 + 4^2 + ... + 20^2)$

$= \frac{20(20+1)(40+1)}{6}$

$- 2^2\ (1^2 + 2^2 + ... + 10^2)$

$= \frac{20 \times 21 \times 41}{6}$

$- \frac{4 \times 10\ (10+1)\ (20+1)}{6}$

$= 2870 - 1540 = 1330$

6. (2) Using Rule 4(iii),

$1^3 + 2^3 + ... + 9^3 = 2025$ (Given)

Now, $(0.11)^3 + (0.22)^3 + ... + (0.99)^3$

$= \left(\frac{11}{100}\right)^3 + \left(\frac{22}{100}\right)^3 + ... + \left(\frac{99}{100}\right)^3$

$= \left(\frac{11}{100}\right)^3 \left(1^3 + 2^3 + ... + 9^3\right)$

$= \frac{1331}{1000000} \times 2025$

$= \frac{2695275}{1000000} = 2.695275$

≈ 2.695

7. (1) Using Rule 4(ii),

$1^2 + 2^2 + 3^2 + ... + n^2$

$= \frac{n(n+1)(2n+1)}{6}$

$? = \frac{10 \times 11 \times 21}{6} + 20^2 - \frac{4 \times 5 \times 9}{6}$

$= 385 + 400 - 30 = 755$

8. (4) $S = 1^2 - 2^2 + 3^2 - 4^2 + ... - 10^2$

$S = (1^2 + 3^2 + 5^2 + 7^2 + 9^2) - (2^2 + 4^2 + 6^2 + 8^2 + 10^2)$

We know that sum of squares of first n odd natural numbers

$= \frac{n(4n^2 - 1)}{3}$

Sum of squares of first n even natural numbers

$= \frac{2}{3}n(n+1)(2n+1)$

Hence,

$S = \frac{5(4 \times 5 \times 5 - 1)}{3} - \frac{2}{3} \times 5\ (5 + 1)\ (2 \times 5 + 1)$

$S = \frac{5 \times 99}{3} = \frac{2 \times 30 \times 11}{3}$

$= 165 - 220 = -55$

9. (2) Using Rule 4(ii),

$1^2 + 2^2 + 3^2 + ... + n^2$

$= \frac{n(n+1)(2n+1)}{6}$

$\therefore\ 10^2 + 11^2 + 12^2 + ... + 20^2$

$= (1^2 + 2^2 + 3^2 + ... + 20^2)$

$- (1^2 + 2^2 + 3^2 + ... + 9^2)$

$= \frac{20(20+1)(2 \times 20+1)}{6}$

$- \frac{9(9+1)(2 \times 9+1)}{6}$

$= \frac{20 \times 21 \times 41}{6} - \frac{9 \times 10 \times 19}{6}$

$= 2870 - 285 = 2585$

10. (2) Using Rule 4(ii),

$1^2 + 2^2 + 3^2 + ... + n^2$

$= \frac{n(n+1)(2n+1)}{6}$

$\therefore\ 1^2 + 2^2 + 3^2 + ... + 10^2$

$= \frac{10(10+1)\ (20+1)}{6} = 385$

11. (3) Using Rule 4(ii),

$1^2 + 2^2 + 3^2 + 4^2 + ... + n^2$

$= \frac{n(n+1)(2n+1)}{6}$

$\therefore\ 5^2 + 6^2 + ... 10^2 = (1^2 + 2^2 + ... + 10^2) - (1^2 + 2^2 + 3^2 + 4^2)$

$= \frac{10 \times 11 \times 21}{6} - \frac{4 \times 5 \times 9}{6}$

$= 385 - 30 = 355$

12. (4) Using Rule 4(ii),

We know that

$1^2 + 2^2 + 3^2 + ... + n^2$

$= \frac{n(n+1)(2n+1)}{6}$

$\therefore\ 2^2 + 3^2 + 4^2 + ... + 10^2$

$= (1^2 + 2^2 + 3^2 + ... + 10^2) - 1$

$= \frac{10(10+1)(2 \times 10+1)}{6} - 1$

$= \frac{10 \times 11 \times 21}{6} - 1 = 385 - 1 = 384$

13. (4) Using Rule 4(ii),

Using formula $1^3 + 2^3 + 3^3 + ... + n^3$

$= \left(\frac{n(n+1)}{2}\right)^2$ we have,

$1^3 + 2^3 + 3^3 + ... + 10^3$

$= \left(\frac{10 \times 11}{2}\right)^2 = (55)^2$

$= 55 \times 55 = 3025$

14. (2) $1^2 + 2^2 + 3^2 + ... + 10^2 = 385$

$\therefore\ 2^2 + 4^2 + 6^2 + ... + 20^2$

$= 2^2\ (1^2 + 2^3 + 3^2 + ... + 10^2)$

$= 4 \times 385 = 1540$

TEST YOURSELF

1. In the sequence of number 0, 7, 26, 63, ..., 215, 342 the missing term is
(1) 115 (2) 124
(3) 125 (4) 135

2. What is the next term in the following sequence ?
2 3 11 38 102 ?
(1) 225 (2) 227
(3) 230 (4) 235

3. Find $1^3 + 2^3 + 3^3 + ... + 15^3$
(1) 11025 (2) 13400
(3) 900 (4) 14400

4. The value of
$(1^3 + 2^3 + 3^3 + ... + 15^3) - (1 + 2 + 3 + ... + 15)$ is —
(1) 14280 (2) 14400
(3) 12280 (4) 13280

5. What is the next number in the series given below ?
53, 48, 50, 50, 47
(1) 51 (2) 46
(3) 53 (4) 52

6. In a GP, the first term is 5 and the common ratio is 2. The eighth term is —
(1) 640 (2) 1280
(3) 256 (4) 160

7. If the arithmetic mean of two numbers is 5 and geometric mean is 4, then the numbers are —
(1) 4, 6 (2) 4, 7
(3) 3, 8 (4) 2, 8

8. What is the next number in the series given below ?
2, 5, 9, 14, 20
(1) 25 (2) 26
(3) 27 (4) 28

9. The sum of 40 terms of an AP whose first term is 4 and common difference is 4, will be —
(1) 3200 (2) 1600
(3) 200 (4) 2800

10. Let S_n denote the sum of the first 'n' terms of an AP
$S_{2n} = 3S_n$. Then, the ratio $\frac{S_{3n}}{S_n}$ is equal to
(1) 4 (2) 6
(3) 8 (4) 10

11. The missing number in the series 8, 24, 12, 36, 18, 54, ... is —
(1) 27 (2) 108
(3) 68 (4) 72

12. The sum of the 6th and 15th elements of an arithmetic progression is equal to the sum of 7th, 10th and 12th elements of the same progression. Which element of the series should necessarily be equal to zero ?
(1) 10th (2) 8th
(3) 1st (4) 9th

13. If p, q, r, s are in harmonic progression and p > s, then —
(1) $\frac{1}{ps} < \frac{1}{qr}$
(2) $q + r = p + s$
(3) $\frac{1}{q} + \frac{1}{p} = \frac{1}{r} + \frac{1}{s}$
(4) None of these

14. What is the eighth term of the sequence 1, 4, 9, 16, 25 ..... ?
(1) 8 (2) 64
(3) 128 (4) 200

15. In a geometric progression, the sum of the first and the last term is 66 and the product of the second and the last but one term is 128. Determine the first term of the series.
(1) 64 (2) 64 or 2
(3) 2 or 32 (4) 32

16. A sequence is generated by the rule that the xth term is $x^2 + 1$ for each positive integer x. In this sequence, for any value $x > 1$, the value of $(x + 1)$th term less the value of xth term is —
(1) $2x^2 + 1$ (2) $x^2 + 1$
(3) $2x + 1$ (4) $x + 2$

17. Four different integers form an increasing AP. If one of these numbers is equal to the sum of the squares of the other three numbers, then the numbers are —
(1) –2, –1, 0, 1 (2) 0, 1, 2, 3
(3) –1,0, 1, 2 (4) 1, 2, 3, 4

18. How many terms are there in an AP whose first and fifth terms are –14 and 2 respectively and the sum of terms is 40 ?
(1) 15 (2) 10
(3) 5 (4) 20

19. The first three numbers in a series are –3, 0, 3, the 10th number in the series will be —
(1) 18 (2) 21
(3) 24 (4) 27

SHORT ANSWERS

1.(2)	**2.**(2)	**3.**(4)	**4.**(1)
5.(4)	**6.**(1)	**7.**(4)	**8.**(3)
9.(1)	**10.**(2)	**11.**(1)	**12.**(2)
13.(4)	**14.**(2)	**15.**(2)	**16.**(3)
17.(3)	**18.**(2)	**19.**(3)	

EXPLANATIONS

1. (2) The given series is based on the following pattern :
$1^3 - 1 = 0$ $2^3 - 1 = 7$
$3^3 - 1 = 26$ $4^3 - 1 = 63$
$5^3 - 1 = \boxed{124}$ $6^3 - 1 = 215$
$7^3 - 1 = 342$

2. (2) The pattern is :
$2 + 1^3 = 2 + 1 = 3$
$3 + 2^3 = 3 + 8 = 11$
$11 + 3^3 = 11 + 27 = 38$
$38 + 4^3 = 38 + 64 = 102$
$102 + 5^3 = 102 + 125 = \boxed{227}$

3. (4) According to question, we have,
$1^3 + 2^3 + 3^3 + ... + n^3$
$$= \left[\frac{n \times (n+1)}{2}\right]^2$$
Here, n = number of terms = 15
$$\therefore \left[\frac{n\,(n+1)}{2}\right]^2 = \left[\frac{15 \times 16}{2}\right]^2$$
$= (120)^2 = 14400$

4. (1) According to question,
$(1^3 + 2^3 + 3^3 + ... + 15^3) - (1 + 2 + 3 + ... + 15)$
$$= \left[\frac{n(n+1)}{2}\right]^2 - \left[\frac{n(n+1)}{2}\right]$$

$$= \left[\frac{15\times 16}{2}\right]^2 - \left[\frac{15\times 16}{2}\right]$$

$$= (120)^2 - (120)$$

$= 120 \times 119 = 14280$

5. (4) According to question,

53, 48, 50, 50, 47, ...

The above series can be splitted into two series one in ascending order and other in descending order

$\underbrace{53\ \ 50}_{-3}\ \underbrace{\ \ 47}_{-3}$ and other is

$\underbrace{48\ \ 50}_{+2}\ \underbrace{\ \ 52}_{+2}$

Hence, 52 will be the next number.

6. (1) According to question, nth term of a GP = ar^{n-1}.

$\therefore$ 8th term = $5 \times (2)^{8-1} = 5 \times (2)^7$

$= 5 \times 128 = 640$

7. (4) Let the two numbers be x and y.

Then, AM,

$$\frac{x+y}{2} = 5$$

$\Rightarrow \quad x + y = 10$

and GM, $\sqrt{xy} = 4$ ...(i)

$xy = 16$

$\Rightarrow \quad (x - y)^2 = (x + y)^2 - 4xy$

$100 - 64 = 36$

$x - y = 6$ ...(ii)

Or

Solving Eqs. (i) and (ii),

$x = 8$ and $y = 2$

8. (3) According to question,

$2\ \ 5\ \ 9\ \ 14\ \ 20\ \ 27$

$+3\ \ +4\ \ +5\ \ +6\ \ +7$

Hence, the next number of the series will be 27.

9. (1) According to question,

$$S_{40} = \frac{n}{2}\ [2a + (n-1)d]$$

$= 20\ [4 + 39 \times 4] = 20 \times 160$

$= 3200$

10. (2) Let a be the first term and d be the common difference.

Then, $S_n = \frac{n}{2}\ [2a + (n-1)d]$

$$S_{2n} = \frac{2n}{2}\ [2a + (2n-1)d]$$

and $S_{3n} = \frac{3n}{2}\ [2a + (3n-1)d]$

Given, $S_{2n} = 3S_n$

$$\therefore \quad \frac{2n}{2}\left[2a + (2n-1)d\right] = 2\frac{n}{2}\left[2a + (n-1)d\right]$$

$\Rightarrow 4a + (4n - 2)d = 6a + (3n - 3)d$

$\Rightarrow \quad d\,(4n - 2 - 3n + 3) = 2a$

$$\Rightarrow \quad d = \frac{2a}{n+1}$$

$$\therefore \quad S_n = \frac{2an^2}{n+1}$$

and $S_{3n} = \frac{12an^2}{n+1}$

$$\therefore \quad \frac{S_n}{S_{3n}} = \frac{2an^2}{n+1} \times \frac{n+1}{12an^2} = \frac{1}{6}$$

$$\Rightarrow \quad \frac{S_{3n}}{S_n} = 6$$

11. (1) According to question,

8, 24, 12, 36, 18, 54

$8\ \ 24\ \ 12\ \ 36\ \ 18\ \ 54\ \ 27$

$\times 3\ \ \div 2\ \ \times 3\ \ \div 2\ \ \times 3\ \ \div 2$

Hence, 27 will come in the blank space.

12. (2) Let the first term and common term of the AP be a and d respectively.

Then, $(a + 5d) + (a + 14d) = (a + 6d) + (a + 9d) + (a + 11d)$

$\Rightarrow \quad 2a + 19d = 3a + 26\,d$

$\Rightarrow \quad a + 7d = 0$

$\therefore$ 8th term is 0.

13. (4) According to question,

If p, q, r, s are in HP.

$\Rightarrow \quad \frac{1}{p}, \frac{1}{q}, \frac{1}{r}, \frac{1}{s}$ are in AP.

$$\Rightarrow \quad \frac{1}{q} - \frac{1}{p} = \frac{1}{s} - \frac{1}{r}$$

$$\Rightarrow \quad \frac{1}{q} + \frac{1}{r} = \frac{1}{s} + \frac{1}{p}$$

Hence, the none of these be answer

14. (2) According to question,

1, 4, 9, 16, 25

$(1)^2\ \ (2)^2\ \ (3)^2\ \ (4)^2\ \ (5)^2$

Each term of the progression is the square of a natural number.

Hence, the eighth term of the sequence will be $(8)^2 = 64$

15. (2) Let the last term be n, then

$a + ar^{n-1} = 66$

and $ar.\ ar^{n-2} = 128$

$a^2r^{n-1} = 128$

From Eqs. (i) and (ii),

$a\,(66 - a) = 128$

$\Rightarrow \quad a^2 - 66a + 128 = 0$

$\Rightarrow \quad a = 64, 2$

16. (3) According to question,

$(x + 1)^{th}$ term $- x^{th}$ term

$= (x + 1)^2 + 1 - (x^2 + 1)$

$= x^2 + 2x + 1 + 1 - x^2 - 1 = 2x + 1$

17. (3) By hit and trial or common sense, we have,

$2 = (-1)^2 + (0)^2 + (1)^2$

Hence the numbers are

$-1, 0, 1, 2$

18. (2) According to question,

$T_5 = a + (n - 1).d$

$2 = -14 + 4d$

$$d = \frac{16}{4} = 4$$

$$\therefore S_n = \frac{n}{2}\ [2a + (n-1) \times d]$$

$$40 = \frac{n}{2}\ [-28 + (n-1) \times 4]$$

$\Rightarrow \quad 80 = -28n + 4n^2 - 4n$

$\Rightarrow \quad 4n^2 - 32n - 80 = 0$

$n^2 - 8n - 20 = 0$

$\Rightarrow \quad (n - 10)(n + 2) = 0$

$\therefore \quad n = 10 \ (\because n \neq -2)$

19. (3) According to question,

$a = -3,\ d = 3$

$\therefore T_{10} = a + (10 - 1)\ .\ d$

$T_{10} = -3 + 9 \times 3 = 24$

17 ALGEBRA

Importance : Algebra based 2-3 questions are essentially asked in almost all competitive exams obviously this chapter should be given sufficient time and practice done.

Scope of questions : Questions based on different algebraic expressions, equations (e.g. quadratic or higher order, square root, cube root and inverse) or based on graphic representation of equations and the value of a variable is asked or an equation is required to be validated.

Way to success : Solution of questions of this chapter can be ensured by memorising the concerved formulae/rules and by regular practice.

Polynomials : An algebraic expression in which the variables involved have only non-negative integral powers is called a polynomial.

General Form : $p(x) = a_0 + a_1x + a_2x^2 + \ldots + a_nx^n$ is a polynomial in variable x, where $a_0, a_1, a_2, a_3 \ldots a_n$ are real numbers and n is non-negative integer.

Remainder Theorem : Let $f(x)$ be a polynomial of degree $n \geq 1$, and let a be any real number. When $f(x)$ is divided by $(x - a)$, then the remainder is $f(a)$.

Proof : Suppose that when $f(x)$ is divided by $(x - a)$, the quotient is $g(x)$ and the remainder is $r(x)$.

Then, degree $r(x)$ < degree $(x - a)$

$\Rightarrow$ degree $r(x) < 1$

$\Rightarrow$ degree $r(x) = 0$ $\quad [\because$ degree of $(x - a) = 1]$

$\Rightarrow r(x)$ is constant, equal to r (say).

Thus, when $f(x)$ is divided by $(x - a)$, then the quotient is $g(x)$ and the remainder is r.

$\therefore f(x) = (x - a) \cdot g(x) + r \quad \ldots$ (i)

Putting $x = a$ in (i), we get $r = f(a)$.

Thus, when $f(x)$ is divided by $(x - a)$, then the remainder is $f(a)$.

Remarks

(i) If a polynomial $p(x)$ is divided by $(x + a)$, the remainder is the value of $p(x)$ at $x = -a$ i.e. $p(-a)$

$$[\because x + a = 0 \Rightarrow x = -a]$$

(ii) If a polynomial $p(x)$ is divided by $(ax - b)$, the remainder is the value of $p(x)$ at $x = \frac{b}{a}$ i.e. $p\left(\frac{b}{a}\right)$.

$$[\because ax - b = 0 \Rightarrow x = \frac{b}{a}]$$

(iii) If a polynomial $p(x)$ is divided by $(ax + b)$, then remainder is the value of $p(x)$ at $x = -\frac{b}{a}$ i.e. $p\left(-\frac{b}{a}\right)$

$$[\because ax + b = 0 \Rightarrow x = -\frac{b}{a}]$$

(iv) If a polynomial $p(x)$ is divided by $b - ax$, the remainder is the value of $p(x)$ at $x = \frac{b}{a}$ i.e. $p\left(\frac{b}{a}\right)$

$$[\because b - ax = 0 \Rightarrow x = \frac{b}{a}]$$

Factor Theorem

Let $p(x)$ be a polynomial of degree greater than or equal to 1 and a be a real number such that $p(a) = 0$, then $(x - a)$ is a factor of $p(x)$.

Conversely, if $(x - a)$ is a factor of $p(x)$,

then $p(a) = 0$

$\Rightarrow p(x)$, when divided by $(x - a)$ gives remainder zero. But by Remainder theorem,

$p(x)$ when divided by $(x - a)$ gives the remainder equal to $p(a)$.

$\therefore p(a) = 0$

Remarks

(i) $(x + a)$ is a factor of a polynomial iff (if and only if) $p(-a) = 0$

(ii) $(ax - b)$ is a factor of a polynomial if $p\left(\frac{b}{a}\right) = 0$

(iii) $(ax + b)$ is a factor of a polynomial $p(x)$ if $p\left(-\frac{b}{a}\right) = 0$

(iv) $(x - a)$ $(x - b)$ are factors of a polynomial $p(x)$ if $p(a) = 0$ and $p(b) = 0$

ALGEBRAIC IDENTITIES

An algebraic identity is an algebraic equation which is true for all values of the variable (s).

IMPORTANT FORMULAE

1. $(a + b)^2 = a^2 + 2ab + b^2$
2. $(a - b)^2 = a^2 - 2ab + b^2$
3. $(a + b)^2 = (a - b)^2 + 4ab$
4. $(a - b)^2 = (a + b)^2 - 4ab$
5. $a^2 - b^2 = (a + b)(a - b)$
6. $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
7. $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
8. $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$
9. $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$
10. $a^3 + b^3 = (a + b)^3 - 3ab(a + b)$
11. $a^3 - b^3 = (a - b)^3 + 3ab(a - b)$

12. $a^3 + b^3 + c^3 - 3abc$

$= (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ac)$

$= (a + b + c)\frac{1}{2}(2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ac)$

$= \frac{1}{2}(a + b + c)[(a - b)^2 + (b - c)^2 + (c - a)^2]$

13. If $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$

14. $(a + b + c)^3 = a^3 + b^3 + c^3 + 3(b + c)(c + a)(a + b)$

15. $a^2 + b^2 = (a + b)^2 - 2ab$

16. $a^2 + b^2 = (a - b)^2 + 2ab$

17. $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2ac + 2bc$

18. $a^4 + b^4 + a^2b^2 = (a^2 - ab + b^2)(a^2 + ab + b^2)$

GRAPHIC REPRESENTATION OF STRAIGHT LINES

Ordered Pair : A pair of numbers a and b listed in a specific order with a at the first place and b at the second place is called an ordered pair (a, b).

Note that $(a, b) \neq (b, a)$.

Thus, (2, 3) is one ordered pair and (3, 2) is another ordered pair.

CO-ORDINATE SYSTEM

Co-ordinate Axes : The position of a point in a plane is determined with reference to two fixed mutually perpendicular lines, called the coordinate axes.

Let us draw two lines X'OX and YOY', which are perpendicular to each other and intersect at the point O. These lines are called the coordinate axes or the axes of reference.

The horizontal line X'OX is called the x-axis.

The vertical line YOY' is called the y-axis.

The point O is called the origin.

The distance of a point from y-axis is called its x-co-ordinate or abscissa and the distance of the point from x-axis is called its y-co ordinate or ordinate.

If x and y, denote respectively the abscissa and ordinate of a point P, then (x, y) are called the coordinates of the point P.

The y–co-ordinate of every point on x-axis is zero. i.e. when a straight line intersects at x-axis, its y-co-ordinate is zero. So, the co-ordinates of any point on the x-axis are of the form (x, 0).

The x-co-ordinate of every point on y-axis is zero. So, the co-ordinates of any point on y-axis are of the form (0, y).

The co-ordinates of the origin are (0, 0).

y = a where a is constant denotes a straight line parallel to x-axis.

x = a where a is constant, denotes a straight line parallel to y-axis.

x = 0 denotes y-axis.

y = 0 denotes x-axis.

We can fix a convenient unit of length and taking the origin as zero, mark equal distances on the x-axis as well as on the y-axis.

Convention of Signs : The distances measured along OX and OY are taken as positive and those along OX' and OY' are taken as negative, as shown in the figure given above.

CO-ORDINATES OF A POINT IN A PLANE

Let P be a point in a plane.

Let the distance of P from the y-axis = a units.

And, the distance of P from the x-axis = b units.

Then, we say that the co-ordinates of P are (a, b).

a is called the x-co-ordinate, or abscissa of P.

b is called the y co-ordinate, or ordinate of P.

Quadrants : Let X' OX and YOY' be the co-ordinate axes.

These axes divide the plane of the paper into four regions, called quadrants. The regions XOY, YOX',X'OY' and Y'OX are respectively known as the first, second, third and fourth quadrants.

Using the convention of signs, we have the signs of the coordinates in various quadrants as given below.

Region	Quadrant	Nature of x and y	Signs of co-ordinates
XOY	I	$x > 0,\ y > 0$	(+, +)
YOX'	II	$x < 0,\ y > 0$	(–, +)
X'OY'	III	$x < 0,\ y < 0$	(–, –)
Y'OX	IV	$x > 0,\ y < 0$	(+, –)

Note : Any point lying on x-axis or y-axis does not lie in any quadrant.

Consistency and Inconsistency

A system of a pair of linear equations in two variables is said to be consistent if it has at least one solution.

A system of a pair of linear equations in two variables is said to be inconsistent if it has no solution.

The system of a pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has :

(i) a unique solution (i.e. consistent) if $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$. The graph of the linear equations intersect at only one point.

(ii) no solution (i.e. inconsistent) if $\frac{a_1}{b_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

The graph of the two linear equations are parallel to each other i.e. the lines do not intersect.

(iii) an infinite number of solution if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

The graph of the linear equations are coincident.

Homogeneous equation of the form $ax + by = 0$ is a line passing through the origin. Therefore, this system is always consistent.

Rule 1. $(a + b)^2 = a^2 + 2ab + b^2$

$\Rightarrow$ $a^2 + b^2 = (a + b)^2 - 2ab$

$(a - b)^2 = a^2 - 2ab + b^2$

$\Rightarrow$ $a^2 + b^2 = (a - b)^2 + 2ab$

Rule 2. $(a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$

Rule 3. $(a + b)^2 - (a - b)^2 = 4ab$

or, $(a + b)^2 = (a - b)^2 + 4ab$

or, $(a - b)^2 = (a + b)^2 - 4ab$

Rule 4. $(a^2 - b^2) = (a + b)(a - b)$

Rule 5. $a^2 + \frac{1}{a^2} = \left(a + \frac{1}{a}\right)^2 - 2$ or, $\left(a - \frac{1}{a}\right)^2 + 2$

Rule 6. $a^4 - b^4 = (a^2 + b^2)(a + b)(a - b)$

Rule 7. $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

or, $a^2 + b^2 + c^2 = (a + b + c)^2 - 2(ab + bc + ca)$

Rule 8. $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$

or, $a^3 + b^3 = (a + b)^3 - 3ab(a + b)$

Rule 9. $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$

or, $a^3 - b^3 = (a - b)^3 - 3ab(a - b)$.

Rule 10. $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

Rule 11. $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

Rule 12. $a^3 + \frac{1}{a^3} = \left(a + \frac{1}{a}\right)^3 - 3\left(a + \frac{1}{a}\right)$

Rule 13. $a^3 - \frac{1}{a^3} = \left(a - \frac{1}{a}\right)^3 + 3\left(a - \frac{1}{a}\right)$

Rule 14. If $a + \frac{1}{a} = 2$ then $a^n + \frac{1}{a^n} = 2$.

Rule 15. If $a + \frac{1}{a} = 2$ then, $a^n - \frac{1}{a^n} = 0$

(By putting a = 1)

Rule 16. If $a + \frac{1}{a} = 2$ then $a^m + \frac{1}{a^n} = 2$

(By putting a = 1), and $m \neq n$.

Rule 17. If $a + \frac{1}{a} = 2$ then $a^m - \frac{1}{a^n} = 0$

(By putting a = 1)

Rule 18. If $a + \frac{1}{a} = -2$, then $a^n + \frac{1}{a^n} = 2$ If n is even and $a^n + \frac{1}{a^n} = -2$, if n is odd.

(By putting a = –1)

Rule 19. If $a + \frac{1}{a} = -2$ then the value of $a^m \pm \frac{1}{a^n} = (-1)^m \pm \frac{1}{(-1)^n}$

Rule 20. $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$ or, $\frac{1}{2}(a + b + c)$ $[(a - b)^2 + (b - c)^2 + (c - a)^2]$

Rule 21. If $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$.

Rule 22. If $a^3 + b^3 + c^3 = 3abc$, then $a + b + c = 0$ or $a = b = c$.

Proof $\because$ $a^3 + b^3 + c^3 = 3abc$

$\Rightarrow$ $a^3 + b^3 + c^3 - 3abc = 0$

Now, $a^3 + b^3 + c^3 - 3abc = \frac{1}{2}(a + b + c)[(a - b)^2 + (b - c)^2 + (c - a)^2]$

$\Rightarrow$ $0 = \frac{1}{2}(a + b + c)[(a - b)^2 + (b - c)^2 + (c - a)^2]$

$\therefore$ Either $a + b + c = 0$ or, $(a - b)^2 + (b - c)^2 + (c - a)^2 = 0$, i.e., $a - b = 0$

$\Rightarrow$ $a = b$, $b - c = 0$

$\Rightarrow$ $b = c$, $c - a = 0$

$\Rightarrow$ $c = a$

$\therefore$ $a = b = c$

Rule 23. If $a^2 + b^2 + c^2 = ab + bc + ca$, then $a = b = c$.

Rule 24. Componendo and Dividendo Rule, If $\frac{a}{b} = \frac{c}{d}$ then $\frac{a+b}{a-b} = \frac{c+d}{c-d}$

Rule 25. If $\frac{a+b}{a-b} = \frac{c}{d}$, then $\frac{a}{b} = \frac{c+d}{c-d}$.

Rule 26. If $\sqrt{x + \sqrt{x + \sqrt{x + \ldots \infty}}}$ where $x = n(n + 1)$

then $\sqrt{x + \sqrt{x + \sqrt{x + \ldots \infty}}} = (n + 1)$

Rule 27. If $\sqrt{x - \sqrt{x - \sqrt{x - \ldots \infty}}}$ where $x = n(n + 1)$ then,

$\sqrt{x - \sqrt{x - \sqrt{x - \ldots \infty}}} = n$.

Rule 28. $(a + b + c)^3 = a^3 + b^3 + c^3 - 3(a + b)(b + c)(c + a)$

Rule 29. $a^4 + a^2b^2 + b^4 = (a^2 + ab + b^2)(a^2 - ab + b^2)$

Rule 30. If $a + \frac{1}{a} = x$, then $a^3 + \frac{1}{a^3} = x^3 - 3x$.

Rule 31. If $a - \frac{1}{a} = x$, then $a^3 - \frac{1}{a^3} = x^3 + 3x$.

Rule 32. Binomial theorem :

$(a + b)^n = {}^nC_0a^nb^0 + {}^nC_1a^{n-1}b^1 + {}^nC_2a^{n-2}b^2 + \ldots + {}^nC_{n-1}a^1b^{n-1} + {}^nC_na^0b^n$, where, n is a positive number and

$${}^nC_r = \frac{n!}{r!(n-r)!}$$

Permutation and Combination

Permutation : It is used where we have to arrange things. Out of total n things, *r* things (taken at a time) can be arranged as ${}^np_r$ or $P(n,r)$

$P(n,r) = {}^nP_r = \frac{n!}{(n-r)!}$ where $n \geq r$

Combination : It is used where we have to select things. It is written as ${}^nC_r$ or $C(n,r)$

$C(n,r) = \frac{n!}{(n-r)!r!}$ $n \geq r$

Some important results.

$n_{P_o=1}$; $n_{P_n} = n!$

${}^nC_o = {}^nC_n = 1$; ${}^nC_r = {}^nC_{n-r} = {}^nC_1 = {}^nC_{n-1} = n$.

Ex. ${}^7P_3 = \frac{7!}{(7-3)!} = \frac{7!}{4!} = \frac{7.6.5.4!}{4!} = 210$

$5_{C_2} = \frac{5!}{(5-2)!2!} = \frac{5.4.3!}{3! \times 2 \times 1} = 10$

n! (is called as n factorial)

5! = 5.4!

= 5.4.3!

= 5.4.3.2!

= 5.4.3.2.1!

$\boxed{5! = 120}$

Also $\boxed{0! = 1}$

COORDINATE GEOMETRY

Importance : Coordinate geometry is separate and important filled in mathematics but very rarely asked in competitive exams. However in two-dimensional (2–D) geometry introductory/easy questions should be practised for improving marks.

Scope of questions : Mostly questions are related to distance between two points, linear/non-linear these coplaner points, cutting a line a specific ratio by a given point.

Way to success : The concept of coordinate geometry and practice of above mentioned questions is very important to solve questions.

Important Points :

x–coordinate is called the abscissa of P, where (x, y) are co-ordinates of any point P.

y–co-ordinate is called the ordinate of P, where (x, y) are co–ordinates of any point P.

Quadrants :

Cartesian Co–ordinate System :

Polar Coordinate System :

RULE 1 : The distance between any two points in the plane is the length of the line segment joining them. The distance between two points P (x_1, y_1) and Q (x_2, y_2) is

$$PQ = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \text{ or,}$$

$$PQ = \sqrt{(\text{difference of abscissa})^2 + (\text{difference of ordinates})^2}$$

RULE 2 : The area of a triangle, the Co-ordinates of whose vertices are (x_1, y_1), (x_2, y_2) and (x_3, y_3) is

$$\text{Area } \Delta = \left(\frac{1}{2}\right) | x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2) |$$

$$= \left(\frac{1}{2}\right) \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$

If all three points are collinear,
then area of $\Delta = 0$

RULE 3 : The Co-ordinates of the point which divides the line segment joining the points (x_1, y_1) and (x_2, y_2) internally in the ratio m : n are given by

$$x = \frac{mx_2 + nx_1}{m+n} \qquad y = \frac{my_2 + ny_1}{m+n}$$

RULE 4 : If P is the mid-point of AB, such that it divides AB in the ratio 1 : 1, then its Co-ordinates are (x,y) = $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ also called mid point formula.

RULE 5 : The Co–ordinates of the point which divides the line segment joining the points (x_1, y_1) and (x_2, y_2) externally in the ratio m : n, are

$$\left(\frac{mx_2 - nx_1}{m-n}, \frac{my_2 - ny_1}{m-n}\right)$$

RULE 6 : The Co-ordinates of the centroid of a triangle whose vertices are (x_1, y_1), (x_2, y_2) and (x_3, y_3) is given by

$$\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}\right)$$

RULE 7 : The Co–ordinates of the in–centre of a triangle whose vertices are A (x_1, y_1), B(x_2, y_2), C(x_3, y_3) are given by

$$\left(\frac{ax_1 + bx_2 + cx_3}{a+b+c}, \frac{ay_1 + by_2 + cy_3}{a+b+c}\right) \text{ where a = BC,}$$

b = CA and c = AB.

Equation of straight line.

A straight line is a curve such that every point on the line segment joining any two points on it lies on it.

RULE 8 : If (x_1, y_1) and (x_2, y_2) are the Co-ordinates of any two points on a line, then its slope is

$$(\tan\theta) = m = \frac{(y_2 - y_1)}{(x_2 - x_1)} = \frac{\text{difference of ordinates}}{\text{difference of abscissa}}$$

RULE 9 : The angle θ between the lines having slopes m_1 and m_2 is given by $\tan\theta = \pm\frac{m_2 - m_1}{1 + m_1 m_2}$

RULE 10 : If two lines having slopes m_1 and m_2 are (i) parallel if $m_1 = m_2$ (ii) Perpendicular if $m_1 \times m_2 = -1$

RULE 11 : (Slope–Intercept) The equation of a line with slope m and making an intercept c on y-axis is y = mx + c.

RULE 12 : (Point-Slope form) The equation of a line which passes through the point (x_1, y_1) and has the slope 'm' is $(y - y_1) = m(x - x_1)$

RULE 13 : (Two-point form) The equation of a line passing through two points (x_1, y_1) and (x_2, y_2) is given by

$$\frac{x - x_1}{x_2 - x_1} = \frac{y - y_1}{y_2 - y_2}$$

RULE 14 : (Intercept form) The equation of a line which cuts off intercepts a and b respectively on the x and y–axes is

$$\frac{x}{a} + \frac{y}{b} = 1$$

RULE 15 : (i) The slope of a line whose general quation is given by Ax + By + C = 0 is $\frac{-A}{B}$

(ii) The intercepts of a line on x and y axes respectively whose general equation is Ax + By + C = 0 is given by :-

x-intercept = $\frac{-C}{A}$ and y-intercept = $\frac{-C}{B}$

RULE 16 : General equation of straight line is ax+ by + c = 0

∴ Now the area of the triangle made by the given straight line and its intercepts is

$$\Delta = \frac{1}{2} \times \left(\frac{-c}{a}\right) \times \left(\frac{-c}{b}\right) \text{ sq. units}$$

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. If a * b = 2a – 3b + ab, then 3 * 5 + 5 * 3 is equal to :
(1) 22 (2) 24
(3) 26 (4) 28
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If $p \times q = p + q + \frac{p}{q}$, the value of 8×2 is :
(1) 6 (2) 10
(3) 14 (4) 16
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. Two numbers x and y (x > y) are such that their sum is equal to three times their difference. Then value of $\frac{3xy}{2(x^2 - y^2)}$ will be:
(1) $\frac{2}{3}$ (2) 1
(3) $1\frac{1}{2}$ (4) $1\frac{2}{3}$
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

4. The value of
$$\left(1+\frac{1}{x}\right)\left(1+\frac{1}{x+1}\right)\left(1+\frac{1}{x+2}\right)\left(1+\frac{1}{x+3}\right)$$
is :
(1) $1+\frac{1}{x+4}$ (2) x+4
(3) $\frac{1}{x}$ (4) $\frac{x+4}{x}$
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

5. If a * b = 2 (a + b), then 5 * 2 is equal to :
(1) 3 (2) 10
(3) 14 (4) 20
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

6. If $\frac{2a+b}{a+4b} = 3$, then find the value of $\frac{a+b}{a+2b}$
(1) $\frac{5}{9}$ (2) $\frac{2}{7}$
(3) $\frac{10}{9}$ (4) $\frac{10}{7}$
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

7. If $x = \sqrt{\frac{\sqrt{5}+1}{\sqrt{5}-1}}$, then the value of $5x^2 - 5x - 1$ is
(1) 0 (2) 3
(3) 4 (4) 5
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

8. If a * b = a + b + ab, then 3 * 4 – 2 * 3 is equal to :
(1) 6 (2) 8
(3) 10 (4) 12
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

9. If $x = 7 - 4\sqrt{3}$, then the value of $\left(x + \frac{1}{x}\right)$ is :
(1) $3\sqrt{3}$ (2) $8\sqrt{3}$
(3) $14 + 8\sqrt{3}$ (4) 14
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

10. If $x \quad y = 3x + 2y$, Then 2 3 + 3 4 is equal to
(1) 18 (2) 29
(3) 32 (4) 38
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

11. If $\frac{a}{3} = \frac{b}{4} = \frac{c}{7}$ then $\frac{a+b+c}{c}$ is equal to
(1) 0 (2) 1
(3) 2 (4) 3
(SSC CPO S.I.Exam.12.01.2003

12. If $\frac{144}{0.144} = \frac{14.4}{x}$, then the value of x is
(1) 144 (2) 14.4
(3) 1.44 (4) 0.0144
(SSC CPO S.I.Exam.12.01.2003

13. If 1 < x < 2, then the value of $\sqrt{(x-1)^2} + \sqrt{(x-3)^2}$ is
(1) 1 (2) 2
(3) 3 (4) 2x–4
(SSC CPO S.I.Exam.12.01.2003

14. If a ⊗ b = (a × b) + b, then 5 ⊗ 7 equals to
(1) 12 (2) 35
(3) 42 (4) 50
(SSC CPO S.I.Exam.12.01.2003

15. Given that $10^{0.48} = x$, $10^{0.70} = y$, and $x^z = y^2$, then the value of z is close to
(1) 1.45 (2) 1.88
(3) 2.9 (4) 3.7
(SSC CPO S.I.Exam.12.01.2003)

16. If $47.2506 = 4A + \frac{7}{B} + 2C + \frac{5}{D} + 6E$, then the value of 5A + 3B + 6C + D + 3E is
(1) 53.6003 (2) 53.603
(3) 153.6003 (4) 213.0003
(SSC CGL Prelim Exam.11.05.2003 (First Sitting)

17. If $x * y = x^2 + y^2 - xy$, then the value of 9 * 11 is
(1) 93 (2) 103
(3) 113 (4) 121
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

18. If $\frac{2p}{p^2 - 2p + 1} = \frac{1}{4}, p \neq 0$, then the value of $p + \frac{1}{p}$ is
(1) 4 (2) 5
(3) 10 (4) 12
FCI Assistant Grade-III Exam.25.02.2012 (Paper-I) North Zone (Ist Sitting)

19. If $5^{5x+5} = 1$, then x equals
(1) 0 (2) – 1
(3) 1 (4) $-\frac{4}{5}$
(SSC CPO S.I. Exam. 07.09.2003)

20. If $3^{x+3} + 7 = 250$, then x is equal to
(1) 5 (2) 3
(3) 2 (4) 1
(SSC CPO S.I.Exam.07.09.2003)

21. If $\frac{1}{4}\times\frac{2}{6}\times\frac{3}{8}\times\frac{4}{10}\times\frac{5}{12}\times$ $.....\times\frac{31}{64}=\frac{1}{2^x}$, the value of x is

(1) 31 (2) 32
(3) 36 (4) 37

(SSC Section Officer (Commercial Audit) Exam.16.11.2003)

22. The value of

$$\frac{(243)^{\frac{n}{5}}.3^{2n+1}}{9^n.3^{n-1}}$$ is

(1) 1 (2) 9
(3) 3 (4) 3^n

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

23. If x = 0.5 and y = 0.2, then value of $\sqrt{0.6}\times(3y)^x$ is equal to

(1) 1.0 (2) 0.5
(3) 0.6 (4) 1.1

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

24. If $x^{x\sqrt{x}}=\left(x\sqrt{x}\right)^x$, then x equals

(1) $\frac{4}{9}$ (2) $\frac{2}{3}$
(3) $\frac{9}{4}$ (4) $\frac{3}{2}$

(SSC CPO S.I. Exam. 05.09.2004)

25. If a = 7, b = 5 and c = 3, then the value of $a^2+b^2+c^2-ab-bc-ca$ is

(1) 12 (2) –12
(3) 0 (4) 8

(SSC CPO S.I. Exam.05.09.2004)

26. If $7^x=\frac{1}{343}$, then the value of x is

(1) 3 (2) –3
(3) $\frac{1}{3}$ (4) $\frac{1}{7}$

(SSC CPO S.I. Exam. 05.09.2004)

27. If $\frac{a}{2}=\frac{b}{3}=\frac{c}{5}$, then $\frac{a+b+c}{c}$ is equal to

(1) 2 (2) 4
(3) 5 (4) 6

(SSC Data Entry Operator Exam. 31.08.2008)

28. If $0.13\div p^2=13$, then p is equal to

(1) 10 (2) 0.01
(3) 0.1 (4) 100

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

29. If $\frac{a}{3}=\frac{b}{2}$, then value of $\frac{2a+3b}{3a-2b}$ is

(1) $\frac{12}{5}$ (2) $\frac{5}{12}$
(3) 1 (4) $\frac{12}{7}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

30. For what value(s) of a is $x+\frac{1}{4}\sqrt{x}+a^2$ a perfect square?

(1) $\pm\frac{1}{18}$ (2) $\frac{1}{8}$
(3) $-\frac{1}{5}$ (4) $\frac{1}{4}$

(SSC CPO S.I. Exam. 03.09.2006)

31. If $a\neq b$, then which of the following statements is true ?

(1) $\frac{a+b}{2}=\sqrt{ab}$
(2) $\frac{a+b}{2}<\sqrt{ab}$
(3) $\frac{a+b}{2}>\sqrt{ab}$
(4) All of the above

(SSC CPO S.I. Exam. 03.09.2006)

32. If $\frac{a}{1-a}+\frac{b}{1-b}+\frac{c}{1-c}=1$, then the value of

$\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}$ is

(1) 1 (2) 2
(3) 3 (4) 4

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone) & (SSC GL Tier-I Exam. 19.05.2013)

33. If x, y are two positive real numbers and $x^{1/3}=y^{1/4}$, then which of the following relations is *true*?

(1) $x^3=y^4$ (2) $x^3=y$
(3) $x=y^4$ (4) $x^{20}=y^{15}$

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

34. If $a^{2x+2}=1$, where a is a positive real number other than 1, then x is equal to

(1) –2 (2) –1
(3) 0 (4) 1

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

35. If x is real, then the minimum value of (x^2-x+1) is

(1) $\frac{3}{4}$ (2) 0
(3) 1 (4) $\frac{1}{4}$

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

36. If $\frac{\sqrt{7}-2}{\sqrt{7}+2}=a\sqrt{7}+b$, then the value of a is

(1) $\frac{11}{3}$ (2) $-\frac{4}{3}$
(3) $\frac{4}{3}$ (4) $\frac{-4\sqrt{7}}{3}$

(SSC CPO S.I. Exam. 16.12.2007)

37. If $(125)^x=3125$, then the value of x is

(1) $\frac{1}{5}$ (2) $\frac{3}{5}$
(3) $\frac{5}{3}$ (4) $\frac{5}{7}$

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

38. If $5^{\sqrt{x}}+12^{\sqrt{x}}=13^{\sqrt{x}}$, then x is equal to

(1) $\frac{25}{4}$ (2) 4
(3) 9 (4) 16

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

39. If $2^{2x-y}=16$ and $2^{x+y}=32$, the value of xy is

(1) 2 (2) 4
(3) 6 (4) 8

(SSC CPO S.I. Exam. 06.09.2009)

40. If $\left(\frac{3}{5}\right)^3\left(\frac{3}{5}\right)^{-6}=\left(\frac{3}{5}\right)^{2x-1}$, then x is equal to

(1) –2 (2) 2
(3) –1 (4) 1

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

41. If $\frac{2x-y}{x+2y}=\frac{1}{2}$, then value of $\frac{3x-y}{3x+y}$ is :

(1) $\frac{1}{5}$ (2) $\frac{3}{5}$

(3) $\frac{4}{5}$ (4) 1

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

42. If a and b be positive integers such that $a^2 - b^2 = 19$, then the value of a is

(1) 19 (2) 20

(3) 9 (4) 10

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

43. $\frac{\sqrt{3+x}+\sqrt{3-x}}{\sqrt{3+x}-\sqrt{3-x}}=2$ then x is equal to

(1) $\frac{5}{12}$ (2) $\frac{12}{5}$

(3) $\frac{5}{7}$ (4) $\frac{7}{5}$

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

44. If $x+\frac{1}{x}=5$, then $\frac{2x}{3x^2-5x+3}$ is equal to

(1) 5 (2) $\frac{1}{5}$

(3) 3 (4) $\frac{1}{3}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

45. If $x=\frac{\sqrt{3}}{2}$, then the value of $\left(\frac{\sqrt{1+x}+\sqrt{1-x}}{\sqrt{1+x}-\sqrt{1-x}}\right)$ is

(1) $-\sqrt{3}$ (2) -1

(3) 1 (4) $\sqrt{3}$

(SSC SAS Exam. 26.06.2010 (Paper-1)

46. If $x=\frac{\sqrt{3}+1}{\sqrt{3}-1}$ and $y=\frac{\sqrt{3}-1}{\sqrt{3}+1}$, then value of $x^2 + y^2$ is :

(1) 14 (2) 13

(3) 15 (4) 10

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

47. If $4^{4x+1}=\frac{1}{64}$, then the value of x is

(1) $\frac{1}{2}$ (2) -1

(3) $-\frac{1}{2}$ (4) $-\frac{1}{6}$

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

48. If $\frac{\sqrt{x+4}+\sqrt{x-4}}{\sqrt{x+4}-\sqrt{x-4}}=2$ then x is equal to

(1) 2.4 (2) 3.2

(3) 4 (4) 5

(SSC (South Zone) Investigator Exam.12.09.2010)

49. If $\sqrt{2^x}=256$, then the value of x is

(1) 14 (2) 16

(3) 18 (4) 20

(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

50. If $\left(\sqrt{5}\right)^7 \div \left(\sqrt{5}\right)^5 = 5^p$, then the value of p is

(1) 5 (2) 2

(3) $\frac{3}{2}$ (4) 1

(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

51. If $\sqrt{1-\frac{x^3}{100}}=\frac{3}{5}$, then x equals

(1) 2 (2) 4

(3) 16 (4) $(136)^{1/3}$

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

52. If $a \quad b = 2a + 3b - ab$, then the value of (3 5 + 5 3) is

(1) 10 (2) 6

(3) 4 (4) 2

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

53. If $\sqrt{1+\frac{x}{9}}=\frac{13}{3}$, then the value of x is

(1) $\frac{1439}{9}$ (2) 160

(3) $\frac{1443}{9}$ (4) 169

(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

54. If $\frac{4\sqrt{3}+5\sqrt{2}}{\sqrt{48}+\sqrt{18}}=a+b\sqrt{6}$, then the values of a and b are respectively

(1) $\frac{9}{15},-\frac{4}{15}$ (2) $\frac{3}{11},\frac{4}{33}$

(3) $\frac{9}{10},\frac{2}{5}$ (4) $\frac{3}{5},\frac{4}{15}$

(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

55. If $x + y = 2z$ then the value of $\frac{x}{x-z}+\frac{z}{y-z}$ is

(1) 1 (2) 3

(3) $\frac{1}{2}$ (4) 2

(SSC Delhi Police S.I.(SI) Exam. 19.08.2012)

56. If $a * b = a^b$, then the value of 5 * 3 is

(1) 125 (2) 243

(3) 53 (4) 15

(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

57. If $\sqrt{0.03\times 0.3a}=0.3\times 0.3\times\sqrt{b}$, value of $\frac{a}{b}$ is

(1) 0.009 (2) 0.03

(3) 0.9 (4) 0.08

(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

58. If $x * y = (x + 3)^2 (y - 1)$, then the value of 5 * 4 is

(1) 192 (2) 182

(3) 180 (4) 172

(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

59. If $9\sqrt{x}=\sqrt{12}+\sqrt{147}$, then $x = ?$

(1) 2 (2) 3

(3) 4 (4) 5

(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

60. If $X * Y = X^2 + Y^2 - XY$ then $11 * 13$ is

(1) 117 (2) 147
(3) 290 (4) 433

(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

61. If $\sqrt{1+\frac{x}{961}} = \frac{32}{31}$, then the value of x is

(1) 63 (2) 61
(3) 65 (4) 64

(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

62. If $\sqrt{0.04 \times 0.4 \times a} = 0{\cdot}004 \times 0{\cdot}4 \times \sqrt{b}$, then the value of $\frac{a}{b}$ is

(1) 16×10^{-3} (2) 16×10^{-4}
(3) 16×10^{-5} (4) 16×10^{-6}

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

63. The expression $x^4 - 2x^2 + k$ will be a perfect square when the value of k is

(1) 2 (2) 1
(3) –1 (4) –2

(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

64. If $2^{x+3} = 32$, then the value of 3^{x+1} is equal to

(1) 27 (2) 81
(3) 72 (4) 9

FCI Assistant Grade-III Exam.25.02.2012 (Paper-I) North Zone (Ist Sitting)

65. The value of the expression $x^4 - 17x^3 + 17x^2 - 17x + 17$ at $x = 16$ is

(1) 0 (2) 1
(3) 2 (4) 3

FCI Assistant Grade-III Exam.05.02.2012 (Paper-I) East Zone (IInd Sitting)

66. If $\frac{x}{y} = \frac{3}{4}$, the value of $\frac{6}{7} + \frac{y-x}{y+x}$ is :

(1) 1 (2) $\frac{2}{7}$
(3) $\frac{3}{7}$ (4) $1\frac{3}{7}$

(SSC CPO S.I.Exam.26.05.2005)

67. If $n + \frac{2}{3}n + \frac{1}{2}n + \frac{1}{7}n = 97$ then the value of n is

(1) 40 (2) 42
(3) 44 (4) 46

(SSC Data Entry Operator Exam. 31.08.2008)

68. If $x^2 - 3x + 1 = 0$, then the vaule of $x + \frac{1}{x}$ is

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

69. If $1.5\ a = 0.04\ b$ then $\frac{b-a}{b+a}$ is equal to

(1) $\frac{73}{77}$ (2) $\frac{77}{33}$
(3) $\frac{2}{75}$ (4) $\frac{75}{2}$

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

70. If $x = \left(\sqrt{2}+1\right)^{-\frac{1}{3}}$, the value of $\left(x^3 - \frac{1}{x^3}\right)$ is

(1) 0 (2) $-\sqrt{2}$
(3) –2 (4) $3\sqrt{2}$

(SSC SAS Exam. 26.06.2010 (Paper-1)

71. If $\frac{x^2 - x + 1}{x^2 + x + 1} = \frac{2}{3}$, then the value of $\left(x + \frac{1}{x}\right)$ is

(1) 4 (2) 5
(3) 6 (4) 8

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

72. If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = 3$, then

$$\frac{2a^2 + 3c^2 + 4e^2}{2b^2 + 3d^2 + 4f^2} = ?$$

(1) 2 (2) 3
(3) 4 (4) 9

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

73. If x, y and z are real numbers such that $(x-3)^2 + (y-4)^2 + (z-5)^2 = 0$ then $(x+y+z)$ is equal to

(1) –12 (2) 0
(3) 8 (4) 12

(SSC Data Entry Operator Exam. 31.08.2008)

74. If $x = 7 - 4\sqrt{3}$, then $\sqrt{x} + \frac{1}{\sqrt{x}}$ is equal to :

(1) 1 (2) 2
(3) 3 (4) 4

(SSC CPO S.I.Exam.26.05.2005)

75. If $(a-1)^2 + (b+2)^2 + (c+1)^2 = 0$, then the value of $2a - 3b + 7c$ is

(1) 12 (2) 3
(3) –11 (4) 1

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

76. If $2x + \frac{1}{3x} = 5$, find the value of $\frac{5x}{6x^2 + 20x + 1}$.

(1) $\frac{1}{4}$ (2) $\frac{1}{6}$
(3) $\frac{1}{5}$ (4) $\frac{1}{7}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

77. If x varies inversely as $(y^2 - 1)$ and is equal to 24 when $y = 10$, then the value of x when $y = 5$ is

(1) 99 (2) 12
(3) 24 (4) 100

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

78. If $x^2 + y^2 + 2x + 1 = 0$, then the value of $x^{31} + y^{35}$ is

(1) –1 (2) 0
(3) 1 (4) 2

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

79. If $\frac{x}{2x^2 + 5x + 2} = \frac{1}{6}$, then value of $\left(x + \frac{1}{x}\right)$ is :

(1) 2 (2) $\frac{1}{2}$
(3) $-\frac{1}{2}$ (4) –2

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

80. If a, b, c are real and $a^2 + b^2 + c^2 = 2(a - b - c) - 3$, then the value of $2a - 3b + 4c$ is

(1) –1 (2) 0

(3) 1 (4) 2

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone) & (SSC GL Tier-I Exam. 21.04.2013) & (SSC CHSL DEO & LDC Exam. 20.10.2013)

81. If $(3a + 1)^2 + (b - 1)^2 + (2c - 3)^2 = 0$, then the value of $(3a + b + 2c)$ is equal to :

(1) 3 (2) –1

(3) 2 (4) 5

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

82. The value of the expression

$$\frac{(a-b)^2}{(b-c)(c-a)} + \frac{(b-c)^2}{(a-b)(c-a)} + \frac{(c-a)^2}{(a-b)(b-c)} \text{ is :}$$

(1) 0 (2) 3

(3) $\frac{1}{3}$ (4) 2

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone) & (SSC CHSL DEO & LDC Exam. 27.10.2013)

83. If $(a-3)^2 + (b - 4)^2 + (c - 9)^2 = 0$, then the value of $\sqrt{a+b+c}$ is :

(1) – 4 (2) 4

(3) ± 4 (4) ± 2

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

84. If $a^3b = abc = 180$, a, b, c are positive integers, then the value of c is

(1) 110 (2) 1

(3) 4 (4) 25

(SSC Graduate Level Tier-II Exam. 16.09.2012)

85. If $(x - 3)^2 + (y - 5)^2 + (z - 4)^2 = 0$, then the value of

$$\frac{x^2}{9} + \frac{y^2}{25} + \frac{z^2}{16} \text{ is}$$

(1) 12 (2) 9

(3) 3 (4) 1

(SSC Graduate Level Tier-I Exam. 19.05.2013)

86. If a, b are rational numbers and $(a-1)\sqrt{2} + 3 = b\sqrt{2} + a$, the value of $(a + b)$ is

(1) –5 (2) 3

(3) –3 (4) 5

(SSC Graduate Level Tier-II Exam. 16.09.2012)

87. If $a = \frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $b = \frac{\sqrt{5}-1}{\sqrt{5}+1}$, then the value of

$$\frac{a^2+ab+b^2}{a^2-ab+b^2} \text{ is}$$

(1) $\frac{3}{4}$ (2) $\frac{4}{3}$

(3) $\frac{3}{5}$ (4) $\frac{5}{3}$

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

88. If $64^{x+1} = \frac{64}{4^x}$, then the value of x is

(1) 1 (2) 0

(3) $\frac{1}{2}$ (4) 2

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

89. If $ax^2 + bx + c = a(x - p)^2$, then the relation among a, b, c would be

(1) $abc = 1$ (2) $b^2 = ac$

(3) $b^2 = 4ac$ (4) $2b = a + c$

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

90. If $a + b + c + d = 1$, then the maximum value of $(1 + a)(1 + b)(1 + c)(1 + d)$ is

(1) 1 (2) $\left(\frac{1}{2}\right)^3$

(3) $\left(\frac{3}{4}\right)^3$ (4) $\left(\frac{5}{4}\right)^4$

(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

91. x varies inversely as square of y. Given that $y = 2$ for $x = 1$, the value of x for $y = 6$ will be equal to

(1) 3 (2) 9

(3) $\frac{1}{3}$ (4) $\frac{1}{9}$

(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

92. If $x = \frac{\sqrt{3}}{2}$, then

$$\frac{\sqrt{1+x}}{1+\sqrt{1+x}} + \frac{\sqrt{1-x}}{1-\sqrt{1-x}} \text{ is equal to}$$

(1) 1 (2) $2/\sqrt{3}$

(3) $2-\sqrt{3}$ (4) 2

(SSC CPO S.I. Exam. 03.09.2006)

93. If $a^2 + b^2 + c^2 + 3 = 2(a - b - c)$, then the value of 2 a – b + c is :

(1) 3 (2) 4

(3) 0 (4) 2

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

94. If $x^2 - y^2 = 80$ and $x - y = 8$, then the average of x and y is

(1) 2 (2) 3

(3) 4 (4) 5

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

95. If for non-zero, x, $x^2 - 4x - 1 = 0$, the value of $x^2 + \frac{1}{x^2}$ is

(1) 4 (2) 10

(3) 12 (4) 18

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

96. The third proportional to

$$\left(\frac{x}{y} + \frac{y}{x}\right) \text{ and } \sqrt{x^2+y^2} \text{ is}$$

(1) xy (2) $\sqrt{xy}$

(3) $\sqrt[3]{xy}$ (4) $\sqrt[4]{xy}$

(SSC Graduate Level Tier-I Exam. 21.04.2013)

97. If $\frac{4x}{3} + 2P = 12$ for what value of P, $x = 6$?

(1) 6 (2) 4

(3) 2 (4) 1

(SSC Graduate Level Tier-I Exam. 19.05.2013)

98. The value of $\frac{4+3\sqrt{3}}{7+4\sqrt{3}}$ is

(1) $5\sqrt{3} - 8$ (2) $5\sqrt{3} + 8$

(3) $8\sqrt{3} + 5$ (4) $8\sqrt{3} - 5$

(SSC Graduate Level Tier-I Exam. 19.05.2013)

99. Let

$a = \sqrt{6} - \sqrt{5}$, $b = \sqrt{5} - 2$,

$c = 2 - \sqrt{3}$

Then point out the correct alternative among the four alternatives given below.

(1) $b < a < c$ (2) $a < c < b$
(3) $b < c < a$ (4) $a < b < c$

(SSC CHSL DEO & LDC Exam. 20.10.2013)

100. If $x = \dfrac{4\sqrt{15}}{\sqrt{5}+\sqrt{3}}$, the value of

$\dfrac{x+\sqrt{20}}{x-\sqrt{20}} + \dfrac{x+\sqrt{12}}{x-\sqrt{12}}$ is

(1) 1 (2) 2
(3) $\sqrt{3}$ (4) $\sqrt{5}$

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

101. If $x = 5 - \sqrt{21}$, then the value of

$\dfrac{\sqrt{x}}{\sqrt{32-2x}-\sqrt{21}}$ is

(1) $\dfrac{1}{\sqrt{2}}\left(\sqrt{3}-\sqrt{7}\right)$

(2) $\dfrac{1}{\sqrt{2}}\left(\sqrt{7}-\sqrt{3}\right)$

(3) $\dfrac{1}{\sqrt{2}}\left(\sqrt{7}+\sqrt{3}\right)$

(4) $\dfrac{1}{\sqrt{2}}\left(7-\sqrt{3}\right)$

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

102. If $6x - 5y = 13$, $7x + 2y = 23$ then $11x + 18y =$

(1) –15 (2) 51
(3) 33 (4) 15

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

103. The value of

$\left(x^{b+c}\right)^{b-c}\left(x^{c+a}\right)^{c-a}\left(x^{a+b}\right)^{a-b}$,

$(x \neq 0)$ is

(1) 1 (2) 2
(3) –1 (4) 0

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

104. If $\dfrac{x}{a} = \dfrac{1}{a} - \dfrac{1}{x}$, then the value of $x - x^2$ is :

(1) $-a$ (2) $\dfrac{1}{a}$

(3) $-\dfrac{1}{a}$ (4) a

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

105. If $x + \dfrac{1}{x} = 99$, find the value of

$\dfrac{100x}{2x^2+102x+2}$

(1) $\dfrac{1}{6}$ (2) $\dfrac{1}{2}$

(3) $\dfrac{1}{3}$ (4) $\dfrac{1}{4}$

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

106. If $\dfrac{4x-3}{x} + \dfrac{4y-3}{y} + \dfrac{4z-3}{z} = 0$,

then the value of $\dfrac{1}{x} + \dfrac{1}{y} + \dfrac{1}{z}$ is

(1) 9 (2) 3
(3) 4 (4) 6

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

107. If $\dfrac{xy}{x+y} = a, \dfrac{xz}{x+z} = b$ and

$\dfrac{yz}{y+z} = c$, where a, b, c are all non-zero numbers, then x equals to

(1) $\dfrac{2abc}{ab+bc-ac}$

(2) $\dfrac{2abc}{ab+ac-bc}$

(3) $\dfrac{2abc}{ac+bc-ab}$

(4) $\dfrac{2abc}{ab+bc+ac}$

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

108. If $x = 3 + \sqrt{8}$, then $x^2 + \dfrac{1}{x^2}$ is equal to

(1) 38 (2) 36
(3) 34 (4) 30

(SSC CGL Prelim Exam. 04.02.2007 (Ist Sitting) & (SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting) & (SSC Investigator Exam. 12.09.2010) (South Zone)

109. If x and y are positive real numbers and $xy = 8$, then the minimum value of $2x + y$ is

(1) 9 (2) 17
(3) 10 (4) 8

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

110. If the expression $x^2 + x + 1$ is written in the form $\left(x+\dfrac{1}{2}\right)^2 + q^2$, then the possible values of q are

(1) $\pm\dfrac{1}{3}$ (2) $\pm\dfrac{\sqrt{3}}{2}$

(3) $\pm\dfrac{2}{\sqrt{3}}$ (4) $\pm\dfrac{1}{2}$

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

111. If $a^2 - 4a - 1 = 0$, then value of

$a^2 + \dfrac{1}{a^2} + 3a - \dfrac{3}{a}$ is

(1) 25 (2) 30
(3) 35 (4) 40

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

112. If $a + \dfrac{1}{b} = 1$ and $b + \dfrac{1}{c} = 1$, then $c + \dfrac{1}{a}$ is equal to

(1) 0 (2) $\dfrac{1}{2}$

(3) 1 (4) 2

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

113. The minimum value of $(x-2)(x-9)$ is

(1) $-\dfrac{11}{4}$ (2) $\dfrac{49}{4}$

(3) 0 (4) $-\dfrac{49}{4}$

(SSC Graduate Level Tier-I Exam. 21.04.2013)

114. One of the factors of the expression

$4\sqrt{3}x^2 + 5x - 2\sqrt{3}$ is :

(1) $4x + \sqrt{3}$ (2) $4x + 3$

(3) $4x - 3$ (4) $4x - \sqrt{3}$

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

115. If $\sqrt{x} = \sqrt{3} - \sqrt{5}$, then the value of $x^2 - 16x + 6$ is

(1) 0 (2) –2

(3) 2 (4) 4

(SSC Graduate Level Tier-II Exam. 29.09.2013

116. If $x - \frac{1}{x} = 4$, then $\left(x + \frac{1}{x}\right)$ is equal to

(1) $5\sqrt{2}$ (2) $2\sqrt{5}$

(3) $4\sqrt{2}$ (4) $4\sqrt{5}$

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

117. If $x = 5 + 2\sqrt{6}$, then the value of

$\left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)$ is,

(1) $2\sqrt{2}$ (2) $3\sqrt{2}$

(3) $2\sqrt{3}$ (4) $3\sqrt{3}$

(SSC SAS Exam 26.06.2010 (Paper-1)

118. For $a > b$, if $a + b = 5$ and $ab = 6$, then the value of $(a^2 - b^2)$ is

(1) 1 (2) 3

(3) 5 (4) 7

(SSC (South Zone) Investigator Exam. 12.09.2010)

119. If $1.5x = 0.04y$, then the value of $\frac{y^2 - x^2}{y^2 + 2xy + x^2}$ is

(1) $\frac{730}{77}$ (2) $\frac{73}{77}$

(3) $\frac{73}{770}$ (4) $\frac{74}{77}$

(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

120. If $a^{\frac{1}{3}} = 11$, then the value of $a^2 - 331a$ is

(1) 1331331 (2) 1331000

(3) 1334331 (4) 1330030

(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

121. If $x^2 + y^2 + \frac{1}{x^2} + \frac{1}{y^2} = 4$, then the value of $x^2 + y^2$ is

(1) 2 (2) 4

(3) 8 (4) 16

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

122. If $x^2 = y + z$, $y^2 = z + x$, $z^2 = x + y$, then the value of

$\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}$ is

(1) –1 (2) 1

(3) 2 (4) 4

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I) & (SSC CHSL DEO & LDC Exam. 04.12.2011) (Ist Sitting) & (SSC CGL Tier-I Exam. 19.05.2013) (Ist Sitting)

123. If $a^2 + b^2 = 2$ and $c^2 + d^2 = 1$, then the value of $(ad - bc)^2 + (ac + bd)^2$ is

(1) $\frac{4}{9}$ (2) $\frac{1}{2}$

(3) 1 (4) 2

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

124. If $a^2 + b^2 + c^2 + 3 = 2(a + b + c)$ then the value of (a + b + c) is

(1) 2 (2) 3

(3) 4 (4) 5

(FCI Assistant Grade-III Exam.25.02.2012 (Paper-I) North Zone (Ist Sitting)

125. If $x - \frac{1}{x} = 5$,

then $x^2 + \frac{1}{x^2}$ is :

(1) 5 (2) 25

(3) 27 (4) 23

(FCI Assistant Grade-III Exam.05.02.2012 (Paper-I) East Zone (IInd Sitting)

126. If $x = 3 + 2\sqrt{2}$, then the value of

$\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)$ is :

(1) 1 (2) 2

(3) $2\sqrt{2}$ (4) $3\sqrt{3}$

(SSC CPO S.I. Exam. 12.01.2003) & (FCI Assistant Grade-III Exam.05.02.2012 (Paper-I) East Zone (IInd Sitting)

127. If $x = \sqrt{3} + \sqrt{2}$, then the value of

$\left(x^2 + \frac{1}{x^2}\right)$ is :

(1) 4 (2) 6

(3) 9 (4) 10

(SSC CHSL DEO & LDC Exam. 27.11.2010)

128. If $x + \frac{9}{x} = 6$, then the value of

$(x^2 + \frac{9}{x^2})$ is

(1) 8 (2) 9

(3) 10 (4) 12

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

129. If $x = \frac{4ab}{a+b}$ $(a \neq b)$, the value of

$\frac{x+2a}{x-2a} + \frac{x+2b}{x-2b}$ is

(1) a (2) b

(3) 2 ab (4) 2

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

130. If $m + \frac{1}{m-2} = 4$, find the value of $(m-2)^2 + \frac{1}{(m-2)^2}$.

(1) –2 (2) 0

(3) 2 (4) 4

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone) & (SSC GL Tier-I Exam. 21.04.2013)

131. If $a^2 + b^2 + 2b + 4a + 5 = 0$, then the value of $\frac{a-b}{a+b}$ is

(1) 3 (2) –3

(3) $\frac{1}{3}$ (4) $-\frac{1}{3}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

132. If $x - y = \frac{x+y}{7} = \frac{xy}{4}$, the numerical value of xy is

(1) $\frac{4}{3}$ (2) $\frac{3}{4}$

(3) $\frac{1}{4}$ (4) $\frac{1}{3}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

133. If $x + y + z = 0$,

then $\frac{x^2}{yz} + \frac{y^2}{zx} + \frac{z^2}{xy} = ?$

(1) $(xyz)^2$ (2) $x^2 + y^2 + z^2$

(3) 9 (4) 3

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone) & (SSC GL Tier-I Exam.19.05.2013 (Ist Sitting)

134. If $a + b + c = 0$, then the value of

$$\frac{1}{(a+b)(b+c)} + \frac{1}{(a+c)(b+a)} + \frac{1}{(c+a)(c+b)}$$ is:

(1) 1 (2) 0
(3) –1 (4) –2

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

135. If $a + b + c = 0$, then the value of $\frac{a^2+b^2+c^2}{a^2-bc}$ is

(1) 0 (2) 1
(3) 2 (4) 3

(SSC Graduate Level Tier-II Exam. 16.09.2012)

136. If $n = 7 + 4\sqrt{3}$, then the value of $\left(\sqrt{n}+\frac{1}{\sqrt{n}}\right)$ is

(1) $2\sqrt{3}$ (2) 4
(3) –4 (4) $-2\sqrt{3}$

(SSC Graduate Level Tier-II Exam. 16.09.2012)

137. If $x = \sqrt{3}+\sqrt{2}$, then the value of $\left(x+\frac{1}{x}\right)$ is

(1) $2\sqrt{2}$ (2) $2\sqrt{3}$
(3) 2 (4) 3

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

138. If $p + q = 10$ and $pq = 5$, then the numerical value of $\frac{p}{q}+\frac{q}{p}$ will be

(1) 16 (2) 20
(3) 22 (4) 18

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

139. If $x = 3 + 2\sqrt{2}$ and $xy = 1$, then the value of $\frac{x^2+3xy+y^2}{x^2-3xy+y^2}$ is

(1) $\frac{30}{31}$ (2) $\frac{70}{31}$
(3) $\frac{35}{31}$ (4) $\frac{37}{31}$

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

140. If $\frac{x}{b+c}=\frac{y}{c+a}=\frac{z}{a+b}$, then

(1) $\frac{x-y}{b-a}=\frac{y-z}{c-b}=\frac{z-x}{a-c}$

(2) $\frac{x}{a}=\frac{y}{b}=\frac{z}{c}$

(3) $\frac{x-y}{c}=\frac{y-z}{b}=\frac{z-x}{c}$

(4) None of the above is true

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

141. If $a + b + c = 0$, then the value of

$$\left(\frac{a+b}{c}+\frac{b+c}{a}+\frac{c+a}{b}\right)\left(\frac{a}{b+c}+\frac{b}{c+a}+\frac{c}{a+b}\right)$$ is :

(1) 8 (2) –3
(3) 9 (4) 0

(SSC Graduate Level Tier-I Exam. 21.04.2013)

142. If a, b, c are non-zero, $a+\frac{1}{b}=1$ and $b+\frac{1}{c}=1$, then the value of abc is :

(1) – 1 (2) 3
(3) – 3 (4) 1

(SSC Graduate Level Tier-I Exam. 21.04.2013)

143. If $a + b + c = 2s$, then

$$\frac{(s-a)^2+(s-b)^2+(s-c)^2+s^2}{a^2+b^2+c^2}$$

is equal to

(1) $a^2 + b^2 + c^2$ (2) 0
(3) 1 (4) 2

(SSC Graduate Level Tier-I Exam. 21.04.2013)

144. If $x = 3 + 2\sqrt{2}$, the value of $x^2+\frac{1}{x^2}$ is

(1) 36 (2) 30
(3) 32 (4) 34

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

145. If $x\left(3-\frac{2}{x}\right)=\frac{3}{x}$, then the value of $x^2+\frac{1}{x^2}$ is

(1) $2\frac{1}{9}$ (2) $2\frac{4}{9}$
(3) $3\frac{1}{9}$ (4) $3\frac{4}{9}$

(SSC Graduate Level Tier-I Exam. 19.05.2013)

146. If $x^2 - 3x + 1 = 0$, then the value of $x^2+x+\frac{1}{x}+\frac{1}{x^2}$ is

(1) 10 (2) 2
(3) 6 (4) 8

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

147. If $a^2 + b^2 = 5ab$, then the value of $\left(\frac{a^2}{b^2}+\frac{b^2}{a^2}\right)$ is :

(1) 32 (2) 16
(3) 23 (4) –23

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

148. If $xy + yz + zx = 0$, then

$$\left(\frac{1}{x^2-yz}+\frac{1}{y^2-zx}+\frac{1}{z^2-xy}\right)$$

$(x, y, z \neq 0)$ is equal to

(1) 3 (2) 1
(3) $x + y + z$ (4) 0

(SSC CHSL DEO & LDC Exam. 20.10.2013)

149. If $a + b + c = 9$ (where a, b, c are real numbers), then the minimum value of $a^2 + b^2 + c^2$ is

(1) 100 (2) 9
(3) 27 (4) 81

(SSC CHSL DEO & LDC Exam. 20.10.2013)

150. If $x + y + z = 13$ and $x^2 + y^2 + z^2 = 69$, then $xy + z(x + y)$ is equal to

(1) 70 (2) 40
(3) 50 (4) 60

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

151. If a = 0.1039, then the value of $\sqrt{4a^2-4a+1}+3a$ is

(1) 0.1039 (2) 0.2078
(3) 1.1039 (4) 2.1039

(SSC CPO S.I. Exam.12.01.2003)

152. If a = 0.25, b = – 0.05, c = 0.5, then the value of

$$\frac{a^2-b^2-c^2-2bc}{a^2+b^2-2ab-c^2} \text{ is}$$

(1) $\frac{7}{8}$ (2) $\frac{14}{17}$

(3) 1 (4) $\frac{25}{16}$

(SSC CPO S.I. Exam. 12.01.2003)

153. If $a = 23$ and $b = -29$ then the value of $25a^2 + 40ab + 16b^2$ is :

(1) 1 (2) –1

(3) 0 (4) 2

FCI Assistant Grade-III Exam.05.02.2012 (Paper-I) East Zone (IInd Sitting)

154. If $x - y = 2$ and $x^2 + y^2 = 20$, then value of $(x + y)^2$ is

(1) 38 (2) 36

(3) 16 (4) 12

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

155. If $x^2 + y^2 - 4x - 4y + 8 = 0$, then the value of $x - y$ is

(1) 4 (2) –4

(3) 0 (4) 8

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

156. If $x = b + c - 2a$, $y = c + a - 2b$, $z = a + b - 2c$, then the value of $x^2 + y^2 - z^2 + 2xy$ is

(1) 0 (2) $a + b + c$

(3) $a - b + c$ (3) $a + b - c$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

157. For real a, b, c if $a^2 + b^2 + c^2 = ab + bc + ca$, then value of $\frac{a+c}{b}$ is

(1) 1 (2) 2

(3) 3 (4) 0

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone) & (SSC CHSL DEO & LDC Exam. 10.11.2013)

158. If $x - y = 2$, $xy = 24$, then the value of $(x^2 + y^2)$ is :

(1) 25 (2) 36

(3) 63 (4) 52

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

159. If the expression $\frac{x^2}{y^2} + tx + \frac{y^2}{4}$ is a perfect square, then the values of t is

(1) ± 1 (2) ± 2

(3) 0 (4) ± 3

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

160. If $a = x + y$, $b = x - y$, $c = x + 2y$, then $a^2 + b^2 + c^2 - ab - bc - ca$ is

(1) $4y^2$ (2) $5y^2$

(3) $6y^2$ (4) $7y^2$

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

161. If $a^2 + b^2 + c^2 = ab + bc + ca$, where a, b, c are non zero real numbers, then the value of $\frac{a+b}{c}$ is

(1) 2 (2) 1

(3) 0 (4) –1

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

162. If $a^2 + b^2 + 4c^2 = 2(a + b - 2c) - 3$ and a, b, c are real, then the value of $(a^2 + b^2 + c^2)$ is

(1) 3 (2) $3\frac{1}{4}$

(3) 2 (4) $2\frac{1}{4}$

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

163. If $\frac{x-a^2}{b+c} + \frac{x-b^2}{c+a} + \frac{x-c^2}{a+b} = 4(a + b + c)$, then x is equal to

(1) $(a + b + c)^2$

(2) $a^2 + b^2 + c^2$

(3) $ab + bc + ca$

(4) $a^2 + b^2 + c^2 - ab - bc - ca$

(SSC Graduate Level Tier-II Exam. 29.09.2013)

164. Number of solutions of the two equations $4x - y = 2$ and $2y - 8x + 4 = 0$ is

(1) zero (2) one

(3) two

(4) infinitely many

(SSC CHSL DEO & LDC Exam. 20.10.2013)

165. If $\frac{a}{b} = \frac{4}{5}$ and $\frac{b}{c} = \frac{15}{16}$, then $\frac{18c^2 - 7a^2}{45c^2 + 20a^2}$ is equal to

(1) $\frac{1}{3}$ (2) $\frac{2}{5}$

(3) $\frac{3}{4}$ (4) $\frac{1}{4}$

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

166. If $x \neq 0$, $y \neq 0$ and $z \neq 0$ and

$$\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = \frac{1}{xy} + \frac{1}{yz} + \frac{1}{zx},$$

then the relation among x, y, z is

(1) $x + y + z = 0$

(2) $x + y = z$

(3) $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$

(4) $x = y = z$

(SSC Graduate Level Tier-I Exam. 21.04.2013)

167. The term to be added to $121a^2 + 64b^2$ to make a perfect square is

(1) $176\ ab$ (2) $276\ a^2b$

(3) $178\ ab$ (4) $188\ b^2a$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

168. If $a = 2 + \sqrt{3}$, then the value of $\left(a^2 + \frac{1}{a^2}\right)$ is

(1) 12 (2) 14

(3) 16 (4) 10

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

169. For what valsue (s) of k the expression $p + \frac{1}{4}\sqrt{p} + k^2$ is a perfect square ?

(1) $\pm\frac{1}{3}$ (2) $\pm\frac{1}{4}$

(3) $\pm\frac{1}{8}$ (4) $\pm\frac{1}{2}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

170. If $\frac{b-c}{a} + \frac{a+c}{b} + \frac{a-b}{c} = 1$ and $a - b + c \neq 0$ then which one of the following relations is true ?

(1) $\frac{1}{c} = \frac{1}{a} + \frac{1}{b}$ (2) $\frac{1}{a} = \frac{1}{b} + \frac{1}{c}$

(3) $\frac{1}{b} = \frac{1}{a} - \frac{1}{c}$ (4) $\frac{1}{b} = \frac{1}{a} + \frac{1}{c}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

171. If $a + b = 1$, $c + d = 1$ and $a - b = \frac{d}{c}$, then the value of $c^2 - d^2$ is

(1) $\frac{a}{b}$ (2) $\frac{b}{a}$

(3) 1 (4) –1

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

172. If $x = 3t$, $y = \frac{1}{2}(t + 1)$, then the value of t for which $x = 2y$ is

(1) 1 (2) $\frac{1}{2}$

(3) –1 (4) $\frac{2}{3}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

173. If $x^2 + \frac{1}{5}x + a^2$ is a perfect square, then a is

(1) $\frac{1}{100}$ (2) $\pm\frac{1}{10}$

(3) $\frac{1}{10}$ (4) $-\frac{1}{10}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

174. Find the value of x for which the expression $2 - 3x - 4x^2$ has the greatest value.

(1) $-\frac{41}{16}$ (2) $\frac{3}{8}$

(3) $-\frac{3}{8}$ (4) $\frac{41}{16}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

175. The expression $x^4 - 2x^2 + k$ will be a perfect square if the value of k is

(1) 1 (2) 0

(3) $\frac{1}{4}$ (4) $\frac{1}{2}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

176. If $(x - 1)$ and $(x + 3)$ are the factors of $x^2 + k_1x + k_2$ then

(1) $k_1 = -2$, $k_2 = -3$
(2) $k_1 = 2$, $k_2 = -3$
(3) $k_1 = 2$, $k_2 = 3$
(4) $k_1 = -2$, $k_2 = 3$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

177. If $\frac{5x}{2x^2 + 5x + 1} = \frac{1}{3}$, then the value of $\left(x + \frac{1}{2x}\right)$ is

(1) 15 (2) 10
(3) 20 (4) 5

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

178. The reciprocal of $x + \frac{1}{x}$ is

(1) $\frac{x}{x^2+1}$ (2) $\frac{x}{x+1}$

(3) $x - \frac{1}{x}$ (4) $\frac{1}{x} + x$

(SSC CGL Tier-I Exam. 26.10.2014)

179. If a, b, c are positive and $a + b + c = 1$, then the least value of $\frac{1}{a} + \frac{1}{b} + \frac{1}{c}$ is

(1) 9 (2) 5
(3) 3 (4) 1

(SSC CGL Tier-I Exam. 26.10.2014)

180. If $a(2+\sqrt{3}) = b(2-\sqrt{3}) = 1$, then the value of

$\frac{1}{a^2+1} + \frac{1}{b^2+1}$ is

(1) –5 (2) 1
(3) 4 (4) 9

(SSC CGL Tier-I Exam. 26.10.2014)

181. If $(2+\sqrt{3})a = (2-\sqrt{3})b = 1$ then the value of $\frac{1}{a} + \frac{1}{b}$ is

(1) 1 (2) 2

(3) $2\sqrt{3}$ (4) 4

(SSC CGL Tier-II Exam. 21.09.2014)

182. If $a + \frac{1}{b} = b + \frac{1}{c} = c + \frac{1}{a}$ $(a \neq b \neq c)$, then the value of abc is

(1) ± 1 (2) ± 2

(3) 0 (4) $\pm\frac{1}{2}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

183. If $\frac{x}{y} = \frac{4}{5}$, then the value of $\left(\frac{4}{7} + \frac{2y-x}{2y+x}\right)$ is

(1) $\frac{3}{7}$ (2) $1\frac{1}{7}$

(3) 1 (4) 2

(SSC CHSL DEO & LDC Exam. 9.11.2014)

184. If $(x - 2)$ is a factor of $x^2 + 3Qx - 2Q$, then the value of Q is

(1) 2 (2) –2
(3) 1 (4) –1

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

185. If $a + b = 12$, $ab = 22$, then $(a^2 + b^2)$ is equal to

(1) 188 (2) 144
(3) 34 (4) 100

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

186. If $x = \sqrt{3} - \frac{1}{\sqrt{3}}$ and $y = \sqrt{3} + \frac{1}{\sqrt{3}}$, then the value of $\frac{x^2}{y} + \frac{y^2}{x}$ is

(1) $\sqrt{3}$ (2) $3\sqrt{3}$

(3) $16\sqrt{3}$ (4) $2\sqrt{3}$

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

187. If $x^2 + ax + b$ is a perfect square, then which one of the following relations between a and b is true ?

(1) $a^2 = b$ (2) $a^2 = 4b$
(3) $b^2 = 4a$ (4) $b^2 = a$

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

188. If $a + b + c + d = 4$, then find the value of

$$\frac{1}{(1-a)(1-b)(1-c)} + \frac{1}{(1-b)(1-c)(1-d)} + \frac{1}{(1-c)(1-d)(1-a)} + \frac{1}{(1-d)(1-a)(1-b)}.$$

(1) 0 (2) 5
(3) 1 (4) 4

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

189. If $a^{\frac{1}{3}} + b^{\frac{1}{3}} + c^{\frac{1}{3}} = 0$, then a relation among a, b, c is

(1) $a + b + c = 0$
(2) $(a + b + c)^3 = 27abc$
(3) $a + b + c = 3abc$
(4) $a^3 + b^3 + c^3 = 0$

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

190. If $a = \sqrt{6} + \sqrt{5}$, $b = \sqrt{6} - \sqrt{5}$ then $2a^2 - 5ab + 2b^2 = ?$

(1) 38 (2) 39
(3) 40 (4) 41

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

191. If $a^2 + b^2 + c^2 = 2a - 2b - 2$, then the value of $3a - 2b + c$ is
(1) 0 (2) 3
(3) 5 (4) 2
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

192. If $a + b + c = 3$, $a^2 + b^2 + c^2 = 6$ and $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 1$, where a, b, c are all non-zero, then 'abc' is equal to
(1) $\frac{2}{3}$ (2) $\frac{3}{2}$
(3) $\frac{1}{2}$ (4) $\frac{1}{3}$
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

193. If $a^2 - 4a - 1 = 0$, $a \neq 0$, then the value of $a^2 + 3a + \frac{1}{a^2} - \frac{3}{a}$ is
(1) 24 (2) 26
(3) 28 (4) 30
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

194. If $x = 2 + \sqrt{3}$, then $x^2 + \frac{1}{x^2}$ is equal to
(1) 10 (2) 12
(3) –12 (4) 14
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

195. If $a^2 + b^2 + c^2 = 2(a - b - c) - 3$, then the value of $(a + b + c)$ is
(1) 0 (2) 1
(3) – 1 (4) 2
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

196. If x is a prime number and $-1 \leq \frac{2x-7}{5} \leq 1$ then the number of values of x is
(1) 4 (2) 3
(3) 2 (4) 5
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

197. If $\frac{3-5x}{2x} + \frac{3-5y}{2y} + \frac{3-5z}{2z} = 0$, the value of $\frac{2}{x} + \frac{2}{y} + \frac{2}{z}$ is
(1) 20 (2) 5
(3) 10 (4) 15
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

198. If 2s = a + b + c, then the value of s(s – c) + (s – a) (s – b) is
(1) ab (2) abc
(3) 0 (4) $\frac{a+b+c}{2}$
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

199. If $\frac{2p}{p^r - 2p + 1} = \frac{1}{4}$, then the value of $\left(p + \frac{1}{p}\right)$ is
(1) 7 (2) $\frac{2}{5}$
(3) 1 (4) 10
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

200. If $\sqrt{1 + \frac{27}{169}} = 1 + \frac{x}{13}$, then x equals
(1) 1 (2) 27
(3) 13 (4) $3\sqrt{3}$
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

201. If $2x = \sqrt{a} + \frac{1}{\sqrt{a}}$, $a > 0$, then the value of $\frac{\sqrt{x^2-1}}{x - \sqrt{x^2-1}}$ is
(1) $a + 1$ (2) $\frac{1}{2}(a + 1)$
(3) $\frac{1}{2}(a - 1)$ (4) $a - 1$
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

202. If a, b, c are real numbers and $a^2 + b^2 + c^2 = 2(a - b - c) - 3$, then the value of $a + b + c$ is
(1) – 1 (2) 1
(3) 3 (4) 0
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

203. If $\frac{a+b-c}{a+b} = \frac{b+c-a}{b+c} = \frac{c+a-b}{c+a}$ and $a + b + c \neq 0$, then
(1) $a \neq b \neq c$ (2) $a = b = c$
(3) $a = b \neq c$ (4) $a \neq b = c$
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

204. If $bc + ab + ca = abc$, then the value of $\frac{b+c}{bc(a-1)} + \frac{a+c}{ac(b-1)} + \frac{a+b}{ab(c-1)}$ is
(1) 0 (2) $-\frac{1}{2}$
(3) $-\frac{3}{2}$ (4) 1
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

205. If $\frac{a^2 - bc}{a^2 + bc} + \frac{b^2 - ca}{b^2 + ca} + \frac{c^2 - ab}{c^2 + ab} = 1$, then the value of $\frac{a^2}{a^2 + bc} + \frac{b^2}{b^2 + ac} + \frac{c^2}{c^2 + ab}$ is
(1) 0 (2) 1
(3) – 1 (4) 2
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

206. If $999x + 888y = 1332$
$888x + 999y = 555$,
then the value of $x + y$ is
(1) 888 (2) 555
(3) 1 (4) 999
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

207. If $a = \frac{\sqrt{x+2} + \sqrt{x-2}}{\sqrt{x+2} - \sqrt{x-2}}$, then the value of $(a^2 - ax)$ is
(1) 1 (2) 2
(3) – 1 (4) 0
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

208. If $x = \frac{1}{2+\sqrt{3}}$, $y = \frac{1}{2-\sqrt{3}}$, then the value of $8xy(x^2 + y^2)$ is

(1) 196 (2) 290
(3) 112 (4) 194

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

209. If $a^2 + b^2 + c^2 = ab + bc + ca$, then the value of $\frac{a+c}{b}$ is

(1) 3 (2) 2
(3) 0 (4) 1

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

210. If $\frac{m-a^2}{b^2+c^2} + \frac{m-b^2}{c^2+a^2} + \frac{m-c^2}{a^2+b^2} = 3$, then the value of m is

(1) $a^2 + b^2 - c^2$ (2) $a^2 + b^2$
(3) $a^2 + b^2 + c^2$ (4) $a^2 - b^2 - c^2$

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

211. If $x + \frac{1}{x} = 1$ then the value of $\frac{x^2+3x+1}{x^2+7x+1}$ is

(1) 1 (2) $\frac{3}{7}$
(3) $\frac{1}{2}$ (4) 2

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

212. If $p = 99$ then, the value of $p(p^2 + 3p + 3)$ is :

(1) 989898 (2) 988899
(3) 999999 (4) 998889

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

213. If $x = \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$ and $y = \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ then the value of $\frac{x^2+xy+y^2}{x^2-xy+y^2} = ?$

(1) $\frac{63}{61}$ (2) $\frac{67}{65}$
(3) $\frac{65}{63}$ (4) $\frac{69}{67}$

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

214. If $x + \frac{1}{x} = 1$ then the value of $\frac{2}{x^2-x+2} = ?$

(1) 2 (2) 4
(3) $\frac{2}{3}$ (4) 1

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

215. If $x = \frac{a-b}{a+b}$, $y = \frac{b-c}{b+c}$, $z = \frac{c-a}{c+a}$, then $\frac{(1-x)(1-y)(1-z)}{(1+x)(1+y)(1+z)}$ is equal to

(1) 1 (2) 0
(3) 2 (4) $\frac{1}{2}$

(SSC CGL Tier-I Re-Exam, 30.08.2015)

216. Let $x = \frac{\sqrt{13}+\sqrt{11}}{\sqrt{13}-\sqrt{11}}$ and $y = \frac{1}{x}$, then the value of $3x^2 - 5xy + 3y^2$ is

(1) 1717 (2) 1177
(3) 1771 (4) 1171

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

217. If $a + \frac{1}{b} = b + \frac{1}{c} = c + \frac{1}{a}$, where $a \neq b \neq c \neq 0$, then the value of $a^2 b^2 c^2$ is

(1) –1 (2) abc
(3) 0 (4) 1

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

218. For real a, b, c if $a^2 + b^2 + c^2 = ab + bc + ca$, the value of $\frac{a+c}{b}$ is

(1) 3 (2) 1
(3) 2 (4) 0

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

219. $9x^2 + 25 - 30x$ can be expressed as the square of

(1) $-3x - 5$ (2) $3x + 5$
(3) $3x - 5$ (4) $3x^2 - 25$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

220. If $\frac{x}{3} + \frac{3}{x} = 1$ then the value of x^3 is

(1) 1 (2) 27
(3) 0 (4) –27

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

221. If $x + y = 2a$, then the value of $\frac{a}{x-a} + \frac{a}{y-a}$ is

(1) 2 (2) 0
(3) 1 (4) –1

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

222. If $\frac{x+1}{x-1} = \frac{a}{b}$ and $\frac{1-y}{1+y} = \frac{b}{a}$, then the value of $\frac{x-y}{1+xy}$ is

(1) $\frac{2ab}{a^2-b^2}$ (2) $\frac{a^2-b^2}{2ab}$
(3) $\frac{a^2+b^2}{2ab}$ (4) $\frac{a^2-b^2}{ab}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

223. If $\frac{a}{b} + \frac{b}{a} = 2$, then the value of $(a - b)$ is :

(1) 1 (2) 2
(3) –1 (4) 0

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

224. If $\sqrt{y} = 4x$, then $\frac{x^2}{y}$ is :

(1) 2 (2) $\frac{1}{16}$
(3) $\frac{1}{4}$ (4) 4

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

225. If $\frac{x}{y} = \frac{a+2}{a-2}$, then the value of $\frac{x^2 - y^2}{x^2 + y^2}$ is :

(1) $\frac{4a}{a^2+2}$ (2) $\frac{2a}{a^2+2}$

(3) $\frac{4a}{a^2+4}$ (4) $\frac{2a}{a^2+4}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

226. If $x(x + y + z) = 20$, $y(x + y + z) = 30$, and $z(x + y + z) = 50$, then the value of $2(x + y + z)$ is :

(1) 20 (2) –10

(3) 15 (4) 18

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

227. If $x + y = 4$, $x^2 + y^2 = 14$ and $x > y$, then the correct value of x and y is :

(1) $2 + \sqrt{3}$, $2 - \sqrt{3}$

(2) $2 - \sqrt{2}$, $\sqrt{3}$

(3) 3, 1

(4) $2 + \sqrt{3}$, $2\sqrt{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

228. If $a^2 + b^2 + c^2 = 2(a + b + c) - 3$, then the value of $a + b + c$ is :

(1) 2 (2) –1

(3) 1 (4) –2

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

229. If for non-zero x, $x^2 - 4x - 1 = 0$, the value of $x^2 + \frac{1}{x^2}$ is :

(1) 12 (2) 4

(3) 18 (4) 10

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

230. If $a + \frac{1}{b} = 1$ and $b + \frac{1}{c} = 1$ then $c + \frac{1}{a}$ is equal to :

(1) $\frac{1}{2}$ (2) 2

(3) 1 (4) 0

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

231. If $\frac{a}{b} = \frac{25}{6}$, then the value of $\frac{a^2 - b^2}{a^2 + b^2}$ is

(1) $\frac{589}{661}$ (2) $\frac{661}{589}$

(3) $\frac{625}{36}$ (4) $\frac{589}{651}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

232. If $(x - 2)(x - p) = x^2 - ax + 6$, then the value of $(a - p)$ is

(1) 0 (2) 1

(3) 2 (4) 3

(SSC CGL Tier-I (CBE) Exam.10.09.2016)

233. If $x = \sqrt{a} + \frac{1}{\sqrt{a}}$, $y = \sqrt{a} - \frac{1}{\sqrt{a}}$, $(a > 0)$, then the value of $(x^4 + y^4 - 2x^2y^2)$ is

(1) 16 (2) 20

(3) 10 (4) 5

(SSC CGL Tier-I (CBE) Exam.10.09.2016)

234. If $2x + \frac{1}{3x} = 5$, the value of $\frac{5x}{6x^2 + 20x + 1}$ is

(1) $\frac{1}{4}$ (2) $\frac{1}{6}$

(3) $\frac{1}{5}$ (4) $\frac{1}{7}$

(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

235. If $a + b = 10$ and $ab = 21$, then the value of $(a - b)^2$ is

(1) 15 (2) 16

(3) 17 (4) 18

(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

236. Let $0 < x < 1$. Then the correct inequality is

(1) $x < \sqrt{x} < x^2$ (2) $\sqrt{x} < x < x^2$

(3) $x^2 < x < \sqrt{x}$ (4) $\sqrt{x} < x^2 < x$

(SSC CGL Tier-II Online Exam.01.12.2016)

237. If $x = \frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $y = \frac{\sqrt{5}-1}{\sqrt{5}+1}$, the value of $\frac{x^2 + xy + y^2}{x^2 - xy + y^2}$ is

(1) $\frac{3}{4}$ (2) $\frac{4}{3}$

(3) $\frac{3}{5}$ (4) $\frac{5}{3}$

(SSC CGL Tier-II Online Exam.01.12.2016)

238. If $a + b + c = m$ and $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 0$, then average of a^2, b^2 and c^2 is

(1) m^2 (2) $\frac{m^2}{3}$

(3) $\frac{m^2}{9}$ (4) $\frac{m^2}{27}$

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

239. If $x = \frac{8ab}{a+b}$ $(a \neq b)$, then the value of $\frac{x+4a}{x-4a} + \frac{x+4b}{x-4b}$ is :

(1) 0 (2) 1

(3) 2 (4) 4

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

240. The value of $(2a + b)^2 - (2a - b)^2$ is :

(1) $8ab$ (2) $-8ab$

(3) $8a^2 + 2b^2$ (4) $8a^2 - 2b^2$

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

241. If $a + b + c = 0$ then the value of $\frac{a^2 + b^2 + c^2}{ab + bc + ca}$ is

(1) 2 (2) –2

(3) 0 (4) 4

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

242. If $a + b = 2c$, find $\frac{a}{a-c} + \frac{c}{b-c}$.

(1) 0 (2) 1

(3) 2 (4) –1

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

243. If $2x + \frac{1}{4x} = 1$, then the value of $x^2 + \frac{1}{64x^2}$ is

(1) 0 (2) 1

(3) $\frac{1}{4}$ (4) 2

(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

244. The value of $\frac{a}{a-b} + \frac{b}{b-a}$ is

(1) $\frac{(a+b)}{(a-b)}$ (2) –1

(3) $2ab$ (4) 1

(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

245. If $a + \frac{1}{b} = 1$ and $b + \frac{1}{c} = 1$ then $c + \frac{1}{a}$ is equal to

(1) 1 (2) 0

(3) –1 (4) 2

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

246. If $\frac{a}{b} = \frac{1}{2}$, find the value of the expression $\frac{(2a-5b)}{(5a+3b)}$

(1) –32 (2) 11

(3) $\frac{-8}{11}$ (4) 17

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

247. If $\frac{1}{x^2} + x^2$ represents the radius of circle P and $\frac{1}{x} + x = 17$, which of the following best approximates the circumference of circle P ?

(1) 287 π (2) 547 π

(3) 574 π (4) 278 π

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

248. What is the value of m in the quadratic equation $x^2 + mx + 24 = 0$ if one of its roots is $\frac{3}{2}$

(1) $-\frac{45}{2}$ (2) 16

(3) $-\frac{21}{2}$ (4) $-\frac{35}{2}$

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

249. If $ab = 21$ and $\frac{(a+b)^2}{(a-b)^2} = \frac{25}{4}$, then the value of $a^2 + b^2 + 3ab$ is

(1) 115 (2) 121

(3) 125 (4) 127

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

250. If $a + \frac{1}{a-2} = 4$, then the value of $(a-2)^2 + \left(\frac{1}{a-2}\right)^2$ is :

(1) 0 (2) 2

(3) –2 (4) 4

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

251. If $x = \frac{6pq}{p+q}$, then the value of $\frac{x+3p}{x-3p} + \frac{x+3q}{x-3q}$ is

(1) 6 (2) 8

(3) 2 (4) 3

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

252. If $x + \frac{1}{9x} = 4$, then the value $9x^2 + \frac{1}{9x^2}$ is

(1) 140 (2) 142

(3) 144 (4) 146

(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

253. If $x\left(3 - \frac{2}{x}\right) = \frac{3}{x}$, then the value of $x^2 + \frac{1}{x^2}$ will be

(1) $3\frac{1}{9}$ (2) $3\frac{2}{9}$

(3) $2\frac{1}{9}$ (4) $2\frac{4}{9}$

(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

254. If $x^2 + \frac{1}{x^2} = 2$, then the value of $x - \frac{1}{x}$ is

(1) –2 (2) 0

(3) 1 (4) –1

(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

255. If $9x^2 + 16y^2 = 60$ and $3x + 4y = 6$, then the value of xy is

(1) –1 (2) 1

(3) –2 (4) 2

(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

256. If $p^2 + q^2 = 7$ pq, then the value of $\frac{p}{q} + \frac{q}{p}$ is equal to

(1) 9 (2) 5

(3) 7 (4) 3

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

257. If $x = 99$, then the value of $2(x^2 + 3x + 3)$ is equal to

(1) 1000001 (2) 1000000

(3) 999999 (4) 9999999

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

258. If $\frac{2p}{p^2 - 2p + 1} = \frac{1}{4}$, then the value of $p + \frac{1}{p}$ will be

(1) 8 (2) 10

(3) 12

(4) None of these

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

259. If $(a - b) = 3$ and $(a^2 + b^2) = 25$, then the value of (ab) is

(1) 16 (2) 8

(3) 10 (4) 15

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

260. If $a + \frac{1}{a} = 1$, then the value of $\frac{a^2 - a + 1}{a^2 + a + 1}$ is $(a \neq 0)$

(1) 1 (2) –1

(3) 0 (4) 2

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

261. If $x - \frac{1}{x} = 2$, then what is the value of $x^2 + \frac{1}{x^2}$?

(1) 4 (2) 5
(3) 3 (4) 6

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

262. If $a + b = 2c$, then the value of $\frac{a}{a-c} + \frac{c}{b-c}$ is equal to (where $a \neq b \neq c$)

(1) –1 (2) 1
(3) 0 (4) $\frac{1}{2}$

(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

263. If $x + \frac{1}{x} = 5$, then the value of $\frac{x}{1+x+x^2}$ is

(1) $\frac{1}{5}$ (2) $\frac{1}{6}$
(3) 5 (4) 6

(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

264. If $\frac{a^2}{b+c} = \frac{b^2}{c+a} = \frac{c^2}{a+b} = 1$ then find the value of $\frac{2}{1+a} + \frac{2}{1+b} + \frac{2}{1+c}$.

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

265. If $5x + \frac{1}{x} = 10$, then $x^2 + \frac{1}{25x^2}$ is equal to

(1) $2\frac{1}{5}$ (2) $3\frac{1}{5}$
(3) $3\frac{3}{5}$ (4) $2\frac{3}{5}$

(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

266. If $4r = h + \sqrt{r^2 + h^2}$ then $r : h$ is ? ($r \neq 0$)

(1) 17:8 (2) 8:17
(3) 8:15 (4) 15:8

(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

267. If p = 99, then the value of $p(p^2 + 3p + 3)$ will be

(1) 999999 (2) 1000000
(3) 1000001 (4) 999998

(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

268. If $\frac{x}{a+b} + 1 = \frac{x}{a-b} + \frac{a-b}{a+b}$, then x is equal to

(1) $2a - b$ (2) $a + b$
(3) $a - b$ (4) $2a + b$

(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

269. If $x^2 + y^2 = 29$ and $xy = 10$, where $x > 0$, $y > 0$, $x > y$ then the value of $\frac{x+y}{x-y}$ is

(1) $\frac{-7}{3}$ (2) $\frac{7}{3}$
(3) $\frac{3}{7}$ (4) $\frac{-3}{7}$

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

270. If $4x^2 - 12x + k$ is a perfect square, then the value of k is

(1) 2 (2) 9
(3) 12 (4) 10

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

271. The value of

$$\left(\frac{1}{(p-n)(n-q)} + \frac{1}{(n-q)(q-p)} + \frac{1}{(q-p)(p-n)}\right)$$

is

(1) 1 (2) 0
(3) $p + q + n$ (4) $\frac{2n}{p+q}$

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

272. If $\frac{a^2}{b+c} = \frac{b^2}{c+a} = \frac{c^2}{a+b} = 1$ then $\frac{1}{1+a} + \frac{1}{1+b} + \frac{1}{1+c}$ is

(1) 1 (2) 2
(3) 3 (4) 4

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

273. If $a^2 + 1 = 9a$, $(a \neq 0)$ then the value of $(a)^2 + \frac{1}{(a)^2}$ is

(1) 81 (2) 18
(3) 79 (4) 83

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

274. If $p = 99$, then the value of $p(p^2 + 3p + 3)$ is

(1) 9999 (2) 999999
(3) 99999 (4) 9999999

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

275. If $x + \frac{1}{x} = c + \frac{1}{c}$ then the value of x is

(1) $c\frac{1}{c}$ (2) c, c^2
(3) $c, 2c$ (4) 0, 1

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

276. If $x^2 + y^2 + 6x + 5 = 4(x - y)$ then $(x - y)$ is

(1) 1 (2) –1
(3) 0 (4) 4

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

277. If $\left(x - \frac{1}{3x}\right) = \frac{1}{3}$, the value of $3\left(x - \frac{1}{3x}\right)$ is :

(1) –1 (2) 1
(3) –2 (4) 2

(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (IST Sitting)

278. If $\frac{a}{q-r} = \frac{b}{r-p} = \frac{c}{p-q}$, find the value of $(pa + qb + rc)$.

(1) 0 (2) 1
(3) 2 (4) –1

(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (IST Sitting)

279. If $\frac{3a+4b}{3c+4d} = \frac{3a-4b}{3c-4d}$, then

(1) $ab = cd$ (2) $ad = bc$
(3) $ac = bd$ (4) $a = b = c \neq d$

(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

280. If $\left(x + \frac{1}{x}\right) = 2$ then $\left(x^2 + \frac{1}{x^2}\right)$ is equal to

(1) 0 (2) 2
(3) 4 (4) 8

(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

281. If $a + b = 17$ and $a - b = 9$, then the value of $(4a^2 + 4b^2)$ is :

(1) 710 (2) 720
(3) 730 (4) 740

(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

282. If $x + y = \sqrt{3}$ and $x - y = \sqrt{2}$, then the value of $8xy(x^2 + y^2)$ is :

(1) 6 (2) $\sqrt{6}$
(3) 5 (4) $\sqrt{5}$

(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

283. If $a^2 + 1 = a$, then the value of a^3 is

(1) 0 (2) 1
(3) –1 (4) 2

(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

284. If $x + 3y = -3x + y$, then $\frac{x^2}{2y^2}$ is equal to

(1) $\frac{1}{8}$ (2) $\frac{1}{2}$

(3) $\frac{1}{4}$ (4) 4

(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

285. If $(a + b - 6)^2 + a^2 + b^2 + 1 + 2b = 2ab + 2a$, then the value of a is

(1) 7 (2) 6
(3) 3.5 (4) 2.5

(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

286. If $\left(a + \frac{1}{a}\right)^2 = 3$, then the value of $\left(a^2 + \frac{1}{a^2}\right)$ will be

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

287. If $\left\{\frac{1}{2}(a - b)\right\}^2 + ab = p\,(a + b)^2$, then the value of p is :

(1) $p = 4$ (2) $p = \frac{1}{2}$

(3) $p = \frac{1}{4}$ (4) $p = 2$

(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

288. The maximum value of $5 + 20x - 4x^2$, when x is a real number is :

(1) 1 (2) 5
(3) 25 (4) 30

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

289. If $x = at^2$ and $y = 2at$ then

(1) $x^2 = 4ay$
(2) $y^2 = 4ax$
(3) $x^2 + y^2 = a^2$
(4) $x^2 - y^2 = a^2$

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

290. If $\left(a + \frac{1}{b}\right) = 1$ and $\left(b + \frac{1}{c}\right) = 1$, then the value of $\left(c + \frac{1}{a}\right)$ is :

(1) 0 (2) 1
(3) –1 (4) 2

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

291. If $(a - 2) + \frac{1}{(a+2)} = -1$, then the value of $(a + 2)^2 + \frac{1}{(a+2)^2}$ is :

(1) 7 (2) 11
(3) 23 (4) 27

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

292. If $a^2 = b + c$, $b^2 = c + a$, $c^2 = a + b$, then the value of

$3\left(\frac{1}{a+1} + \frac{1}{b+1} + \frac{1}{c+1}\right)$ is :

(1) 1 (2) $\frac{1}{3}$

(3) 3 (4) 4

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

293. If $x^2 + 5x + 6 = 0$, then the value of $\frac{2x}{x^2 - 7x + 6}$ is :

(1) $\frac{1}{6}$ (2) $\frac{1}{3}$

(3) $-\frac{1}{6}$ (4) $-\frac{1}{3}$

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

294. If $a + b = 5$ and $a - b = 3$, then the value of $(a^2 + b^2)$ is :

(1) 17 (2) 18
(3) 19 (4) 20

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

295. If $\left(x + \frac{1}{x}\right) = 5$, then find the value of $\frac{6x}{x^2 + x + 1}$

(1) 3 (2) 2
(3) 1 (4) 0

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

296. If $\frac{3}{(x+2)(2x+1)} = \frac{a}{2x+1} + \frac{b}{x+2}$ be an identify, then the value of b is :

(1) 0 (2) –1
(3) 2 (3) 3

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

297. If $a + \frac{1}{b} = 1$, $b + \frac{1}{c} = 1$, then the value of (abc) is :

(1) 0 (2) –1
(3) 1 (4) ab

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

298. If $2x - \frac{1}{2x} = 5, x \neq 0$ then the value of $\left(x^2 + \frac{1}{16x^2} - 2\right)$ is :

(1) $\frac{19}{4}$ (2) $\frac{23}{4}$

(3) $\frac{27}{4}$ (4) $\frac{31}{4}$

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

299. If $a\,(x + y) = b(x - y) = 2ab$, then the value of $2\,(x^2 + y^2)$ is :

(1) $2\,(a^2 - b^2)$ (2) $2\,(a^2 + b^2)$
(3) $4\,(a^2 - b^2)$ (4) $4\,(a^2 + b^2)$

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

300. If $\left(x + \frac{1}{x}\right) = 6$, then value of $\left(x^2 + \frac{1}{x^2}\right)$ is :

(1) 23 (2) 16
(3) 34 (4) 32

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

301. If $x^2 - 3x + 1 = 0$, $(x \neq 0)$, then the value of $\left(x + \frac{1}{x}\right)$ is

(1) 1 (2) 0
(3) 3 (4) 2

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

302. If $\frac{2+a}{a} + \frac{2+b}{b} + \frac{2+c}{c} = 4$, then the value of $\left(\frac{ab + bc + ca}{abc}\right)$ is

(1) 2 (2) 1

(3) 0 (4) $\frac{1}{2}$

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

303. If $\left(x + \frac{1}{x}\right) = 5$, then the value of $\frac{5x}{x^2 + 5x + 1}$ is :

(1) $\frac{1}{3}$ (2) $\frac{1}{4}$

(3) $\frac{1}{2}$ (4) $\frac{1}{5}$

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

304. If $\left(p^2 + \frac{1}{p^2}\right) = 47$, the value of $\left(p + \frac{1}{p}\right)$ is :

(1) 5 (2) 6
(3) 7 (4) 8

(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

305. If $\frac{a}{1-2a} + \frac{b}{1-2b} + \frac{c}{1-2c} = \frac{1}{2}$, then the value of $\frac{1}{1-2a} + \frac{1}{1-2b} + \frac{1}{1-2c}$ is :
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

306. If $\left(4x + \frac{1}{x}\right) = 5$, $x \neq 0$, then the value of $\frac{5x}{4x^2 + 10x + 1}$ is
(1) $\frac{1}{2}$ (2) $\frac{1}{3}$
(3) $\frac{2}{3}$ (4) 3
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

307. If $(a + b)^2 = 100$ and $(a - b) = 4$, then ab equals to :
(1) 116 (2) 84
(3) 21 (4) 53
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

308. $\frac{x^2 + 3x + 1}{x^2 - 3x + 1} = \frac{1}{2}$, then the value of $\left(x + \frac{1}{x}\right)$ is :
(1) 9 (2) –9
(3) 1 (4) 2
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

309. What should be added to $8(3x - 4y)$ to obtain $(18x - 18y)$?
(1) $6x - 14y$ (2) $14y + 6x$
(3) $14y - 6x$ (4) $6xy$
(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

310. If $4(2x + 3) > 5 - x$ and $5x - 3(2x - 7) > 3x - 1$, then x can take which of the following values?
(1) 6 (2) –1
(3) 5 (4) –6
(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

311. If $5x - 40 = 3x$, then the numerical value of $(2x - 11)$ is
(1) 29 (2) 39
(3) 19 (4) 9
(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

312. Which of the following equations has equal roots?
(1) $3x^2 - 6x + 2 = 0$
(2) $3x^2 - 6x + 3 = 0$
(3) $x^2 - 8x + 8 = 0$
(4) $4x^2 - 8x + 2 = 0$
(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

313. If $2x - 3(4 - 2x) < 4x - 5 < 4x + \frac{2x}{3}$, then x can take which of the following values ?
(1) 2 (2) 8
(3) 0 (4) –8
(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

314. If $a - b = 11$ and $ab = 24$, then the value of $(a^2 + b^2)$ is
(1) 169 (2) 37
(3) 73 (4) 48
(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

315. The simplified form of $(x + (3)^2 + (x - 1)^2$ is
(1) $(x^2 + 2x + 5)$ (2) $2(x^2 + 2x + 5)$
(3) $(x^2 - 2x + 5)$ (4) $2(x^2 - 2x + 5)$
(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

316. If $a + \frac{1}{b} = 1$ and $b + \frac{1}{c} = 1$, then the value of $c + \frac{1}{a}$ is
(1) 0 (2) 2
(3) 1 (4) 3
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

317. If $a + b + c + d = 4$ then the value of $\frac{1}{(1-a)(1-b)(1-c)} + \frac{1}{(1-b)(1-c)(1-d)} + \frac{1}{(1-c)(1-d)(1-a)} + \frac{1}{(1-d)(1-a)(1-b)}$ is
(1) 0 (2) 1
(3) 4 (4) $1 + abcd$
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

318. If $a = \frac{1}{a-5}$ $(a > 0)$, then the value of $a + \frac{1}{a}$ is
(1) $\sqrt{29}$ (2) $-\sqrt{27}$
(3) $-\sqrt{29}$ (4) $\sqrt{27}$
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

319. If $a + \frac{1}{b} = b + \frac{1}{c} = c + \frac{1}{a}$ (where $a \neq b \neq c$), then abc is equal to
(1) +1 (2) –1
(3) +1 and –1
(4) None of the options
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

320. If $ax + by = 1$ and $bx + ay = \frac{2ab}{a^2 + b^2}$ then $(x^2 + y^2)(a^2 + b^2)$ is equal to
(1) 1 (2) 2
(3) 0.5 (4) 0
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–II

1. If $x = \sqrt{3} + \sqrt{2}$, then the value of $\left(x^3 + \frac{1}{x^3}\right)$ is
(1) $6\sqrt{3}$ (2) $12\sqrt{3}$
(3) $18\sqrt{3}$ (4) $24\sqrt{3}$
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

2. If $x + y = 7$, then the value of $x^3 + y^3 + 21xy$ is
(1) 243 (2) 143
(3) 343 (4) 443
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

3. If $x^{\frac{1}{3}} + y^{\frac{1}{3}} = z^{\frac{1}{3}}$, then $\{(x + y - z)^3 + 27\,xyz\}$ equals :
(1) –1 (2) 1
(3) 0 (4) 27
(SSC CPO S.I. Exam. 16.12.2007)

4. If $4b^2 + \frac{1}{b^2} = 2$, then the value of $8b^3 + \frac{1}{b^3}$ is
(1) 0 (2) 1
(3) 2 (4) 5
(SSC CPO S.I. Exam. 09.11.2008)

5. If $2p + \frac{1}{p} = 4$, then value of $p^3 + \frac{1}{8p^3}$ is
(1) 4 (2) 5
(3) 8 (4) 15
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

6. If $a^4 + b^4 = a^2b^2$, then $(a^6 + b^6)$ equals
(1) 0 (2) 1
(3) $a^2 + b^2$ (4) $a^2b^4 + a^4b^2$
(SSC CPO S.I.Exam.12.12.2010 (Paper-I)

7. If $x + \frac{1}{x} = \sqrt{3}$ then the value of $x^{18} + x^{12} + x^6 + 1$ is
(1) 0 (2) 1
(3) 2 (4) 3
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

8. If $x + \frac{1}{x} = 2, x \neq 0$ then value of $x^2 + \frac{1}{x^3}$ is equal to
(1) 1 (2) 2
(3) 3 (4) 4
FCI Assistant Grade-III Exam.25.02.2012 (Paper-I) North Zone (Ist Sitting)

9. If $\frac{a}{b} + \frac{b}{a} = 1, a \neq 0, b \neq 0$ the value of $a^3 + b^3$ is
(1) 0 (2) 1
(3) –1 (4) 2
(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting) & (FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting) & (SSC GL Tier-I Exam. 19.05.2013 (Ist Sitting)

10. If $x + \frac{1}{x} = 3$, then the value of $\frac{x^3 + \frac{1}{x}}{x^2 - x + 1}$ is :
(1) $\frac{3}{2}$ (2) $\frac{5}{2}$
(3) $\frac{7}{2}$ (4) $\frac{11}{2}$
(SSC CHSL DEO & LDC Exam. 27.11.2010)

11. If $a + \frac{1}{a} + 1 = 0 \ (a \neq 0)$ then the value of $(a^4 - a)$ is :
(1) 0 (2) 1
(3) 2 (4) – 1
(SSC CHSL DEO & LDC Exam. 27.11.2010)

12. If $x = a + \frac{1}{a}$ and $y = a - \frac{1}{a}$, then the value of $x^4 + y^4 - 2x^2y^2$ is
(1) 24 (2) 18
(3) 16 (4) 12
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

13. If $x + \frac{1}{2x} = 2$, find the value of $8x^3 + \frac{1}{x^3}$.
(1) 48 (2) 88
(3) 40 (4) 44
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

14. If for two real constants a and b, the expression $ax^3 + 3x^2 - 8x + b$ is exactly divisible by $(x + 2)$ and $(x - 2)$, then
(1) $a = 2, b = 12$
(2) $a = 12, b = 2$
(3) $a = 2, b = -12$
(4) $a = -2, b = 12$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

15. If $x^2 - 3x + 1 = 0$, then the value of $x^3 + \frac{1}{x^3}$ is
(1) 9 (2) 18
(3) 27 (4) 1
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

16. If $x + \frac{1}{4x} = \frac{3}{2}$, find the value of $8x^3 + \frac{1}{8x^3}$.
(1) 18 (2) 36
(3) 24 (4) 16
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

17. If $\frac{1}{x+y} = \frac{1}{x} + \frac{1}{y}$ $(x \neq 0, y \neq 0, x \neq y)$ then, the value of $x^3 - y^3$ is
(1) 0 (2) 1
(3) –1 (4) 2
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

18. If $x = a(b - c)$, $y = b(c - a)$ and $z = c(a - b)$, then
$\left(\frac{x}{a}\right)^3 + \left(\frac{y}{b}\right)^3 + \left(\frac{z}{c}\right)^3 =$
(1) $\frac{xyz}{3abc}$ (2) $3\ xyzabc$
(3) $\frac{3xyz}{abc}$ (4) $\frac{xyz}{abc}$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

19. If $xy(x + y) = 1$, then the value of $\frac{1}{x^3y^3} - x^3 - y^3$ is :
(1) 0 (2) 1
(3) 3 (4) –2
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone) & (SSC GL Tier-I Exam. 21.04.2013)

20. If $x^4 + \frac{1}{x^4} = 119$ and $x > 1$, then the value of $x^3 - \frac{1}{x^3}$ is
(1) 54 (2) 18
(3) 72 (4) 36
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

21. If $3x + \frac{1}{2x} = 5$, then the value of $8x^3 + \frac{1}{27x^3}$ is :
(1) $118\frac{1}{2}$ (2) $30\frac{10}{27}$
(3) 0 (4) 1
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

22. If $x + y = z$, then the expression $x^3 + y^3 - z^3 + 3xyz$ will be equal to :
(1) 0 (2) $3xyz$
(3) $-3xyz$ (4) z^3
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

23. If $\left(x + \frac{1}{x}\right)^2 = 3$, then the value of $(x^{72} + x^{66} + x^{54} + x^{36} + x^{24} + x^6 + 1)$ is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC Graduate Level Tier-II Exam. 16.09.2012)

24. If $\left(x + \frac{1}{x}\right)^2 = 3$, then the value of $x^{206} + x^{200} + x^{90} + x^{84} + x^{18} + x^{12} + x^6 + 1$ is
(1) 0 (2) 1
(3) 84 (4) 206
(SSC Graduate Level Tier-II Exam. 16.09.2012)

25. If $a + \frac{1}{a} = \sqrt{3}$, then the value of $a^6 - \frac{1}{a^6} + 2$ will be

(1) 1 (2) 2
(3) $3\sqrt{3}$ (4) 5

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

26. If $x^3 + y^3 = 35$ and $x + y = 5$, then the value of $\frac{1}{x} + \frac{1}{y}$ will be :

(1) $\frac{1}{3}$ (2) $\frac{5}{6}$
(3) 6 (4) $\frac{2}{3}$

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

27. If $a^3 - b^3 = 56$ and $a - b = 2$, then value of $a^2 + b^2$ will be :

(1) 48 (2) 20
(3) 22 (4) 5

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

28. If $(a^2 + b^2)^3 = (a^3 + b^3)^2$, then $\frac{a}{b} + \frac{b}{a}$ is

(1) $\frac{1}{3}$ (2) $\frac{2}{3}$
(3) $-\frac{1}{3}$ (4) $-\frac{2}{3}$

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

29. If $x + \frac{1}{x} = 5$, then the value of

$$\frac{x^4 + 3x^3 + 5x^2 + 3x + 1}{x^4 + 1}$$

(1) $\frac{43}{23}$ (2) $\frac{47}{21}$
(3) $\frac{41}{23}$ (4) $\frac{45}{21}$

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

30. If x is real, $x + \frac{1}{x} \neq 0$ and $x^3 + \frac{1}{x^3} = 0$, then the value of $\left(x + \frac{1}{x}\right)^4$ is

(1) 4 (2) 9
(3) 16 (4) 25

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

31. If $x + \frac{1}{x} = 3$, then the value of $\left(x^5 + \frac{1}{x^5}\right)$ is

(1) 322 (2) 126
(3) 123 (4) 113

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting) & (SSC CHSL DEO & LDC Exam. 27.10.2013 (IInd Sitting)

32. If $x - \frac{1}{x} = 3$, then value of $x^3 - \frac{1}{x^3}$ is

(1) 32 (2) 36
(3) 40 (4) 49

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

33. If $m^4 + \frac{1}{m^4} = 119$, then $m - \frac{1}{m} = ?$

(1) ± 3 (2) 4
(3) ± 2 (4) ± 1

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

34. If $x + y + z = 6$, then the value of $(x - 1)^3 + (y - 2)^3 + (z - 3)^3$ is

(1) $3(x - 1)(y + 2)(z - 3)$
(2) $3(x + 1)(y - 2)(z - 3)$
(3) $3(x - 1)(y - 2)(z + 3)$
(4) $3(x - 1)(y - 2)(z - 3)$

(SSC Delhi Police S.I.(SI) Exam. 19.08.2012)

35. If $x^2 + 1 = 2x$, then the value of

$$\frac{x^4 + \frac{1}{x^2}}{x^2 - 3x + 1} \text{ is}$$

(1) 0 (2) 1
(3) 2 (4) –2

(SSC Delhi Police S.I.(SI) Exam. 19.08.2012)

36. If $x = \sqrt{3} + \sqrt{2}$, then the value of $x^3 - \frac{1}{x^3}$ is :

(1) $14\sqrt{2}$ (2) $14\sqrt{3}$
(3) $22\sqrt{2}$ (4) $10\sqrt{2}$

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

37. If $x > 1$ and $x^2 + \frac{1}{x^2} = 83$, then $x^3 - \frac{1}{x^3}$ is

(1) 764 (2) 750
(3) 756 (4) 760

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

38. If $\left(a + \frac{1}{a}\right)^2 = 3$, then $a^3 + \frac{1}{a^3} = ?$

(1) $2\sqrt{3}$ (2) 2
(3) $3\sqrt{3}$ (4) 0

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

39. If $\frac{x}{x^2 - 2x + 1} = \frac{1}{3}$, then the value of $x^3 + \frac{1}{x^3}$ is :

(1) 81 (2) 110
(3) 125 (4) 27

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

40. If, $\left(x + \frac{1}{x}\right) = 4$, then the value of $x^4 + \frac{1}{x^4}$ is :

(1) 64 (2) 194
(3) 81 (4) 124

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

41. If $x + y + z = 6$ and $x^2 + y^2 + z^2 = 20$ then the value of $x^3 + y^3 + z^3 - 3xyz$ is

(1) 64 (2) 70
(3) 72 (4) 76

(SSC Graduate Level Tier-I Exam. 21.04.2013)

42. If $x = 1 - \sqrt{2}$, the value of $\left(x - \frac{1}{x}\right)^3$ is

(1) – 8 (2) 8
(3) $2\sqrt{2}$ (4) 1

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

43. If $x = a - b$, $y = b - c$, $z = c - a$, then the numerical value of the algebraic expression $x^3 + y^3 + z^3 - 3xyz$ will be

(1) $a + b + c$ (2) 0
(3) $4(a + b + c)$
(4) $3abc$

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

44. If $x = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ and $y = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$, then the value of $x^3 + y^3$ is :
(1) 950 (2) 730
(3) 650 (4) 970
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

45. If $(x - a)(x - b) = 1$ and $a - b + 5 = 0$, then the value of $(x-a)^3 - \frac{1}{(x-a)^3}$ is
(1) –125 (2) 1
(2) 125 (4) 140
(SSC Graduate Level Tier-II Exam. 29.09.2013

46. If $a^2 + b^2 + c^2 = 2(a - b - c) - 3$, then the value of $4a - 3b + 5c$ is
(1) 2 (2) 3
(3) 5 (4) 6
(SSC Graduate Level Tier-II Exam. 29.09.2013

47. If $2x + \frac{2}{x} = 3$, then the value of $x^3 + \frac{1}{x^3} + 2$ is
(1) $-\frac{9}{8}$ (2) $-\frac{25}{8}$
(3) $\frac{7}{8}$ (4) 11
(SSC Graduate Level Tier-II Exam. 29.09.2013

48. If $a + b + c = 15$ and $a^2 + b^2 + c^2 = 83$ then the value of $a^3 + b^3 + c^3 - 3abc$
(1) 200 (2) 180
(3) 190 (4) 210
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

49. If $a - b = 3$ and $a^3 - b^3 = 117$ then $|a + b|$ is equal to
(1) 3 (2) 5
(3) 7 (4) 9
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

50. If $x + \frac{1}{x+1} = 1$, then $(x+1)^5 + \frac{1}{(x+1)^5}$ equals
(1) 1 (2) 2
(3) 4 (4) 8
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

51. If $\frac{1}{a} - \frac{1}{b} = \frac{1}{a-b}$, then the value of $a^3 + b^3$ is
(1) 0 (2) –1
(3) 1 (4) 2
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

52. If $a + b + c = 0$, then $a^3 + b^3 + c^3$ is equal to
(1) $a + b + c$ (2) abc
(3) $2\,abc$ (4) $3\,abc$
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

53. If a = 4,965, b = 2.343 and c = 2.622, then the value of $a^3 - b^3 - c^3 - 3abc$ is :
(1) – 2 (2) – 1
(3) 0 (4) 9.9^3
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

54. If $a = 1.21$, $b = 2.12$ and $c = -3.33$, then the value of $a^3 + b^3 + c^3 - 3abc$ is
(1) 0 (2) 1
(3) 2 (4) 3
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

55. If $p = 999$, then the value of $\sqrt[3]{p\left(p^2+3p+3\right)+1}$ is
(1) 1000 (2) 999
(3) 998 (4) 1002
(SSC CGL Prelim Exam. 11.05.2003 & 27.07.2008 (Second Sitting)

56. If $a = 4.36$, $b = 2.39$ and $c = 1.97$, then the value of $a^3 - b^3 - c^3 - 3abc$ is
(1) 3.94 (2) 2.39
(3) 0 (4) 1
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

57. $\left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right)\left(x^2+\frac{1}{x^2}-1\right)\left(x^2+\frac{1}{x^2}+1\right)$ is equal to
(1) $x^6 + \frac{1}{x^6}$ (2) $x^8 + \frac{1}{x^8}$
(3) $x^8 - \frac{1}{x^8}$ (4) $x^6 - \frac{1}{x^6}$
(SSC CPO S.I. Exam. 03.09.2006)

58. If $a = 11$ and $b = 9$, then the value of $\left(\frac{a^2+b^2+ab}{a^3-b^3}\right)$ is
(1) $\frac{1}{2}$ (2) 2
(3) $\frac{1}{20}$ (4) 20
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

59. If $a = \sqrt{7+2\sqrt{12}}$ and $b = \sqrt{7-2\sqrt{12}}$, then $\left(a^3+b^3\right)$ is equal to
(1) 40 (2) 44
(3) 48 (4) 52
(SSC SAS Exam. 26.06.2010 (Paper-1)

60. If the sum of $\frac{a}{b}$ and its reciprocal is 1 and $a \neq 0$, $b \neq 0$, then the value of $a^3 + b^3$ is
(1) 2 (2) –1
(3) 0 (4) 1
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

61. If $x = 2 - 2^{1/3} + 2^{2/3}$, then the value of $x^3 - 6x^2 + 18x + 18$ is
(1) 22 (2) 33
(3) 40 (4) 45
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

62. If $a^3 - b^3 - c^3 - 3abc = 0$, then
(1) $a = b = c$
(2) $a + b + c = 0$
(3) $a + c = b$
(4) $a = b + c$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

63. If p, q, r are all real numbers, then $(p-q)^3 + (q-r)^3 + (r-p)^3$ is equal to
(1) $(p-q)(q-r)(r-p)$
(2) $3(p-q)(q-r)(r-p)$
(3) 0
(4) 1
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone) (IInd Sitting (North Zone)

64. If $a = 2{\cdot}361$, $b = 3{\cdot}263$ and $c = 5{\cdot}624$, then the value of $a^3 + b^3 - c^3 + 3abc$ is
(1) 35·621 (2) 0
(3) 19·277 (4) 1
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

65. If $a + b + c = 6$, $a^2 + b^2 + c^2 = 14$ and $a^3 + b^3 + c^3 = 36$, then the value of abc is

(1) 3 (2) 6
(3) 9 (4) 12

(SSC Graduate Level Tier-II Exam. 16.09.2012)

66. If $a + b = 1$ and $a^3 + b^3 + 3ab = k$, then the value of k is

(1) 1 (2) 3
(3) 5 (4) 7

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

67. If $a = 34$, $b = c = 33$, then the value of $a^3 + b^3 + c^3 - 3abc$ is

(1) 0 (2) 111
(3) 50 (4) 100

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

68. If $x = y = 333$ and $z = 334$, then the value of $x^3 + y^3 + z^3 - 3xyz$ is

(1) 0 (2) 667
(3) 1000 (4) 2334

(SSC Graduate Level Tier-II Exam. 29.09.2013)

69. Out of the given responses, one of the factors of $(a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3$ is

(1) $(a + b)(a - b)$
(2) $(a + b)(a + b)$
(3) $(a - b)(a - b)$
(4) $(b - c)(b - c)$

(SSC Graduate Level Tier-II Exam. 29.09.2013)

70. If $a = \dfrac{b^2}{b-a}$ then the value of $a^3 + b^3$ is

(1) $6\,ab$ (2) 0
(3) 1 (4) 2

(SSC CHSL DEO & LDC Exam. 20.10.2013)

71. If p = 99, then value of $p(p^2 + 3p + 3)$ is

(1) 999 (2) 9999
(3) 99999 (4) 999999

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

72. If $p = 101$, then the value of $\sqrt[3]{p(p^2 - 3p + 3) - 1}$ is

(1) 100 (2) 101
(3) 102 (4) 1000

(SSC SAS Exam. 26.06.2010 (Paper-1)

73. If p = 124,

$\sqrt[3]{p(p^2 + 3p + 3) + 1} = ?$

(1) 5 (2) 7
(3) 123 (4) 125

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

74. If $p - 2q = 4$, then the value of $p^3 - 8q^3 - 24pq - 64$ is :

(1) 2 (2) 0
(3) 3 (4) –1

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

75. If $x = 19$ and $y = 18$, then the value of $\dfrac{x^2 + y^2 + xy}{x^3 - y^3}$ is

(1) 1 (2) 37
(3) 324 (4) 361

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

76. If $x + \dfrac{1}{x} = 2$ and x is real, then the value of $x^{17} + \dfrac{1}{x^{19}}$ is

(1) 1 (2) 0
(3) 2 (4) –2

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

77. The value of $(x + y + z)^3 - (y + z - x)^3 - (z + x - y)^3 - (x + y - z)^3$ is :

(1) $12\,xyz$ (2) $24xyz$
(3) $36\,xyz$ (4) 0

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

78. If $x = -1$, then the value of

$$\frac{1}{x^{99}} + \frac{1}{x^{98}} + \frac{1}{x^{97}} + \frac{1}{x^{96}} + \frac{1}{x^{95}} + \frac{1}{x^{94}} + \frac{1}{x} - 1$$

is

(1) 1 (2) 0
(3) –2 (4) –1

(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

79. If $\dfrac{1}{\sqrt[3]{4} + \sqrt[3]{2} + 1} = a\sqrt[3]{4} + b\sqrt[3]{2} + c$ and a, b, c are rational numbers, then $a + b + c$ is equal to

(1) 0 (2) 1
(3) 2 (4) 3

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

80. If $x = \sqrt[3]{2 + \sqrt{3}}$, then the value of $x^3 + \dfrac{1}{x^3}$ is

(1) 8 (2) 9
(3) 2 (4) 4

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

81. If $x = \sqrt[3]{5} + 2$, then the value of $x^3 - 6x^2 + 12x - 13$ is

(1) –1 (2) 1
(3) 2 (4) 0

(SSC Graduate Level Tier-II Exam. 29.09.2013

82. If $x + y = a$ and $xy = b^2$, then the value of $x^3 - x^2y - xy^2 + y^3$ in terms of a and b is :

(1) $(a^2 + 4b^2)\,a$ (2) $a^3 - 3b^2$
(3) $a^3 - 4b^2\,a$ (4) $a^3 + 3b^2$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

83. If $x - \dfrac{1}{x} = 1$, then the value of

$$\frac{x^4 - \dfrac{1}{x^2}}{3x^2 + 5x - 3} \text{ is}$$

(1) $\dfrac{1}{4}$ (2) $\dfrac{1}{2}$

(3) $\dfrac{3}{4}$ (4) 0

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

84. If $x + y = 15$, then $(x - 10)^3 + (y - 5)^3$ is

(1) 25 (2) 125
(3) 625 (4) 0

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

85. If $x^2 + \dfrac{1}{x^2} = 66$, then the value of $\dfrac{x^2 - 1 + 2x}{x} = ?$

(1) ± 8 (2) 10, – 6
(3) 6, –10 (4) ± 4

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

86. If $a^2 + a + 1 = 0$, then the value of a^9 is

(1) 2 (2) 3
(3) 1 (4) 0

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

87. If $x+\frac{2}{x}=1$, then the value of $\frac{x^2+x+2}{x^2(1-x)}$ is

(1) 1 (2) –1
(3) 2 (4) –2

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

88. If $x = k^3 - 3k^2$ and $y = 1 - 3k$, then for what value of k, will be $x = y$?

(1) 0 (2) 1
(3) –1 (4) 2

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

89. Find the value of $\sqrt{(x^2+y^2+z)(x+y-3z)} \div \sqrt[3]{xy^3z^2}$ when $x = +1$, $y = -3$, $z = -1$.

(1) 1 (2) 0
(3) –1 (4) $\frac{1}{2}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

90. The simplest form of the expression

$$\frac{p^2-p}{2p^3+6p^2} \div \frac{p^2-1}{p^2+3p} \div \frac{p^2}{p+1} \text{ is}$$

(1) $2p^2$ (2) $\frac{1}{2p^2}$
(3) $p + 3$ (4) $\frac{1}{p+3}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

91. If $x+\frac{1}{x}=2$, then the value of $\left(x^2+\frac{1}{x^2}\right)\left(x^3+\frac{1}{x^3}\right)$ is

(1) 20 (2) 4
(3) 8 (4) 16

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

92. If a, b, c be all positive integers, then the least positive value of $a^3 + b^3 + c^3 - 3abc$ is

(1) 1 (2) 2
(3) 4 (4) 3

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

93. When $f(x) = 12x^3 - 13x^2 - 5x + 7$ is divided by $(3x + 2)$, then the remainder is

(1) 2 (2) 0
(3) –1 (4) 1

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

94. If $ab + bc + ca = 0$, then the value of

$$\frac{1}{a^2-bc}+\frac{1}{b^2-ac}+\frac{1}{c^2-ab} \text{ is}$$

(1) 2 (2) –1
(3) 0 (4) 1

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

95. If the equation $2x^2 - 7x + 12 = 0$ has two roots α and β, then the value of $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$ is

(1) $\frac{7}{2}$ (2) $\frac{1}{24}$
(3) $\frac{7}{24}$ (4) $\frac{97}{24}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

96. If $x^3+\frac{3}{x} = 4\ (a^3 + b^3)$ and $3x+\frac{1}{x^3} = 4\ (a^3 - b^3)$, then $a^2 - b^2$ is equal to

(1) 4 (2) 0
(3) 1 (4) 2

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

97. If $x = 6 + \frac{1}{x}$, then the value of $x^4 + \frac{1}{x^4}$ is

(1) 1448 (2) 1442
(3) 1444 (4) 1446

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

98. If $x+\frac{1}{x}=5$, then $x^6+\frac{1}{x^6}$ is

(1) 12098 (2) 12048
(3) 14062 (4) 12092

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

99. If $x^2 - 3x + 1 = 0$, then the value of $\frac{x^6+x^4+x^2+1}{x^3}$ will be

(1) 18 (2) 15
(3) 21 (4) 30

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

100. If $x^4+\frac{1}{x^4}=119$ and $x > 1$, then find the positive value of $x^3-\frac{1}{x^3}$.

(1) 25 (2) 27
(3) 36 (4) 49

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

101. If $\frac{p}{a}+\frac{q}{b}+\frac{r}{c}=1$ and $\frac{a}{p}+\frac{b}{q}+\frac{c}{r}=0$, where p, q, r and a, b, c are non-zero, then the value of $\frac{p^2}{a^2}+\frac{q^2}{b^2}+\frac{r^2}{c^2}$ is

(1) –1 (2) 0
(3) 1 (4) 2

(SSC CGL Tier-I Exam. 19.10.2014)

102. If x is a rational number and $\frac{(x+1)^3-(x-1)^3}{(x+1)^2-(x-1)^2} = 2$, then the sum of numerator and denominator of x is

(1) 3 (2) 4
(3) 5 (4) 7

(SSC CGL Tier-I Exam. 19.10.2014)

103. If $x = \sqrt{5} + 2$, then the value $\frac{2x^2-3x-2}{3x^2-4x-3}$ is equal to

(1) 0.185 (2) 0.525
(3) 0.625 (4) 0.785

(SSC CGL Tier-I Exam. 19.10.2014)

104. If $a = 2.234$, $b = 3.121$ and $c = -5.355$, then the value of $a^3+b^3 + c^3 - 3\ abc$ is

(1) –1 (2) 0
(3) 1 (4) 2

(SSC CGL Tier-I Exam. 19.10.2014)

105. If $x^2 + y^2 + 1 = 2x$, then the value of $x^3 + y^5$ is

(1) 2 (2) 0
(3) –1 (4) 1

(SSC CGL Tier-I Exam. 19.10.2014)

106. If $3(a^2 + b^2 + c^2) = (a + b + c)^2$, then the relation between a, b and c is

(1) $a = b = c$ (2) $a = b \neq c$
(3) $a < b < c$ (4) $a > b > c$

(SSC CGL Tier-I Exam. 19.10.2014)

107. If $x(x - 3) = -1$, then the value of $x^3(x^3 - 18)$ is

(1) -1 (2) 2
(3) 1 (4) 0

(SSC CGL Tier-I Exam. 26.10.2014)

108. If $a^2 + b^2 + c^2 = ab + bc + ac$ then the value of $\frac{a+C}{b}$ is

(1) 0 (2) 2
(3) 1 (4) -1

(SSC CGL Tier-II Exam. 21.09.2014)

109. If $ab + bc + ca = 0$ then the value of $\left(\frac{1}{a^2 - bc} + \frac{1}{b^2 - ca} + \frac{1}{c^2 - ab}\right)$ is

(1) 0 (2) 1
(3) 3 (4) $a + b + c$

(SSC CGL Tier-II Exam. 21.09.2014)

110. If $3x + \frac{3}{x} = 1$ then $x^3 + \frac{1}{x^3} + 1$ is

(1) 0 (2) $\frac{1}{27}$
(3) $\frac{5}{27}$ (4) $\frac{28}{27}$

(SSC CGL Tier-II Exam. 21.09.2014)

111. The factors of $(a^2 + 4b^2 + 4b - 4ab - 2a - 8)$ are

(1) $(a - 2b - 4)(a - 2b + 2)$
(2) $(a - b + 2)(a - 4b - 4)$
(3) $(a + 2b - 4)(a + 2b + 2)$
(4) $(a + 2b - 1)(a - 2b + 1)$

(SSC CGL Tier-II Exam. 21.09.2014)

112. The value of

$$\frac{1}{a^2 + ax + x^2} - \frac{1}{a^2 - ax + x^2} + \frac{2ax}{a^4 + a^2x^2 + x^4}$$ is

(1) 2 (2) 1
(3) -1 (4) 0

(SSC CGL Tier-II Exam. 21.09.2014)

113. If $x = 11$, then the value of $x^5 - 12x^4 + 12x^3 - 12x^2 + 12x - 1$ is

(1) 5 (2) 10
(3) 15 (4) 20

(SSC CGL Tier-II Exam. 21.09.2014)

114. If p = 99, then the value of $p(p^2 + 3p + 3)$ is

(1) 10000000 (2) 999000
(3) 999999 (4) 990000

(SSC CGL Tier-II Exam. 21.09.2014)

115. An example of an equality relation of two expressions in x, which is not an identity is

(1) $(x + 3)^2 = x^2 + 6x + 9$
(2) $(x + 2y)^3 = x^3 + 8y^3 + 6xy(x+2y)$
(3) $(x + 2)^2 = x^2 + 2x + 4$
(4) $(x + 3)(x - 3) = x^2 - 9$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

116. The numerical value of

$$\frac{(a-b)^2}{(b-c)(c-a)} + \frac{(b-c)^2}{(c-a)(a-b)} + \frac{(c-a)^2}{(a-b)(b-c)}$$ is $(a \neq b \neq c)$

(1) 0 (2) 1
(3) $\frac{1}{3}$ (4) 3

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

117. If $\left(a + \frac{1}{a}\right)^2 = 3$, then the value of $a^3 + \frac{1}{a^3}$ is

(1) 0 (2) 1
(3) 2 (4) 6

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

118. If $a + \frac{1}{a} = \sqrt{3}$, then the value of $a^{18} + a^{12} + a^6 + 1$ is

(1) 0 (2) 1
(3) -1 (4) 4

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

119. If $x = 997$, $y = 998$ and $z = 999$, then the value of $x^2 + y^2 + z^2 - xy - yz - zx$ is

(1) 0 (2) 1
(3) -1 (4) 3

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

120. If $x + \frac{1}{x} = 3$, then the value of $\frac{3x^2 - 4x + 3}{x^2 - x + 1}$ is

(1) $\frac{4}{3}$ (2) $\frac{3}{2}$
(3) $\frac{5}{2}$ (4) $\frac{5}{3}$

(SSC CHSL DEO & LDC Exam. 9.11.2014)

121. If $x = 3 + 2\sqrt{2}$, then $\frac{x^6 + x^4 + x^2 + 1}{x^3}$ is equal to

(1) 216 (2) 192
(3) 198 (4) 204

(SSC CHSL CGLDEO & LDC Exam. 9.11.2014)

122. If $x = p + \frac{1}{p}$ and $y = p - \frac{1}{p}$ then the value of $x^4 - 2x^2y^2 + y^4$ is

(1) 24 (2) 4
(3) 16 (4) 8

(SSC CHSL DEO & LDC Exam. 9.11.2014)

123. If $a + b + c = 0$, then the value of $(a + b - c)^2 + (b + c - a)^2 + (c + a - b)^2$ is

(1) 0 (2) $8abc$
(3) $4(a^2 + b^2 + c^2)$
(4) $4(ab + bc + ca)$

(SSC CHSL DEO & LDC Exam. 16.11.2014)

124. If $p^3 + 3p^2 + 3p = 7$, then the value of $p^2 + 2p$ is

(1) 4 (2) 3
(3) 5 (4) 6

(SSC CHSL DEO & LDC Exam. 16.11.2014)

125. If $x = 2015$, $y = 2014$ and $z = 2013$, then value of $x^2 + y^2 + z^2 - xy - yz - zx$ is

(1) 3 (2) 4
(3) 6 (4) 2

(SSC CHSL DEO & LDC Exam. 16.11.2014)

126. If $3a^2 = b^2 \neq 0$, then the value of $\frac{(a+b)^3 - (a-b)^3}{(a+b)^2 + (a-b)^2}$ is

(1) $\frac{3b}{2}$ (2) b
(3) $\frac{b}{2}$ (4) $\frac{2b}{3}$

(SSC CHSL DEO & LDC Exam. 16.11.2014)

127. If $x > 1$ and $x + \frac{1}{x} = 2\frac{1}{12}$, then the value of $x^4 - \frac{1}{x^4}$ is

(1) $\frac{58975}{20736}$ (2) $\frac{59825}{20736}$

(3) $\frac{57985}{20736}$ (4) $\frac{57895}{20736}$

(SSC CHSL DEO & LDC Exam. 16.11.2014)

128. The value of $\frac{4x^3 - x}{(2x+1)(6x-3)}$ when $x = 9999$ is

(1) 1111 (2) 2222
(3) 3333 (4) 6666

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

129. If $a^3 + b^3 = 9$ and $a + b = 3$, then the value of $\frac{1}{a} + \frac{1}{b}$ is

(1) $\frac{1}{2}$ (2) $\frac{3}{2}$

(3) $\frac{5}{2}$ (4) -1

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

130. If $t^2 - 4t + 1 = 0$, then the value of $t^3 + \frac{1}{t^3}$ is

(1) 44 (2) 48
(3) 52 (4) 64

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

131. If $\sqrt[3]{a} + \sqrt[3]{b} = \sqrt[3]{c}$, then the simplest value of $(a + b - c)^3 + 27abc$ is

(1) – 1 (2) 3
(3) – 3 (4) 0

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

132. If $p = \frac{5}{18}$, then

$$27p^3 - \frac{1}{216} - \frac{9}{2}p^2 + \frac{1}{4}p$$

is equal to

(1) $\frac{4}{27}$ (2) $\frac{5}{27}$

(3) $\frac{8}{27}$ (4) $\frac{10}{27}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

133. If $x + \frac{1}{x} = 2$, then

$$x^{2013} + \frac{1}{x^{2014}} = ?$$

(1) 0 (2) 1
(3) –1 (4) 2

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

134. If $a = 331$, $b = 336$ and $c = -667$, then the value of $a^3 + b^3 + c^3 - 3abc$ is

(1) 1 (2) 6
(3) 3 (4) 0

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

135. If $a = 4.965$, $b = 2.343$ and $c = 2.622$, then the value of $a^3 - b^3 - c^3 - 3abc$ is

(1) –2 (2) –1
(3) 0 (4) 9.93

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

136. If $x + y + z = 0$, then the value of $\frac{x^2 + y^2 + z^2}{x^2 - yz}$ is

(1) –1 (2) 0
(3) 1 (4) 2

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

137. If $x + \frac{1}{x} = 0$, then the value of $x^5 + \frac{1}{x^5}$ is

(1) 2 (2) – 1
(3) 1 (4) 0

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

138. If $a^2 + b^2 + c^2 - ab - bc - ca = 0$, then

(1) $a = b = c$ (2) $a \neq b = c$
(3) $a = b \neq c$ (4) $a \neq b \neq c$

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

139. If $x^4 + \frac{1}{x^4} = 119$, then the values of $x^3 + \frac{1}{x^3}$ are

(1) $\pm 10\sqrt{13}$ (2) $\pm \sqrt{13}$

(3) $\pm 16\sqrt{13}$ (4) $\pm 13\sqrt{13}$

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

140. If $x + \frac{1}{x} = \sqrt{3}$, then the value of $x^{30} + x^{24} + x^{18} + x^{12} + x^6 + 1$ is

(1) $\sqrt{3}$ (2) $-\sqrt{3}$

(3) 1 (4) 0

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

141. If $m + n = -2$, then the value of $m^3 + n^3 - 6mn$ is

(1) 8 (2) 4
(3) –8 (4) –4

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

142. If $u_n = \frac{1}{n} - \frac{1}{n+1}$ then the value of $u_1 + u_2 + u_3 + u_4 + u_5$ is

(1) $\frac{1}{2}$ (2) $\frac{1}{3}$

(3) $\frac{2}{5}$ (4) $\frac{5}{6}$

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

143. If $x = 5$, $y = 6$ and $z = -11$, then the value of $x^3 + y^3 + z^3$ is

(1) –890 (2) –970
(3) –870 (4) –990

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

144. If $p + m = 6$ and $p^3 + m^3 = 72$, then the value of pm is

(1) 6 (2) 12

(3) 9 (4) 8

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

145. If average of two numbers x and $\frac{1}{x}$ (where $x \neq 0$) is A, what will be the average of x^3 and $\frac{1}{x^3}$?

(1) $4A^3 - 2A$ (2) $4A^3 - 3A$

(3) $4A^3 - 4A$ (4) $4A^3 - A$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

146. If $a = 2 + \sqrt{3}$, then the value of $\frac{a^6 + a^4 + a^2 + 1}{a^3}$ is

(1) 45 (2) 65
(3) 42 (4) 56

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

147. If $x = \sqrt{5} + \sqrt{3}$ and $y = \sqrt{5} - \sqrt{3}$, then the value of $(x^4 - y^4)$ is

(1) $64\sqrt{15}$ (2) 16
(3) 544 (4) $32\sqrt{15}$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

148. If $x + y + z = 6$, then the value of $(x - 1)^3 + (y - 2)^3 + (z - 3)^3$ is

(1) $3(x - 1)(y - 2)(z - 3)$
(2) $3xyz$
(3) $(x - 1)(y - 2)(z - 3)$
(4) $2(x - 1)(y - 2)(z - 3)$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

149. If $p^4 = 119 - \frac{1}{p^4}$, then the value of $p^3 - \frac{1}{p^3}$ is

(1) 24 (2) 32
(3) 36 (4) 18

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

150. If $x + \left(\frac{1}{x}\right) = 2$, then the value of $x^7 + \left(\frac{1}{x^5}\right)$ is

(1) 2^{12} (2) 2
(3) 2^5 (4) 2^7

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

151. If $x = 332$, $y = 333$, $z = 335$, then the value of $x^3 + y^3 + z^3 - 3xyz$ is

(1) 10000 (2) 7000
(3) 8000 (4) 9000

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

152. If $m = -4$, $n = -2$, then the value of $m^3 - 3m^2 + 3m + 3n + 3n^2 + n^3$ is

(1) – 126 (2) 124
(3) – 124 (4) 126

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

153. If $x + \frac{1}{x} = 2$ then the value of $x^{12} - \frac{1}{x^{12}}$ is

(1) 2 (2) – 4
(3) 0 (4) 4

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

154. Given that $x^3 + y^3 = 72$ and $xy = 6$ with $x > y$. Then the value of $(x - y)$ is

(1) 4 (2) – 4
(3) 2 (4) – 2

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

155. If $x = 2$ then the value of $x^3 + 27x^2 + 243x + 631$ is

(1) 1233 (2) 1211
(3) 1231 (4) 1321

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

156. If $\frac{x^{24} + 1}{x^{12}} = 7$ then the value of $\frac{x^{72} + 1}{x^{36}}$ is

(1) 433 (2) 322
(3) 343 (4) 432

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

157. The HCF of $x^8 - 1$ and $x^4 + 2x^3 - 2x - 1$ is :

(1) $x^2 + 1$ (2) $x^2 - 1$
(3) $x + 1$ (4) $x - 1$

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

158. If $x^2 + y^2 + z^2 = 2(x + z - 1)$, then the value of :
$x^3 + y^3 + z^3 = ?$

(1) 2 (2) 0
(3) –1 (4) 1

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

159. If $x^2 + x = 5$ then the value of $(x + 3)^3 + \frac{1}{(x+3)^3}$ is :

(1) 140 (2) 110
(3) 130 (4) 120

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

160. If $x = z = 225$ and $y = 226$ then the value of :
$x^3 + y^3 + z^3 - 3xyz$ is

(1) 765 (2) 676
(3) 576 (4) 674

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

161. If $4a - \frac{4}{a} + 3 = 0$ then the value of : $a^3 - \frac{1}{a^3} + 3 = ?$

(1) $\frac{3}{16}$ (2) $\frac{7}{16}$
(3) $\frac{21}{64}$ (4) $\frac{21}{16}$

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

162. If $a + b - c = 0$ then the value of $2b^2c^2 + 2c^2a^2 + 2a^2b^2 - a^4 - b^4 - c^4$

(1) 7 (2) 0
(3) 14 (4) 28

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

163. If $\frac{p^2}{q^2} + \frac{q^2}{p^2} = 1$, then the value of $(p^6 + q^6)$ is

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CGL Tier-I Re-Exam, 30.08.2015)

164. If $(m + 1) = \sqrt{n} + 3$, the value of $\frac{1}{2}\left(\frac{m^3 - 6m^2 + 12m - 8}{\sqrt{n}} - n\right)$ is

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CGL Tier-I Re-Exam, 30.08.2015)

165. If $(3x - 2y) : (2x + 3y) = 5 : 6$, then one of the values of

$$\left(\frac{\sqrt[3]{x}+\sqrt[3]{y}}{\sqrt[3]{x}-\sqrt[3]{y}}\right)^2 \text{ is}$$

(1) $\frac{1}{5}$ (2) 5

(3) 25 (4) $\frac{1}{25}$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

166. If $a - \frac{1}{a-3} = 5$, then the value of $(a-3)^3 - \frac{1}{(a-3)^3}$ is

(1) 5 (2) 7

(3) 2 (4) 14

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

167. If $\left(\frac{p^{-1}q^2}{p^3q^{-2}}\right)^{\frac{1}{3}} \div \left(\frac{p^6\ q^{-3}}{p^{-2}q^3}\right)^{\frac{1}{3}} = p^a q^b$, then the value of $a + b$, where p and q are different positive primes, is

(1) –1 (2) 2

(3) 1 (4) 0

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

168. If $a + b = 1$, find the value of $a^3 + b^3 - ab - (a^2 - b^2)^2$.

(1) –1 (2) 1

(3) 0 (4) 2

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

169. If $x = a^{\frac{1}{2}} + a^{-\frac{1}{2}}$, $y = a^{\frac{1}{2}} - a^{-\frac{1}{2}}$ then value of $(x^4 - x^2y^2 - 1) + (y^4 - x^2y^2 + 1)$ is

(1) 16 (2) 13

(3) 12 (4) 14

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

170. If $x^2 + y^2 + z^2 = xy + yz + zx$, then the value of

$$\frac{3x^4+7y^4+5z^4}{5x^2y^2+7y^2z^2+3z^2x^2} \text{ is}$$

(1) 2 (2) 1

(3) 0 (4) –1

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

171. If $x - \sqrt{3} - \sqrt{2} = 0$ and $y - \sqrt{3} + \sqrt{2} = 0$, then the value of $\left(x^3 - 20\sqrt{2}\right) - \left(y^3 + 20\sqrt{2}\right)$ is

(1) 0 (2) 1

(3) 3 (4) 2

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

172. If $p^3 - q^3 = (p-q)\ \{(p-q)^2 - xpq\}$, then find the value of x

(1) 3 (2) –3

(3) 1 (4) –1

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

173. If $x + y + z = 6$ and $xy + yz + zx = 10$ then the value of $x^3 + y^3 + z^3 - 3xyz$ is :

(1) 36 (2) 48

(3) 42 (4) 40

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

174. If $x - \frac{1}{x} = 2$, then the value of $x^3 - \frac{1}{x^3}$ is :

(1) 15 (2) 2

(3) 14 (4) 11

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

175. If $a^2 + a + 1 = 0$, then the value of $a^5 + a^4 + 1$ is :

(1) a^2 (2) 1

(3) 0 (4) $a + 1$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

176. If $x = a\ (b - c)$, $y = b\ (c - a)$, $z = c\ (a - b)$, then the value of

$$\left(\frac{x}{a}\right)^3 + \left(\frac{y}{b}\right)^3 + \left(\frac{z}{c}\right)^3 \text{ is :}$$

(1) $\frac{2xyz}{abc}$ (2) $\frac{xyz}{abc}$

(3) 0 (4) $\frac{3xyz}{abc}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

177. If $x = y = z$, then $\frac{(x+y+z)^2}{x^2+y^2+z^2}$ is equal to

(1) 4 (2) 2

(3) 3 (4) 1

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

178. The simplified value of following is :

$$\left(\frac{3}{15}a^5b^6c^3 \times \frac{5}{9}ab^5c^4\right) \div \frac{10}{27}a^2bc^3$$

(1) $\frac{9a^2bc^4}{10}$ (2) $\frac{3ab^4c^3}{10}$

(3) $\frac{3a^4b^{10}c^4}{10}$ (4) $\frac{1a^4b^4c^{10}}{10}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

179. If $(2a-1)^2 + (4b-3)^2 + (4c+5)^2 = 0$, then the value of $\frac{a^3+b^3+c^3-3abc}{a^2+b^2+c^2}$ is

(1) $1\frac{3}{8}$ (2) $2\frac{3}{8}$

(3) $3\frac{3}{8}$ (4) 0

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

180. If $x + \frac{1}{x} = 3$, then the value of $x^5 + \frac{1}{x^5}$ is

(1) 110 (2) 132

(3) 122 (4) 123

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

181. When $2x + \frac{2}{x} = 3$, then value of $\left(x^3 + \frac{1}{x^3} + 2\right)$ is

(1) $\frac{2}{7}$ (2) $\frac{7}{8}$

(3) $\frac{7}{2}$ (4) $\frac{8}{7}$

(SSC CGL Tier-I (CBE) Exam.10.09.2016)

182. If $x = \sqrt[3]{x^2+11} - 2$, then the value of $(x^3 + 5x^2 + 12x)$ is
(1) 0 (2) 3
(3) 7 (4) 11
(SSC CGL Tier-I (CBE) Exam.10.09.2016)

183. If x, y, and z are real numbers such that $(x-3)^2 + (y-4)^2 + (z-5)^2 = 0$ then, $(x + y + z)$ is equal to
(1) –12 (2) 0
(3) 8 (4) 12
(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

184. If $(x - 4)(x^2 + 4x + 16) = x^3 - p$, then p is equal to
(1) 27 (2) 8
(3) 64 (4) 0
(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

185. The simplified value of
$$\left(1-\frac{2xy}{x^2+y^2}\right) \div \left(\frac{x^3-y^3}{x-y} - 3xy\right) \text{ is}$$
(1) $\frac{1}{x^2-y^2}$ (2) $\frac{1}{x^2+y^2}$
(3) $\frac{1}{x-y}$ (4) $\frac{1}{x+y}$
(SSC CGL Tier-II Online Exam.01.12.2016)

186. If $a + b + c = 0$ then the value of
$$\frac{1}{(a+b)(b+c)} + \frac{1}{(b+c)(c+a)} + \frac{1}{(c+a)(a+b)} \text{ is}$$
(1) 0 (2) 1
(3) 3 (4) 2
(SSC CGL Tier-II Online Exam.01.12.2016)

187. If $x^2 + y^2 + 2x + 1 = 0$, then the value of $x^{31} + y^{35}$ is
(1) –1 (2) 0
(3) 1 (4) 2
(SSC CGL Tier-II Online Exam.01.12.2016)

188. If $\left(x - \frac{1}{x}\right)^2 = 3$, then the value of $\left(x^6 + \frac{1}{x^6}\right)$ equals
(1) 90 (2) 100
(3) 110 (4) 120
(SSC CGL Tier-II Online Exam.01.12.2016)

189. If $x^4 + 2x^3 + ax^2 + bx + 9$ is a perfect square, where a and b are positive real numbers, then the values of a and b are
(1) $a = 5, b = 6$
(2) $a = 6, b = 7$
(3) $a = 7, b = 6$
(4) $a = 7, b = 8$
(SSC CGL Tier-II Online Exam.01.12.2016)

190. If $a^2 + b^2 + c^2 = 16$, $x^2 + y^2 + z^2 = 25$ and $ax + by + cz = 20$, then the value of $\frac{a+b+c}{x+y+z}$ is
(1) $\frac{3}{5}$ (2) $\frac{5}{3}$
(3) $\frac{4}{5}$ (4) $\frac{5}{4}$
(SSC CGL Tier-II Online Exam.01.12.2016)

191. The value of x which satisfies the equation $\frac{x+a^2+2c^2}{b+c} + \frac{x+b^2+2a^2}{c+a} + \frac{x+c^2+2b^2}{a+b} = 0$ is
(1) $(a^2 + b^2 + c^2)$
(2) $-(a^2 + b^2 + c^2)$
(3) $(a^2 + 2b^2 + c^2)$
(4) $-(a^2 + b^2 + 2c^2)$
(SSC CGL Tier-II Online Exam.01.12.2016)

192. If $a^3 = 117 + b^3$ and $a = 3 + b$, then the value of $(a + b)$ is :
(1) ± 7 (2) ± 49
(3) ± 13 (4) 0
(SSC CGL Tier-II Online Exam.01.12.2016)

193. If $\left(a + \frac{1}{a}\right) = -2$, then the value of $a^{1000} + a^{-1000}$ is
(1) 2 (2) 0
(3) 1 (4) $\frac{1}{2}$
(SSC CGL Tier-II Online Exam.01.12.2016)

194. If $a^2 = b + c$, $b^2 = a + c$, $c^2 = b + a$, then what will be the value of
$$\frac{1}{a+1} + \frac{1}{b+1} + \frac{1}{c+1}?$$
(1) –1 (2) 2
(3) 1 (4) 0
(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

195. If a, b, c and d satisfy the equations
$a + 7b + 3c + 5d = 0$,
$8a + 4b + 6c + 2d = -4$
$2a + 6b + 4c + 8d = 4$,
$5a + 3b + 7c + d = -4$,
then $(a + d)/(b + c) = ?$
(1) 0 (2) 1
(3) –1 (4) –4
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

196. If $\frac{x}{(b-c)(b+c-2a)} = \frac{y}{(c-a)(c+a-2b)} = \frac{z}{(a-b)(a+b-2c)}$ then $(x + y + z)$ is
(1) $a + b + c$ (2) 0
(3) $a^2 + b^2 + c^2$ (4) 2
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

197. If $a + \frac{1}{a} = 3$ then $a^3 + 1\frac{1}{a^3}$ is
(1) 27 (2) 24
(3) 19 (4) 25
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

198. If $c + \frac{1}{c} = 3$, then the value of $(c - 3)^7 + \frac{1}{c^7}$ is
(1) 2 (2) 0
(3) 3 (4) 1
(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

199. If $x = \sqrt[3]{7} + 3$ then the vlaue of $x^3 - 9x^2 + 27x - 34$ is :
(1) 0 (2) 1
(3) 2 (4) –1
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

200. If $p(x + y)^2 = 5$ and $q(x - y)^2 = 3$, then the simplified value of $p^2(x + y)^2 + 4pq\,xy - q^2(x - y)^2$ is :
(1) $-(p + q)$ (2) $2(p + q)$
(3) $p + q$ (4) $-2(p + q)$
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

201. If $x + \frac{1}{x} = -2$ then the vlaue of $x^p + x^q$ is :
(where p is an even number and q is an odd number)
(1) –2 (2) 2
(3) 1 (4) 0
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

202. If $(2a - 3)^2 + (3b + 4)^2 + (6c + 1)^2 = 0$, then the value of $\frac{a^3 + b^3 + c^3 - 3abc}{a^2 + b^2 + c^2} + 3$ is :
(1) $abc + 3$ (2) 6
(3) 0 (4) 3
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

203. If $a + b + c = 1$, $ab + bc + ca = -1$ and $abc = -1$, then the value of $a^3 + b^3 + c^3$ is :
(1) 1 (2) –1
(3) 2 (4) –2
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

204. If for a non–zero x, $3x^2 + 5x + 3 = 0$, then the value of $x^3 + \frac{1}{x^3}$ is :
(1) $\frac{10}{27}$ (2) $-\left(\frac{10}{27}\right)$
(3) $\frac{2}{3}$ (4) $-\left(\frac{2}{3}\right)$
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

205. What will be the value of $x^3 + y^3 + z^3 - 3xyz$ when $x + y + z = 9$ and $x^2 + y^2 + z^2 = 31$?
(1) 27 (2) 3
(3) 54 (4) 9
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

206. What is
$$\frac{(x^2 - y^2)^3 + (y^2 - z^2)^3 + (z^2 - x^2)^3}{(x - y)^3 + (y - z)^3 + (z - x)^3}$$
(1) $\frac{(x + y)(y + z)}{(x + z)}$
(2) $(x + y)^3 (y + z)^3 (z + x)^3$
(3) $(x + y)(y + z)(z + x)$
(4) $(x + y)(y + z)$
(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

207. If $\frac{x^3 + 3y^2x}{y^3 + 3x^2y} = \frac{35}{19}$, what is $\frac{x}{y}$ =
(1) $\frac{7}{6}$ (2) $\frac{5}{6}$
(3) $\frac{5}{1}$ (4) $\frac{7}{1}$
(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

208. Given $(a - b) = 2$, $(a^3 - b^3) = 26$ then $(a + b)^2$ is
(1) 9 (2) 4
(3) 16 (4) 12
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

209. If $x + y + z = 9$ then the value of $(x - 4)^3 + (y - 2)^3 + (z - 3)^3 - 3(x - 4)(y - 2)(z - 3)$ is
(1) 6 (2) 9
(3) 0 (4) 1
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

210. If $a = 2$, $b = -3$ then the value of $27a^3 - 54a^2b + 36ab^2 - 8b^3$ is
(1) 1562 (2) 1616
(3) 1676 (4) 1728
(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

211. If $a^3 + \frac{1}{a^3} = 2$, then value of $\frac{a^2 + 1}{a}$ is (a is a positive number.)
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

212. If $pq(p + q) = 1$, then the value of $\frac{1}{p^3q^3} - p^3 - q^3$ is equal to
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

213. If $x + \frac{1}{x} = \sqrt{3}$, then the value of $x^3 + \frac{1}{x^3}$ is equal to
(1) 1 (2) $3\sqrt{3}$
(3) 0 (4) 3
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

214. If $\frac{a}{b} + \frac{b}{a} = 1$, the value of $a^3 + b^3$ is equal to
(1) 0 (2) 1
(3) 2 (4) 3
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

215. If $l + m + n = 9$ and $l^2 + m^2 + n^2 = 31$, then the value of $(lm + mn + nl)$ will be
(1) 22 (2) 50
(3) 25 (4) –25
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

216. If $\left(x + \frac{1}{x}\right)^2 = 3$, then the value of $\left(x^3 + \frac{1}{x^3}\right)$ is
(1) 0 (2) 1
(3) 2 (4) –1
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

217. If $x = \frac{3}{2}$, then the value of $27x^3 - 54x^2 + 36x - 11$ is
(1) $11\frac{3}{8}$ (2) $11\frac{5}{8}$
(3) $12\frac{3}{8}$ (4) $12\frac{5}{8}$
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

218. If $a + b + c = 6$ and $ab + bc + ca = 11$, then the value of $bc(b + c) + ca(c + a) + ab(a + b) + 3abc$ is
(1) 33 (2) 66
(3) 55 (4) 23
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

219. If $\left(a + \frac{1}{a}\right)^2 = 3$, then the value of $a^6 - \frac{1}{a^6}$ will be
(1) 1 (2) 3
(3) 0 (4) 2
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

220. If $m + n = 1$, then the value of $m^3 + n^3 + 3mn$ is equal to
(1) 0 (2) 1
(3) 2 (4) 3
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

221. If $x^4 + \frac{1}{x^4} = 119$, then the value of $\left(x - \frac{1}{x}\right)$ is

(1) 6 (2) 12
(3) 11 (4) 3

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

222. If $x^3 + \frac{1}{x^3} = 110$, then find the value of $x + \frac{1}{x}$.

(1) 2 (2) 3
(3) 4 (4) 5

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

223. If $x^2 + y^2 + z^2 = 14$ and $xy + yz + zx = 11$, then the value of $(x + y + z)^2$ is

(1) 16 (2) 25
(3) 36 (4) 49

(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

224. If $x = \sqrt[3]{28}$, $y = \sqrt[3]{27}$, then the value of $x + y - \frac{1}{x^2 + xy + y^2}$ is

(1) 8 (2) 7
(3) 6 (4) 5

(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

225. If $x = 12$ and $y = 4$, then the value of $(x + y)^{\frac{x}{y}}$ is

(1) 48 (2) 1792
(3) 4096 (4) 570

(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

226. If $2x + \frac{2}{x} = 3$, then the value of $x^3 + \frac{1}{x^3} + 2$ is

(1) $\frac{3}{4}$ (2) $\frac{4}{5}$
(3) $\frac{5}{8}$ (4) $\frac{7}{8}$

(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

227. If $a + b = 3$, then the value of $a^3 + b^3 + 9ab - 27$ is

(1) 24 (2) 25
(3) 0 (4) 27

(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

228. If $x + \frac{1}{x} = 2$, then the value of $x^2 + \frac{2}{x^6}$ is equal to ?

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

229. If $\frac{a}{b} + \frac{b}{a} = 1$, then the value of $a^3 + b^3$ will be

(1) 1 (2) 0
(3) –1 (4) 2

(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

230. If $a - b = 1$ and $a^3 - b^3 = 61$, then the value of ab will be

(1) –20 (2) 20
(3) 30 (4) 60

(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

231. If $p^3 - q^3 = (p - q)\{(p + q)^2 - x\,p\,q\}$ then the value of x is

(1) 1 (2) –1
(3) 2 (4) –2

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

232. If $a^2 = by + cz$, $b^2 = cz + ax$, $c^2 = ax + by$, then the value of $\frac{x}{a + x} + \frac{y}{b + y} + \frac{z}{c + z}$ is

(1) 1 (2) $a + b + c$
(3) $\frac{1}{a} + \frac{1}{b} + \frac{1}{c}$ (4) 0

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

233. If $p^3 - q^3 = (p - q)\{(p - q)^2 + x\,p\,q\}$ then value of x is

(1) 1 (2) –1
(3) 3 (4) 2

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

234. If $\left(a + \frac{1}{a}\right)^2 = 3$, then the value of $a^{18} + a^{12} + a^6 + 1$ is

(1) 3 (2) 1
(3) 0 (4) 2

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

235. If $x + 5 + \frac{1}{x+1} = 6$, then the value of $(x + 1)^3 + \frac{1}{(x+1)^3}$ is

(1) 2 (2) 0
(3) –2 (4) 4

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

236. If $a + b + c = 15$ and $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = \frac{71}{abc}$, then the value of $a^3 + b^3 + c^3 - 3abc$ is

(1) 160 (2) 180
(3) 200 (4) 220

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

237. If k is the largest possible real number such that $p^4 + q^4 = (p^2 + kpq + q^2)(p^2 - kpq + q^2)$, then the value of k is

(1) 1 (2) $-\sqrt{2}$
(3) 2 (4) $\sqrt{2}$

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

238. A complete factorisation of $(x^4 + 64)$ is

(1) $(x^2 + 8)^2$
(2) $(x^2 + 8)(x^2 - 8)$
(3) $(x^2 - 4x + 8)(x^2 - 4x - 8)$
(4) $(x^2 + 4x + 8)(x^2 - 4x + 8)$

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

239. If $a + b = 1$, then $a^4 + b^4 - a^3 - b^3 - 2a^2b^2 + ab$ is equal to

(1) 1 (2) 2
(3) 4 (4) 0

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

240. If $a = 299$, $b = 298$, $c = 297$ then the value of $2a^3 + 2b^3 + 2c^3 - 6abc$ is

(1) 5154 (2) 5267
(3) 5364 (4) 5456

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

241. If $x + \frac{1}{x} = \sqrt{3}$ the value of $(x^{18} + x^{12} + x^6 + 1)$ is

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

242. If $x = 1 + \sqrt{2} + \sqrt{3}$, then the value of $(2x^4 - 8x^3 - 5x^2 + 26x - 28)$ is

(1) $2\sqrt{2}$ (2) $3\sqrt{3}$
(3) $5\sqrt{5}$ (4) $6\sqrt{6}$

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

243. If $x + y = 1 + xy$, then $x^3 + y^3 - x^3y^3$ is equal to :

(1) 0 (2) 1
(3) –1 (4) 2

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

244. If $p = 3 + \frac{1}{p}$, the value of $\left(p^4 + \frac{1}{p^4}\right)$ is :

(1) 81 (2) 27
(3) 120 (4) 119

(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (IST Sitting)

245. If $x^2 - xy + y^2 = 2$ and $x^4 + x^2y^2 + y^4 = 6$, then the value of $(x^2 + xy + y^2)$ is :

(1) 1 (2) 12
(3) 3 (4) 36

(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (IST Sitting)

246. If $\left(a + \frac{1}{a}\right)^2 = 3$, the value of $\left(a^3 + \frac{1}{a^3}\right)$ is :

(1) 0 (2) $3\left(a + \frac{1}{a}\right)$
(3) $3\left(a^2 + \frac{1}{a^2}\right)$
(4) 1

(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (IST Sitting)

247. If $\frac{a^2 + b^2}{c^2} = \frac{b^2 + c^2}{a^2} = \frac{c^2 + a^2}{b^2} = \frac{1}{k}$, $(k \neq 0)$ then $k = ?$

(1) 2 (2) 1
(3) 0 (4) $\frac{1}{2}$

(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (IST Sitting)

248. If $\left(2x + \frac{2}{9x}\right) = 4$, then the value of $\left(27x^3 + \frac{1}{27x^3}\right)$ is :

(1) 180 (2) 198
(3) 234 (4) 252

(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (IST Sitting)

249. If $xy(x + y) = m$, then the value of $(x^3 + y^3 + 3m)$ is :

(1) $\frac{m^3}{xy}$ (2) $\frac{m^3}{(x+y)^3}$
(3) $\frac{m^3}{x^3y^3}$ (4) mx^3y^3

(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

250. If $p + \frac{1}{p+2} = 1$, then the value of $(p + 2)^3 + \frac{1}{(p+2)^3} - 3$ is :

(1) 12 (2) 16
(3) 18 (4) 15

(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

251. If $\left(x + \frac{1}{x}\right) \neq 0$ and $\left(x^3 + \frac{1}{x^3}\right) = 0$ then the value $\left(x + \frac{1}{x}\right)^4$ is

(1) 9 (2) 12
(3) 15 (4) 16

(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

252. If $2x - \frac{2}{x} = 1 (x \neq 0)$, then the value of $\left(x^3 - \frac{1}{x^3}\right)$ is

(1) $\frac{13}{4}$ (2) $\frac{13}{8}$
(3) $\frac{17}{4}$ (4) $\frac{17}{8}$

(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

253. Sum of the factors of $4b^2c^2 - (b^2 + c^2 - a^2)^2$ is :

(1) $a + b + c$ (2) $2(a + b + c)$
(3) 0 (4) 1

(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

254. If $(4a - 3)^2 = 0$, then the value of $64a^3 - 48a^2 + 12a + 13$ is :

(1) 0 (2) 11
(3) 22 (4) 33

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

255. If $a = 101$, then the value of $a(a^2 - 3a + 3)$ is :

(1) 1000000 (2) 1010101
(3) 1000001 (4) 999999

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

256. If $\left(x + \frac{1}{x}\right) = -2$, then the value of $\left(x^7 + \frac{1}{x^7}\right)$ is

(1) 1 (2) –1
(3) 0 (4) –2

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

257. If $a^2 + b^2 + c^2 = 14$ and $a + b + c = 6$, then the value of $(ab + bc + ca)$ is,

(1) 11 (2) 12
(3) 13 (4) 14

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

258. If $\frac{a}{b} + \frac{b}{a} = 1$, then the value of $(a^3 + b^3)$ is :

(1) 1 (2) 0
(3) –1 (4) 2

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

259. If $(a + b) = 5$, then the value of $(a - 3)^7 + (b - 2)^7$ is :

(1) 2^7 (2) 3^7
(3) 1 (4) 0

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

260. If $(x^2 - 2x + 1) = 0$, then the value of $\left(x^4 + \frac{1}{x^4}\right)$ is :

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

261. If $a^2 + b^2 + c^2 = 83$ and $a + b + c = 15$, then the value of $(ab + bc + ca)$ is :

(1) 69 (2) 70
(3) 71 (4) 72

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

262. If $m - n = 2$ and $mn = 15$, $(m, n > 0)$ then the value of $(m^2 - n^2)(m^3 - n^3)$ is :

(1) 1856 (2) 1658
(3) 1586 (4) 1568

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

263. If $xy + yz + zx = 1$, then the value of $\frac{1 + y^2}{(x + y)(y + z)}$ is :

(1) 2 (2) 3
(3) 4 (4) 1

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

264. If $x^2 - 4x + 1 = 0$, then the value of $\left(\frac{x^6 + 1}{x^3}\right)$ is :

(1) 48 (2) 52
(3) 55 (4) 58

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

265. If $x = a + \frac{1}{a}$ and $y = a - \frac{1}{a}$, then the value of $x^4 + y^4 - 2x^2y^2$ is :
(1) 4 (2) 8
(3) 16 (4) 64
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

266. If $a^3 - b^3 = 56$ and $a - b = 2$, what is the value of $(a^2 + b^2)$?
(1) 12 (2) 20
(3) 28 (4) 32
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

267. If $x + y + z = 1$, $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$ and $xyz = -1$, then $x^3 + y^3 + z^3$ is equal to
(1) –1 (2) 1
(3) –2 (4) 2
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

268. If $\frac{1}{a}(a^2 + 1) = 3$, then the value of $\left(\frac{a^6+1}{a^3}\right)$ is :
(1) 9 (2) 18
(3) 27 (4) 1
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

269. The third proportional of the following numbers $(x - y)^2$, $(x^2 - y^2)^2$ is :
(1) $(x + y)^3 (x - y)^2$
(2) $(x + y)^4 (x - y)^2$
(3) $(x + y)^2 (x - y)^2$
(4) $(x + y)^2 (x - y)^3$
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

270. If $(x - 5)^2 + (y - 2)^2 + (z - 9)^2 = 0$, then value of $(x + y - z)$ is :
(1) 16 (2) – 1
(3) – 2 (4) 12
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

271. If $\left(x + \frac{1}{x}\right) = 3$ then $\left(x^8 + \frac{1}{x^8}\right)$ is equal to
(1) 2201 (2) 2203
(3) 2207 (4) 2213
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

272. If $x = 999$, $y = 1000$, $z = 1001$, then the value of
$$\frac{x^3 + y^3 + z^3 - 3xyz}{x - y + z} \text{ is :}$$
(1) 1000 (2) 9000
(3) 1 (4) 9
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

273. If $a + b + c = 0$, then the value of $(a^3 + b^3 + c^3)$ is
(1) abc (2) $2abc$
(3) $3abc$ (4) 0
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

274. If, $\frac{1}{p} + \frac{1}{q} = \frac{1}{p+q}$, then the value of $(p^3 - q^3)$ is
(1) $p - q$ (2) pq
(3) 1 (4) 0
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

275. If $x = 93$, $y = 93$, $z = 94$ then the value of $(x^2 - y^2 + 10xz + 10yz)$ is
(1) 104784 (2) 147840
(3) 174840 (4) 184740
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

276. If $x = 222$, $y = 223$, $z = 225$ then the value of $(x^3 + y^3 + z^3 + 3xyz)$ is :
(1) 4590 (2) 4690
(3) 4950 (4) 4960
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

277. If $\frac{a}{b} + \frac{b}{a} = 1$, then the value of $a^3 + b^3 - 2$ is
(1) 0 (2) –2
(3) –1 (4) 2
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

278. If $x + \frac{1}{x} = \sqrt{3}$, then the value of $\left(x^3 + \frac{1}{x^3}\right)$ is :
(1) $\sqrt{3}$ (2) $\frac{1}{\sqrt{3}}$
(3) 0 (4) 1
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

279. If $a + b = 3$, then the value of $a^3 + b^3 + 9ab$ is :
(1) 27 (2) 9
(3) 16 (4) 81
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

280. If $6x^2 - 12x + 1 = 0$, then the value of $27x^3 + \frac{1}{8x^3}$ is
(1) 162 (2) 189
(3) 207 (4) 225
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

281. If $x^2 + \frac{1}{x^2} = 98$ $(x > 0)$, then the value of $\left(x^3 + \frac{1}{x^3}\right)$ is
(1) 970 (2) 1030
(3) –970 (4) –1030
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

282. If $x = y + z$ then $x^3 - y^3 - z^3$ is
(1) 0 (2) $3xyz$
(3) $-3xyz$ (4) 1
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

283. If $x = 11$, the value of $x^5 - 12x^4 + 12x^3 - 12x^2 + 12x - 1$ is
(1) 11 (2) 10
(3) 12 (4) –10
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

284. If x, y, z are the three factors of $a^3 - 7a - 6$, then value of $(x + y + z)$ will be
(1) $3a$ (2) 3
(3) 6 (4) a
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–III

1. If $(2^x)(2^y) = 8$ and $(9^x)(3^y) = 81$, then (x, y) is :
(1) (1,2) (2) (2, 1)
(3) (1,1) (4) (2, 2)
FCI Assistant Grade-III Exam.05.02.2012 (Paper-I) East Zone (IInd Sitting)

2. The lines $2x + y = 5$ and $x + 2y = 4$ intersect at the point :
(1) (1,2) (2) (2,1)
(3) $(\frac{5}{2}, 0)$ (4) (0,2)
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

3. The graph of the linear equation $3x + 4y = 24$ is a straight line intersecting x-axis and y-axis at the points A and B respectively. P(2, 0) and Q $\left(0, \frac{3}{2}\right)$ are two points on the sides OA and OB respectively of Δ OAB, where O is the origin of the co-ordinate system. Given that AB = 10 cm, then PQ =
(1) 20 cm (2) 2.5 cm
(3) 40 cm (4) 5 cm
(SSC Graduate Level Tier-II Exam. 16.09.2012)

4. The length of the intercept of the graph of the equation $9x - 12y = 108$ between the two axes is
(1) 15 units (2) 9 units
(3) 12 units (4) 18 units
(SSC Graduate Level Tier-II Exam. 16.09.2012)

5. The x-intercept on the graph of $7x - 3y = 2$ is
(1) $\frac{3}{4}$ (2) $\frac{3}{7}$
(3) $\frac{2}{5}$ (4) $\frac{2}{7}$
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

6. If $2x + y = 6$ and $x = 2$ are two linear equations, then graph of two equations meet at a point :
(1) (2,0) (2) (0,2)
(3) (2,2) (4) (1,2)
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

7. An equation whose graph passes through the origin, out of the given equations $2x + 3y = 2$, $2x - 3y = 3$, $-2x + 3y = 5$ and $2x + 3y = 0$ is :
(1) $2x - 3y = 3$
(2) $-2x + 3y = 5$
(3) $2x + 3y = 0$
(4) $2x + 3y = 2$
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

8. If a linear equation is of the form $x = k$ where k is a constant, then graph of the equation will be
(1) a line parallel to x-axis
(2) a line cutting both the axes
(3) a line making positive acute angle with x-axis
(4) a line parallel to y-axis
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

9. The graph of the equation $2x - 3y = 6$ intersects the y-axis at the point
(1) (–2, 0) (2) (0, –2)
(3) (2, 3) (4) (2, –3)
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

10. The graph of the equations $25x + 75y = 225$ and $x = 9$ meet at the point
(1) (0,9) (2) (9,0)
(3) (3,0) (4) (0,3)
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

11. The area bounded by the lines $x = 0$, $y = 0$, $x + y = 1$, $2x + 3y = 6$ (in square units) is
(1) 2 (2) $2\frac{1}{3}$
(3) $2\frac{1}{2}$ (4) 3
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting

12. The graph of the equation $4x - 5y = 20$ intersects the x-axis at the point
(1) (2, 0) (2) (5, 0)
(3) (4, 5) (4) (0, 5)
(SSC Delhi Police S.I.(SI) Exam. 19.08.2012)

13. The graph of $2x + 1 = 0$ and $3y - 9 = 0$ intersect at the point
(1) $(-\frac{1}{2}, -3)$ (2) $(-\frac{1}{2}, 3)$
(3) $(\frac{1}{2}, -3)$ (4) None of these
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

14. An equation of the form $ax + by + c = 0$ where $a \neq 0$, $b \neq 0$, $c = 0$ represents a straight line which passes through
(1) (0, 0) (2) (3, 2)
(3) (2, 4) (4) None of these
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

15. The linear equation such that each point on its graph has an ordinate four times its abscissa is :
(1) $y + 4x = 0$ (2) $y = 4x$
(3) $x = 4y$ (4) $x + 4y = 0$
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

16. If the graph of the equations $3x + 2y = 18$ and $3y - 2x = 1$ intersect at the point (p, q), then the value of $p + q$ is
(1) 7 (2) 6
(3) 5 (4) 4
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

17. If the graph of the equations $x + y = 0$ and $5y + 7x = 24$ intersect at (m, n), then the value of $m + n$ is
(1) 2 (2) 1
(3) 0 (4) –1
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

18. The area of the triangle formed by the graph of $3x + 4y = 12$, x-axis and y-axis (in sq. units) is
(1) 4 (2) 12
(3) 6 (4) 8
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

19. Equation of the straight line parallel to x-axis and also 3 units below x-axis is :
(1) $x = -3$ (2) $y = 3$
(3) $y = -3$ (4) $x = 3$
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

20. The straight line $2x + 3y = 12$ passes through :
(1) 1st, 2nd and 3rd quadrant
(2) 1st, 2nd and 4th quadrant
(3) 2nd, 3rd and 4th quadrant
(4) 1st, 3rd and 4th quadrant
(SSC Graduate Level Tier-I Exam. 19.05.2013)

21. The graphs of $x = a$ and $y = b$ intersect at
(1) (a, b) (2) (b, a)
(3) $(-a, b)$ (4) $(a, -b)$
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

22. The area in sq. unit. of the triangle formed by the graphs of $x = 4$, $y = 3$ and $3x + 4y = 12$ is
(1) 12 (2) 8
(3) 10 (4) 6
(SSC CGL Tier-I Exam. 19.10.2014)

23. The equations
$3x + 4y = 10$
$-x + 2y = 0$
have the solution (a, b). The value of $a + b$ is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CGL Tier-I Exam. 19.10.2014)

24. Area of the triangle formed by the graph of the straight lines $x - y = 0$, $x + y = 2$ and the x– axis is
(1) 1 sq unit (2) 2 sq units
(3) 4 sq units (4) None of these
(SSC CGL Tier-II Exam. 21.09.2014)

25. If $2\left(x^2 + \frac{1}{x^2}\right) - \left(x - \frac{1}{x}\right) - 7 = 0$, then two values of x are
(1) 1, 2 (2) $2, -\frac{1}{2}$
(3) 0, 1 (4) $\frac{1}{2}, 1$
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

26. The total area (in sq. unit) of the triangles formed by the graph of $4x + 5y = 40$, x - axis, y - axis and $x = 5$ and $y = 4$ is

(1) 10 (2) 20
(3) 30 (4) 40

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

27. For what value of k, the system of equations $kx + 2y = 2$ and $3x + y = 1$ will be coincident ?

(1) 2 (2) 3
(3) 5 (4) 6

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

28. The area (in square units) of the triangle formed by the graphs of the equations $x = 4$, $y = 3$ and $3x + 4y = 12$; is

(1) 24 (2) 12
(3) 6 (4) 3

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9 and SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

29. If the ordinate and abscissa of the point $(k, 2k-1)$ be equal, then the value of k is

(1) 0 (2) – 1
(3) 1 (4) $\frac{1}{2}$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

30. The graph of $3x + 4y - 24 = 0$ forms a triangle OAB with the coordinate axes, where O is the origin. Also the graph of $x + y + 4 = 0$ forms a triangle OCD with the coordinate axes. Then the area of ΔOCD is equal to

(1) $\frac{1}{2}$ of area of ΔOAB
(2) $\frac{1}{3}$ of area of ΔOAB
(3) $\frac{2}{3}$ of area of ΔOAB
(4) the area of ΔOAB

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

31. The angle between the graph of the linear equation $239x - 239y + 5 = 0$ and the x – axis is

(1) 0° (2) 60°
(3) 30° (4) 45°

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

32. The length of the portion of the straight line $3x + 4y = 12$ intercepted between the axes is

(1) 5 (2) 3
(3) 4 (4) 7

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

33. $2x - ky + 7 = 0$ and $6x - 12y + 15 = 0$ has no solution for

(1) $k = -1$ (2) $k = -4$
(3) $k = 4$ (4) $k = 1$

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

34. Among the equations

$x + 2y + 9 = 0$; $5x - 4 = 0$; $2y - 13 = 0$; $2x - 3y = 0$, the equation of the straight line passing through origin is

(1) $2x - 3y = 0$
(2) $x + 2y + 9 = 0$
(3) $5x - 4 = 0$
(4) $2y - 13 = 0$

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

35. If the number of vertices, edges and faces of a rectangualr parallelopiped are denoted by v, e and f respectively, the value of $(v - e + f)$ is

(1) 0 (2) 2
(3) 4 (4) 1

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

36. The area of the triangle formed by the graphs of the equations $x = 0$, $2x + 3y = 6$ and $x + y = 3$ is :

(1) 3 sq. unit (2) $4\frac{1}{2}$ sq. unit
(3) $1\frac{1}{2}$ sq. unit (4) 1 sq. unit

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

37. If $5x + 9y = 5$ and $125x^3 + 729y^3 = 120$ then the vlaue of the product of x and y is

(1) $\frac{1}{9}$ (2) $\frac{1}{135}$
(3) 45 (4) 135

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

38. A point in the 4th quadrant is 6 unit away from x–axis and 7 unit away from y–axis. The point is at

(1) (7, –6) (2) (–7, 6)
(3) (–6, –7) (4) (–6, 7)

(SSC CGL Tier-I Re-Exam, 30.08.2015)

39. The straight line $y = 3x$ must pass through the point :

(1) (0, 0) (2) (0, 1)
(3) (1, 2) (4) (2, 0)

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

40. If (2, 0) is a solution of the linear equation $2x + 3y = k$, then the value of k is

(1) 6 (2) 5
(3) 2 (4) 4

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

41. The graph of linear equation $y = x$ passes through the point

(1) $\left(0, \frac{3}{2}\right)$ (2) (1, 1)
(3) $\left(-\frac{1}{2}, \frac{1}{2}\right)$ (4) $\left(\frac{3}{2}, -\frac{3}{2}\right)$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

42. What is the area of the region bounded by straight line $9x + 4y = 36$, x - axis and the y - axis ?

(1) 12 sq. units
(2) 18 sq. units
(3) 16 sq. units
(4) 15 sq. units

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

43. The slope of the given line is:

(1) Positive (2) Negative
(3) Undefined
(4) Zero

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

44. What is the area of the triangle formed by points (0,0), (3,4), (4,3) ?

(1) 4 units^2 (2) $\frac{7}{2}$ units^2

(3) $\frac{5}{2}$ units^2 (4) $\frac{5}{3}$ units^2

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

45. The area of a triangle with vertices A (0, 8) , O (0,0) and B (5, 0) is :

(1) 8 sq. units (2) 13 sq. units

(3) 20 sq. units (4) 40 sq. units

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

46. What is the equation of the line whose y-intercept is $\frac{-3}{4}$ and making an angle of 45° with the positive x-axis?

(1) $4x - 4y = 3$ (2) $4x - 4y = -3$

(3) $3x - 3y = 4$ (4) $3x - 3y = -4$

(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

47. In what ratio does the point T (3, 0) divide the segment joining the points S (4, –2) and U (1, 4)?

(1) 2 : 1 (2) 1 : 2

(3) 2 : 3 (4) 3 : 2

(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

48. P (4, (2) and R (–2, 0) are vertices of a rhombus PQRS. What is the equation of diagonal QS ?

(1) $x - 3y = -2$ (2) $3x + y = 4$

(3) $3x + y = -4$ (4) $x - 3y = 2$

(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

49. Point P is the midpoint of segment AB. Co-ordinates of point P are (2,1) and that of point A are (11,5). The co-ordinates of point B are

(1) (-7,-(3) (2) (6.5,(3)

(3) (7,(3) (4) (-6.5,-(3)

(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

TYPE–IV

1. If $\frac{a}{b} = \frac{2}{3}$ and $\frac{b}{c} = \frac{4}{5}$, then the ratio $\frac{a+b}{b+c}$ equal to :

(1) $\frac{20}{27}$ (2) $\frac{27}{20}$

(3) $\frac{6}{8}$ (4) $\frac{8}{6}$

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. If a : b = 2 : 3 and b : c = 4 : 5, find $a^2 : b^2 : bc$

(1) 4 : 9 : 45 (2) 16 : 36 : 45

(3) 16 : 36 : 20 (4) 4 : 36 : 40

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

3. If A : B $= \frac{1}{2} : \frac{3}{8}$,

B : C $= \frac{1}{3} : \frac{5}{9}$ and C : D $= \frac{5}{6} : \frac{3}{4}$

then the ratio A : B : C : D is

(1) 6 : 4 : 8 : 10

(2) 6 : 8 : 9 : 10

(3) 8 : 6 : 10 : 9

(4) 4 : 6 : 8 : 10

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. If x : y = 3 : 2, then the ratio $2x^2 + 3y^2 : 3x^2 - 2y^2$ is equal to :

(1) 12 : 5 (2) 6 : 5

(3) 30 : 19 (4) 5 : 3

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. If A : B : C = 2 : 3 : 4, then $\frac{A}{B} : \frac{B}{C} : \frac{C}{A}$ is equal to :

(1) 8 : 9 : 16 (2) 8 : 9 : 12

(3) 8 : 9 : 24 (4) 4 : 9 : 16

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

6. If A : B = 1 : 2. B : C = 3 : 4 and C : D = 5 : 6, find D : C : B : A

(1) 6 : 5 : 4 : 2

(2) 6 : 3 : 2 : 1

(3) 6 : 4 : 2 : 1

(4) 48 : 40 : 30 : 15

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

7. If $\frac{2a - 5b}{3a + 6b} = \frac{4}{7}$ then $a : b$ is equal to

(1) 21 : 36 (2) 2 : 59

(3) 59 : 2 (4) 36 : 21

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

8. If $\frac{a}{b} = \frac{7}{9}, \frac{b}{c} = \frac{3}{5}$, then the value of a : b : c is

(1) 7 : 9 : 15 (2) 7 : 9 : 5

(3) 21 : 35 : 45 (4) 7 : 3 : 15

(SSC CPO S.I.Exam.12.01.2003

9. If x : y = 7 : 3, then the value of $\frac{xy + y^2}{x^2 - y^2}$ is

(1) $\frac{3}{4}$ (2) $\frac{4}{3}$

(3) $\frac{3}{7}$ (4) $\frac{7}{3}$

(SSC CPO S.I.Exam.12.01.2003

10. If $\frac{3a + 5b}{3a - 5b} = 5$, then $a : b$ is equal to :

(1) 2 : 1 (2) 5 : 3

(3) 3 : 2 (4) 5 : 2

(SSC CPO S.I. Exam. 26.05.2005)

11. If $p : q = r : s = t : u = 2 : 3$, then $(mp + nr + ot) : (mq + ns + ou)$ equals :

(1) 3 : 2 (2) 2 : 3

(3) 1 : 3 (4) 1 : 2

(SSC CPO S.I.Exam.26.05.2005)

12. If $x : y = 3 : 4$, then $(7x + 3y) : (7x - 3y)$ is equal to :

(1) 5 : 2 (2) 4 : 3

(3) 11 : 3 (4) 37 : 19

(SSC CPO S.I. Exam. 26.05.2005)

13. If $a : b : c = (y - z) : (z - x) : (x - y)$ then the value of $ax + by + cz$ is

(1) 1 (2) 3

(3) 0 (4) –1

(SSC (South Zone) Investigator Exam. 12.09.2010)

14. If 50% of (p – q) =30% of (p + q), then p : q is equal to

(1) 5 : 3 (2) 4 : 1

(3) 3 : 5 (4) 1 : 4

(SSC (South Zone) Investigator Exam.12.09.2010)

15. If $x : y = 2 : 1$, then $(5x^2 - 13xy + 6y^2)$ is equal to

(1) $\frac{3}{4}$ (2) $\frac{4}{3}$

(3) 0 (4) $\frac{55}{4}$

(SSC CPO Sub-Inspector Exam. 12.12.2010 (Paper-I)

16. If $y : x = 4 : 15$, then the value of $\left(\frac{x-y}{x+y}\right)$ is

(1) $\frac{11}{19}$ (2) $\frac{19}{11}$

(3) $\frac{4}{11}$ (4) $\frac{15}{19}$

FCI Assistant Grade-III Exam.25.02.2012 (Paper-I) North Zone (Ist Sitting)

17. If $x : y = 3 : 4$, then the value of $\frac{5x-2y}{7x+2y} =$

(1) $\frac{7}{25}$ (2) $\frac{7}{23}$

(3) $\frac{7}{29}$ (4) $\frac{7}{17}$

(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

18. If $x^2 + 9y^2 = 6xy$, then $x : y$ is

(1) 1 : 3 (2) 3 : 2

(3) 3 : 1 (4) 2 : 3

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

19. If $a + b + c = 4\sqrt{3}$ and $a^2 + b^2 + c^2 = 16$, then the ratio $a : b : c$ is

(1) 1 : 1 : 1 (2) $1 : \sqrt{2} : \sqrt{3}$

(3) 1 : 2 : 3 (4) None of these

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

20. If $4x + 5y = 83$ and $3x : 2y = 21 : 22$, then $(y - x)$ equals

(1) 3 (2) 4

(3) 7 (4) 11

(SSC CGL Tier-II Exam. 21.09.2014)

21. If $\frac{x}{xa+yb+zc} = \frac{y}{ya+zb+xc} = \frac{z}{za+xb+yc}$ and $x + y + z \neq 0$, then each ratio is

(1) $\frac{1}{a-b-c}$ (2) $\frac{1}{a+b-c}$

(3) $\frac{1}{a-b+c}$ (4) $\frac{1}{a+b+c}$

(SSC CHSL DEO & LDC Exam. 9.11.2014)

22. If $x : y = 3 : 2$, then the value of $\frac{x+y}{x-y}$ is

(1) 5 : 1 (2) 1 : 3

(3) 1 : 5 (4) 3 : 1

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

23. If $a^2 + b^2 + c^2 - ab - bc - ca = 0$, Then $a : b : c$ is :

(1) 1 : 1 : 2 (2) 1 : 1 : 1

(3) 1 : 2 : 1 (4) 2 : 1 : 1

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

24. If $a^2 + 13b^2 + c^2 - 4ab - 6bc = 0$, then $a : b : c$ is

(1) 1 : 2 : 3 (2) 2 : 3 : 1

(3) 2 : 1 : 3 (4) 1 : 3 : 2

(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (IST Sitting)

25. If $(2x - y)^2 + (3y - 2z)^2 = 0$, then the ratio $x : y : z$ is :

(1) 1 : 3 : 2 (2) 1 : 2 : 3

(3) 3 : 1 : 2 (4) 3 : 2 : 1

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

TYPE–V

1. In how many ways can a committee schedule three speakers for three different meetings if they are all available on any of five possible dates?

(1) 10 (2) 36

(3) 60 (4) 120

(SSC CPO S.I. Exam. 05.09.2004)

2. How many even three-digit numbers can be formed from the digits 1, 2, 5, 6 and 9 without repeating any of the digits ?

(1) 120 (2) 48

(3) 40 (4) 24

(SSC CPO S.I. Exam. 07.09.2003)

3. If ten friends shake hands mutually, then the total number of hand shakes is

(1) 45 (2) 50

(3) 90 (4) 100

(SSC CPO S.I. Exam. 05.09.2004)

4. The total number of integers between 200 and 400, each of which either begins with 3 or ends with 3 or both, is

(1) 10 (2) 100

(3) 110 (4) 120

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

TYPE–VI

1. If $[p]$ means the greatest integer less than or equal to p, then $\left[-\frac{1}{4}\right] + \left[4\frac{1}{4}\right] + [3]$ is equal to

(1) 4 (2) 5

(3) 6 (4) 7

(SSC Section Officer (Commercial Audit) Exam.16.11.2003)

2. If $\oplus$ is an operation such that

$a \oplus b = 2a$ when $a > b$

$= a + b$ when $a < b$

$= a^2$ when $a = b$,

then, $\left[\frac{(5\oplus 7)+(4\oplus 4)}{3(5\oplus 5)-(15\oplus 11)-3}\right]$ is equal to :

(1) $\frac{1}{3}$ (2) $\frac{14}{23}$

(3) $\frac{2}{3}$ (4) $\frac{14}{13}$

(SSC CPO S.I. Exam. 16.12.2007)

3. If $\bigstar$ is an operation such that $a \bigstar b = a + b$ when $a > 0, b > 0$

$a \bigstar b = \sqrt{a^2 + b^2}$ for all other values of a and b. The value of $\frac{8 \bigstar (7-13) - (3 \bigstar 1)}{(3-6) \bigstar (9-5)}$ is

(1) $\frac{1}{5}$ (2) $\frac{4}{5}$

(3) $\frac{6}{5}$ (4) $\frac{2}{5}$

(SSC CPO S.I. Exam. 09.11.2008)

4. The expression $x^4 - 2x^2 + k$ will be a perfect square when the value of k is

(1) 2 (2) 1

(3) –1 (4) –2

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

5. If $x = \sqrt[3]{a + \sqrt{a^2 + b^3}} + \sqrt[3]{a - \sqrt{a^2 + b^3}}$, then $x^3 + 3bx$ is equal to

(1) 0 (2) a
(3) $2a$ (4) 1

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

6.

$$\frac{\frac{1}{3}.\frac{1}{3}.\frac{1}{3}+\frac{1}{4}.\frac{1}{4}.\frac{1}{4}-3.\frac{1}{3}.\frac{1}{4}.\frac{1}{5}+\frac{1}{5}.\frac{1}{5}.\frac{1}{5}}{\frac{1}{3}.\frac{1}{3}+\frac{1}{4}.\frac{1}{4}+\frac{1}{5}.\frac{1}{5}-\left(\frac{1}{3}.\frac{1}{4}+\frac{1}{4}.\frac{1}{5}+\frac{1}{5}.\frac{1}{3}\right)}$$

is equal to :

(1) $\frac{2}{3}$ (2) $\frac{3}{4}$

(3) $\frac{47}{60}$ (4) $\frac{49}{60}$

(SSC CGL Prelim Exam. 08.02.2004 (Ist Sitting) & (SSC Delhi Police S.I. Exam. 19.08.2012)

7. When x^m is multiplied by x^n, product is 1. The relation between m and n is

(1) $mn = 1$ (2) $m = n$

(3) $m + n = 1$ (4) $m = -n$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

8. The term, that should be added to $(4x^2 + 8x)$ so that resulting expression be a perfect square, is

(1) 2 (2) 4
(3) $2x$ (4) 1

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

9. The mean of x and $\frac{1}{x}$ is N. Then the mean of x^2 and $\frac{1}{x^2}$ is

(1) N^2 (2) $2N^2-1$
(3) N^2-2 (4) $4N^2-2$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

10. If $3(a^2 + b^2 + c^2) = (a + b + c)^2$, then the relation between a, b and c is

(1) $a \neq b \neq c$ (2) $a = b \neq c$
(3) $a \neq b = c$ (4) $a = b = c$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

11. What is the digit in the unit's place in the number $\frac{15!}{100}$.

(1) 5 (2) 7
(3) 3 (4) 0

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

12. Three numbers are in Arithmetic Progression (A.P.) whose sum is 30 and the product is 910. Then the greatest number in the A.P. is

(1) 17 (2) 15
(3) 13 (4) 10

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

13. If $U_n = \frac{1}{n} - \frac{1}{n+1}$, then the value of $U_1 + U_2 + U_3 + U_4 + U_5$ is :

(1) $\frac{1}{4}$ (2) $\frac{5}{6}$

(3) $\frac{1}{6}$ (4) $\frac{1}{3}$

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

SHORT ANSWERS

TYPE-I

1. (1)	**2.** (3)	**3.** (2)	**4.** (4)
5. (3)	**6.** (3)	**7.** (3)	**8.** (2)
9. (4)	**10.** (2)	**11.** (3)	**12.** (4)
13. (2)	**14.** (3)	**15.** (3)	**16.** (3)
17. (2)	**18.** (3)	**19.** (2)	**20.** (3)
21. (3)	**22.** (2)	**23.** (3)	**24.** (3)
25. (1)	**26.** (2)	**27.** (1)	**28.** (3)
29. (1)	**30.** (2)	**31.** (3)	**32.** (4)
33. (4)	**34.** (2)	**35.** (1)	**36.** (2)
37. (3)	**38.** (2)	**39.** (3)	**40.** (3)
41. (2)	**42.** (4)	**43.** (2)	**44.** (2)
45. (4)	**46.** (1)	**47.** (2)	**48.** (4)
49. (2)	**50.** (4)	**51.** (2)	**52.** (1)
53. (2)	**54.** (4)	**55.** (1)	**56.** (1)
57. (3)	**58.** (1)	**59.** (2)	**60.** (2)
61. (1)	**62.** (3)	**63.** (2)	**64.** (1)
65. (2)	**66.** (1)	**67.** (2)	**68.** (4)
69. (1)	**70.** (3)	**71.** (2)	**72.** (4)
73. (4)	**74.** (4)	**75.** (4)	**76.** (4)
77. (1)	**78.** (1)	**79.** (2)	**80.** (3)
81. (1)	**82.** (2)	**83.** (3)	**84.** (2)
85. (3)	**86.** (4)	**87.** (2)	**88.** (2)
89. (3)	**90.** (4)	**91.** (4)	**92.** (2)
93. (4)	**94.** (4)	**95.** (4)	**96.** (1)
97. (3)	**98.** (1)	**99.** (4)	**100.** (2)
101. (2)	**102.** (2)	**103.** (1)	**104.** (4)
105. (3)	**106.** (3)	**107.** (3)	**108.** (3)
109. (4)	**110.** (2)	**111.** (2)	**112.** (3)
113. (4)	**114.** (4)	**115.** (3)	**116.** (2)
117. (3)	**118.** (3)	**119.** (2)	**120.** (2)
121. (1)	**122.** (2)	**123.** (4)	**124.** (2)
125. (3)	**126.** (2)	**127.** (4)	**128.** (3)
129. (4)	**130.** (3)	**131.** (3)	**132.** (1)
133. (4)	**134.** (2)	**135.** (3)	**136.** (2)
137. (2)	**138.** (4)	**139.** (4)	**140.** (1)
141. (3)	**142.** (1)	**143.** (3)	**144.** (4)
145. (2)	**146.** (1)	**147.** (3)	**148.** (4)
149. (3)	**150.** (3)	**151.** (3)	**152.** (1)
153. (1)	**154.** (2)	**155.** (3)	**156.** (1)
157. (2)	**158.** (4)	**159.** (1)	**160.** (4)
161. (1)	**162.** (4)	**163.** (1)	**164.** (4)
165. (4)	**166.** (4)	**167.** (1)	**168.** (2)
169. (3)	**170.** (3)	**171.** (2)	**172.** (2)
173. (3)	**174.** (3)	**175.** (1)	**176.** (2)
177. (4)	**178.** (1)	**179.** (1)	**180.** (2)
181. (4)	**182.** (1)	**183.** (3)	**184.** (4)
185. (4)	**186.** (2)	**187.** (2)	**188.** (1)
189. (2)	**190.** (2)	**191.** (3)	**192.** (2)
193. (4)	**194.** (4)	**195.** (3)	**196.** (4)
197. (3)	**198.** (1)	**199.** (4)	**200.** (1)
201. (3)	**202.** (1)	**203.** (2)	**204.** (4)
205. (4)	**206.** (3)	**207.** (3)	**208.** (3)
209. (2)	**210.** (3)	**211.** (3)	**212.** (3)
213. (1)	**214.** (1)	**215.** (1)	**216.** (1)
217. (4)	**218.** (3)	**219.** (3)	**220.** (4)
221. (2)	**222.** (1)	**223.** (4)	**224.** (2)
225. (3)	**226.** (1)	**227.** (1)	**228.** (2)
229. (3)	**230.** (3)	**231.** (1)	**232.** (3)
233. (1)	**234.** (4)	**235.** (2)	**236.** (3)
237. (2)	**238.** (2)	**239.** (3)	**240.** (1)

241. (2)	**242.** (2)	**243.** (1)	**244.** (4)
245. (1)	**246.** (3)	**247.** (3)	**248.** (4)
249. (2)	**250.** (2)	**251.** (3)	**252.** (2)
253. (4)	**254.** (2)	**255.** (1)	**256.** (3)
257. (*)	**258.** (2)	**259.** (2)	**260.** (3)
261. (4)	**262.** (2)	**263.** (2)	**264.** (3)
265. (3)	**266.** (3)	**267.** (1)	**268.** (3)
269. (2)	**270.** (2)	**271.** (2)	**272.** (1)
273. (3)	**274.** (2)	**275.** (1)	**276.** (1)
277. (2)	**278.** (1)	**279.** (2)	**280.** (2)
281. (4)	**282.** (3)	**283.** (3)	**284.** (1)
285. (3)	**286.** (2)	**287.** (3)	**288.** (4)
289. (2)	**290.** (2)	**291.** (1)	**292.** (3)
293. (3)	**294.** (1)	**295.** (3)	**296.** (2)
297. (2)	**298.** (1)	**299.** (4	**300.** (3)
301. (3)	**302.** (4)	**303.** (3)	**304.** (3)
305. (4)	**306.** (2)	**307.** (3)	**308.** (2)
309. (3)	**310.** (3)	**311.** (1)	**312.** (2)
313. (3)	**314.** (1)	**315.** (2)	**316.** (3)
317. (1)	**318.** (1)	**319.** (3)	**320.** (1)

TYPE-II

1. (3)	**2.** (3)	**3.** (3)	**4.** (1)
5. (2)	**6.** (1)	**7.** (1)	**8.** (2)
9. (1)	**10.** (3)	**11.** (1)	**12.** (3)
13. (3)	**14.** (3)	**15.** (2)	**16.** (1)
17. (1)	**18.** (3)	**19.** (3)	**20.** (4)
21. (2)	**22.** (1)	**23.** (1)	**24.** (1)
25. (2)	**26.** (2)	**27.** (2)	**28.** (2)
29. (1)	**30.** (2)	**31**. (3)	**32.** (2)
33. (1)	**34.** (4)	**35.** (4)	**36.** (3)
37. (3)	**38.** (4)	**39.** (2)	**40.** (2)
41. (3)	**42.** (2)	**43.** (2)	**44.** (4)
45. (4)	**46.** (1)	**47.** (3)	**48.** (2)
49. (3)	**50.** (2)	**51.** (1)	**52.** (4)
53. (3)	**54.** (1)	**55.** (1)	**56.** (3)
57. (4)	**58.** (1)	**59.** (4)	**60.** (3)
61. (3)	**62.** (4)	**63.** (2)	**64.** (2)
65. (2)	**66.** (1)	**67.** (4)	**68.** (3)
69. (1)	**70.** (2)	**71.** (4)	**72.** (1)
73. (4)	**74.** (2)	**75.** (1)	**76.** (3)
77. (2)	**78.** (3)	**79.** (1)	**80.** (4)
81. (4)	**82.** (3)	**83.** (2)	**84.** (4)
85. (2)	**86.** (3)	**87.** (1)	**88.** (2)

89. (3)	**90.** (2)	**91.** (2)	**92.** (3)
93. (4)	**94.** (3)	**95.** (2)	**96.** (3)
97. (2)	**98.** (1)	**99.** (3)	**100.** (3)
101. (3)	**102.** (2)	**103.** (3)	**104.** (2)
105. (4)	**106.** (1)	**107.** (1)	**108.** (2)
109. (1)	**110.** (2)	**111.** (1)	**112.** (4)
113. (2)	**114.** (3)	**115.** (3)	**116.** (4)
117. (1)	**118.** (1)	**119.** (4)	**120.** (3)
121. (4)	**122.** (3)	**123.** (3)	**124.** (2)
125. (1)	**126.** (1)	**127.** (1)	**128.** (3)
129. (2)	**130.** (3)	**131.** (4)	**132.** (3)
133. (4)	**134.** (4)	**135.** (3)	**136.** (4)
137. (4)	**138.** (1)	**139.** (1)	**140.** (4)
141. (3)	**142.** (4)	**143.** (4)	**144.** (4)
145. (2)	**146.** (4)	**147.** (1)	**148.** (1)
149. (3)	**150.** (2)	**151.** (2)	**152.** (1)
153. (1)	**154.** (3)	**155.** (1)	**156.** (2)
157. (2)	**158.** (1)	**159.** (2)	**160.** (2)
161. (3)	**162.** (2)	**163.** (1)	**164.** (1)
165. (3)	**166.** (4)	**167.** (*)	**168.** (3)
169. (1)	**170.** (2)	**171.** (1)	**172.** (2)
173. (1)	**174.** (3)	**175.** (3)	**176.** (4)
177. (3)	**178.** (3)	**179.** (4)	**180.** (4)
181. (2)	**182.** (2)	**183.** (4)	**184.** (3)
185. (2)	**186.** (1)	**187.** (1)	**188.** (3)
189. (3)	**190.** (3)	**191.** (2)	**192.** (1)
193. (1)	**194.** (3)	**195.** (3)	**196.** (2)
197. (3)	**198.** (2)	**199.** (1)	**200.** (2)
201. (4)	**202.** (4)	**203.** (1)	**204.** (1)
205. (3)	**206.** (3)	**207.** (3)	**208.** (3)
209. (3)	**210.** (4)	**211.** (2)	**212.** (3)
213. (3)	**214.** (1)	**215.** (3)	**216.** (1)
217. (4)	**218.** (2)	**219.** (3)	**220.** (2)
221. (4)	**222.** (4)	**223.** (3)	**224.** (3)
225. (3)	**226.** (4)	**227.** (3)	**228.** (4)
229. (2)	**230.** (2)	**231.** (1)	**232.** (1)
233. (3)	**234.** (3)	**235.** (1)	**236.** (2)
237. (4)	**238.** (4)	**239.** (4)	**240.** (3)
241. (1)	**242.** (4)	**243.** (2)	**244.** (4)
245. (3)	**246.** (1)	**247.** (4)	**248.** (2)
249. (3)	**250.** (4)	**251.** (1)	**252.** (2)
253. (2)	**254.** (3)	**255.** (3)	**256.** (4)

257. (1)	**258.** (2)	**259.** (4)	**260.** (3)
261. (3)	**262.** (4)	**263.** (4)	**264.** (2)
265. (3)	**266.** (2)	**267.** (2)	**268.** (2)
269. (2)	**270.** (3)	**271.** (3)	**272.** (4)
273. (3)	**274.** (4)	**275.** (3)	**276.** (2)
277. (2)	**278.** (3)	**279.** (1)	**280.** (2)
281. (1)	**282.** (2)	**283.** (2)	**284.** (1)

TYPE-III

1. (1)	**2.** (2)	**3.** (2)	**4.** (1)
5. (4)	**6.** (3)	**7.** (3)	**8.** (4)
9. (2)	**10.** (2)	**11.** (3)	**12.** (2)
13. (2)	**14.** (1)	**15.** (2)	**16.** (1)
17. (3)	**18.** (3)	**19.** (3)	**20.** (2)
21. (1)	**22.** (4)	**23.** (3)	**24.** (1)
25. (2)	**26.** (2)	**27.** (4)	**28.** (3)
29. (3)	**30.** (2)	**31**. (4)	**32.** (1)
33. (3)	**34.** (1)	**35.** (2)	**36.** (3)
37. (2)	**38.** (1)	**39.** (1)	**40.** (4)
41. (2)	**42.** (2)	**43.** (2)	**44.** (2)
45. (3)	**46.** (1)	**47.** (2)	**48.** (2)
49. (1)			

TYPE-IV

1. (1)	**2.** (2)	**3.** (3)	**4.** (3)
5. (3)	**6.** (4)	**7.** (3)	**8.** (1)
9. (1)	**10.** (4)	**11.** (2)	**12.** (3)
13. (3)	**14.** (2)	**15.** (3)	**16.** (1)
17. (3)	**18.** (3)	**19.** (1)	**20.** (2)
21. (4)	**22.** (1)	**23.** (2)	**24.** (3)
25. (2)			

TYPE-V

1. (3)	**2.** (4)	**3.** (1)	**4.** (3)

TYPE-VI

1. (3)	**2.** (3)	**3.** (3)	**4.** (2)
5. (3)	**6.** (3)	**7.** (4)	**8.** (2)
9. (2)	**10.** (4)	**11.** (4)	**12.** (3)
13. (2)			

EXPLANATIONS

TYPE-I

1. (1) a * b = 2a – 3b + ab
$\Rightarrow 3 * 5 = 2 \times 3 - 3 \times 5 + 3 \times 5 = 6$
$5 * 3 = 2 \times 5 - 3 \times 3 + 3 \times 5$
$= 10 - 9 + 15 = 16$
Therefore, 3 * 5 + 5 *3
$= 6 + 16 = 22$

2. (3) $p \times q = p + q + \frac{p}{q}$

$\therefore\ 8 \times 2 = 8 + 2 + \frac{8}{2}$

$=10 + 4 = 14$

3. (2) $(x + y) = 3(x - y) = 3x - 3y$
$\Rightarrow 3y + y = 3x - x$
$\Rightarrow 2x = 4y$
$\Rightarrow x = 2y$

$\Rightarrow \frac{x}{y} = \frac{2}{1}$

$\therefore x = 2,\ y = 1$

$\frac{3xy}{2(x^2 - y^2)} = \frac{3 \times 2 \times 1}{2 \times (4-1)} = \frac{6}{6} = 1$

4. (4) Given expression

$= \left(1 + \frac{1}{x}\right)\left(1 + \frac{1}{x+1}\right)\left(1 + \frac{1}{x+2}\right)\left(1 + \frac{1}{x+3}\right)$

$= \frac{x+1}{x} \times \frac{x+2}{x+1} \times \frac{x+3}{x+2} \times \frac{x+4}{x+3}$

$= \frac{x+4}{x}$

5. (3) a * b = 2 (a + b)
$\therefore 5 * 2 = 2(5 + 2)$
$= 2 \times 7 = 14$

6. (3) $\frac{2a + b}{a + 4b} = 3$ (Given)
$\Rightarrow 2a + b = 3a + 12b$
$\Rightarrow 3a - 2a = b - 12b$
$\Rightarrow a = -11b$

Then, $\frac{a + b}{a + 2b} = \frac{-11b + b}{-11b + 2b}$

$= \frac{-10b}{-9b} = \frac{10}{9}$

7. (3)

$x = \sqrt{\frac{\sqrt{5}+1}{\sqrt{5}-1} \times \frac{\sqrt{5}+1}{\sqrt{5}+1}} = \sqrt{\frac{(\sqrt{5}+1)^2}{5-1}}$

$= \sqrt{\frac{(\sqrt{5}+1)^2}{4}} = \frac{\sqrt{5}+1}{2}$

$\therefore\ 5x^2 - 5x - 1$

$= 5\left(\frac{(\sqrt{5}+1}{2}\right)^2 - 5\frac{(\sqrt{5}+1)}{2} - 1$

$= 5\left(\frac{5+1+2\sqrt{5}}{4}\right) - \frac{5\sqrt{5}+5}{2} - 1$

$= 5\left(\frac{3+\sqrt{5}}{2}\right) - \frac{5\sqrt{5}+5}{2} - 1$

$= \frac{15 + 5\sqrt{5} - 5\sqrt{5} - 5 - 2}{2}$

$= \frac{8}{2} = 4$

8. (2) Given a * b = a + b + ab
$\therefore 3 * 4 - 2 * 3$
$= (3 + 4 + 3 \times 4) - (2 + 3 + 2 \times 3)$
$= (7 + 12) - (5 + 6) = 19 - 11 = 8$

9. (4) $x = 7 - 4\sqrt{3}$

$\therefore\ \frac{1}{x} = \frac{1}{7 - 4\sqrt{3}}$

$= \frac{1(7 + 4\sqrt{3})}{(7 + 4\sqrt{3})(7 - 4\sqrt{3})}$

$= \frac{7 + 4\sqrt{3}}{49 - 48} = 7 + 4\sqrt{3}$

$\therefore\ x + \frac{1}{x}$

$= 7 - 4\sqrt{3} + 7 + 4\sqrt{3} = 14$

10. (2) $\because x * y = 3x + 2y$
$2 * 3 + 3 * 4$
$= 3 \times 2 + 2 \times 3 + 3 \times 3 + 2 \times 4$
$= 6 + 6 + 9 + 8 = 29$

11. (3) $\frac{a}{3} = \frac{b}{4} = \frac{c}{7} = k$ (Let)
$a = 3k,\ b = 4k,\ c = 7k$

$\therefore \frac{a + b + c}{c} = \frac{3k + 4k + 7k}{7k}$

$= \frac{14k}{7k} = 2$

12. (4) $\frac{144}{0.144} = \frac{14.4}{x}$
$\Rightarrow 144 \times x = 14.4 \times 0.144$

$\Rightarrow x = \frac{14.4 \times 0.144}{144}$

$= \frac{144 \times 144}{144 \times 10000} = 0.0144$

13. (2) Since $1 < x < 2$, we have
$x - 1 > 0$ and
$x - 3 < 0$
or, $3 - x > 0$

$\therefore \sqrt{(x-1)^2} + \sqrt{(x-3)^2}$

$= \sqrt{(x-1)^2} + \sqrt{(3-x)^2}$

$[\because (x-3)^2 = (3-x)^2]$
$= x - 1 + 3 - x = 2$

14. (3) It is given that

$a \otimes b = (a \times b) + b$

$\therefore 5 \otimes 7 = (5 \times 7) + 7 = 35 + 7 = 42$

15. (3) We have,
$10^{0.48} = x,\ 10^{0.70} = y$
$\therefore x^z = y^2$
$\Rightarrow (10^{0.48})^z = (10^{0.70})^2$
$\Rightarrow 10^{0.48z} = 10^{1.4}$
$\Rightarrow 0.48z = 1.4$

$\Rightarrow z = \frac{1.4}{0.48} = 2.9$

16. (3) $4A + \frac{7}{B} + 2C + \frac{5}{D} + 6E$
$= 47.2506$

$= 40 + 7 + \frac{2}{10} + \frac{5}{100} + \frac{6}{10000}$

$4A = 40 \Rightarrow A = 10$

$\frac{7}{B} = 7 \Rightarrow 7B = 7 = \Rightarrow B = 1$

$2C = \frac{2}{10} \Rightarrow C = 0.1$

$\frac{5}{D} = \frac{5}{100} \Rightarrow D = 100$

$6E = \frac{6}{10000} \Rightarrow E = 0.0001$

$5A + 3B + 6C + D + 3E$
$= 5 \times 10 + 3 \times 1 + 6 \times 0.1 + 100 + 3 \times 0.0001$
$= 50 + 3 + 0.6 + 100 + 0.0003$
$= 153.6003$

17. (2) $x * y = x^2 + y^2 - xy$ (Given)
$\Rightarrow 9 * 11 = 9^2 + 11^2 - 9 \times 11$
$= 81 + 121 - 99$
$= 202 - 99 = 103$

18. (3) $\frac{2p}{p^2 - 2p + 1} = \frac{1}{4}$

$\Rightarrow \frac{p^2 - 2p + 1}{2p} = 4$

$\Rightarrow \frac{p^2 - 2p + 1}{p} = 8$

$\Rightarrow \frac{p^2}{p} - \frac{2p}{p} + \frac{1}{p} = 8$

$\Rightarrow p + \frac{1}{p} = 8 + 2 = 10$

19. (2) $5^{5x+5} = 1$

$\Rightarrow 5^{5x} \times 5^5 = 1$

$\Rightarrow 5^{5x} = \frac{1}{5^5}$

$\Rightarrow 5^{5x} = 5^{-5} \Rightarrow 5x = -5$

$\Rightarrow x = -1$

Method 2 :

$5^{5x+5} = 1$

$\Rightarrow 5^{5x+5} = 5^{\circ}$

$\Rightarrow 5x + 5 = 0 \Rightarrow x = -1$

20. (3) $3^{x+3} + 7 = 250$

$\Rightarrow 3^{x+3} = 243 \quad \Rightarrow 3^{x+3} = 3^5$

$\Rightarrow x + 3 = 5 \Rightarrow x = 2$

21. (3) $\frac{1}{4} \times \frac{2}{6} \times \frac{3}{8} \times \frac{4}{10} \times \frac{5}{12} \ldots \times \frac{31}{64}$

$= \frac{1}{2^x}$

$\Rightarrow \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \ldots$ to 30 terms

$\times \frac{1}{64} = \frac{1}{2^x}$

$\Rightarrow \frac{1}{2^{30}} \times \frac{1}{2^6} = \frac{1}{2^x}$

$\Rightarrow \frac{1}{2^{36}} = \frac{1}{2^x} \Rightarrow x = 36$

22. (2) Expression

$= \frac{(243)^{\frac{n}{5}} \times 3^{2n+1}}{9^n \times 3^{n-1}}$

$= \frac{\left(3^5\right)^{\frac{n}{5}} \times 3^{2n+1}}{\left(3^2\right)^n \times 3^{n-1}} = \frac{3^n \times 3^{2n+1}}{3^{2n} \times 3^{n-1}}$

$= \frac{3^{n+2n+1}}{3^{2n+n-1}} = \frac{3^{3n+1}}{3^{3n-1}}$

$= 3^{3n+1-3n+1} = 3^2 = 9$

23. (3) $x = 0.5$ and $y = 0.2$ (Given)

$\therefore \sqrt{0.6} \times (3y)^x$

$= \sqrt{0.6} \times (3 \times 0.2)^{0.5}$

$= \sqrt{0.6} \times (0.6)^{\frac{1}{2}}$

$= \sqrt{0.6 \times 0.6} = 0.6$

24. (3) $x^{x\sqrt{x}} = \left(x\sqrt{x}\right)^x$

$\Rightarrow x^{x.x^{\frac{1}{2}}} = \left(x \times x^{\frac{1}{2}}\right)^x$

$\Rightarrow x^{x^{1+\frac{1}{2}}} = \left(x^{1+\frac{1}{2}}\right)^x$

$x^{x^{3/2}} = \left(x^{3/2}\right)^x = x^{\frac{3x}{2}}$

$\Rightarrow x^{\frac{3}{2}} = \frac{3x}{2} \Rightarrow x^{\frac{3}{2}} - \frac{3x}{2} = 0$

$\Rightarrow x\left(x^{\frac{1}{2}} - \frac{3}{2}\right) = 0$

$\Rightarrow x = 0$ or $x^{\frac{1}{2}} = \frac{3}{2}$

$\Rightarrow x = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$

$x = 0$ given indeterminate value.

$\therefore x = \frac{9}{4}$

25. (1) $a^2 + b^2 + c^2 - ab - bc - ca$

$= \frac{1}{2}\left[(a-b)^2 + (b-c)^2 + (c-a)^2\right]$

$= \frac{1}{2}\left[(7-5)^2 + (5-3)^2 + (3-7)^2\right]$

$= \frac{1}{2}(4 + 4 + 16)$

$= \frac{1}{2} \times 24 = 12$

26. (2) $7^x = \frac{1}{343}$

$\Rightarrow 7^x = \frac{1}{7^3} = 7^{-3}$

$\Rightarrow x = -3$

27. (1) $\frac{a}{2} = \frac{b}{3} = \frac{c}{5} = k$ (Let)

$\therefore a = 2k,\ b = 3k,\ c = 5k$

$\therefore \frac{a+b+c}{c} = \frac{2k+3k+5k}{5k}$

$= \frac{10k}{5k} = 2$

28. (3) $0.13 \div p^2 = 13$

$\Rightarrow \frac{0.13}{p^2} = 13$

$\Rightarrow p^2 = \frac{0.13}{13} = \frac{1}{100}$

$\Rightarrow p = \frac{1}{10} = 0.1$

29. (1) $\frac{a}{3} = \frac{b}{2} \Rightarrow \frac{a}{b} = \frac{3}{2}$

$\therefore \frac{2a+3b}{3a-2b} = \frac{2 \times \frac{a}{b} + 3}{3 \times \frac{a}{b} - 2}$

$= \frac{2 \times \frac{3}{2} + 3}{3 \times \frac{3}{2} - 2} = \frac{6}{\frac{9-4}{2}} = \frac{12}{5}$

30. (2) $x + \frac{1}{4}\sqrt{x} + a^2$

$= \left(\sqrt{x}\right)^2 + 2.\sqrt{x}.\frac{1}{8} + (a)^2$

Clearly $a = \frac{1}{8}$.

Then, expression $= \left(\sqrt{x} + \frac{1}{8}\right)^2$

31. (3) Arithmetic mean (AM) $= \frac{a+b}{2}$

Geometric mean (GM) $= \sqrt{ab}$

As AM > GM

$\frac{a+b}{2} > \sqrt{ab}$

32. (4) **Tricky Approach**

$\frac{a}{1-a} + \frac{b}{1-b} + \frac{c}{1-c} = 1$

$\Rightarrow \left(\frac{a}{1-a} + 1\right) + \left(\frac{b}{1-b} + 1\right) + \left(\frac{c}{1-c} + 1\right)$

$= 3 + 1 = 4$

$\Rightarrow \frac{a+1-a}{1-a} + \frac{b+1-b}{1-b} + \frac{c+1-c}{1-c} = 4$

$\Rightarrow \frac{1}{1-a} + \frac{1}{1-b} + \frac{1}{1-c} = 4$

33. (4) $x^{\frac{1}{3}} = y^{\frac{1}{4}}$

$\Rightarrow \left(x^{\frac{1}{3}}\right)^{12} = \left(y^{\frac{1}{4}}\right)^{12} \Rightarrow x^4 = y^3$

$\Rightarrow (x^4)^5 = (y^3)^5 \Rightarrow x^{20} = y^{15}$

34. (2) We know that $a^{\circ} = 1$

$\therefore a^{2x+2} = 1 = a^{\circ}$

$\Rightarrow 2x + 2 = 0$

$\Rightarrow x = \frac{-2}{2} = -1$

35. (1) For expression $ax^2 + bx + c$, $a > 0$, the minimum value is given by

$\frac{4ac - b^2}{4a}$

Here, for $x^2 - x + 1$
$a = 1,\ b = -1,\ c = 1$
$\therefore$ Minimum value

$$= \frac{4 \times 1 \times 1 - 1}{4 \times 1} = \frac{3}{4}$$

36. (2) $\dfrac{\sqrt{7}-2}{\sqrt{7}+2} = \dfrac{\sqrt{7}-2}{\sqrt{7}+2} \times \dfrac{\sqrt{7}-2}{\sqrt{7}-2}$

(Rationalising the denominator)

$$= \frac{\left(\sqrt{7}-2\right)^2}{7-4} = \frac{7+4-4\sqrt{7}}{3}$$

$$= \frac{11}{3} - \frac{4\sqrt{7}}{3}$$

$$\therefore \frac{\sqrt{7}-2}{\sqrt{7}+2} = a\sqrt{7} + b$$

$$\Rightarrow \frac{11}{3} - \frac{4}{3}\sqrt{7} = a\sqrt{7} + b$$

Clearly,

$$a = -\frac{4}{3} \text{ and } b = \frac{11}{3}$$

37. (3) $(125)^x = 3125$
$\Rightarrow (5^3)^x = 5^5 \Rightarrow 5^{3x} = 5^5$
$\Rightarrow 3x = 5$

$$\Rightarrow x = \frac{5}{3}$$

38. (2) $5^{\sqrt{x}} + 12^{\sqrt{x}} = 13^{\sqrt{x}}$
We know that $5^2 + 12^2 = 13^2$
[Pythagorean Triplet]

$\therefore \sqrt{x} = 2 \Rightarrow x = 2^2 = 4$

39. (3) $2^{2x-y} = 16 = 2^4$
$\Rightarrow 2x - y = 4$ ..... (i)
$2^{x+y} = 32 = 2^5$
$\Rightarrow x + y = 5$ ..... (ii)
On adding equations (i) and (ii),
$3x = 9 \Rightarrow x = 3$
From equation (ii),
$y = 5 - x = 5 - 3 = 2$
$\therefore xy = 3 \times 2 = 6$

40. (3) $\left(\dfrac{3}{5}\right)^3\left(\dfrac{3}{5}\right)^{-6} = \left(\dfrac{3}{5}\right)^{2x-1}$

$$\Rightarrow \left(\frac{3}{5}\right)^3\left(\frac{3}{5}\right)^{-3}\left(\frac{3}{5}\right)^{-3} = \left(\frac{3}{5}\right)^{2x-1}$$

$$\Rightarrow \left(\frac{3}{5}\right)^0\left(\frac{3}{5}\right)^{-3} = \left(\frac{3}{5}\right)^{2x-1}$$

$\Rightarrow 2x - 1 = -3$
$\Rightarrow 2x = -3 + 1 = -2$
$\Rightarrow x = -1$

Method : 2

$$\left(\frac{3}{5}\right)^3\left(\frac{3}{5}\right)^{-6} = \left(\frac{3}{5}\right)^{2x-1}$$

$$\Rightarrow \left(\frac{3}{5}\right)^{-6+3} = \left(\frac{3}{5}\right)^{2x-1}$$

$\Rightarrow -3 = 2x - 1$
$\Rightarrow -2 = 2x$
$\Rightarrow x = -1$

41. (2) $\dfrac{2x-y}{x+2y} = \dfrac{1}{2}$

$\Rightarrow 4x - 2y = x + 2y$
$\Rightarrow 3x = 4y$

$$\Rightarrow \frac{x}{y} = \frac{4}{3}$$

$$\therefore \frac{3x-y}{3x+y} = \frac{y\left(3\dfrac{x}{y}-1\right)}{y\left(3\dfrac{x}{y}+1\right)}$$

$$= \frac{3 \times \dfrac{4}{3} - 1}{3 \times \dfrac{4}{3} + 1}$$

$$= \frac{4-1}{4+1} = \frac{3}{5}$$

42. (4) $\boxed{\text{Tricky approach}}$
$a^2 - b^2 = 19$
$\Rightarrow 10^2 - 9^2 = 19$
$\Rightarrow a = 10$

43. (2) $\boxed{\text{Tricky approach}}$

$$\frac{\sqrt{3+x}+\sqrt{3-x}}{\sqrt{3+x}-\sqrt{3-x}} = \frac{2}{1}$$

By componendo and dividendo,

$$\Rightarrow \frac{2\sqrt{3+x}}{2\sqrt{3-x}} = \frac{2+1}{2-1} = 3$$

Squaring on both sides, we get

$$\frac{3+x}{3-x} = 9$$

$\Rightarrow 3 + x = 27 - 9x$
$\Rightarrow 9x + x = 27 - 3 = 24$

$$\Rightarrow x = \frac{24}{10} = \frac{12}{5}$$

44. (2) $x + \dfrac{1}{x} = 5$

$\Rightarrow x^2 - 5x + 1 = 0$
$\Rightarrow 3x^2 - 15x + 3 = 0$

$$\therefore \frac{2x}{3x^2 - 5x + 3} = \frac{2x}{15x - 5x}$$

$$= \frac{2x}{10x} = \frac{1}{5}$$

45. (4) $x = \dfrac{\sqrt{3}}{2} \Rightarrow \dfrac{1}{x} = \dfrac{2}{\sqrt{3}}$

By componendo and dividendo,

$$\frac{1+x}{1-x} = \frac{2+\sqrt{3}}{2-\sqrt{3}}$$

$$\Rightarrow \frac{1+x}{1-x} = \frac{2+\sqrt{3}}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}}$$

$$= \frac{\left(2+\sqrt{3}\right)^2}{\left(2-\sqrt{3}\right)\left(2+\sqrt{3}\right)} = \frac{\left(2+\sqrt{3}\right)^2}{4-3}$$

$$\Rightarrow \frac{1+x}{1-x} = \left(2+\sqrt{3}\right)^2$$

$$\therefore \frac{\sqrt{1+x}}{\sqrt{1-x}} = \frac{2+\sqrt{3}}{1}$$

By componendo and dividendo

$$\frac{\sqrt{1+x}+\sqrt{1-x}}{\sqrt{1+x}-\sqrt{1-x}} = \frac{2+\sqrt{3}+1}{2+\sqrt{3}-1}$$

$$= \frac{3+\sqrt{3}}{\sqrt{3}+1} = \frac{\sqrt{3}\,(\sqrt{3}+1)}{\sqrt{3}+1} = \sqrt{3}$$

46. (1) $x = \dfrac{\sqrt{3}+1}{\sqrt{3}-1}$

$$= \frac{\sqrt{3}+1}{\sqrt{3}-1} \times \frac{\left(\sqrt{3}+1\right)}{\left(\sqrt{3}+1\right)}$$

$$= \frac{(\sqrt{3}+1)^2}{3-1} = \frac{3+1+2\sqrt{3}}{2}$$

$$= \frac{4+2\sqrt{3}}{2} = 2+\sqrt{3}$$

Similarly,

$$y = \frac{\sqrt{3}-1}{\sqrt{3}+1} = 2-\sqrt{3}$$

$$\therefore x^2 + y^2 = \left(2+\sqrt{3}\right)^2 + \left(2-\sqrt{3}\right)^2$$

$= 4 + 3 + 4\sqrt{3} + 4 + 3 - 4\sqrt{3}$
$= 14$

47. (2) $4^{4x+1} = \dfrac{1}{64} = \dfrac{1}{4^3}$

$\Rightarrow 4^{4x+1} = 4^{-3} \Rightarrow 4x + 1 = -3$
$\Rightarrow 4x = -4 \qquad \Rightarrow x = -1$

48. (4) $\dfrac{\sqrt{x+4}+\sqrt{x-4}}{\sqrt{x+4}-\sqrt{x-4}}=\dfrac{2}{1}$

By componendo and dividendo,

$\dfrac{2\sqrt{x+4}}{2\sqrt{x-4}}=\dfrac{3}{1}$

On squaring,

$\dfrac{x+4}{x-4}=\dfrac{9}{1}$

$\Rightarrow 9x-36=x+4$

$\Rightarrow 9x-x=36+4$

$\Rightarrow 8x=40$

$\Rightarrow x=5$

49. (2) $\sqrt{2^x}=256$

$\Rightarrow 2^{\frac{x}{2}}=2^8$

$\Rightarrow \dfrac{x}{2}=8 \Rightarrow x=16$

50. (4) $\dfrac{\left(\sqrt{5}\right)^7}{\left(\sqrt{5}\right)^5}=5^p$

$\Rightarrow \left(\sqrt{5}\right)^{7-5}=5^p$

$\Rightarrow \left(\sqrt{5}\right)^2=5^p$

$\Rightarrow 5^1=5^P \Rightarrow p=1$

51. (2) $\sqrt{1-\dfrac{x^3}{100}}=\dfrac{3}{5}$

Squaring both sides,

$1-\dfrac{x^3}{100}=\dfrac{9}{25}$

$\Rightarrow \dfrac{x^3}{100}=1-\dfrac{9}{25}=\dfrac{25-9}{25}=\dfrac{16}{25}$

$\Rightarrow x^3=\dfrac{16}{25}\times 100=64$

$\therefore x=\sqrt[3]{64}=\sqrt[3]{4\times4\times4}=4$

52. (1) Given that

$a \bigstar b=2a+3b-ab$

$\therefore 3 \bigstar 5+5 \bigstar 3$

$=(2\times3+3\times5-3\times5)+(5\times2+3\times3-5\times3)$

$=(6+15-15)+(10+9-15)$

$=6+4=10$

53. (2) $\sqrt{1+\dfrac{x}{9}}=\dfrac{13}{3}$

Squaring both sides,

$1+\dfrac{x}{9}=\dfrac{169}{9}$

$\Rightarrow \dfrac{x}{9}=\dfrac{169}{9}-1=\dfrac{160}{9}$

$\Rightarrow x=\dfrac{160}{9}\times9=160$

54. (4) L.H.S. $=\dfrac{4\sqrt{3}+5\sqrt{2}}{\sqrt{48}+\sqrt{18}}$

$=\dfrac{4\sqrt{3}+5\sqrt{2}}{4\sqrt{3}+3\sqrt{2}}$

$=\dfrac{4\sqrt{3}+5\sqrt{2}}{4\sqrt{3}+3\sqrt{2}}\times\dfrac{4\sqrt{3}-3\sqrt{2}}{4\sqrt{3}-3\sqrt{2}}$

(Rationalising the denominator)

$=\dfrac{16\times3-12\sqrt{6}+20\sqrt{6}-15\times2}{\left(4\sqrt{3}\right)^2-\left(3\sqrt{2}\right)^2}$

$=\dfrac{48+8\sqrt{6}-30}{48-18}$

$=\dfrac{18+8\sqrt{6}}{30}=\dfrac{9}{15}+\dfrac{4\sqrt{6}}{15}$

$=\dfrac{3}{5}+\dfrac{4\sqrt{6}}{15}$

Now, $\dfrac{3}{5}+\dfrac{4\sqrt{6}}{15}=a+b\sqrt{6}$

$\therefore a=\dfrac{3}{5}$ and $b=\dfrac{4}{15}$

55. (1) $x+y=2z$

$\Rightarrow x=2z-y$

$\Rightarrow x-z=2z-y-z=z-y$

$\therefore \dfrac{x}{x-z}+\dfrac{z}{y-z}$

$=\dfrac{x}{x-z}-\dfrac{z}{z-y}$

$=\dfrac{x}{x-z}-\dfrac{z}{x-z}=\dfrac{x-z}{x-z}=1$

56. (1) $a * b=a^b$

$\therefore 5 * 3=5^3=5\times5\times5=125$

57. (3) $\sqrt{0.03\times0.3\times a}$

$=0.3\times0.3\sqrt{b}$

On squaring,

$0.03\times0.3\times a=0.09\times0.09\times b$

$\Rightarrow \dfrac{a}{b}=\dfrac{0.09\times0.09}{0.03\times0.3}=0.9$

58. (1) $x \bigstar y=(x+3)^2(y-1)$

$\therefore 5 \bigstar 4=(5+3)^2(4-1)$

$=64\times3=192$

59. (2)

$9\sqrt{x}=\sqrt{3\times2\times2}+\sqrt{3\times7\times7}$

$\Rightarrow 9\sqrt{x}=2\sqrt{3}+7\sqrt{3}=9\sqrt{3}$

$\therefore x=3$

60. (2) $X \bigstar\bigstar Y=X^2+Y^2-XY$

$\therefore 11 \bigstar\bigstar 13=11^2+13^2-11\times13$

$=121+169-143=147$

61. (1) $\sqrt{1+\dfrac{x}{961}}=\dfrac{32}{31}$

Squaring both sides,

$1+\dfrac{x}{961}=\left(\dfrac{32}{31}\right)^2=\dfrac{1024}{961}$

$\Rightarrow \dfrac{x}{961}=\dfrac{1024}{961}-1=\dfrac{1024-961}{961}=\dfrac{63}{961}$

$\Rightarrow x=63$

62. (3) $\sqrt{0.04\times0.4\times a}$

$=0.004\times0.4\times\sqrt{b}$

Squaring both sides,

$0.04\times0.4\times a$

$=0.004\times0.4\times0.004\times0.4\times b$

$\Rightarrow \dfrac{a}{b}$

$=\dfrac{0.004\times0.004\times0.4\times0.4}{0.04\times0.4}$

$=0.00016$

$=\dfrac{16}{100000}=16\times10^{-5}$

63. (2) Using Rule 1,

$(a-b)^2=a^2-2ab+b^2$

$x^4-2x^2+k=(x^2)^2-2.x^2.1+k$

$\therefore k=(1)^2=1$

64. (1) $2^{x+3}=32=2^5$

$\Rightarrow x+3=5 \Rightarrow x=5-3=2$

$\therefore 3^{x+1}=3^3=27$

65. (2) $x^4-17x^3+17x^2-17x+17$

$=x^4-16x^3+16x^2-16x-x^3+x^2-x+17$

When $x=16$,

Expression $=16^4-16^4+16^3-16^2-16^3+16^2-16+17=1$

66. (1) Given, $\dfrac{x}{y}=\dfrac{3}{4}$

Now, $\dfrac{6}{7}+\dfrac{y-x}{y+x}=\dfrac{6}{7}+\dfrac{1-\dfrac{x}{y}}{1+\dfrac{x}{y}}$

[Dividing N^r and D^r by y]

$=\dfrac{6}{7}+\dfrac{1-\dfrac{3}{4}}{1+\dfrac{3}{4}}=\dfrac{6}{7}+\dfrac{4-3}{4+3}$

$= \frac{6}{7} + \frac{1}{7} = 1$

67. (2) $n + \frac{2n}{3} + \frac{n}{2} + \frac{n}{7} = 97$

$\Rightarrow \frac{42n + 28n + 21n + 6n}{42} = 97$

$\Rightarrow \frac{97n}{42} = 97 \Rightarrow n = \frac{97 \times 42}{97} = 42,$

$\therefore n = 42$

68. (4) $x^2 - 3x + 1 = 0$

$\Rightarrow x^2 + 1 = 3x$

$\Rightarrow \frac{x^2 + 1}{x} = \frac{3x}{x}$

$\Rightarrow x + \frac{1}{x} = 3$

69. (1) $\boxed{\text{Tricky Approach}}$

$1.5a = 0.04b$

$\frac{b}{a} = \frac{1.5}{0.04}$

By componendo and dividendo,

$\frac{b-a}{b+a} = \frac{1.5 - 0.04}{1.5 + 0.04} = \frac{1.46}{1.54} = \frac{73}{77}$

70. (3) $x = \left(\sqrt{2}+1\right)^{-\frac{1}{3}}$

$\Rightarrow x^{-3} = \sqrt{2} + 1$

$\Rightarrow \frac{1}{x3} = \sqrt{2} + 1$

and $x^3 = \frac{1}{\sqrt{2}+1} = \frac{1\left(\sqrt{2}-1\right)}{\left(\sqrt{2}+1\right)\left(\sqrt{2}-1\right)}$

$= \sqrt{2} - 1$

$\therefore x^3 - \frac{1}{x^3}$

$= \sqrt{2} - 1 - \sqrt{2} - 1 = -2$

71. (2) $\frac{x^2 - x + 1}{x^2 + x + 1} = \frac{2}{3}$

$\Rightarrow \frac{x^2 + 1 - x}{x^2 + 1 + x} = \frac{2}{3}$

Dividing numerator and denominator by x,

$\frac{\left(x + \frac{1}{x}\right) - 1}{\left(x + \frac{1}{x}\right) + 1} = \frac{2}{3}$

$\Rightarrow 3\left(x + \frac{1}{x}\right) - 3 = 2\left(x + \frac{1}{x}\right) + 2$

$\Rightarrow x + \frac{1}{x} = 2 + 3 = 5$

72. (4) $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = 3$

$\Rightarrow a = 3b\ ;\ c = 3d\ ;\ e = 3f$

$\therefore \frac{2a^2 + 3c^2 + 4e^2}{2b^2 + 3d^2 + 4f^2}$

$= \frac{2 \times 9b^2 + 3 \times 9d^2 + 4 \times 9f^2}{2b^2 + 3d^2 + 4f^2}$

$= \frac{9\left(2b^2 + 3d^2 + 4f^2\right)}{2b^2 + 3d^2 + 4f^2} = 9$

73. (4) $(x-3)^2 + (y-4)^2 + (z-5)^2 = 0$

$\Rightarrow x - 3 = 0,\ \ y - 4 = 0$

and $z - 5 = 0$

$\Rightarrow x = 3,\ y = 4$ and $z = 5$

$\therefore x + y + z = 3 + 4 + 5 = 12$

74. (4) $x = 7 - 4\sqrt{3}$

$\therefore \sqrt{x} = \sqrt{7 - 4\sqrt{3}}$

$= \sqrt{7 - 2 \times 2 \times \sqrt{3}}$

$= \sqrt{4 + 3 - 2 \times 2 \times \sqrt{3}}$

$= \sqrt{(2 - \sqrt{3})^2} = 2 - \sqrt{3}$

$\therefore \frac{1}{\sqrt{x}} = \frac{1}{2 - \sqrt{3}}$

$= \frac{1}{2 - \sqrt{3}} \times \frac{2 + \sqrt{3}}{2 + \sqrt{3}} = \frac{2 + \sqrt{3}}{4 - 3}$

$= 2 + \sqrt{3}$

$\therefore \sqrt{x} + \frac{1}{\sqrt{x}} = 2 - \sqrt{3} + 2 + \sqrt{3} = 4$

75. (4) $(a-1)^2 + (b+2)^2 + (c+1)^2 = 0$

$\Rightarrow a - 1 = 0 \Rightarrow a = 1;$

$b + 2 = 0 \Rightarrow b = -2$

$c + 1 = 0 \Rightarrow c = -1$

$\therefore 2a - 3b + 7c$

$= 2 - 3(-2) + 7(-1)$

$= 2 + 6 - 7 = 1$

76. (4) $2x + \frac{1}{3x} = 5$

$\Rightarrow 6x^2 + 1 = 15x$

$\Rightarrow 6x^2 + 20x + 1 = 15x + 20x$

$= 35x$

$\Rightarrow \frac{5x}{6x^2 + 20x + 1} = \frac{5x}{35x} = \frac{1}{7}$

77. (1) $x \propto \frac{1}{y^2 - 1}$

$\Rightarrow x = \frac{k}{y^2 - 1}$

Where k is a constant.

When $y = 10$, $x = 24$, then

$\therefore 24 = \frac{k}{10^2 - 1} \Rightarrow 24 = \frac{k}{99}$

$\Rightarrow k = 24 \times 99$

When $y = 5$, then

$x = \frac{k}{y^2 - 1} = \frac{24 \times 99}{5^2 - 1} = \frac{24 \times 99}{24} = 99$

78. (1) Using Rule 1,

$x^2 + y^2 + 2x + 1 = 0$

$\Rightarrow x^2 + 2x + 1 + y^2 = 0$

$\Rightarrow (x + 1)^2 + y^2 = 0$

$\Rightarrow x + 1 = 0 \Rightarrow x = -1$ and $y = 0$

$\therefore x^{31} + y^{35} = -1$

79. (2) $\frac{x}{2x^2 + 5x + 2} = \frac{1}{6}$

$\Rightarrow 2x^2 + 5x + 2 = 6x$

$\Rightarrow 2x^2 + 2 = 6x - 5x = x$

$\Rightarrow x^2 + 1 = \frac{x}{2}$

On dividing by x,

$\Rightarrow x + \frac{1}{x} = \frac{1}{2}$

80. (3) $a^2 + b^2 + c^2 = 2a - 2b - 2c - 3$

$\Rightarrow a^2 - 2a + b^2 + 2b + c^2 + 2c + 1 + 1 + 1 = 0$

$\Rightarrow (a^2 - 2a + 1) + (b^2 + 2b + 1) + (c^2 + 2c + 1) = 0$

$\Rightarrow (a - 1)^2 + (b + 1)^2 + (c + 1)^2 = 0$

$\Rightarrow a - 1 = 0 \Rightarrow a = 1$

$\Rightarrow b + 1 = 0 \Rightarrow b = -1$

and $c + 1 = 0 \Rightarrow c = -1$

$\therefore 2a - 3b + 4c = 2 + 3 - 4 = 1$

81. (1) $(3a + 1)^2 + (b - 1)^2 + (2c - 3)^2 = 0$

$\Rightarrow 3a + 1 = 0$

$\Rightarrow 3a = -1$

$b - 1 = 0$

$\Rightarrow b = 1$

$2c - 3 = 0$

$\Rightarrow 2c = 3$

$\therefore 3a + b + 2c = -1 + 1 + 3 = 3$

82. (2) $\frac{(a-b)^2}{(b-c)(c-a)} +$

$\frac{(b-c)^2}{(a-b)(c-a)} + \frac{(c-a)^2}{(a-b)(b-c)}$

$= \frac{(a-b)^3}{(a-b)(b-c)(c-a)} +$

$\frac{(b-c)^3}{(a-b)(b-c)(c-a)} +$

$$\frac{(c-a)^3}{(a-b)(b-c)(c-a)}$$

$$= \frac{(a-b)^3+(b-c)^3+(c-a)^3}{(a-b)(b-c)(c-a)}$$

$[\because [a-b+b-c+c-a=0]]$

$$= \frac{3(a-b)(b-c)(c-a)}{(a-b)(b-c)(c-a)} = 3$$

$$\left[\begin{array}{r}\text{If } a+b+c=0,\\ \because a^3+b^3+c^3=3abc\end{array}\right]$$

83. (3) $(a-3)^2+(b-4)^2+(c-9)^2=0$

$\Rightarrow a-3=0 \Rightarrow a=3$

$b-4=0 \Rightarrow b=4$

and $c-9=0 \Rightarrow c=9$

$\therefore \sqrt{a+b+c} = \sqrt{3+4+9}$

$= \sqrt{16} = \pm 4$

84. (2) $180 = 2\times2\times3\times3\times5$

$a^3b = abc$

$\Rightarrow a^2 = c$

$\therefore a^3b = abc = 180 = 1^2\times180\times1$

$= 1^3\times180$

$\Rightarrow c = 1$

85. (3) $(x-3)^2+(y-5)^2+(z-4)^2=0$

$\Rightarrow x-3=0 \quad \Rightarrow x=3$

$y-5=0 \quad \Rightarrow y=5$

$z-4=0 \quad \Rightarrow z=4$

$$\therefore \frac{x^2}{9}+\frac{y^2}{25}+\frac{z^2}{16}$$

$$= \frac{9}{9}+\frac{25}{25}+\frac{16}{16}$$

$= 1+1+1 = 3$

86. (4) $(a-1)\sqrt{2}+3 = b\sqrt{2}+a$

$\Rightarrow a = 3\ ;\ a-1 = b$

$\Rightarrow 3-1 = b \Rightarrow b = 2$

$\therefore a+b = 3+2 = 5$

87. (2) $a = \dfrac{\sqrt{5}+1}{\sqrt{5}-1} = \dfrac{\sqrt{5}+1}{\sqrt{5}-1}\times\dfrac{\sqrt{5}+1}{\sqrt{5}+1}$

$$= \frac{(\sqrt{5}+1)^2}{5-1} = \frac{5+1+2\sqrt{5}}{4}$$

$$= \frac{3+\sqrt{5}}{2}$$

$$\therefore b = \frac{\sqrt{5}-1}{2} = \frac{3-\sqrt{5}}{2}$$

$\therefore a+b$

$$= \frac{3+\sqrt{5}}{2}+\frac{3-\sqrt{5}}{2} = 3$$

and $ab = \dfrac{\sqrt{5}+1}{\sqrt{5}-1}\times\dfrac{\sqrt{5}-1}{\sqrt{5}+1} = 1$

$\therefore$ Expression

$$= \frac{a^2+ab+b^2}{a^2-ab+b^2} = \frac{(a+b)^2-ab}{(a+b)^2-3ab}$$

$$= \frac{9-1}{9-3} = \frac{8}{6} = \frac{4}{3}$$

88. (2) $(64)^{x+1} = \dfrac{64}{4^x}$

$\Rightarrow (4^3)^{x+1}\times4^x = 64$

$\Rightarrow 4^{3x+3+x} = 4^3$

$\Rightarrow 4^{4x+3} = 4^3$

$\Rightarrow 4x+3 = 3$

$\Rightarrow x = 0$

89. (3) $ax^2+bx+c = a(x-p)^2$

$\Rightarrow ax^2+bx+c = a(x^2-2px+p^2)$

$\Rightarrow ax^2+bx+c = ax^2-2apx+ap^2$

Comparing the corresponding coefficients,

$b = -2ap$ and $c = ap^2$

$\Rightarrow b^2 = 4a^2p^2$ and $p^2 = \dfrac{c}{a}$

$$\Rightarrow p^2 = \frac{b^2}{4a^2};$$

$$\therefore \frac{b^2}{4a^2} = \frac{c}{a} \Rightarrow b^2 = 4ac$$

90. (4) For maximum value,

$$a = b = c = d = \frac{1}{4}$$

$\therefore (1+a)(1+b)(1+c)(1+d)$

$$= \left(\frac{5}{4}\right)^4$$

91. (4) $x \alpha \dfrac{1}{y^2}$

$\Rightarrow x = \dfrac{k}{y^2}$ where k is a constant of proportionality.

When, $x = 1,\ y = 2$

$$\Rightarrow 1 = \frac{k}{4} \Rightarrow k = 4$$

$$\therefore x = \frac{4}{y^2}$$

When $y = 6$,

$$x = \frac{4}{6\times6} = \frac{1}{9}$$

92. (2) Given $x = \dfrac{\sqrt{3}}{2}$

Given expression

$$= \frac{\sqrt{1+x}}{1+\sqrt{1+x}}+\frac{\sqrt{1-x}}{1-\sqrt{1-x}}$$

$$= \frac{\sqrt{1+x}}{1+\sqrt{1+x}}\times\frac{1-\sqrt{1+x}}{1-\sqrt{1+x}}$$

$$+\frac{\sqrt{1-x}}{1-\sqrt{1-x}}\times\frac{1+\sqrt{1-x}}{1+\sqrt{1-x}}$$

$$= \frac{\sqrt{1+x}-1-x}{1-1-x}+\frac{\sqrt{1-x}+1-x}{1-1+x}$$

$$= \frac{\sqrt{1-x}+1-x}{x}-\frac{\sqrt{1+x}-1-x}{x}$$

$$= \frac{\sqrt{1-x}+1-x-\sqrt{1+x}+1+x}{x}$$

$$= \frac{2+\sqrt{1-x}-\sqrt{1+x}}{x}$$

$$= \frac{2+\sqrt{1-\frac{\sqrt{3}}{2}}-\sqrt{1+\frac{\sqrt{3}}{2}}}{\frac{\sqrt{3}}{2}}$$

$$= \frac{2+\sqrt{\frac{2-\sqrt{3}}{2}}-\sqrt{\frac{2+\sqrt{3}}{2}}}{\frac{\sqrt{3}}{2}}$$

$$= \frac{2+\frac{\sqrt{4-2\sqrt{3}}}{2}-\frac{\sqrt{4+2\sqrt{3}}}{2}}{\frac{\sqrt{3}}{2}}$$

$\left[\because \sqrt{4-2\sqrt{3}} = \sqrt{3+1-2\sqrt{3}}\right.$

$\left.= \sqrt{(\sqrt{3}-1)^2} = \sqrt{3}-1\right]$ and

$\left[\sqrt{4+2\sqrt{3}} = \sqrt{3+1+2\sqrt{3}}\right.$

$= \sqrt{(\sqrt{3}+1)^2} = \sqrt{3}+1\Big]$

$= \dfrac{4+\sqrt{3}-1-\sqrt{3}-1}{\sqrt{3}} = \dfrac{2}{\sqrt{3}}$

93. (4) $a^2 + b^2 + c^2 + 3$

$= 2a - 2b - 2c$

$\Rightarrow a^2 - 2a + 1 + b^2 + 2b + 1 + c^2 + 2c + 1 = 0$

$\Rightarrow (a-1)^2 + (b+1)^2 + (c+1)^2 = 0$

$\therefore a - 1 = 0 \Rightarrow a = 1$

$b + 1 = 0 \Rightarrow b = -1$

$c + 1 = 0 \Rightarrow c = -1$

$\therefore 2a - b + c = 2 + 1 - 1 = 2$

94. (4) $x^2 - y^2 = 80$

$x - y = 8$

$\therefore x + y = \dfrac{x^2 - y^2}{x - y} = \dfrac{80}{8} = 10$

$\therefore$ Required average

$= \dfrac{x+y}{2} = \dfrac{10}{2} = 5$

95. (4) $x^2 - 4x - 1 = 0$

$\Rightarrow x^2 - 1 = 4x$

Dividing by x,

$x - \dfrac{1}{x} = 4$

On squaring both sides,

$\left(x - \dfrac{1}{x}\right)^2 = 16$

$\Rightarrow x^2 + \dfrac{1}{x^2} - 2 = 16$

$\Rightarrow x^2 + \dfrac{1}{x^2} = 16 + 2 = 18$

Aliter :

Using Rule 5,

Here, $x^2 - 4x - 1 = 0$

$\Rightarrow x^2 - 1 = 4x$

$\Rightarrow x^2 - \dfrac{1}{x} = 4$

We know that

$x^2 + \dfrac{1}{x^2} = \left(x - \dfrac{1}{x}\right)^2 + 2$

$= 4^2 + 2 = 18$

96. (1) Third proportional of a and b

$= \dfrac{b^2}{a}$

$= \dfrac{\left(\sqrt{x^2+y^2}\right)^2}{\dfrac{x}{y} + \dfrac{y}{x}} = \dfrac{x^2+y^2}{\dfrac{x^2+y^2}{xy}} = xy$

97. (3) When $x = 6$,

$\dfrac{4 \times 6}{3} + 2P = 12$

$\Rightarrow 8 + 2P = 12$

$\Rightarrow 2P = 12 - 8 = 4$

$\Rightarrow P = 2$

98. (1) Expression $= \dfrac{4+3\sqrt{3}}{7+4\sqrt{3}}$

Rationalising the denominator,

$= \dfrac{(4+3\sqrt{3})(7-4\sqrt{3})}{(7+4\sqrt{3})(7-4\sqrt{3})}$

$= \dfrac{28 - 16\sqrt{3} + 21\sqrt{3} - 12 \times 3}{49 - 48}$

$= 28 + 5\sqrt{3} - 36 = 5\sqrt{3} - 8$

99. (4) $\dfrac{1}{a} = \dfrac{1}{\sqrt{6}-\sqrt{5}}$

$= \dfrac{\sqrt{6}+\sqrt{5}}{6-5} = \sqrt{6}+\sqrt{5}$

Similarly,

$\dfrac{1}{b} = \sqrt{5}+2;\ \dfrac{1}{c} = 2+\sqrt{3}$

$\therefore \dfrac{1}{a} > \dfrac{1}{b} > \dfrac{1}{c} \Rightarrow a < b < c$

100. (2) $x = \dfrac{4\sqrt{15}}{\sqrt{5}+\sqrt{3}}$

$= \dfrac{4\sqrt{15}\left(\sqrt{5}-\sqrt{3}\right)}{\left(\sqrt{5}+\sqrt{3}\right)\left(\sqrt{5}-\sqrt{3}\right)}$

$= \dfrac{4\sqrt{15}\left(\sqrt{5}-\sqrt{3}\right)}{5-3}$

$= 2\sqrt{15}\left(\sqrt{5}-\sqrt{3}\right) = 10\sqrt{3} - 6\sqrt{5}$

$\therefore \dfrac{x+\sqrt{20}}{x-\sqrt{20}} + \dfrac{x+\sqrt{12}}{x-\sqrt{12}}$

$= \dfrac{10\sqrt{3} - 6\sqrt{5} + 2\sqrt{5}}{10\sqrt{3} - 6\sqrt{5} - 2\sqrt{5}} + \dfrac{10\sqrt{3} - 6\sqrt{5} + 2\sqrt{3}}{10\sqrt{3} - 6\sqrt{5} - 2\sqrt{3}}$

$= \dfrac{10\sqrt{3} - 4\sqrt{5}}{10\sqrt{3} - 8\sqrt{5}} + \dfrac{12\sqrt{3} - 6\sqrt{5}}{8\sqrt{3} - 6\sqrt{5}}$

$= \dfrac{5\sqrt{3} - 2\sqrt{5}}{5\sqrt{3} - 4\sqrt{5}} + \dfrac{6\sqrt{3} - 3\sqrt{5}}{4\sqrt{3} - 3\sqrt{5}}$

$= \dfrac{60 - 15\sqrt{15} - 8\sqrt{15} + 30 + 90 - 15\sqrt{15} - 24\sqrt{15} + 60}{\left(5\sqrt{3} - 4\sqrt{5}\right)\left(4\sqrt{3} - 3\sqrt{5}\right)}$

$= \dfrac{240 - 62\sqrt{15}}{60 - 15\sqrt{15} - 16\sqrt{15} + 60}$

$= \dfrac{240 - 62\sqrt{15}}{120 - 31\sqrt{15}}$

$= \dfrac{2\left(120 - 31\sqrt{15}\right)}{120 - 31\sqrt{15}} = 2$

101. (2) $\sqrt{x} = \sqrt{5 - \sqrt{21}}$

$\Rightarrow \sqrt{x} = \dfrac{\sqrt{10 - 2\sqrt{21}}}{\sqrt{2}}$

$= \dfrac{\sqrt{7 + 3 - 2 \times \sqrt{7} \times \sqrt{3}}}{\sqrt{2}}$

$= \dfrac{\sqrt{7} - \sqrt{3}}{\sqrt{2}}$

$\sqrt{32 - 2x} = \sqrt{32 - 2\left(5 - \sqrt{21}\right)}$

$= \sqrt{32 - 10 + 2\sqrt{21}}$

$= \sqrt{22 + 2\sqrt{21}}$

$= \sqrt{21 + 1 + 2 \times \sqrt{21} \times 1}$

$= \sqrt{21} + 1$

$\therefore$ Expression

$= \dfrac{\sqrt{7} - \sqrt{3}}{\sqrt{2}\left(\sqrt{21} + 1 - \sqrt{21}\right)}$

$= \dfrac{1}{\sqrt{2}}\left(\sqrt{7} - \sqrt{3}\right)$

102. (2) $6x - 5y = 13$ ...(i)

$7x + 2y = 23$ ...(ii)

By equation (i) × 2 + (ii) × 5,

$12x - 10y = 26$

$35x + 10y = 115$

$47x = 141$

$\Rightarrow x = 3$

From equation (i),
$6 \times 3 - 5y = 13$
$\Rightarrow 18 - 5y = 13$
$\Rightarrow 5y = 5$
$\Rightarrow y = 1$
$\therefore 11x + 18y = 11 \times 3 + 18 \times 1$
$= 33 + 18 = 51$

103. (1) $(x^{b+c})^{b-c}.(x^{c+a})^{c-a}.(x^{a+b})^{a-b}$
$= x^{b^2-c^2}.x^{c^2-a^2}.x^{a^2-b^2}$
$= x^{b^2-c^2+c^2-a^2+a^2-b^2} = x^0 = 1$

104. (4) $\frac{x}{a} = \frac{1}{a} - \frac{1}{x}$

$\Rightarrow \frac{x}{a} = \frac{x-a}{ax}$

$\Rightarrow x^2 = x - a$

$\Rightarrow x - x^2 = a$

105. (3) $x + \frac{1}{x} = 99$

$\therefore \frac{100x}{2x^2+102x+2}$

$= \frac{100x}{2x^2+2+102x}$

On dividing by x,

$= \frac{100}{2x+\frac{2}{x}+102}$

$= \frac{100}{2\left(x+\frac{1}{x}\right)+102}$

$= \frac{100}{2\times 99+102} = \frac{100}{300} = \frac{1}{3}$

106. (3) $\frac{4x-3}{x}+\frac{4y-3}{y}+\frac{4z-3}{z}=0$

$\Rightarrow \frac{4x}{x}-\frac{3}{x}+\frac{4y}{y}-\frac{3}{y}+\frac{4z}{z}-\frac{3}{z}=0$

$\Rightarrow \frac{3}{x}+\frac{3}{y}+\frac{3}{z} = 4+4+4 = 12$

$\Rightarrow \frac{1}{x}+\frac{1}{y}+\frac{1}{z} = \frac{12}{3} = 4$

107. (3) $\frac{xy}{x+y} = a \Rightarrow \frac{x+y}{xy} = \frac{1}{a}$

$\Rightarrow \frac{1}{y}+\frac{1}{x} = \frac{1}{a}$ ...(i)

$\frac{xz}{x+z} = b \Rightarrow \frac{x+z}{xz} = \frac{1}{b}$

$\Rightarrow \frac{1}{z}+\frac{1}{x} = \frac{1}{b}$ ...(ii)

Similarly,

$\frac{1}{z}+\frac{1}{y} = \frac{1}{c}$

$\Rightarrow \frac{1}{y} = \frac{1}{c}-\frac{1}{z}$ ...(iii)

By substitutio method
From equations (i) and (iii),

$\frac{1}{a}-\frac{1}{x} = \frac{1}{c}-\frac{1}{z}$

$\Rightarrow \frac{1}{a}-\frac{1}{x} = \frac{1}{c}-\frac{1}{b}+\frac{1}{x}$

[From equation (ii)]

$\Rightarrow \frac{1}{x}+\frac{1}{x} = \frac{1}{a}-\frac{1}{c}+\frac{1}{b}$

$\Rightarrow \frac{2}{x} = \frac{bc-ab+ac}{abc}$

$\Rightarrow x = \frac{2abc}{bc+ac-ab}$

108. (3) $x = 3 + \sqrt{8}$

$\therefore \frac{1}{x} = \frac{1}{3+\sqrt{8}} = \frac{3-\sqrt{8}}{(3+\sqrt{8})(3-\sqrt{8})}$

$= \frac{3-\sqrt{8}}{9-8} = 3 - \sqrt{8}$

Now, $x^2+\frac{1}{x^2} = \left(x+\frac{1}{x}\right)^2 - 2$

$= (3+\sqrt{8}+3-\sqrt{8})^2 - 2$
$= 36 - 2 = 34$

109. (4) $xy = 8 = 1 \times 8 = 2 \times 4$

$= \frac{1}{2} \times 16 = \frac{1}{3} \times 24$

$\therefore$ Minimum value of $2x + y$
$= 2 \times 2 + 4 = 8$

110. (2) $x^2 + x + 1$

$= x^2 + 2.x.\frac{1}{2}+\frac{1}{4}+\frac{3}{4}$

$= \left(x+\frac{1}{2}\right)^2+\left(\pm\frac{\sqrt{3}}{2}\right)^2$

$\therefore \left(x+\frac{1}{2}\right)^2+\left(\pm\frac{\sqrt{3}}{2}\right)^2$

$= \left(x+\frac{1}{2}\right)^2+q^2$

$\Rightarrow q = \pm\frac{\sqrt{3}}{2}$

111. (2) $a^2 - 4a - 1 = 0$
$\Rightarrow a^2 - 1 = 4a$
On dividing by a, we have

$a - \frac{1}{a} = 4$

$\therefore a^2+\frac{1}{a^2}+3\left(a-\frac{1}{a}\right)$

$= \left(a-\frac{1}{a}\right)^2+2+3\left(a-\frac{1}{a}\right)$

$= 16 + 2 + 3\ (4) = 30$

112. (3) $a+\frac{1}{b} = 1 \Rightarrow a = 1-\frac{1}{b} = \frac{b-1}{b}$

$\Rightarrow \frac{1}{a} = \frac{b}{b-1}$ and

$b+\frac{1}{c} = 1 \Rightarrow \frac{1}{c} = 1-b \Rightarrow c = \frac{1}{1-b}$

$\therefore c+\frac{1}{a} = \frac{1}{1-b}+\frac{b}{b-1}$

$= \frac{1}{1-b}-\frac{b}{1-b} = \frac{1-b}{1-b} = 1$

113. (4) Expression = $(x - 2)(x - 9)$
$= x^2 - 11x + 18 = ax^2 + bx + c$

Minimum value $= \frac{4ac-b^2}{4a}$

$= \frac{4\times 1\times 18-121}{4} = \frac{-49}{4}$

114. (4) $4\sqrt{3}\ x^2 + 5x - 2\sqrt{3}$

$= 4\sqrt{3}\ x^2 + 8x - 3x - 2\sqrt{3}$

$= 4x\left(\sqrt{3}x+2\right) - \sqrt{3}\left(\sqrt{3}x+2\right)$

$= \left(4x-\sqrt{3}\right)\left(\sqrt{3}x+2\right) \Rightarrow$ factors

115. (3) $\sqrt{x} = \sqrt{3} - \sqrt{5}$
On squaring both sides,
$x = 3 + 5 - 2\sqrt{15}$

$\Rightarrow x - 8 = -2\sqrt{15}$
Squaring again,
$x^2 - 16x + 64 = 60$
$\Rightarrow x^2 - 16x + 4 = 0$
$\therefore x^2 - 16x + 6 = 2$

116. (2) $x - \frac{1}{x} = 4$ (Given)

$\therefore \left(x + \frac{1}{x}\right)^2 = \left(x - \frac{1}{x}\right)^2 + 4$

$= (4)^2 + 4 = 20$

$\Rightarrow x + \frac{1}{x} = \sqrt{20} = 2\sqrt{5}$

117. (3) $x = 5 + 2\sqrt{6}$

$\therefore \frac{1}{x} = \frac{1}{5+2\sqrt{6}} = \frac{5-2\sqrt{6}}{(5+2\sqrt{6})(5-2\sqrt{6})}$

$= \frac{5-2\sqrt{6}}{25-24} = 5 - 2\sqrt{6}$

$\therefore \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)^2 = x + \frac{1}{x} + 2$

$= 5 + 2\sqrt{6} + 5 - 2\sqrt{6} + 2 = 12$

$\therefore \sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{12} = 2\sqrt{3}$

118. (3) $(a - b)^2 = (a + b)^2 - 4ab$
$= 5^2 - 4 \times 6 = 1$
$\Rightarrow a - b = 1$
$\therefore (a^2 - b^2) = (a + b)(a - b) = 5$

119. (2) $1.5x = 0.04y$

$\Rightarrow \frac{x}{y} = \frac{0.04}{1.5} = \frac{4}{150} = \frac{2}{75}$

$\Rightarrow \frac{y}{x} = \frac{75}{2}$

Now, $\frac{y^2 - x^2}{y^2 + 2xy + x^2}$

$= \frac{(y-x)(y+x)}{(y+x)^2}$

$= \frac{y-x}{y+x} = \frac{\frac{y}{x} - 1}{\frac{y}{x} + 1}$

$= \frac{\frac{75}{2} - 1}{\frac{75}{2} + 1} = \frac{73}{77}$

120. (2) $a^{\frac{1}{3}} = 11 \Rightarrow a = 11^3 = 1331$
$\therefore a^2 - 331a = a(a - 331)$
$= 1331\ (1331 - 331)$
$= 1331 \times 1000 = 1331000$

121. (1) $x^2 + y^2 + \frac{1}{x^2} + \frac{1}{y^2} - 4 = 0$

$\Rightarrow x^2 + \frac{1}{x^2} - 2 + y^2 + \frac{1}{y^2} - 2 = 0$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 + \left(y - \frac{1}{y}\right)^2 = 0$

$\Rightarrow x - \frac{1}{x} = 0$

$\Rightarrow x^2 - 1 = 0 \Rightarrow x = 1$
Similarly,
$y = 1$
$\therefore x^2 + y^2 = 1 + 1 = 2$

122. (2) **Tricky Approach**
$x^2 = y + z$
$\Rightarrow x^2 + x = x + y + z$
$\Rightarrow x(x + 1) = x + y + z$ ....(i)
Similarly,
$y(y + 1) = x + y + z$ .....(ii)
and, $z(z + 1) = x + y + z$ ...(iii)

$\therefore \frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}$

$= \frac{x}{x+y+z} + \frac{y}{x+y+z} + \frac{z}{x+y+z}$

$\Rightarrow \frac{x+y+z}{x+y+z} = 1$

123. (4) $(ad - bc)^2 + (ac + bd)^2$
$= a^2d^2 + b^2c^2 - 2abcd + a^2c^2 + b^2d^2 + 2abcd$
$= a^2d^2 + b^2c^2 + a^2c^2 + b^2d^2$
$= a^2d^2 + b^2d^2 + b^2c^2 + a^2c^2$
$= d^2(a^2 + b^2) + c^2(b^2 + a^2)$
$= (a^2 + b^2)(c^2 + d^2)$
$= 2 \times 1 = 2$

124. (2) $a^2 + b^2 + c^2 + 3$
$= 2a + 2b + 2c$
$\Rightarrow a^2 - 2a + 1 + b^2 - 2b + 1 + c^2 - 2c + 1 = 0$
$\Rightarrow (a - 1)^2 + (b - 1)^2 + (c - 1)^2 = 0$
$\Rightarrow a - 1 = 0 \Rightarrow a = 1;$
$b - 1 = 0 \Rightarrow b = 1$
and, $c - 1 = 0 \Rightarrow c = 1$
$\therefore a + b + c = 3$

125. (3) $x - \frac{1}{x} = 5$

On squaring both sides,

$x^2 + \frac{1}{x^2} - 2 = 25$

$\Rightarrow x^2 + \frac{1}{x^2} = 27$

Aliter :
Using Rule 5,

Here, $x - \frac{1}{x} = 5$

We know that

$x^2 + \frac{1}{x^2} = \left(x - \frac{1}{x}\right)^2 + 2$

$= 5^2 + 2 = 27$

126. (2) $x = 3 + 2\sqrt{2}$

$\therefore \frac{1}{x} = \frac{1}{3+2\sqrt{2}}$

$= \frac{1}{3+2\sqrt{2}} \times \frac{3-2\sqrt{2}}{3-2\sqrt{2}}$

$= \frac{3-2\sqrt{2}}{9-8} = 3 - 2\sqrt{2}$

$\therefore \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 = x + \frac{1}{x} - 2$

$= 3 + 2\sqrt{2} + 3 - 2\sqrt{2} - 2$
$= 4$

$\therefore \sqrt{x} - \frac{1}{\sqrt{x}} = 2$

127. (4) $x = \sqrt{3} + \sqrt{2}$

$\frac{1}{x} = \frac{1}{\sqrt{3}+\sqrt{2}}$

$= \frac{1}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}} = \sqrt{3} - \sqrt{2}$

$\therefore x + \frac{1}{x} = 2\sqrt{3}$

$\therefore \left(x^2 + \frac{1}{x^2}\right) = \left(x + \frac{1}{x}\right)^2 - 2$

$= (2\sqrt{3})^2 - 2 \quad = 12 - 2 = 10$

128. (3) $x + \frac{9}{x} = 6$

$\Rightarrow x^2 - 6x + 9 = 0$
$\Rightarrow (x - 3)^2 = 0 \Rightarrow x = 3$

$\therefore \left(x^2 + \frac{9}{x^2}\right) = \left(9 + \frac{9}{9}\right) = 10$

129. (4) $x = \frac{4ab}{a+b} \Rightarrow \frac{x}{2a} = \frac{2b}{a+b}$

By componendo and dividendo,

$$\frac{x+2a}{x-2a} = \frac{2b+a+b}{2b-a-b} = \frac{3b+a}{b-a}$$

Similarly, $\frac{x}{2b} = \frac{2a}{a+b}$

$$\Rightarrow \frac{x+2b}{x-2b} = \frac{2a+a+b}{2a-a-b}$$

$$= \frac{3a+b}{a-b}$$

$$\therefore \frac{x+2a}{x-2a} + \frac{x+2b}{x-2b}$$

$$= \frac{3b+a}{b-a} + \frac{3a+b}{a-b}$$

$$= \frac{3b+a-3a-b}{b-a} = \frac{2b-2a}{b-a}$$

$$= \frac{2(b-a)}{b-a} = 2$$

130. (3) $m + \frac{1}{m-2} = 4$

$$\Rightarrow m + \frac{1}{m-2} - 2 = 4 - 2$$

$$\Rightarrow (m-2) + \frac{1}{(m-2)} = 4 - 2 = 2$$

On squaring both sides,

$$(m-2)^2 + \frac{1}{(m-2)^2} +$$

$$2(m-2)\left(\frac{1}{m-2}\right) = 4$$

$$\Rightarrow (m-2)^2 + \frac{1}{(m-2)^2} = 4 - 2 = 2$$

Aliter :

Using Rule 14,

$$m + \frac{1}{m-2} = 4$$

$$\Rightarrow m - 2 + \frac{1}{m-2} = 4 - 2$$

$$\Rightarrow m - 2 + \frac{1}{m-2} = 2$$

$$\Rightarrow (m-2)^2 + \frac{1}{(m-2)^2} = 2$$

131. (3) Using Rule 1,

$a^2 + b^2 + 2b + 4a + 5 = 0$

$\Rightarrow a^2 + 4a + b^2 + 2b + 5 = 0$

$\Rightarrow a^2 + 4a + 4 + b^2 + 2b + 1 = 0$

$\Rightarrow (a+2)^2 + (b+1)^2 = 0$

It is possible only when

$a + 2 = 0 \Rightarrow a = -2$

and, $b + 1 = 0 \Rightarrow b = -1$

$$\therefore \frac{a-b}{a+b} = \frac{-2+1}{-2-1}$$

$$= \frac{-1}{-3} = \frac{1}{3}$$

132. (1) $x - y = \frac{x+y}{7} = \frac{xy}{4} = k$

$\Rightarrow x - y = k$

$x + y = 7k$

$\therefore (x+y)^2 - (x-y)^2 = 49k^2 - k^2$

$\Rightarrow 4xy = 48k^2$

$\Rightarrow 16k = 48k^2$

$$\Rightarrow k = \frac{1}{3}$$

$$\therefore xy = 4k = 4 \times \frac{1}{3} = \frac{4}{3}$$

133. (4) $\frac{x^2}{yz} + \frac{y^2}{zx} + \frac{z^2}{xy}$

$$= \frac{x^3 + y^3 + z^3}{xyz} = \frac{3xyz}{xyz} = 3$$

134. (2) $\frac{1}{(a+b)(b+c)} + \frac{1}{(a+c)(b+a)}$

$$+ \frac{1}{(c+a)(c+b)}$$

$$= \frac{c+a+b+c+a+b}{(a+b)(b+c)(c+a)}$$

$$= \frac{2(a+b+c)}{(a+b)(b+c)(c+a)}$$

$= 0$ [$\because a + b + c = 0$]

135. (3) Using Rule 1,

$a + b + c = 0$

$\Rightarrow b + c = -a$

On squaring both sides,

$\Rightarrow (b+c)^2 = a^2$

$\Rightarrow b^2 + c^2 + 2bc = a^2$

$\Rightarrow a^2 + b^2 + c^2 + 2bc = 2a^2$

$\Rightarrow a^2 + b^2 + c^2 = 2a^2 - 2bc$

$= 2(a^2 - bc)$

$$\therefore \frac{a^2+b^2+c^2}{a^2-bc} = \frac{2(a^2-bc)}{a^2-bc} = 2$$

136. (2) $n = 7 + 4\sqrt{3} = 7 + 2 \times 2 \times \sqrt{3}$

$= 4 + 3 + 2 \times 2 \times \sqrt{3}$

$= \left(2+\sqrt{3}\right)^2$

$\therefore \sqrt{n} = 2 + \sqrt{3}$

$$\therefore \frac{1}{\sqrt{n}} = \frac{1}{2+\sqrt{3}}$$

$$= \frac{1}{2+\sqrt{3}} \times \frac{2-\sqrt{3}}{2-\sqrt{3}} = 2 - \sqrt{3}$$

$$\therefore \sqrt{n} + \frac{1}{\sqrt{n}} = 2 + \sqrt{3} + 2 - \sqrt{3} = 4$$

137. (2) $x = \sqrt{3} + \sqrt{2}$

$$\therefore \frac{1}{x} = \frac{1}{\sqrt{3}+\sqrt{2}}$$

$$= \frac{\sqrt{3}-\sqrt{2}}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$$

$$= \sqrt{3} - \sqrt{2}$$

$$\therefore x + \frac{1}{x}$$

$$= \sqrt{3} + \sqrt{2} + \sqrt{3} - \sqrt{2} = 2\sqrt{3}$$

138. (4) $\frac{p}{q} + \frac{q}{p} = \frac{p^2+q^2}{pq}$

$$= \frac{(p+q)^2 - 2pq}{pq}$$

$$= \frac{100 - 2 \times 5}{5} = \frac{90}{5} = 18$$

139. (4) $x = 3 + 2\sqrt{2}$

$xy = 1$

$$\Rightarrow y = \frac{1}{3+2\sqrt{2}}$$

$$= \frac{1}{3+2\sqrt{2}} \times \frac{3-2\sqrt{2}}{3-2\sqrt{2}}$$

$= \frac{3-2\sqrt{2}}{9-8} = 3-2\sqrt{2}$

$\therefore x + y$

$= 3+2\sqrt{2}+3-2\sqrt{2} = 6$

$\therefore \frac{x^2+3xy+y^2}{x^2-3xy+y^2}$

$= \frac{(x+y)^2+xy}{(x+y)^2-5xy}$

$= \frac{36+1}{36-5} = \frac{37}{31}$

140. (1) $\frac{x}{b+c} = \frac{y}{c+a}$

$= \frac{x-y}{b+c-c-a} = \frac{x-y}{b-a}$;

$\frac{y}{c+a} = \frac{z}{a+b}$

$= \frac{y-z}{c+a-a-b} = \frac{y-z}{c-b}$;

$\frac{z}{a+b} = \frac{x}{b+c}$

$= \frac{z-x}{a+b-b-c} = \frac{z-x}{a-c}$

$\therefore \frac{x-y}{b-a} = \frac{y-z}{c-b} = \frac{z-x}{a-c}$

141. (3) $a + b + c = 0$

$\Rightarrow a + b = -c$; $b + c = -a$,

$c + a = -b$

$\therefore \frac{a+b}{c} + \frac{b+c}{a} + \frac{c+a}{b}$

$= -1 - 1 - 1 = -3$

$\frac{a}{b+c} + \frac{b}{c+a} + \frac{c}{a+b}$

$= -1 - 1 - 1 = -3$

$\therefore$ Expression $= (-3) \times (-3) = 9$

142. (1) $a + \frac{1}{b} = 1 \Rightarrow ab + 1 = b$

$\Rightarrow ab = b - 1$ .....(i)

Again,

$b + \frac{1}{c} = 1$

$\frac{1}{c} = 1 - b \Rightarrow c = \frac{1}{1-b}$ .....(ii)

On multiplying (i) & (ii)

$abc = \frac{b-1}{1-b} = -1$

143. (3) Expression

$= \frac{(s-a)^2+(s-b)^2+(s-c)^2+s^2}{a^2+b^2+c^2}$

$= \frac{s^2-2sa+a^2+s^2+b^2-2sb+s^2-2sc+c^2+s^2}{a^2+b^2+c^2}$

$= \frac{4s^2+a^2+b^2+c^2-2s(a+b+c)}{a^2+b^2+c^2}$

$= \frac{4s^2+a^2+b^2+c^2-4s^2}{a^2+b^2+c^2} = 1$

144. (4) $x = 3+2\sqrt{2}$

$\therefore \frac{1}{x} = \frac{1}{3+2\sqrt{2}}$

$= \frac{1}{3+2\sqrt{2}} \times \frac{3-2\sqrt{2}}{3-2\sqrt{2}}$

$= \frac{3-2\sqrt{2}}{9-8}$

$= 3-2\sqrt{2}$

$x + \frac{1}{x} = 3+2\sqrt{2}+3-2\sqrt{2} = 6$

$\therefore x^2 + \frac{1}{x^2} = \left(x+\frac{1}{x}\right)^2 - 2$

$= (6)^2 - 2 = 36 - 2 = 34$

145. (2) $3x - 2 = \frac{3}{x}$

$\Rightarrow 3x - \frac{3}{x} = 2$

$\Rightarrow x - \frac{1}{x} = \frac{2}{3}$

On squaring both sides

$\left(x-\frac{1}{x}\right)^2 = \frac{4}{9}$

$\Rightarrow x^2 + \frac{1}{x^2} - 2 = \frac{4}{9}$

$\Rightarrow x^2 + \frac{1}{x^2}$

$= \frac{4}{9} + 2 = \frac{22}{9} = 2\frac{4}{9}$

146. (1) $x^2 - 3x + 1 = 0$

$\Rightarrow x^2 + 1 = 3x$

Dividing both sides by x,

$\Rightarrow x + \frac{1}{x} = 3$

$\therefore x^2 + x + \frac{1}{x} + \frac{1}{x^2}$

$= \left(x^2+\frac{1}{x^2}\right) + \left(x+\frac{1}{x}\right)$

$= \left(x+\frac{1}{x}\right)^2 - 2 + \left(x+\frac{1}{x}\right)$

$= 9 - 2 + 3 = 10$

147. (3) $a^2 + b^2 = 5ab$

$\Rightarrow \frac{a^2+b^2}{ab} = 5$

$\Rightarrow \frac{a}{b} + \frac{b}{a} = 5$

On squaring both sides,

$\therefore \left(\frac{a}{b}+\frac{b}{a}\right)^2 = 25$

$\Rightarrow \frac{a^2}{b^2} + \frac{b^2}{a^2} + 2 = 25$

$\Rightarrow \frac{a^2}{b^2} + \frac{b^2}{a^2} = 25 - 2 = 23$

148. (4) $x^2 - yz = x^2 + xy + zx$

$= x(x + y + z)$

$\left[\because \begin{array}{l} xy + yz + zx = 0 \\ \Rightarrow yz = -xy - zx \end{array}\right]$

Similarly,

$y^2 - zx = y(x + y + z)$

$z^2 - xy = x(x + y + z)$

$\therefore$ Expression

$= \frac{1}{x(x+y+z)} + \frac{1}{y(x+y+z)} + \frac{1}{z(x+y+z)}$

$= \frac{yz+zx+xy}{xyz(x+y+z)} = 0$

149. (3) $a + b + c = 9$

$a^2 + b^2 + c^2$

$= (a + b + c)^2 - 2(ab + bc + ca)$

[$ab + bc + ca$ will be maximum if $a = b = c$]

$a^2 + b^2 + c^2 = 9^2 - 2 \times 27$

$= 81 - 54 = 27$

150. (3) $x + y + z = 13$

$x^2 + y^2 + z^2 = 69$

$(x + y + z)^2$
$= x^2 + y^2 + z^2 + 2(xy + yz + zx)$
$\Rightarrow (13)^2 = 69 + 2(xy + yz + zx)$
$\Rightarrow 2(xy + yz + zx)$
$= 169 - 69 = 100$

$\Rightarrow xy + yz + zx = \frac{100}{2} = 50$

151. (3) a = 0.1039 (Given)

Now, $\sqrt{4a^2 - 4a + 1} + 3a$

$= \sqrt{(1-2a)^2} + 3a$
$= 1 - 2a + 3a$
$= 1 + a = 1 + 0.1039$
$= 1.1039$

152. (1) $\frac{a^2 - b^2 - c^2 - 2bc}{a^2 + b^2 - 2ab - c^2}$

$= \frac{a^2 - (b^2 + c^2 + 2bc)}{(a^2 + b^2 - 2ab) - c^2}$

$= \frac{a^2 - (b+c)^2}{(a-b)^2 - c^2}$

$= \frac{(a+b+c)(a-b-c)}{(a-b+c)(a-b-c)}$

$= \frac{a+b+c}{a-b+c} = \frac{0.25 - 0.05 + 0.5}{0.25 + 0.05 + 0.5}$

$= \frac{0.7}{0.8} = \frac{7}{8}$

153. (1) Using Rule 1,
$25a^2 + 40ab + 16b^2$
$= (5a + 4b)^2$
$= (5 \times 23 - 29 \times 4)^2$
$= (115 - 116)^2 = 1$

154. (2) Using Rule 1,
$(x - y)^2 = x^2 + y^2 - 2xy$
$\Rightarrow 2^2 = 20 - 2xy$
$\Rightarrow 2xy = 20 - 4 = 16$
$\therefore (x + y)^2 = x^2 + y^2 + 2xy$
$= 20 + 16 = 36$

155. (3) Using Rule 1,
$x^2 + y^2 - 4x - 4y + 8 = 0$
$\Rightarrow x^2 - 4x + 4 + y^2 - 4y + 4 = 0$
$\Rightarrow (x - 2)^2 + (y - 2)^2 = 0$
$\Rightarrow x = 2$ and $y = 2$
$\therefore x - y = 2 - 2 = 0$

156. (1) $x^2 + y^2 - z^2 + 2xy$
$= x^2 + y^2 + 2xy - z^2$
$= (x + y)^2 - z^2 = (x+y+z)(x+y-z)$
$= (b + c - 2a + c + a - 2b + a + b - 2c)(x + y - z) = 0$

157. (2) $a^2 + b^2 + c^2 = ab + bc + ca$
$\Rightarrow 2a^2 + 2b^2 + 2c^2$
$= 2ab + 2bc + 2ca$
$\Rightarrow a^2 - 2ab + b^2 + b^2 - 2bc + c^2 + c^2 - 2ac + a^2 = 0$
$\Rightarrow (a - b)^2 + (b - c)^2 + (c - a)^2$
$= 0$
$\Rightarrow a - b = 0 \Rightarrow a = b$
$b - c = 0 \Rightarrow b = c$
$c - a = 0 \Rightarrow c = a$
$\Rightarrow a = b = c$

$\therefore \frac{a+c}{b} = \frac{a+a}{a} = 2$

158. (4) $x^2 + y^2 = (x - y)^2 + 2xy$
$= 4 + 2 \times 24 = 52$

159. (1) $(a \pm b)^2 = a^2 \pm 2ab + b^2$

If $a = \frac{x}{y}$; $b = \frac{y}{2}$

then,

$\pm 2ab = \pm 2 \times \frac{x}{y} \times \frac{y}{2} = \pm x$

$\therefore tx = \pm x$
$\Rightarrow t = \pm 1$

160. (4) $a - b = x + y - x + y = 2y$
$b - c = x - y - x - 2y = -3y$
$c - a = x + 2y - x - y = y$
Now,
$a^2 + b^2 + c^2 - ab - bc - ca$

$= \frac{1}{2}(2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca)$

$= \frac{1}{2}[(a - b)^2 + (b - c)^2 + (c - a)^2]$

$= \frac{1}{2}((2y)^2 + (-3y)^2 + y^2)$

$= \frac{1}{2} \times 14y^2 = 7y^2$

161. (1) $a^2 + b^2 + c^2 = ab + bc + ca$
$\Rightarrow 2a^2 + 2b^2 + 2c^2 = 2ab + 2bc + 2ca$
$\Rightarrow a^2 - 2ab + b^2 + b^2 - 2bc + c^2 + c^2 - 2ac + a^2 = 0$
$\Rightarrow (a - b)^2 + (b - c)^2 + (c - a)^2 = 0$
$\therefore a - b = 0 \Rightarrow a = b$
$b - c = 0 \Rightarrow b = c$
$c - a = 0 \Rightarrow c = a$
$\therefore a = b = c$

$\therefore \frac{a+b}{c} = \frac{a+a}{a} = 2$

162. (4) $a^2 + b^2 + 4c^2 = 2a + 2b - 4c - 3$
$\Rightarrow a^2 + b^2 + 4c^2 - 2a - 2b + 4c + 3 = 0$
$\Rightarrow a^2 - 2a + 1 + b^2 - 2b + 1 + 4c^2 + 4c + 1 = 0$
$\Rightarrow (a - 1)^2 + (b - 1)^2 + (2c + 1)^2 = 0$
$\therefore a - 1 = 0 \Rightarrow a = 1;$
$b - 1 = 0 \Rightarrow b = 1;$

$2c + 1 = 0 \Rightarrow c = -\frac{1}{2}$

$\therefore a^2 + b^2 + c^2 = 1 + 1 + \frac{1}{4} = 2\frac{1}{4}$

163. (1) Check through option
When $x = (a + b + c)^2$,

$\frac{x - a^2}{b + c} + \frac{x - b^2}{c + a} + \frac{x - c^2}{a + b}$

$= \frac{(a+b+c)^2 - a^2}{b+c} + \frac{(a+b+c)^2 - b^2}{c+a} + \frac{(a+b+c)^2 - c^2}{a+b}$

$= \frac{(2a+b+c)(b+c)}{b+c} + \frac{(a+2b+c)(c+a)}{c+a} + \frac{(a+b+2c)(a+b)}{a+b}$

$= 2a + b + c + a + 2b + c + a + b + 2c$
$= 4a + 4b + 4c = 4(a + b + c) =$ RHS.

164. (4) $4x - y = 2$ ....(i)
$2y - 8x + 4 = 0$
$\Rightarrow 8x - 2y = 4$ .....(ii)
For simultaneous linear equations
$a_1x + b_1y = c_1$
$a_2x + b_2y = c_2$ if
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$, there are infinite solutions.

165. (4) $\frac{a}{b} \times \frac{b}{c} = \frac{4}{5} \times \frac{15}{16}$

$\frac{a}{c} = \frac{3}{4}$

$\Rightarrow a = \frac{3}{4}c$

Put in the given equation,

$= \frac{18c^2 - 7\left(\frac{3}{4}c\right)^2}{45c^2 + 20\left(\frac{3}{4}c\right)^2}$

$= \frac{18c^2 - \frac{63}{16}c^2}{45c^2 + \frac{180}{16}c^2} = \frac{1}{4}$

166. (4) Check through options.
If $x = y = z$, then

$$\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}=\frac{3}{x^2}$$

and

$$\frac{1}{xy}+\frac{1}{yz}+\frac{1}{zx}$$

$$=\frac{1}{x^2}+\frac{1}{x^2}+\frac{1}{x^2}=\frac{3}{x^2}$$

167. (1) Using Rule 1,
$121a^2 + 64b^2$
$= (11a)^2 + (8b)^2$
$\because (x + y)^2 = x^2 + y^2 + 2xy$
$\therefore$ Required expression
$= 2 \times 11a \times 8b = 176ab$

168. (2) $a = 2+\sqrt{3}$

$$\frac{1}{a}=\frac{1}{2+\sqrt{3}}=\frac{1}{\left(2+\sqrt{3}\right)}\times\frac{2-\sqrt{3}}{\left(2-\sqrt{3}\right)}$$

$$=\frac{2-\sqrt{3}}{4-3}=2-\sqrt{3}$$

$$\therefore\ a^2+\frac{1}{a^2}=\left(a+\frac{1}{a}\right)^2-2$$

$$=\left(2+\sqrt{3}+2-\sqrt{3}\right)^2-2$$

$$=16-2=14$$

169. (3) $p+\frac{1}{4}\sqrt{p}+k^2$

$$=\left(\sqrt{p}\right)^2+2.\sqrt{p}.\frac{1}{8}+\left(\frac{1}{8}\right)^2-\left(\frac{1}{8}\right)^2+k^2$$

$$\Rightarrow\ k^2=\left(\frac{1}{8}\right)^2\Rightarrow k=\pm\frac{1}{8}$$

170. (3) $\frac{b-c}{a}+\frac{a+c}{b}+\frac{a-b}{c}=1$

$$\Rightarrow\frac{b-c}{a}+\frac{a-b}{c}+\frac{a+c}{b}-1=0$$

$$\Rightarrow\frac{b-c}{a}+\frac{a-b}{c}+\frac{a+c-b}{b}=0$$

$$\Rightarrow\frac{c-b}{a}+\frac{b-a}{c}=\frac{a+c-b}{b}$$

$$\Rightarrow\frac{c^2-bc+ab-a^2}{ac}=\frac{a+c-b}{b}$$

$$\Rightarrow\frac{(c^2-a^2)-(bc-ab)}{ac}=\frac{a+c-b}{b}$$

$$\Rightarrow\frac{(c-a)(c+a)-b(c-a)}{ac}$$

$$=\frac{a+c-b}{b}$$

$$\Rightarrow\frac{(c-a)(c+a-b)}{ac}=\frac{a+c-b}{b}$$

$$\Rightarrow\frac{c-a}{ac}=\frac{1}{b}$$

$$\Rightarrow\frac{c}{ac}-\frac{a}{ac}=\frac{1}{b}$$

$$\Rightarrow\frac{1}{a}-\frac{1}{c}=\frac{1}{b}$$

171. (2) $\frac{d}{c}=a-b$

$$\Rightarrow\frac{c}{d}=\frac{1}{a-b}=\frac{a+b}{a-b}$$

$$\Rightarrow\frac{c+d}{c-d}=\frac{a+b+a-b}{a+b-a+b}=\frac{a}{b}$$

(By componendo and dividendo)

$$\Rightarrow\frac{1}{c-d}=\frac{a}{b}$$

$$\Rightarrow(c-d)=\frac{b}{a}$$

$$\Rightarrow c^2-d^2=(c+d)\ (c-d)\ =\frac{b}{a}$$

172. (2) $x = 2y$

$$\Rightarrow 3t = 2\times\frac{1}{2}\ (t+1)$$

$$\Rightarrow 3t = t+1 \Rightarrow 3t-t=1$$

$$\Rightarrow 2t = 1 \Rightarrow t=\frac{1}{2}$$

173. (3) $x^2+\frac{1}{5}x+a^2$

$$=x^2+2.x.\frac{1}{10}+\left(\frac{1}{10}\right)^2-\left(\frac{1}{10}\right)^2+a^2$$

$$\therefore\ a^2-\left(\frac{1}{10}\right)^2=0\Rightarrow a^2=\left(\frac{1}{10}\right)^2$$

$$\Rightarrow a=\frac{1}{10}$$

174. (3) Expression $= 2 - 3x - 4x^2$
$= -(4x^2 + 3x - 2)$

$$=-\left[(2x)^2+2\times2x\times\frac{3}{4}+\left(\frac{3}{4}\right)^2-\left(\frac{3}{4}\right)^2-2\right]$$

$$=-\left[\left(2x+\frac{3}{4}\right)^2\right]+\left(\frac{3}{4}\right)^2+2$$

The value of expression will be maximum if,

$$2x+\frac{3}{4}=0$$

$$\Rightarrow 2x=-\frac{3}{4}$$

$$\Rightarrow x=-\frac{3}{8}$$

175. (1) Expression $= x^4 - 2x^2 + k$
$= (x^2)^2 - 2.x^2.1 + (1)^2 - (1)^2 + k$
For a perfect square,
$-1 + k = 0 \Rightarrow k = 1$

176. (2) $f(x) = x^2 + k_1x + k_2$
$(x - 1)$ is a factor of $f(x)$.
$\therefore f(1) = 0$
$\Rightarrow 1 + k_1 + k_2 = 0$
$\Rightarrow k_1 + k_2 = -1$ ... (i)
Again,
$f(-3) = 0$
$\Rightarrow (-3)^2 + k_1(-3) + k_2 = 0$
$\Rightarrow 9 - 3k_1 + k_2 = 0$
$\Rightarrow 3k_1 - k_2 = 9$ ...(ii)
On adding both equations,
$4k_1 = 8 \Rightarrow k_1 = 2$
From equation (i),
$k_1 + k_2 = -1$
$\Rightarrow 2 + k_2 = -1$
$\Rightarrow k_2 = -1 - 2 = -3$

177. (4) $\frac{5x}{2x^2+5x+1}=\frac{1}{3}$

Dividing Numerator and Denominator by x,

$$\frac{5}{2x+5+\frac{1}{x}}=\frac{1}{3}$$

On dividing N^r and D^r by 2,

$$\frac{\frac{5}{2}}{x+\frac{5}{2}+\frac{1}{2x}}=\frac{1}{3}$$

$$\Rightarrow\left(x+\frac{1}{2x}\right)+\frac{5}{2}=\frac{15}{2}$$

$$\Rightarrow\ x+\frac{1}{2x}=\frac{15}{2}-\frac{5}{2}=\frac{10}{2}=5$$

178. (1) $x+\frac{1}{x}=\frac{x^2+1}{x}$

$\therefore$ Its reciprocal $= \dfrac{x}{x^2+1}$

179. (1) The value of $\dfrac{1}{a}+\dfrac{1}{b}+\dfrac{1}{c}$ will be minimum, if values of a, b and c be maximum.

$a + b + c = 1$

$\therefore$ Values of a, b and c will be maximum if

$a = b = c$

$\therefore a = b = c = \dfrac{1}{3}$

$\therefore \dfrac{1}{a}+\dfrac{1}{b}+\dfrac{1}{c} = 3 + 3 + 3 = 9$

180. (2) $a(2+\sqrt{3}) = b(2-\sqrt{3}) = 1$

$\Rightarrow a = \dfrac{1}{2+\sqrt{3}} = \dfrac{2-\sqrt{3}}{(2+\sqrt{3})(2-\sqrt{3})}$

$= \dfrac{2-\sqrt{3}}{4-3} = 2-\sqrt{3}$

and $b = \dfrac{1}{2-\sqrt{3}}$

$= \dfrac{2+\sqrt{3}}{(2-\sqrt{3})(2+\sqrt{3})} = \dfrac{2+\sqrt{3}}{4-3}$

$= 2+\sqrt{3}$

$\therefore a^2 + 1 = (2-\sqrt{3})^2 + 1$

$= 4 + 3 - 4\sqrt{3} + 1 = 8 - 4\sqrt{3}$

$b^2 + 1 = (2+\sqrt{3})^2 + 1$

$= 4 + 3 + 4\sqrt{3} + 1 = 8 + 4\sqrt{3}$

$\therefore \dfrac{1}{a^2+1} + \dfrac{1}{b^2+1}$

$= \dfrac{1}{8-4\sqrt{3}} + \dfrac{1}{8+4\sqrt{3}}$

$= \dfrac{8+4\sqrt{3}+8-4\sqrt{3}}{(8-4\sqrt{3})(8+4\sqrt{3})}$

$= \dfrac{16}{64-16\times 3} = \dfrac{16}{64-48}$

$= \dfrac{16}{16} = 1$

181. (4) $(2+\sqrt{3})a = (2-\sqrt{3})b = 1$

$\Rightarrow a = \dfrac{1}{2+\sqrt{3}}$

$\therefore \dfrac{1}{a} = 2+\sqrt{3}$

Similarly,

$b = \dfrac{1}{2-\sqrt{3}}$

$\dfrac{1}{b} = 2-\sqrt{3}$

$\therefore \dfrac{1}{a}+\dfrac{1}{b} = 2+\sqrt{3}+2-\sqrt{3} = 4$

182. (1) $a+\dfrac{1}{b} = b+\dfrac{1}{c} = c+\dfrac{1}{a} = \pm 1$

$\Rightarrow a+\dfrac{1}{b} = 1$

$\Rightarrow ab + 1 = b \Rightarrow ab = b - 1$

$b+\dfrac{1}{c} = 1, \Rightarrow \dfrac{1}{c} = 1 - b$

$\Rightarrow c = \dfrac{1}{1-b}$

$\therefore abc = \dfrac{b-1}{1-b} = -1$

Again, $a+\dfrac{1}{b} = -1$

$\Rightarrow ab + 1 = -b \Rightarrow ab = -b - 1$

$b+\dfrac{1}{c} = -1 \Rightarrow \dfrac{1}{c} = -1 - b$

$\Rightarrow c = \dfrac{1}{-1-b}$

$\therefore abc = 1$

$\therefore abc = \pm 1$

183. (3) $\dfrac{x}{y} = \dfrac{4}{5}$ (Given)

Expression $= \dfrac{4}{7} + \dfrac{2y-x}{2y+x}$

$= \dfrac{4}{7} + \dfrac{\dfrac{2y}{y}-\dfrac{x}{y}}{\dfrac{2y}{y}+\dfrac{x}{y}}$

$= \dfrac{4}{7} + \dfrac{2-\dfrac{x}{y}}{2+\dfrac{x}{y}} = \dfrac{4}{7} + \dfrac{2-\dfrac{4}{5}}{2+\dfrac{4}{5}}$

$= \dfrac{4}{7} + \dfrac{\dfrac{10-4}{5}}{\dfrac{10+4}{5}} = \dfrac{4}{7} + \dfrac{6}{14}$

$= \dfrac{4}{7} + \dfrac{3}{7} = \dfrac{7}{7} = 1$

184. (4) $P(x) = x^2 + 3Q x - 2Q$

$\because (x-2)$ is a factor of $P(x)$.

$\therefore P(2) = 0$

$\Rightarrow (2)^2 + 3Q \times 2 - 2Q = 0$

$\Rightarrow 4 + 6Q - 2Q = 0$

$\Rightarrow 4Q + 4 = 0$

$\Rightarrow 4Q = -4 \Rightarrow Q = -1$

185. (4) Using Rule 1,

$a + b = 12$, $ab = 22$

$\therefore a^2 + b^2 = (a+b)^2 - 2ab$

$= (12)^2 - 2 \times 22$

$= 144 - 44 = 100$

186. (2) $x = \sqrt{3} - \dfrac{1}{\sqrt{3}}$

$y = \sqrt{3} + \dfrac{1}{\sqrt{3}}$

$x + y = \sqrt{3} - \dfrac{1}{\sqrt{3}} + \sqrt{3} + \dfrac{1}{\sqrt{3}}$

$= 2\sqrt{3}$

$xy = \left(\sqrt{3}-\dfrac{1}{\sqrt{3}}\right)\left(\sqrt{3}+\dfrac{1}{\sqrt{3}}\right)$

$= 3 - \dfrac{1}{3} = \dfrac{9-1}{3} = \dfrac{8}{3}$

$\therefore \dfrac{x^2}{y} + \dfrac{y^2}{x} = \dfrac{x^3+y^3}{xy}$

$= \dfrac{(x+y)^3 - 3xy(x+y)}{xy}$

$= \dfrac{(2\sqrt{3})^3 - 3\times\dfrac{8}{3}(2\sqrt{3})}{\dfrac{8}{3}}$

$= \dfrac{24\sqrt{3} - 16\sqrt{3}}{\dfrac{8}{3}}$

$= \frac{8\sqrt{3} \times 3}{8} = 3\sqrt{3}$

187. (2) $ax^2 + bx + c$ will be a perfect square, if $b^2 = 4ac$

$\therefore$ $x^2 + ax + b$ will be a perfect square if $a^2 = 4b$

Look : $x^2 + 2\sqrt{b}\,x + b$

$= x^2 + 2.x.\sqrt{b} + \left(\sqrt{b}\right)^2$

$= (x + \sqrt{b})^2$

188. (1) $a + b + c + d = 4$ (Given)

Expression

$= \frac{1}{(1-a)(1-b)(1-c)} + \frac{1}{(1-b)(1-c)(1-d)}$

$+ \frac{1}{(1-c)(1-d)(1-a)} + \frac{1}{(1-d)(1-a)(1-b)}$

$= \frac{1-d+1-a+1-b+1-c}{(1-a)(1-b)(1-c)(1-d)}$

$= \frac{4-(a+b+c+d)}{(1-a)(1-b)(1-c)(1-d)}$

$= \frac{4-4}{(1-a)(1-b)(1-c)(1-d)} = 0$

189. (2) If $a + b + c = 0$,

$a^3 + b^3 + c^3 = 3abc$

$\therefore$ If $a^{\frac{1}{3}} + b^{\frac{1}{3}} + c^{\frac{1}{3}} = 0$

$\Rightarrow \left(a^{\frac{1}{3}}\right)^3 + \left(b^{\frac{1}{3}}\right)^3 + \left(c^{\frac{1}{3}}\right)^3$

$= 3.a^{\frac{1}{3}}.b^{\frac{1}{3}}.c^{\frac{1}{3}}$

$\Rightarrow a + b + c = 3a^{\frac{1}{3}}.b^{\frac{1}{3}}.c^{\frac{1}{3}}$

$\Rightarrow (a + b + c)^3$

$= 3^3.\left(a^{\frac{1}{3}}.b^{\frac{1}{3}}.c^{\frac{1}{3}}\right)^3 = 27abc$

190. (2) $a = \sqrt{6} + \sqrt{5}$, $b = \sqrt{6} - \sqrt{5}$ $a - b = \sqrt{6} + \sqrt{5} - \sqrt{6} + \sqrt{5}$

$= 2\sqrt{5}$

$ab = \left(\sqrt{6} + \sqrt{5}\right)\left(\sqrt{6} - \sqrt{5}\right)$

$= 6 - 5 = 1$

$\therefore$ $2a^2 - 5ab + 2b^2$

$= 2\left(a^2 - \frac{5}{2}ab + b^2\right)$

$= 2\left(a^2 - 2ab + b^2 - \frac{1}{2}ab\right)$

$= 2\,(a^2 - 2ab + b^2) - ab$

$= 2\,(a - b)^2 - ab$

$= 2 \times \left(2\sqrt{5}\right)^2 - 1$

$= 2 \times 4 \times 5 - 1 = 40 - 1 = 39$

191. (3) $a^2 + b^2 + c^2 = 2a - 2b - 2$

$\Rightarrow a^2 + b^2 + c^2 - 2a + 2b + 2 = 0$

$\Rightarrow a^2 - 2a + 1 + b^2 + 2b + 1 + c^2 = 0$

$\Rightarrow (a - 1)^2 + (b + 1)^2 + c^2 = 0$

$\Rightarrow a - 1 = 0 \Rightarrow a = 1;$

$\Rightarrow b + 1 = 0 \Rightarrow b = -1;$

and $c = 0$

$\therefore 3a - 2b + c = 3 \times 1 - 2\,(-1) + 0$

$= 3 + 2 = 5$

192. (2) $a + b + c = 3$; $a^2 + b^2 + c^2 = 6$

$\therefore$ $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

$\Rightarrow 3^2 = 6 + 2\,(ab + bc + ca)$

$\Rightarrow 9 - 6 = 2(ab + bc + ca)$

$\Rightarrow ab + bc + ca = \frac{3}{2}$

$\therefore \frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 1$

$\Rightarrow \frac{bc + ac + ab}{abc} = 1$

$\Rightarrow abc = ab + bc + ca = \frac{3}{2}$

193. (4) $a^2 - 4a - 1 = 0$

$\Rightarrow a^2 - 1 = 4a$

On dividing both sides by a,

$\frac{a^2 - 1}{a} = \frac{4a}{a}$

$\Rightarrow a - \frac{1}{a} = 4$ ...(i)

Expression $= a^2 + 3a + \frac{1}{a^2} - \frac{3}{a}$

$= a^2 + \frac{1}{a^2} + 3a - \frac{3}{a}$

$= \left(a - \frac{1}{a}\right)^2 + 2 + 3\left(a - \frac{1}{a}\right)$

$= (4)^2 + 2 + 3 \times 4$

$= 16 + 2 + 12 = 30$

194. (4) $x = 2 + \sqrt{3}$

$\therefore \frac{1}{x} = \frac{1}{2+\sqrt{3}} = \frac{2-\sqrt{3}}{(2+\sqrt{3})\,(2-\sqrt{3})}$

$= \frac{2-\sqrt{3}}{4-3} = 2 - \sqrt{3}$

$\therefore x^2 + \frac{1}{x^2} = \left(x + \frac{1}{x}\right)^2 - 2$

$= (2 + \sqrt{3} + 2 - \sqrt{3})^2 - 2$

$= 4^2 - 2 = 16 - 2 = 14$

195. (3) $a^2 + b^2 + c^2 = 2a - 2b - 2c - 3$

$\Rightarrow (a^2 - 2a + 1) + (b^2 + 2b + 1) + (c^2 + 2c + 1) = 0$

$\Rightarrow (a - 1)^2 + (b + 1)^2 + (c + 1)^2 = 0$

$\Rightarrow a = 1,\ b = -1,\ c = -1$

$\therefore$ $a + b + c = 1 - 1 - 1 = -1$

196. (4) $-1 \le \frac{2x-7}{5} \le 1$

$\Rightarrow -5 \le 2x - 7 \le 5$

$\Rightarrow -5 + 7 \le 2x - 7 + 7 \le 5 + 7$

$\Rightarrow 2 \le 2x \le 12$

$\Rightarrow 1 \le x \le 6$

197. (3)

$\frac{3-5x}{2x} + \frac{3-5y}{2y} + \frac{3-5z}{2z} = 0$

$\Rightarrow \frac{3}{2x} - \frac{5x}{2x} + \frac{3}{2y} - \frac{5y}{2y} + \frac{3}{2z} - \frac{5z}{2z} = 0$

$\Rightarrow \frac{3}{2x} + \frac{3}{2y} + \frac{3}{2z} - \frac{5}{2} - \frac{5}{2} - \frac{5}{2} = 0$

$\Rightarrow \frac{3}{2x} + \frac{3}{2y} + \frac{3}{2z} = \frac{3 \times 5}{2}$

$\Rightarrow \frac{1}{2x} + \frac{1}{2y} + \frac{1}{2z} = \frac{5}{2}$

$\Rightarrow \frac{4}{2x} + \frac{4}{2y} + \frac{4}{2z} = \frac{4 \times 5}{2}$

$\Rightarrow \frac{2}{x} + \frac{2}{y} + \frac{2}{z} = 10$

198. (1) $2s = a + b + c$

$\therefore s\,(s - c) = \left(\frac{a+b+c}{2}\right)\left(\frac{a+b+c}{2} - c\right)$

$= \frac{(a+b+c)(a+b-c)}{4}$

Again, $(s - a)\,(s - b)$

$= \frac{1}{4}\,(2s - 2a)\,(2s - 2b)$

$= \frac{1}{4}(a+b+c-2a)(a+b+c-2b)$

$= \frac{1}{4}(b+c-a)(a+c-b)$

$\therefore\ s(s-c)+(s-a)(s-b)$

$= \frac{1}{4}[(a+b+c)(a+b-c)+(b+c-a)(a+c-b)]$

$= \frac{1}{4}[(a+b)^2-c^2+ab+ac-a^2+bc+c^2-ac-b^2-bc+ab]$

$= \frac{1}{4}(a^2+b^2+2ab-c^2+ab+ac-a^2+bc+c^2-ac-b^2-bc+ab)$

$= \frac{1}{4}\times 4ab = ab$

199. (4) $\frac{2p}{p^2-2p+1} = \frac{1}{4}$

On dividing numerator and denominator by p, we get,

$\frac{2}{p-2+\frac{1}{p}} = \frac{1}{4}$

$\Rightarrow p+\frac{1}{p}-2 = 8$

$\Rightarrow p+\frac{1}{p} = 8+2 = 10$

200. (1) $\sqrt{1+\frac{27}{169}} = 1+\frac{x}{13}$

$\Rightarrow \sqrt{\frac{169+27}{169}} = 1+\frac{x}{13}$

$\Rightarrow \sqrt{\frac{196}{169}} = 1+\frac{x}{13}$

$\Rightarrow \frac{14}{13} = 1+\frac{x}{13}$

$\Rightarrow 1+\frac{1}{13} = 1+\frac{x}{13}$

$\Rightarrow x = 1$

201. (3) $2x = \sqrt{a}+\frac{1}{\sqrt{a}}$

On squaring both sides,

$4x^2 = a+\frac{1}{a}+2$

$\Rightarrow 4x^2-4 = a+\frac{1}{a}+2-4$

$= a+\frac{1}{a}-2$

$\therefore \sqrt{4x^2-4} = \sqrt{\left(\sqrt{a}-\frac{1}{\sqrt{a}}\right)^2}$

$= \sqrt{a}-\frac{1}{\sqrt{a}}$

$\therefore \sqrt{x^2-1} = \frac{1}{2}\left(\sqrt{a}-\frac{1}{\sqrt{a}}\right)$

$\therefore$ Expression $= \frac{\sqrt{x^2-1}}{x-\sqrt{x^2-1}}$

$= \frac{\frac{1}{2}\left(\sqrt{a}-\frac{1}{\sqrt{a}}\right)}{\frac{1}{2}\left(\sqrt{a}+\frac{1}{\sqrt{a}}\right)-\frac{1}{2}\left(\sqrt{a}-\frac{1}{\sqrt{a}}\right)}$

$= \frac{\frac{1}{2}\left(\sqrt{a}-\frac{1}{\sqrt{a}}\right)}{\frac{1}{\sqrt{a}}} = \frac{1}{2}\sqrt{a}\left(\sqrt{a}-\frac{1}{\sqrt{a}}\right)$

$= \frac{1}{2}(a-1)$

202. (1) $a^2+b^2+c^2 = 2a-2b-2c-3$

$\Rightarrow a^2-2a+1+b^2+2b+1+c^2+2c+1 = 0$

$\Rightarrow (a-1)^2+(b+1)^2+(c+1)^2 = 0$

$\Rightarrow a-1 = 0,\ b+1 = 0,\ c+1 = 0$

$\Rightarrow a = 1,\ b = -1,\ c = -1$

$\therefore a+b+c = 1-1-1 = -1$

203. (2) $\frac{a+b-c}{a+b} = \frac{b+c-a}{b+c}$

$= \frac{c+a-b}{c+a}$

$\Rightarrow \frac{a+b}{a+b}-\frac{c}{a+b} = \frac{b+c}{b+c}-\frac{a}{b+c}$

$= \frac{c+a}{c+a}-\frac{b}{c+a}$

$\Rightarrow 1-\frac{c}{a+b} = 1-\frac{a}{b+c}$

$= 1-\frac{b}{c+a}$

$\Rightarrow \frac{c}{a+b} = \frac{a}{b+c} = \frac{b}{c+a}$

$\Rightarrow \frac{a+b}{c} = \frac{b+c}{a} = \frac{c+a}{b}$

$\Rightarrow \frac{a+b}{c}+1 = \frac{b+c}{a}+1 = \frac{c+a}{b}+1$

$\Rightarrow \frac{a+b+c}{c} = \frac{b+c+a}{a}$

$= \frac{c+a+b}{b}$

$\Rightarrow \frac{1}{c} = \frac{1}{a} = \frac{1}{b} \Rightarrow a = b = c$

204. (4) Given, $bc+ab+ca = abc$

$\therefore bc+ab = abc-ac$

$ab+ca = abc-bc$

$bc+ca = abc-ab$

$\therefore$ Expression $= \frac{b+c}{abc-bc}+\frac{a+c}{abc-ac}+\frac{a+b}{abc-ab}$

$= \frac{b+c}{ab+ac}+\frac{a+c}{bc+ab}+\frac{a+b}{bc+ca}$

$= \frac{b+c}{a(b+c)}+\frac{a+c}{b(c+a)}+\frac{a+b}{c(a+b)}$

$= \frac{1}{a}+\frac{1}{b}+\frac{1}{c}$

$= \frac{bc+ac+ab}{abc}$

$= \frac{abc}{abc} = 1$

205. (4) $\frac{a^2-bc}{a^2+bc}+\frac{b^2-ca}{b^2+ca}+\frac{c^2-ab}{c^2+ab} = 1$

$\Rightarrow \left(\frac{a^2-bc}{a^2+bc}+1\right)+\left(\frac{b^2-ca}{b^2+ca}+1\right)+\left(\frac{c^2-ab}{c^2+ab}+1\right) = 4$

$$\Rightarrow \frac{a^2-bc+a^2+bc}{a^2+bc} +$$

$$\frac{b^2-ca+b^2+ca}{b^2+ca}+\frac{c^2-ab+c^2+ab}{c^2+ab}=4$$

$$\Rightarrow \frac{2a^2}{a^2+bc}+\frac{2b^2}{b^2+ca}+\frac{2c^2}{c^2+ab}=4$$

$$\Rightarrow \frac{a^2}{a^2+bc}+\frac{b^2}{b^2+ca}+\frac{c^2}{c^2+ab}$$

$$=\frac{4}{2}=2$$

206. (3) $999x + 888y = 1332$
$888x + 999y = 555$
On adding,
$1887x + 1887y = 1887$
$\Rightarrow 1887\ (x + y) = 1887$

$$\Rightarrow x+y=\frac{1887}{1887}=1$$

207. (3) $a=\dfrac{\sqrt{x+2}+\sqrt{x-2}}{\sqrt{x+2}-\sqrt{x-2}}$

By componendo and dividendo,

$$\frac{a+1}{a-1}$$

$$=\frac{\sqrt{x+2}+\sqrt{x-2}+\sqrt{x+2}-\sqrt{x-2}}{\sqrt{x+2}+\sqrt{x-2}-\sqrt{x+2}+\sqrt{x-2}}$$

$$\Rightarrow \frac{a+1}{a-1}$$

$$=\frac{2\sqrt{x+2}}{2\sqrt{x-2}}=\frac{\sqrt{x+2}}{\sqrt{x-2}}$$

On squaring both sides,

$$\frac{a^2+2a+1}{a^2-2a+1}=\frac{x+2}{x-2}$$

$$\Rightarrow \frac{a^2+1+2a}{a^2+1-2a}=\frac{x+2}{x-2}$$

By componendo and dividendo,

$$\frac{2(a^2+1)}{4a}=\frac{2x}{4}$$

$$\Rightarrow \frac{a^2+1}{a}=x$$

$\Rightarrow a^2 + 1 = ax$
$\Rightarrow a^2 - ax = -1$

208. (3) $x=\dfrac{1}{2+\sqrt{3}}$

$$=\frac{1}{2+\sqrt{3}}\times\frac{2-\sqrt{3}}{2-\sqrt{3}}=\frac{2-\sqrt{3}}{4-3}$$

$$=2-\sqrt{3}$$

$$\therefore\ y=\frac{1}{2-\sqrt{3}}=2+\sqrt{3}$$

$$\therefore\ x+y=2-\sqrt{3}+2+\sqrt{3}=4$$

$xy = (2 - \sqrt{3})\ (2 + \sqrt{3})$
$= 4 - 3 = 1$
$\therefore\ 8xy\ (x^2 + y^2)$
$= 8xy\ [(x + y)^2 - 2\ xy]$
$= 8 \times 1\ (4^2 - 2 \times 1)$
$= 8\ (16 - 2) = 8 \times 14 = 112$

209. (2) $a^2 + b^2 + c^2 = ab + bc + ca$
$\Rightarrow 2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca = 0$
$\Rightarrow a^2 + b^2 - 2ab + b^2 + c^2 - 2bc + c^2 + a^2 - 2ca = 0$
$\Rightarrow (a - b)^2 + (b - c)^2 + (c - a)^2 = 0$
$\Rightarrow a - b = 0,\ b - c = 0,\ c - a = 0$
$\Rightarrow a = b,\ b = c,\ c = a$
$\Rightarrow a = b = c$

$$\therefore\ \frac{a+c}{b}=\frac{2a}{a}=2$$

210. (3) $\dfrac{m-a^2}{b^2+c^2}+\dfrac{m-b^2}{c^2+a^2}+$

$$\frac{m-c^2}{a^2+b^2}-3=0$$

$$\Rightarrow \frac{m-a^2}{b^2+c^2}-1+\frac{m-b^2}{c^2+a^2}-1$$

$$+\frac{m-c^2}{a^2+b^2}-1=0$$

$$\Rightarrow \frac{m-a^2-b^2-c^2}{b^2+c^2}+$$

$$\frac{m-b^2-c^2-a^2}{c^2+a^2}+\frac{m-c^2-a^2-b^2}{a^2+b^2}$$
$$=0$$

$$\Rightarrow \frac{m-(a^2+b^2+c^2)}{b^2+c^2}+$$

$$\frac{m-(a^2+b^2+c^2)}{c^2+a^2}+$$

$$\frac{m-(a^2+b^2+c^2)}{a^2+b^2}=0$$

$\therefore$ Each term $= 0$

$$\therefore\ \frac{m-(a^2+b^2+c^2)}{b^2+c^2}=0$$

$\Rightarrow m - (a^2 + b^2 + c^2) = 0$
$\Rightarrow m = a^2 + b^2 + c^2$

211. (3) $x+\dfrac{1}{x}=1$ (Given)

$$\text{Expression}=\frac{x^2+3x+1}{x^2+7x+1}$$

$$=\frac{x+\frac{1}{x}+3}{x+\frac{1}{x}+7}$$

(Dividing numerator and denominator by x)

$$=\frac{1+3}{1+7}=\frac{4}{8}=\frac{1}{2}$$

212. (3) Using Rule 8,
p = 99 (Given)
Expression = $p\ (p^2 + 3p + 3)$
$= p^3 + 3p^2 + 3p$
$= p^3 + 3p^2 + 3p + 1 - 1$
$= (p + 1)^3 - 1$
$= (99 + 1)^3 - 1 = (100)^3 - 1$
$= 1000000 - 1 = 999999$

213. (1) $x=\dfrac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$,

$$y=\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$$

$$\therefore\ x+y=\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}+\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$$

$$=\frac{\left(\sqrt{5}-\sqrt{3}\right)^2+\left(\sqrt{5}+\sqrt{3}\right)^2}{\left(\sqrt{5}+\sqrt{3}\right)\times\left(\sqrt{5}-\sqrt{3}\right)}$$

$$=\frac{2\left(\left(\sqrt{5}\right)^2+\left(\sqrt{3}\right)^2\right)}{5-3}$$

$= 5 + 3 = 8$

$$xy=\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}\times\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}=1$$

$\therefore \dfrac{x^2+xy+y^2}{x^2-xy+y^2}$

$= \dfrac{(x+y)^2-xy}{(x+y)^2-3xy}$

$= \dfrac{8^2-1}{8^2-3} = \dfrac{64-1}{64-3} = \dfrac{63}{61}$

214. (1) $x + \dfrac{1}{x} = 1$

$\Rightarrow x^2 + 1 = x \Rightarrow x^2 - x + 1 = 0$

$\therefore \dfrac{2}{x^2-x+2} = \dfrac{2}{x^2-x+1+1}$

$= \dfrac{2}{0+1} = 2$

215. (1) $\dfrac{x}{1} = \dfrac{a-b}{a+b}$

By componendo and dividendo,

$\dfrac{1-x}{1+x} = \dfrac{1-\dfrac{a-b}{a+b}}{1+\dfrac{a-b}{a+b}}$

$= \dfrac{a+b-a+b}{a+b+a-b} = \dfrac{b}{a}$

Similarly,

$\dfrac{1-y}{1+y} = \dfrac{c}{b}$; $\dfrac{1-z}{1+z} = \dfrac{a}{c}$

$\therefore$ Expression$= \dfrac{(1-x)(1-y)(1-z)}{(1+x)(1+y)(1+z)}$

$= \dfrac{b}{a} \times \dfrac{c}{b} \times \dfrac{a}{c} = 1$

216. (1) $x = \dfrac{\sqrt{13}+\sqrt{11}}{\sqrt{13}-\sqrt{11}}$

On rationalising the denominator,

$= \dfrac{\sqrt{13}+\sqrt{11}}{\sqrt{13}-\sqrt{11}} \times \dfrac{\sqrt{13}+\sqrt{11}}{\sqrt{13}+\sqrt{11}}$

$= \dfrac{\left(\sqrt{13}+\sqrt{11}\right)^2}{\left(\sqrt{13}\right)^2-\left(\sqrt{11}\right)^2}$

$= \dfrac{13+11+2\sqrt{143}}{13-11}$

$= \dfrac{24+2\sqrt{143}}{2} = 12 + \sqrt{143}$

$\therefore y = \dfrac{1}{x} = \dfrac{1}{12+\sqrt{143}}$

$= \dfrac{1}{12+\sqrt{143}} \times \dfrac{12-\sqrt{143}}{12-\sqrt{143}}$

$= \dfrac{12-\sqrt{143}}{144-143} = 12 - \sqrt{143}$

$\therefore x - y = 12 + \sqrt{143} - 12 + \sqrt{143} = 2\sqrt{143}$ and

$xy = \left(12+\sqrt{143}\right)\left(12-\sqrt{143}\right)$

$= 144 - 143 = 1$

$\therefore 3x^2 - 5xy + 3y^2 = 3x^2 - 6xy + 3y^2 + xy$

$= 3(x-y)^2 + xy$

$= 3\left(2\sqrt{143}\right)^2 + 1$

$= 3 \times 4 \times 143 + 1 = 1716 + 1$

$= 1717$

217. (4) $a + \dfrac{1}{b} = b + \dfrac{1}{c} = c + \dfrac{1}{a}$

$\Rightarrow \dfrac{abc+c}{bc} = \dfrac{abc+a}{ac}$

$= \dfrac{abc+b}{ab}$

$\Rightarrow \dfrac{c}{bc} = \dfrac{a}{ac} = \dfrac{b}{ab}$

$\Rightarrow \dfrac{1}{b} = \dfrac{1}{c} = \dfrac{1}{a}$

$\Rightarrow a = b = c = 1$

$\therefore a^2 b^2 c^2 = 1$

218. (3) $a^2 + b^2 + c^2 = ab + bc + ca$

$\Rightarrow 2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca = 0$

$\Rightarrow a^2 + b^2 - 2ab + b^2 + c^2 - 2bc + c^2 + a^2 - 2ca = 0$

$\Rightarrow (a-b)^2 + (b-c)^2 + (c-a)^2 = 0$

$\therefore a-b = 0 \Rightarrow a = b$

$b-c = 0 \Rightarrow b = c$

$c-a = 0 \Rightarrow c = a$

$\therefore a = b = c$

$\therefore \dfrac{a+c}{b} = \dfrac{2a}{a} = 2$

219. (3) $9x^2 + 25 - 30x$

$= (3x)^2 + (5)^2 - 2 \times 3x \times 5$

$= (3x-5)^2$

220. (4) $\dfrac{x}{3} + \dfrac{3}{x} = 1$

$\Rightarrow \dfrac{x^2+9}{3x} = 1$

$\Rightarrow x^2 + 9 = 3x$

$\Rightarrow x^2 - 3x + 9 = 0$

$\therefore x^3+3^3 = (x+3)(x^2-3x+9) = 0$

$\Rightarrow x^3 = -27$

221. (2) $x + y = 2a = a + a$

$\Rightarrow x - a = a - y$

Expression $= \dfrac{a}{x-a} + \dfrac{a}{y-a}$

$= \dfrac{a}{x-a} - \dfrac{a}{a-y}$

$= \dfrac{a}{x-a} - \dfrac{a}{x-a} = 0$

222. (1) $\dfrac{x+1}{x-1} = \dfrac{a}{b}$

By componendo and dividendo,

$\dfrac{x+1+x-1}{x+1-x+1} = \dfrac{a+b}{a-b}$

$\Rightarrow \dfrac{2x}{2} = \dfrac{a+b}{a-b}$

$\Rightarrow x = \dfrac{a+b}{a-b}$

Again,

$\dfrac{1-y}{1+y} = \dfrac{b}{a}$

$\Rightarrow \dfrac{1+y}{1-y} = \dfrac{a}{b}$

$\Rightarrow \dfrac{1+y+1-y}{1+y-1+y} = \dfrac{a+b}{a-b}$

$\Rightarrow \dfrac{2}{2y} = \dfrac{a+b}{a-b}$

$\Rightarrow y = \dfrac{a-b}{a+b}$

$\therefore x - y = \dfrac{a+b}{a-b} - \dfrac{a-b}{a+b}$

$$= \frac{(a+b)^2-(a-b)^2}{(a+b)(a-b)} = \frac{4ab}{a^2-b^2}$$

$$xy = \frac{a+b}{a-b} \times \frac{a-b}{a+b} = 1$$

$\therefore$ Expression

$$= \frac{x-y}{1+xy} = \frac{4ab}{\frac{a^2-b^2}{1+1}}$$

$$= \frac{4ab}{2(a^2-b^2)} = \frac{2ab}{a^2-b^2}$$

223. (4) $\frac{a}{b}+\frac{b}{a} = 2$

$$\Rightarrow \frac{a^2+b^2}{ab} = 2$$

$\Rightarrow a^2 + b^2 = 2ab$

$\Rightarrow a^2 + b^2 - 2ab = 0$

$\Rightarrow (a-b)^2 = 0 \Rightarrow a - b = 0$

224. (2) $\sqrt{y} = 4x \Rightarrow y = (4x)^2 = 16x^2$

$$\therefore \frac{x^2}{y} = \frac{x^2}{16x^2} = \frac{1}{16}$$

225. (3) $\frac{x}{y} = \frac{a+2}{a-2}$

On squaring both sides,

$$\frac{x^2}{y^2} = \frac{(a+2)^2}{(a-2)^2}$$

By componendo and dividendo,

$$\frac{x^2-y^2}{x^2+y^2} = \frac{(a+2)^2-(a-2)^2}{(a+2)^2+(a-2)^2}$$

$$\Rightarrow \frac{x^2-y^2}{x^2+y^2} = \frac{4\times a\times 2}{2(a^2+4)}$$

$$= \frac{4a}{a^2+4}$$

[$\because (a+b)^2 + (a-b)^2 = 2(a^2 + b^2)$; $(a + b)^2 - (a-b)^2 = 4ab$]

226. (1) $x(x + y + z) = 20$

$\Rightarrow x^2 + xy + xz = 20$ --- (i)

Again, $y(x + y + z) = 30$

$\Rightarrow xy + y^2 + yz = 30$ --- (ii)

and, $z(x + y + z) = 50$

$\Rightarrow xz + yz + z^2 = 50$ --- (iii)

On adding all three equations,

$x^2 + y^2 + z^2 + 2xy + 2yz + 2zx = 20 + 30 + 50$

$\Rightarrow (x + y + z)^2 = 100$

$\Rightarrow x + y + z = 10$

$\Rightarrow 2(x + y + z) = 20$

227. (1) $x + y = 4$ --- (i)

$x^2 + y^2 = 14$ --- (ii)

$\therefore (x + y)^2 = x^2 + y^2 + 2xy$

$\Rightarrow 16 = 14 + 2xy$

$\Rightarrow 2xy = 16 - 14 = 2$

$\Rightarrow xy = 1$ --- (iii)

$\therefore (x - y)^2 = (x + y)^2 - 4xy$

$= (4)^2 - 4 = 16 - 4 = 12$

$\Rightarrow x - y = \sqrt{12} = 2\sqrt{3}$ --- (iv)

$\therefore$ On adding equations (i) and (iv)

$x + y = 4$

$x - y = 2\sqrt{3}$

$2x = 4 + 2\sqrt{3}$

$\Rightarrow x = 2+\sqrt{3}$

From equation (i),

$2 + \sqrt{3} + y = 4$

$\Rightarrow y = 4 - 2 - \sqrt{3} = 2-\sqrt{3}$

228. (2) $a^2 + b^2 + c^2 = 2(a - b - c) - 3$

$\Rightarrow a^2 + b^2 + c^2 - 2a + 2b + 2c + 3 = 0$

$\Rightarrow a^2 - 2a + 1 + b^2 + 2b + 1 + c^2 + 2c + 1 = 0$

$\Rightarrow (a-1)^2 + (b+1)^2 + (c+1)^2 = 0$

$\therefore a - 1 = 0 \Rightarrow a = 1$

$b + 1 = 0 \Rightarrow b = -1$

$c + 1 = 0 \Rightarrow c = -1$

[If $x^2 + y^2 + z^2 = 0 \Rightarrow x = 0, y = 0, z = 0$]

$\therefore a + b + c = 1 - 1 - 1 = -1$

229. (3) $x^2 - 4x - 1 = 0$

$\Rightarrow x^2 - 1 = 4x$

$$\Rightarrow \frac{x^2-1}{x} = \frac{4x}{x}$$

$$\Rightarrow x - \frac{1}{x} = 4$$

On squaring both sides,

$$\left(x-\frac{1}{x}\right)^2 = 16$$

$$\Rightarrow x^2 + \frac{1}{x^2} - 2 = 16$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 16 + 2 = 18$$

230. (3) $a + \frac{1}{b} = 1 \Rightarrow a = \frac{1}{2}$; $b = 2$

$b + \frac{1}{c} = 1 \Rightarrow b = 2, c = -1$

$\therefore c + \frac{1}{a} = -1 + 2 = 1$

231. (1) $\frac{a}{b} = \frac{25}{6}$

$$\Rightarrow \frac{a^2}{b^2} = \frac{25^2}{6^2} = \frac{625}{36}$$

By componendo and dividendo,

$$\frac{a^2-b^2}{a^2+b^2} = \frac{625-36}{625+36}$$

$$= \frac{589}{661}$$

232. (3) $(x - 2)(x - p) = x^2 - ax + 6$

$\Rightarrow x(x - p) - 2(x - p)$

$= x^2 - ax + 6$

$\Rightarrow x^2 - px - 2x + 2p = x^2 - ax + 6$

$\Rightarrow x^2 - x(p + 2) + 2p$

$= x^2 - ax + 6$

$\therefore p + 2 = a$

(comparing respective co-efficients)

$\Rightarrow a - p = 2$

233. (1) $x = \sqrt{a} + \frac{1}{\sqrt{a}}$

$$y = \sqrt{a} - \frac{1}{\sqrt{a}}$$

$$\therefore x + y = \sqrt{a} + \frac{1}{\sqrt{a}} + \sqrt{a} - \frac{1}{\sqrt{a}}$$

$$= 2\sqrt{a}$$

$$x - y = \sqrt{a} + \frac{1}{\sqrt{a}} - \sqrt{a} + \frac{1}{\sqrt{a}}$$

$$= \frac{2}{\sqrt{a}}$$

Now,

$x^4 + y^4 - 2x^2 y^2$
$= (x^2 - y^2)^2$
$= \{(x + y)(x - y)\}^2$

$$\left(2\sqrt{a} \times \frac{2}{\sqrt{a}}\right)^2 = 4^2 = 16$$

234. (4) $2x + \frac{1}{3x} = 5$

$$\Rightarrow \frac{6x^2+1}{3x} = 5$$

$\Rightarrow 6x^2 + 1 = 15x$

$$\therefore \frac{5x}{6x^2+20x+1}$$

$$= \frac{5x}{6x^2+1+20x}$$

$$= \frac{5x}{15x+20x}$$

$$= \frac{5x}{35x} = \frac{1}{7}$$

235. (2) $a + b = 10$;
$ab = 21$
$\therefore (a - b)^2 = (a + b)^2 - 4ab$
$= (10)^2 - 4 \times 21$
$= 100 - 84 = 16$

236. (3) Given,
$0 < x < 1$
$\Rightarrow x.0 < x.x < 1.x$
$\Rightarrow 0 < x^2 < x$
Again, $x < 1$
$\Rightarrow \sqrt{x} < 1$
$\therefore x^2 < x < \sqrt{x}$

237. (2) $x = \frac{\sqrt{5}+1}{\sqrt{5}-1}$

$$= \frac{\left(\sqrt{5}+1\right)^2}{\left(\sqrt{5}-1\right)\left(\sqrt{5}+1\right)}$$

(Rationalising the denominator)

$$= \frac{5+1+2\sqrt{5}}{5-1} = \frac{6+2\sqrt{5}}{4}$$

$$= \frac{3+\sqrt{5}}{2}$$

$$\therefore y = \frac{\sqrt{5}-1}{\sqrt{5}+1} = \frac{3-\sqrt{5}}{2}$$

$$\therefore x + y = \frac{3+\sqrt{5}}{2} + \frac{3-\sqrt{5}}{2}$$

$$= \frac{3+\sqrt{5}+3-\sqrt{5}}{2} = 3$$

$$xy = \frac{3+\sqrt{5}}{2} \times \frac{3-\sqrt{5}}{2}$$

$$= \frac{9-5}{4} = 1$$

$$\therefore \frac{x^2+xy+y^2}{x^2-xy+y^2} = \frac{(x+y)^2-xy}{(x+y)^2-3xy}$$

$$= \frac{(3)^2-1}{(3)^2-3} = \frac{9-1}{9-3} = \frac{8}{6} = \frac{4}{3}$$

238. (2) $a + b + c = m$

and, $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 0$

$$\Rightarrow \frac{bc+ac+ab}{abc} = 0$$

$\Rightarrow bc + ac + ab = 0$
$\therefore (a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$
$\Rightarrow m^2 = a^2 + b^2 + c^2 + 2 \times 0$
$\Rightarrow a^2 + b^2 + c^2 = m^2$
$\therefore$ Required average

$$= \frac{a^2+b^2+c^2}{3} = \frac{m^2}{3}$$

239. (3) $x = \frac{8ab}{a+b}$

$$\Rightarrow \frac{x}{4a} = \frac{2b}{a+b}$$

By componendo and dividendo,

$$\frac{x+4a}{x-4a} = \frac{2b+a+b}{2b-a-b}$$

$$= \frac{a+3b}{b-a} \quad \text{..... (i)}$$

Again,

$$x = \frac{8ab}{a+b}$$

$$\frac{x}{4b} = \frac{2a}{a+b}$$

By componendo and dividendo,

$$\frac{x+4b}{x-4b} = \frac{2a+a+b}{2a-a-b} = \frac{3a+b}{a-b}$$

$$\therefore \frac{x+4a}{x-4a} + \frac{x+4b}{x-4b}$$

$$= \frac{a+3b}{b-a} + \frac{3a+b}{a-b}$$

$$= \frac{a+3b}{b-a} - \frac{3a+b}{b-a}$$

$$= \frac{a+3b-3a-b}{b-a}$$

$$= \frac{2b-2a}{b-a} = \frac{2(b-a)}{b-a} = 2$$

240. (1) $x^2 - y^2 = (x + y)(x - y)$
$\therefore (2a + b)^2 - (2a - b)^2 = (2a + b + 2a - b)(2a + b - 2a + b)$
$= 4a \times 2b = 8ab$

241. (2) $a + b + c = 0$
$\therefore (a + b + c)^2 = 0$
$\Rightarrow a^2 + b^2 + c^2 + 2ab + 2bc + 2ca = 0$
$\Rightarrow a^2 + b^2 + c^2 = -2ab - 2bc - 2ca$

$$\therefore \frac{a^2+b^2+c^2}{ab+bc+ca}$$

$$= \frac{-2(ab+bc+ca)}{ab+bc+ca} = -2$$

242. (2) $a + b = 2c$
$\Rightarrow a - c = c - b$

$$\therefore \frac{a}{a-c} + \frac{c}{b-c}$$

$$= \frac{a}{c-b} + \frac{c}{b-c}$$

$$= \frac{a}{c-b} - \frac{c}{c-b} = \frac{a-c}{c-b}$$

$$= \frac{c-b}{c-b} = 1$$

243. (1) $2x + \frac{1}{4x} = 1$

On dividing by 2, we get

$$x + \frac{1}{8x} = \frac{1}{2}$$

On squaring both sides, we get

$$\left(x+\frac{1}{8x}\right)^2 = \frac{1}{4}$$

$$\Rightarrow x^2+\frac{1}{64x^2}+2\times x\times\frac{1}{8x}$$

$$= \frac{1}{4}$$

$$\Rightarrow x^2+\frac{1}{64x^2}+\frac{1}{4} = \frac{1}{4}$$

$$\Rightarrow x^2+\frac{1}{64x^2} = \frac{1}{4}-\frac{1}{4} = 0$$

244. (4) Expression

$$= \frac{a}{a-b}+\frac{b}{b-a}$$

$$= \frac{a}{a-b}-\frac{b}{a-b}$$

$$= \frac{a-b}{a-b} = 1$$

245. (1) $a+\frac{1}{b} = 1$

$$\Rightarrow a = 1-\frac{1}{b} = \frac{b-1}{b}$$

$$\therefore \frac{1}{a} = \frac{b}{b-1}$$

Again, $b+\frac{1}{c} = 1$

$$\Rightarrow \frac{1}{c} = 1-b$$

$$\Rightarrow c = \frac{1}{1-b}$$

$$\therefore c+\frac{1}{a} = \frac{1}{1-b}+\frac{b}{b-1}$$

$$= \frac{1}{1-b}-\frac{b}{1-b} = \frac{1-b}{1-b} = 1$$

246. (3) $\frac{a}{b} = \frac{1}{2}$

$$\therefore \frac{2a-5b}{5a+3b} = \frac{2\left(\frac{a}{b}\right)-5}{5\left(\frac{a}{b}\right)+3}$$

$$= \frac{2\times\frac{1}{2}-5}{5\times\frac{1}{2}+3}$$

$$= \frac{1-5}{\frac{5}{2}+3} = \frac{-4\times 2}{5+6} = \frac{-8}{11}$$

247. (3) $x+\frac{1}{x} = 17$

On squaring both sides,

$$\left(x+\frac{1}{x}\right)^2 = 17^2$$

$$\Rightarrow x^2+\frac{1}{x^2}+2 = 289$$

$$\Rightarrow x^2+\frac{1}{x^2} = 289-2 = 287$$

= radius of the circle

$\therefore$ Circumferece of circle $= 2\pi r$

$= 2\times 287\times\pi$

$= 574\pi$ units

248. (4) Putting $x = \frac{3}{2}$ in $x^2+mx+24 = 0$

$$\left(\frac{3}{2}\right)^2+m\times\frac{3}{2}+24 = 0$$

$$\Rightarrow \frac{9}{4}+\frac{3m}{2}+24 = 0$$

$$\Rightarrow \frac{3m}{2} = -\left(24+\frac{9}{4}\right)$$

$$\Rightarrow \frac{3m}{2} = -\left(\frac{96+9}{4}\right)$$

$$\Rightarrow \frac{3m}{2} = -\left(\frac{105}{4}\right)$$

$$\Rightarrow m = -\left(\frac{105}{4}\times\frac{2}{3}\right) = -\frac{35}{2}$$

249. (2) $\frac{(a+b)^2}{(a-b)^2} = \frac{25}{4}$

By componendo and dividendo,

$$\frac{(a+b)^2+(a-b)^2}{(a+b)^2-(a-b)^2} = \frac{25+4}{25-4}$$

$$\Rightarrow \frac{2(a^2+b^2)}{4ab} = \frac{29}{21}$$

$$\Rightarrow \frac{a^2+b^2}{2ab} = \frac{29}{21}$$

$$\Rightarrow \frac{a^2+b^2}{2\times 21} = \frac{29}{21}$$

$\Rightarrow a^2+b^2 = 2\times 29 = 58$

$\therefore a^2+b^2+3ab = 58+3\times 21$
$= 58+63 = 121$

250. (2) $a+\frac{1}{a-2} = 4$

$$\Rightarrow (a-2)+\frac{1}{(a-2)} = 4-2 = 2$$

On squaring both sides,

$$\left[(a-2)+\frac{1}{(a-2)}\right]^2 = 4$$

$$\Rightarrow (a-2)^2+\frac{1}{(a-2)^2}+$$

$$2\times(a-2)\times\frac{1}{(a-2)} = 4$$

$$\Rightarrow (a-2)^2+\frac{1}{(a-2)^2} = 4-2 = 2$$

251. (3) $x = \frac{6pq}{p+q} = \frac{3p\times 2q}{p+q}$

$$\Rightarrow \frac{x}{3p} = \frac{2q}{p+q}$$

$$\Rightarrow \frac{x+3p}{x-3p} = \frac{2q+p+q}{2q-p-q}$$

(By componendo and dividendo)

$$\Rightarrow \frac{x+3p}{x-3p} = \frac{3q+p}{q-p} \quad .....(i)$$

Again, $x = \frac{6pq}{p+q} = \frac{2p\times 3q}{p+q}$

$$\Rightarrow \frac{x}{3q} = \frac{2p}{p+q}$$

$$\Rightarrow \frac{x+3q}{x-3q} = \frac{2p+p+q}{2p-p-q}$$

(By componendo and dividendo)

$$\Rightarrow \frac{x+3q}{x-3q} = \frac{3p+q}{p-q} \quad ....(ii)$$

$$\therefore \frac{x+3p}{x-3p}+\frac{x+3q}{x-3q} = \frac{3q+p}{q-p}+\frac{3p+q}{p-q}$$

$$= \frac{3q+p}{q-p}-\frac{3p+q}{q-p}$$

$$= \frac{3q+p-3p-q}{q-p} = \frac{2q-2p}{q-p}$$

$$= \frac{2(q-p)}{q-p} = 2$$

252. (2) $x+\frac{1}{9x} = 4$

On multiplying by 3,

$$3x+\frac{1}{3x} = 12$$

On squaring both sides,

$$\left(3x+\frac{1}{3x}\right)^2 = (12)^2$$

$$\Rightarrow 9x^2 + \frac{1}{9x^2} + 2\times 3x\times\frac{1}{3x}$$

$= 144$

$$\Rightarrow 9x^2 + \frac{1}{9x^2} = 144 - 2 = 142$$

253. (4) $x\left(3-\frac{2}{x}\right) = \frac{3}{x}$

$$\Rightarrow 3x - 2 = \frac{3}{x}$$

$$\Rightarrow 3x - \frac{3}{x} = 2$$

On dividing by 3,

$$x - \frac{1}{x} = \frac{2}{3}$$

On squaring both sides,

$$x^2 + \frac{1}{x^2} - 2 = \frac{4}{9}$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 2 + \frac{4}{9}$$

$$= 2\frac{4}{9}$$

254. (2) $x^2 + \frac{1}{x^2} = 2$

$$\Rightarrow \left(x-\frac{1}{x}\right)^2 + 2x\times\frac{1}{x} = 2$$

$$\Rightarrow \left(x-\frac{1}{x}\right)^2 = 2 - 2 = 0$$

$$\Rightarrow x - \frac{1}{x} = 0$$

255. (1) $9x^2 + 16y^2 = 60$ .... (i)

and $3x + 4y = 6$

On squaring,

$9x^2 + 16y^2 + 2 \times 3x \times 4y = 36$

$\Rightarrow 60 + 24xy = 36$

$\Rightarrow 24xy = 36 - 60 = -24$

$$\Rightarrow xy = -\frac{24}{24} - 1$$

256. (3) $p^2 + q^2 = 7\,pq$

$$\Rightarrow \frac{p^2+q^2}{pq} = 7$$

$$\Rightarrow \frac{p^2}{pq} + \frac{q^2}{pq} = 7$$

$$\Rightarrow \frac{p}{q} + \frac{q}{p} = 7$$

257. (*) $x^2 + 3x + 3$

$= x^2 + 2x + 1 + x + 2$

$= (x + 1)^2 + x + 2$

$= (99 + 1)^2 + 99 + 2$

$= (100)^2 + 101$

$= 10000 + 101 = 10101$

$\therefore 2(x^2 + 3x + 3) = 2 \times 10101$

$= 20202$

258. (2) $\frac{2p}{p^2-2p+1} = \frac{1}{4}$

$$\Rightarrow \frac{p^2-2p+1}{2p} = 4$$

$$\Rightarrow \frac{p^2}{p} - \frac{2p}{p} + \frac{1}{p} = 8$$

$$\Rightarrow p + \frac{1}{p} = 8 + 2 = 10$$

259. (2) $a - b = 3$

On squaring both sides,

$(a - b)^2 = 9$

$\Rightarrow a^2 + b^2 - 2ab = 9$

$\Rightarrow 25 - 2ab = 9$

$\Rightarrow 2ab = 25 - 9 = 16$

$$\Rightarrow ab = \frac{16}{2} = 8$$

260. (3) $a + \frac{1}{a} = 1$

$\Rightarrow a^2 + 1 = a \Rightarrow a^2 - a + 1 = 0$

$$\therefore \frac{a^2-a+1}{a^2+a+1} = \frac{0}{a^2+a+1} = 0$$

261. (4) $x - \frac{1}{x} = 2$

On squaring both sides,

$$x^2 + \frac{1}{x^2} - 2 = 4$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 6$$

262. (2) $a + b = 2c$

$\Rightarrow a - c = c - b$

$$\therefore \frac{a}{a-c} + \frac{c}{b-c}$$

$$= \frac{a}{a-c} - \frac{c}{a-c}$$

$$= \frac{a-c}{a-c} = 1$$

263. (2) $x + \frac{1}{x} = 5$ (Given)

$$\therefore \frac{x}{1+x+x^2} = \frac{x}{x\left(\frac{1}{x}+1+x\right)}$$

$$= \frac{1}{x+\frac{1}{x}+1} = \frac{1}{5+1} = \frac{1}{6}$$

264. (3) $\frac{a^2}{b+c} = \frac{b^2}{c+a} = \frac{c^2}{a+b} = 1$

$$\Rightarrow \frac{a^2}{b+c} = 1 \Rightarrow a^2 = b + c$$

$\Rightarrow a^2 + a = a + b + c$

$\Rightarrow a(a + 1) = a + b + c$

$$\Rightarrow a + 1 = \frac{a+b+c}{a}$$

$$\Rightarrow \frac{1}{a+1} = \frac{a}{a+b+c}$$

Similarly,

$$\frac{b^2}{c+a} = 1$$

$$\Rightarrow \frac{1}{b+1} = \frac{b}{a+b+c}$$

and, $\frac{c^2}{a+b} = 1$

$$\Rightarrow \frac{1}{c+1} = \frac{c}{a+b+c}$$

$$\therefore \frac{2}{1+a} + \frac{2}{1+b} + \frac{2}{1+c}$$

$$= 2\left(\frac{a}{a+b+c} + \frac{b}{a+b+c} + \frac{c}{a+b+c}\right)$$

$$= 2\left(\frac{a+b+c}{a+b+c}\right) = 2$$

265. (3) $5x + \frac{1}{x} = 10$

On dividing by 5,

$$x + \frac{1}{5x} = 2$$

On squaring both sides,

$$\left(x+\frac{1}{5x}\right)^2 = 4$$

$$\Rightarrow x^2 + \frac{1}{25x^2} + 2x\times\frac{1}{5x} = 4$$

$$\Rightarrow x^2 + \frac{1}{25x^2} = 4 - \frac{2}{5}$$

$$= \frac{20-2}{5} = \frac{18}{5} = 3\frac{3}{5}$$

266. (3) $4r = h + \sqrt{r^2+h^2}$

$$\Rightarrow 4r - h = \sqrt{r^2+h^2}$$

On squaring both sides,

$(4r - h)^2 = \left(\sqrt{r^2 + h^2}\right)^2$

$\Rightarrow 16r^2 + h^2 - 8rh = r^2 + h^2$

$\Rightarrow 16r^2 - r^2 = 8\,rh \Rightarrow 15r^2 = 8rh$

$\Rightarrow 15r = 8h \Rightarrow \frac{r}{h} = \frac{8}{15}$

267. (1) $p\,(p^2 + 3p + 3)$
$= p^3 + 3p^2 + 3p$
$= p^3 + 3p^2 + 3p + 1 - 1$
$= (p + 1)^3 - 1$
$= (99 + 1)^3 - 1$
$= (100)^3 - 1 = 1000000 - 1$
$= 999999$

268. (3) $\frac{x}{a+b} + 1 = \frac{x}{a-b} + \frac{a-b}{a+b}$

$\Rightarrow \frac{x}{a+b} - \frac{a-b}{a+b} = \frac{x}{a-b} - 1$

$\Rightarrow \frac{x-a+b}{a+b} = \frac{x-a+b}{a-b}$

$\Rightarrow (x - a + b)\left(\frac{1}{a+b} - \frac{1}{a-b}\right)$
$= 0$
$\Rightarrow x - a + b = 0$
$\Rightarrow x = a - b$

269. (2) $x^2 + y^2 = 29$;
$xy = 10$
$\therefore\ (x + y)^2 = x^2 + y^2 + 2xy$
$= 29 + 2 \times 10 = 49$
$\Rightarrow x + y = \pm 7$
Again, $(x - y)^2 = x^2 + y^2 - 2xy$
$= 29 - 2 \times 10 = 9$
$\therefore\ x - y = \pm 3$

$\therefore\ \frac{x+y}{x-y} = \frac{\pm 7}{\pm 3} = \frac{7}{3}$

270. (2) $(a - b)^2 = a^2 - 2ab + b^2$
$\therefore\ 4x^2 - 12x + k = (2x)^2 - 2 \times 2x \times 3 + k$
$\therefore\ k = (3)^2 = 9$

271. (2)

$\frac{1}{(p-n)(n-q)} + \frac{1}{(n-q)(q-p)} + \frac{1}{(q-p)(p-n)}$

$= \frac{(q-p)+(p-n)+(n-q)}{(p-n)\,(n-q)\,(q-p)}$

$= \frac{0}{(p-n)\,(n-q)\,(q-p)} = 0$

272. (1) $\frac{a^2}{b+c} = \frac{b^2}{c+a} = \frac{c^2}{a+b} = 1$

$\Rightarrow \frac{a^2}{b+c} = 1$

$\Rightarrow a^2 = b + c$

$\Rightarrow a^2 + a = a + b + c$

$\Rightarrow a\,(a + 1) = a + b + c$

$\Rightarrow \frac{1}{a+1} = \frac{a}{a+b+c}$

Similarly,

$\frac{b^2}{c+a} = 1 \Rightarrow b^2 = c + a$

$\Rightarrow b^2 + b = a + b + c$

$\Rightarrow b\,(b + 1) = a + b + c$

$\Rightarrow \frac{1}{b+1} = \frac{b}{a+b+c}$

and $\frac{c^2}{a+b} = 1 \Rightarrow c^2 = a + b$

$\Rightarrow c^2 + c = a + b + c$

$\Rightarrow c\,(c + 1) = a + b + c$

$\Rightarrow \frac{1}{c+1} = \frac{c}{a+b+c}$

$\therefore\ \frac{1}{1+a} + \frac{1}{1+b} + \frac{1}{1+c}$

$= \frac{a}{a+b+c} + \frac{b}{a+b+c} + \frac{c}{a+b+c}$

$= \frac{a+b+c}{a+b+c} = 1$

273. (3) $a^2 + 1 = 9a$

$\Rightarrow \frac{a^2+1}{a} = 9$

$\Rightarrow a + \frac{1}{a} = 9$

On squaring both sides,

$a^2 + \frac{1}{a^2} + 2 = 81$

$\Rightarrow a^2 + \frac{1}{a^2} = 81 - 2 = 79$

274. (2) Expression $= p\,(p^2 + 3p + 3)$
$= p^3 + 3p^2 + 3p + 1 - 1$
$= (p + 1)^3 - 1$
$= (99 + 1)^3 - 1 = (100)^3 - 1$
$= 1000000 - 1 = 999999$

275. (1) $x + \frac{1}{x} = c + \frac{1}{c}$

$\Rightarrow x - c = \frac{1}{c} - \frac{1}{x}$

$\Rightarrow x - c = \frac{x-c}{xc}$

$\Rightarrow (x - c) - \frac{x-c}{xc} = 0$

$\Rightarrow (x - c)\left(1 - \frac{1}{xc}\right) = 0$

$\Rightarrow x - c = 0 \Rightarrow x = c$

or, $1 - \frac{1}{xc} = 0$

$\Rightarrow \frac{1}{xc} = 1 \Rightarrow xc = 1$

$\Rightarrow x = \frac{1}{c}$

$\Rightarrow x = c,\ \frac{1}{c}$

276. (1) $x^2 + y^2 + 6x + 5 = 4x - 4y$
$\Rightarrow x^2 + y^2 + 6x - 4x + 4y + 5 = 0$
$\Rightarrow x^2 + 2x + 1 + y^2 + 4y + 4 = 0$
$\Rightarrow (x + 1)^2 + (y + 2)^2 = 0$
$\therefore\ x + 1 = 0 \Rightarrow x = -1$
$y + 2 = 0 \Rightarrow y = -2$
$\therefore\ x - y = -1 + 2 = 1$

277. (2) $x - \frac{1}{3x} = \frac{1}{3}$

$\therefore\ 3\left(x - \frac{1}{3x}\right)$

$= 3 \times \frac{1}{3} = 1$

278. (1)

$\frac{a}{q-r} = \frac{b}{r-p} = \frac{c}{p-q} = k$ (let)

$\Rightarrow a = k\,(q - r)$;
$b = k\,(r - p)$;
$c = k\,(p - q)$
$\therefore\ pa + qb + rc$
$= k\,[p\,(q - r) + q\,(r - p) + r\,(p - q)]$
$= k\,(pq - pr + qr - pq + rp - qr)$
$= k \times 0 = 0$

279. (2) $\frac{3a+4b}{3c+4d} = \frac{3a-4b}{3c-4d}$

$\Rightarrow \frac{3a+4b}{3a-4b} = \frac{3c+4d}{3c-4d}$

By componendo and dividendo,

$\frac{3a+4b+3a-4b}{3a+4b-3a+4b}$

$= \frac{3c+4d+3c-4d}{3c+4d-3c+4d}$

$\Rightarrow \frac{6a}{8b} = \frac{6c}{8d}$

$\Rightarrow \frac{a}{b} = \frac{c}{d}$

$\Rightarrow ad = bc$

280. (2) $x + \frac{1}{x} = 2$

On squaring both sides,

$\left(x + \frac{1}{x}\right)^2 = 4$

$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 4$

$\Rightarrow x^2 + \frac{1}{x^2} = 4 - 2 = 2$

281. (4) $a + b = 17$
$a - b = 9$
$\therefore (a + b)^2 + (a - b)^2 = 17^2 + 9^2$
$\Rightarrow 2(a^2 + b^2) = 289 + 81 = 370$
$\Rightarrow 4(a^2 + b^2) = 2 \times 370 = 740$

282. (3) $x + y = \sqrt{3}$
$x - y = \sqrt{2}$
$\therefore (x + y)^2 + (x - y)^2 = 3 + 2$
$\Rightarrow 2(x^2 + y^2) = 5$ ...(i)
Again,
$(x + y)^2 - (x - y)^2 = 3 - 2$
$\Rightarrow 4xy = 1$ ...(ii)
$\therefore 8xy(x^2 + y^2) = 5 \times 1 = 5$

283. (3) $a^2 + 1 = a$
$\Rightarrow a^2 - a + 1 = 0$
$\Rightarrow (a + 1)(a^2 - a + 1) = 0$
$\Rightarrow a^3 + 1 = 0$
$\Rightarrow a^3 = -1$

284. (1) $x + 3y = -3x + y$
$\Rightarrow x + 3x = -3y + y$
$\Rightarrow 4x = -2y$
$\Rightarrow 2x = -y$
$\Rightarrow \frac{x}{y} = -\frac{1}{2}$
$\therefore \frac{x^2}{y^2} = \left(-\frac{1}{2}\right)^2 = \frac{1}{4}$
$\therefore \frac{x^2}{2y^2} = \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$

285. (3) $(a + b - 6)^2 + a^2 + b^2 + 1 + 2b = 2ab + 2a$
$\Rightarrow (a + b - 6)^2 + a^2 + b^2 + 1 + 2b - 2ab - 2a = 0$
$\Rightarrow (a + b - 6)^2 + (a)^2 + (-b)^2 + (-1)^2 + 2a(-b) + 2(-b)(-1) + 2(a)(-1) = 0$
$\Rightarrow (a + b - 6)^2 + (a - b - 1)^2 = 0$
$\Rightarrow a + b - 6 = 0$ and $a - b - 1 = 0$
$\Rightarrow a + b = 6$ and $a - b = 1$
On adding these two equations,
$a + b + a - b = 6 + 1$
$\Rightarrow 2a = 7$
$\Rightarrow a = \frac{7}{2} = 3.5$

286. (2) $\left(a + \frac{1}{a}\right)^2 = 3$
$\Rightarrow a^2 + \frac{1}{a^2} + 2 = 3$
$\Rightarrow a^2 + \frac{1}{a^2} = 3 - 2 = 1$

287. (3) $\left\{\frac{1}{2}(a - b)\right\}^2 + ab = p(a + b)^2$
$\Rightarrow \frac{1}{4}(a^2 + b^2 - 2ab) + ab$
$= p(a + b)^2$
$\Rightarrow \frac{1}{4}(a^2 + b^2 - 2ab + 4ab)$
$= p(a + b)^2$
$\Rightarrow \frac{1}{4}(a + b)^2 = p(a + b)^2$
$\Rightarrow p = \frac{1}{4}$

288. (4) For $y = ax^2 + bx + c$
Maximum value $= c - \frac{b^2}{4a}$
Here, $c = 5$, $b = 20$, $a = -4$
$\therefore$ Maximum value
$= 5 - \frac{20 \times 20}{4 \times -4} = 5 + 5 \times 5 = 30$

289. (2) $x = at^2$
$y = 2at$
$\Rightarrow y^2 = 4a^2t^2$
$= 4a.at^2 = 4ax$

290. (2) $a + \frac{1}{b} = 1$
$\Rightarrow a = 1 - \frac{1}{b} = \frac{b-1}{b}$
$\Rightarrow \frac{1}{a} = \frac{b}{b-1}$ ..... (i)
Again, $b + \frac{1}{c} = 1$
$\Rightarrow \frac{1}{c} = 1 - b$
$\Rightarrow c = \frac{1}{1-b}$ ...(ii)
$\therefore c + \frac{1}{a} = \frac{1}{1-b} + \frac{b}{b-1}$
$= \frac{1}{1-b} - \frac{b}{1-b}$
$= \frac{1-b}{1-b} = 1$

291. (1) $a - 2 + \frac{1}{a+2} = -1$
$\Rightarrow (a - 2 + 4) + \frac{1}{a+2} = 4 - 1$
$\Rightarrow (a + 2) + \frac{1}{(a+2)} = 3$
On squaring both sides,
$(a + 2)^2 + \frac{1}{(a+2)^2} + 2 \times (a + 2) \times \frac{1}{(a+2)} = 9$
$\Rightarrow (a + 2)^2 + \frac{1}{(a+2)^2}$
$= 9 - 2 = 7$

292. (3) $a^2 = b + c$
$\Rightarrow a^2 + a = a + b + c$
$\Rightarrow a(a + 1) = a + b + c$
$\Rightarrow \frac{1}{a+1} = \frac{a}{a+b+c}$
Again,
$b^2 = c + a$
$\Rightarrow b^2 + b = a + b + c$
$\Rightarrow b(b + 1) = a + b + c$
$\Rightarrow \frac{1}{b+1} = \frac{b}{a+b+c}$
$c^2 = a + b$
$\Rightarrow c^2 + c = a + b + c$
$\Rightarrow c(c + 1) = a + b + c$
$\Rightarrow \frac{1}{c+1} = \frac{c}{a+b+c}$
$\therefore 3\left(\frac{1}{a+1} + \frac{1}{b+1} + \frac{1}{c+1}\right)$
$= 3\left(\frac{a}{a+b+c} + \frac{b}{a+b+c} + \frac{c}{a+b+c}\right)$
$= 3\left(\frac{a+b+c}{a+b+c}\right) = 3$

293. (3) Given, $x^2 + 5x + 6 = 0$
$\therefore$ Expression $= \frac{2x}{x^2 - 7x + 6}$
$= \frac{2x}{x^2 + 5x + 6 - 12x} = \frac{2}{-12}$
$= \frac{-1}{6}$

294. (1) $a + b = 5$
$a - b = 3$
$\because (a + b)^2 + (a - b)^2$
$= 2(a^2 + b^2)$
$\Rightarrow 2(a^2 + b^2) = 5^2 + 3^2$
$= 25 + 9 = 34$
$\Rightarrow a^2 + b^2 = \frac{34}{2} = 17$

295. (3) It is given, $x + \frac{1}{x} = 5$
Expression $= \frac{6x}{x^2 + x + 1}$
$= \frac{6x}{x\left(x + 1 + \frac{1}{x}\right)} = \frac{6}{\left(x + \frac{1}{x} + 1\right)}$
$= \frac{6}{5+1} = \frac{6}{6} = 1$

296. (2) $\frac{3}{(x+2)(2x+1)}$

$= \frac{a}{2x+1} + \frac{b}{x+2}$

$\Rightarrow \frac{3}{(x+2)(2x+1)}$

$= \frac{a(x+2)+b(2x+1)}{(2x+1)(x+2)}$

$\Rightarrow 3 = ax + 2a + 2bx + b$

$\Rightarrow 3 = ax + 2bx + 2a + b$

$\Rightarrow 3 = x(a + 2b) + (2a + b)$

On comparing the respective co–efficients,

$a + 2b = 0$

$\Rightarrow a = -2b$ ..... (i)

and, $2a + b = 3$

$2(-2b) + b = 3$

$\Rightarrow -4b + b = 3$

$\Rightarrow -3b = 3 \Rightarrow b = \frac{-3}{3} = -1$

297. (2) $a + \frac{1}{a} = 1$

$\Rightarrow a = 1 - \frac{1}{b} = \frac{b-1}{b}$

Again,

$b + \frac{1}{c} = 1$

$\Rightarrow b = 1 - \frac{1}{c} = \frac{c-1}{c}$

$\therefore a = \frac{b-1}{b} = \frac{\frac{c-1}{c} - 1}{\frac{c-1}{c}}$

$= \frac{c-1-c}{c-1} = \frac{-1}{c-1}$

$\therefore abc = \frac{-1}{c-1} \times \frac{c-1}{c} \times c = -1$

298. (1) $2x - \frac{1}{2x} = 5$

On dividing by 2,

$x - \frac{1}{4x} = \frac{5}{2}$

On squaring both sides

$\left(x - \frac{1}{4x}\right)^2 = \left(\frac{5}{2}\right)^2 = \frac{25}{4}$

$\Rightarrow x^2 + \frac{1}{16x^2} - 2 \times x \times \frac{1}{4x} = \frac{25}{4}$

$\Rightarrow x^2 + \frac{1}{16x^2} = \frac{25}{4} + \frac{1}{2}$

$= \frac{25+2}{4} = \frac{27}{4}$

$\Rightarrow x^2 + \frac{1}{16x^2} - 2$

$= \frac{27}{4} - 2 = \frac{27-8}{4} = \frac{19}{4}$

299. (4) $a(x + y) = b(x - y)$

$\Rightarrow ax - bx = -by - ay$

$\Rightarrow bx - ax = ay + by$

$\Rightarrow x(b - a) = y(a + b)$

$\Rightarrow \frac{x}{a+b} = \frac{y}{b-a}$

$= \frac{x^2+y^2}{(a+b)^2+(b-a)^2} = \frac{x^2+y^2}{2(a^2+b^2)}$

$\therefore 2(x^2 + y^2) = 4(a^2 + b^2)$

300. (3) $x + \frac{1}{x} = 6$

On squaring both sides,

$\left(x + \frac{1}{x}\right)^2 = 36$

$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 36$

$\Rightarrow x^2 + \frac{1}{x^2} = 36 - 2 = 34$

301. (3) $x^2 - 3x + 1 = 0$

$\Rightarrow x^2 + 1 = 3x$

On dividing by x,

$\frac{x^2+1}{x} = \frac{3x}{x}$

$\Rightarrow x + \frac{1}{x} = 3$

302. (4) $\frac{2+a}{a} + \frac{2+b}{b} + \frac{2+c}{c} = 4$

$\Rightarrow \frac{2}{a} + 1 + \frac{2}{b} + 1 + \frac{2}{c} + 1 = 4$

$\Rightarrow \frac{2}{a} + \frac{2}{b} + \frac{2}{c} = 4 - 3 = 1$

$\Rightarrow \frac{1}{a} + \frac{1}{b} + \frac{1}{c} = \frac{1}{2}$

$\Rightarrow \frac{bc+ca+ab}{abc} = \frac{1}{2}$

303. (3) It is given, $x + \frac{1}{x} = 5$

Expression $= \frac{5x}{x^2+5x+1}$

$= \frac{5x}{x\left(x+5+\frac{1}{x}\right)}$

$= \frac{5}{\left(x+\frac{1}{x}\right)+5}$

$= \frac{5}{5+5} = \frac{5}{10} = \frac{1}{2}$

304. (3) $p^2 + \frac{1}{p^2} = 47$

$\Rightarrow \left(p + \frac{1}{p}\right)^2 - 2 = 47$

$\Rightarrow \left(p + \frac{1}{p}\right)^2 = 47 + 2 = 49$

$\Rightarrow p + \frac{1}{p} = \sqrt{49} = 7$

305. (4) $\frac{a}{1-2a} + \frac{b}{1-2b} + \frac{c}{1-2c}$

$= \frac{1}{2}$

$\Rightarrow \frac{2a}{1-2a} + \frac{2b}{1-2b} + \frac{2c}{1-2c}$

$= \frac{2}{2} = 1$

$\Rightarrow \left(\frac{2a}{1-2a}+1\right) + \left(\frac{2b}{1-2b}+1\right) + \left(\frac{2c}{1-2c}+1\right)$

$= 4$

$\Rightarrow \frac{2a+1-2a}{1-2a} + \frac{2b+1-2b}{1-2b}$

$+ \frac{2c+1-2c}{1-2c} = 4$

$\Rightarrow \frac{1}{1-2a} + \frac{1}{1-2b} + \frac{1}{1-2c}$

$= 4$

306. (2) $4x + \frac{1}{x} = 5$

Expression

$= \frac{5x}{4x^2+1+10x}$

$= \frac{5x}{x(4x+\frac{1}{x}+10)}$

$= \frac{5}{5+10} = \frac{5}{15} = \frac{1}{3}$

307. (3) We know that,

$4ab = (a + b)^2 - (a - b)^2$

$\Rightarrow 4ab = 100 - (4)^2 = 100 - 16$

$\Rightarrow 4ab = 84$

$\Rightarrow ab = \frac{84}{4} = 21$

308. (2) $\frac{x^2+3x+1}{x^2-3x+1} = \frac{1}{2}$

$\Rightarrow 2x^2 + 6x + 2 = x^2 - 3x + 1$

$\Rightarrow 2x^2 - x^2 + 2 - 1 = -6x - 3x$

$\Rightarrow x^2 + 1 = -9x$

$\Rightarrow \frac{x^2+1}{x} = -9$

$\Rightarrow x + \frac{1}{x} = -9$

309. (3) Required answer

$= (18x - 18y) - 8(3x - 4y)$

$= 18x - 18y - 24x + 32y$

$= 14y - 6x$

310. (3) $4(2x + 3) > 5 - x$

$\Rightarrow 8x + 12 > 5 - x$

$\Rightarrow 8x + x > 5 - 12$

$\Rightarrow 9x > -7$

$\Rightarrow x > \frac{-7}{9}$

Again,

$5x - 3(2x - 7) > 3x - 1$

$\Rightarrow 5x - 6x + 21 > 3x - 1$

$\Rightarrow -x + 21 > 3x - 1$

$\Rightarrow -x - 3x > -21 - 1$

$\Rightarrow -4x > -22$

$\Rightarrow 4x < 22$

$\Rightarrow x < \frac{22}{4}$ i.e., $x < 5.5$

$\therefore$ Required value of $x = 5$

311. (1) $5x - 40 = 3x$

$\Rightarrow 5x - 3x = 40$

$\Rightarrow 2x = 40 \Rightarrow x = \frac{40}{2} = 20$

$\therefore 2x - 11 = 2 \times 20 - 11$

$= 40 - 11 = 29$

312. (2) The roots of quadratic equation $ax^2 + bx + c = 0$ will be equal if $b^2 - 4ac = 0$

Option (1),

$3x^2 - 6x + 2 = 0$

$a = 3, b = -6, c = 2$

$\therefore b^2 - 4ac = (-6)^2 - 4 \times 3 \times 2$

$= 36 - 24 = 12 \neq 0$

Option (2),

$3x^2 - 6x + 3 = 0$

$a = 3, b = -6, c = 3$

$\therefore b^2 - 4ac = (-6)^2 - 4 \times 3 \times 3$

$= 36 - 36 = 0$

Option (3),

$x^2 - 8x + 8 = 0$

$\therefore b^2 - 4ac = (-8)^2 - 4 \times 8$

$= 64 - 32 = 32 \neq 0$

Option (4),

$4x^2 - 8x + 2 = 0$

$\therefore b^2 - 4ac = (-8)^2 - 4 \times 4 \times 2$

$= 64 - 32$

$= 32 \neq 0$

313. (3) $2x - 3(4 - 2x) < 4x - 5 < 4x + \frac{2x}{3}$

$\Rightarrow 2x - 12 + 6x < 4x - 5 < \frac{12x + 2x}{3}$

$\Rightarrow 8x - 12 < 4x - 5 < \frac{14x}{3}$

$\Rightarrow 24x - 36 < 12x - 15 < 14x$

When $x = 0$,

$-36 < -15 < 0$

314. (1) $a - b = 11$ and $ab = 24$

$\therefore (a - b)^2 = 11^2$

$\Rightarrow a^2 + b^2 - 2ab = 121$

$\Rightarrow a^2 + b^2 - 2 \times 24 = 121$

$\Rightarrow a^2 + b^2 = 121 + 48 = 169$

315. (2) $(x + (3)^2 + (x - 1)^2$

$= x^2 + 2 \times x \times 3 + 3^2 + x^2 - 2 \times x \times 1 + 1^2$

$= x^2 + 6x + 9 + x^2 - 2x + 1$

$= 2x^2 + 4x + 10 = 2(x^2 + 2x + 5)$

316. (3) $a + \frac{1}{b} = 1$

$\Rightarrow a = 1 - \frac{1}{b} = \frac{b-1}{b}$

$\Rightarrow \frac{1}{a} = \frac{b}{b-1}$

Again, $b + \frac{1}{c} = 1$

$\Rightarrow \frac{1}{c} = 1 - b$

$\Rightarrow c = \frac{1}{1-b}$

$\therefore c + \frac{1}{a} = \frac{1}{1-b} + \frac{b}{b-1}$

$= \frac{1}{1-b} - \frac{b}{1-b} = \frac{1-b}{1-b} = 1$

317. (1) $a + b + c + d = 4$

$\Rightarrow 4 - a - b - c - d = 0$ ...(i)

Expression

$= \frac{1}{(1-a)(1-b)(1-c)} + \frac{1}{(1-b)(1-c)(1-d)}$

$+ \frac{1}{(1-c)(1-d)(1-a)} + \frac{1}{(1-d)(1-a)(1-b)}$

$= \frac{(1-d)+(1-a)+(1-b)+(1-c)}{(1-a)(1-b)(1-c)(1-d)}$

$= \frac{4-a-b-c-d}{(1-a)(1-b)(1-c)(1-d)} = 0$

318. (1) $a = \frac{1}{a-5}$

$\Rightarrow a^2 - 5a = 1$

$\Rightarrow a^2 - 5a - 1 = 0$

$\therefore a = \frac{5 \pm \sqrt{(-5)^2 - 4 \times 1 \times (-1)}}{2}$

$\left(\text{If } ax^2 + bx + c = 0, \text{then } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}\right)$

$= \frac{5 \pm \sqrt{25+4}}{2}$

$= \frac{5 \pm \sqrt{29}}{2}$

If $a = \frac{5+\sqrt{29}}{2}$, then

$\frac{1}{a} = \frac{2}{5+\sqrt{29}}$

$= \frac{2}{5+\sqrt{29}} \times \frac{5-\sqrt{29}}{5-\sqrt{29}}$

$= \frac{2(5-\sqrt{29})}{25-29} = \frac{5-\sqrt{29}}{-2}$

$\therefore a + \frac{1}{a} = \frac{5+\sqrt{29}}{2} - \frac{5-\sqrt{29}}{2}$

$= \frac{5+\sqrt{29}-5+\sqrt{29}}{2} = \sqrt{29}$

319. (3) $a + \frac{1}{b} = b + \frac{1}{c} = c + \frac{1}{a}$

$= \pm 1$ (let)

$\Rightarrow a + \frac{1}{b} = 1$

$\Rightarrow ab + 1 = b \Rightarrow ab = b - 1$

$b + \frac{1}{c} = 1 \Rightarrow \frac{1}{c} = 1 - b$

$c = \frac{1}{1-b}$

$\therefore abc = \frac{b-1}{1-b} = -1$

Again, $a + \frac{1}{b} = -1$

$\Rightarrow ab + 1 = -b \Rightarrow ab = -b - 1$

$b + \frac{1}{c} = -1 \Rightarrow \frac{1}{c} = -1 - b$

$c = \frac{1}{-1-b}$

$\therefore abc = 1$

$\therefore abc = \pm 1$

320. (1) $ax + by - 1 = 0$

$bx + ay - \frac{2ab}{a^2+b^2} = 0$

By cross-multiplication.

$\frac{x}{b \times \frac{-2ab}{a^2+b^2} - a \times -1}$

TYPE-II

1. (3) Using Rule 8,

$x = \sqrt{3} + \sqrt{2}$

$\therefore \frac{1}{x} = \frac{1}{\sqrt{3}+\sqrt{2}}$

$= \frac{1}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

$= \frac{\sqrt{3}-\sqrt{2}}{3-2} = \sqrt{3}-\sqrt{2}$

$\therefore x + \frac{1}{x} = \sqrt{3} + \sqrt{2} + \sqrt{3} - \sqrt{2}$

$= 2\sqrt{3}$

Now,

$x^3 + \frac{1}{x^3} = \left(x + \frac{1}{x}\right)^3 - 3.x.\frac{1}{x}\left(x + \frac{1}{x}\right)$

$= (2\sqrt{3})^3 - 3(2\sqrt{3})$

$= 24\sqrt{3} - 6\sqrt{3} = 18\sqrt{3}$

2. (3) Using Rule 8,

Given, $x + y = 7$

Now, $x^3 + y^3 + 21xy$

$= (x + y)^3 - 3xy\,(x + y) + 21xy$

$= (7)^3 - 3xy\,(7) + 21xy$

$= 343 - 21xy + 21xy = 343$

3. (3) Using Rule 8,

$x^{\frac{1}{3}} + y^{\frac{1}{3}} = z^{\frac{1}{3}}$ .....(i)

Cubing both sides,

$\left(x^{\frac{1}{3}} + y^{\frac{1}{3}}\right)^3 = z$

$\Rightarrow x + y + 3\,x^{\frac{1}{3}}.y^{\frac{1}{3}}\left(x^{\frac{1}{3}} + y^{\frac{1}{3}}\right) = z$

$[\because (a + b)^3 = a^3 + b^3 + 3ab\,(a + b)]$

$\Rightarrow x + y - z$

$= -3.\,x^{\frac{1}{3}}.y^{\frac{1}{3}}.z^{\frac{1}{3}}$ .....(ii)

[From equation (i)]

$\therefore (x + y - z)^3 + 27\,xyz$

$= \left(-3x^{\frac{1}{3}}.y^{\frac{1}{3}}.z^{\frac{1}{3}}\right)^3 + 27\,xyz$

[From equation (ii)]

$= -27xyz + 27xyz = 0$

4. (1) Using Rule 1,

$\left(2b + \frac{1}{b}\right)^2$

$= 4b^2 + \frac{1}{b^2} + 2 \times 2b \times \frac{1}{b} = 2 + 4 = 6$

$\Rightarrow 2b + \frac{1}{b} = \sqrt{6}$

$\therefore 8b^3 + \frac{1}{b^3}$

$= \left(2b + \frac{1}{b}\right)^3 - 3 \times 2b \times \frac{1}{b}\left(2b + \frac{1}{b}\right)$

$= \left(\sqrt{6}\right)^3 - 6\left(\sqrt{6}\right)$

$= 6\sqrt{6} - 6\sqrt{6} = 0$

5. (2) Using Rule 8,

$2p + \frac{1}{p} = 4$

$\Rightarrow p + \frac{1}{2p} = 2$

$\therefore \left(p + \frac{1}{2p}\right)^3$

$= p^3 + \frac{1}{8p^3} + 3.p.\frac{1}{2p}\left(p + \frac{1}{2p}\right)$

$\Rightarrow 8 = p^3 + \frac{1}{8p^3} + \frac{3}{2} \times 2$

$\Rightarrow p^3 + \frac{1}{8p^3} = 8 - 3 = 5$

6. (1) $a^4 + b^4 - a^2b^2 = 0$ ..... (i)

We know, $a^6 + b^6 = (a^2)^3 + (b^2)^3$

$= (a^2 + b^2)\,(a^4 - a^2b^2 + b^4)$

$= (a^2 + b^2) \times 0 = 0$

[From equation (i)]

7. (1) Using Rule 8,

$x + \frac{1}{x} = \sqrt{3}$

Cubing both sides,

$x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = \left(\sqrt{3}\right)^3$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\sqrt{3} = 3\sqrt{3}$

$\Rightarrow x^3 + \frac{1}{x^3} = 0$

Now, $x^{18} + x^{12} + x^6 + 1$

$= x^{12}\,(x^6 + 1) + 1\,(x^6 + 1)$

$= (x^{12} + 1)\,(x^6 + 1)$

$= (x^{12} + 1)\,.\,x^3\left(x^3 + \frac{1}{x^3}\right) = 0$

8. (2) $x + \frac{1}{x} = 2$

$\Rightarrow x^2 + 1 = 2x \Rightarrow x^2 - 2x + 1 = 0$

$\Rightarrow (x - 1)^2 = 0$

$\Rightarrow x = 1$

$\therefore x^2 + \frac{1}{x^3} = 1 + 1 = 2$

Aliter :

Using Rule 16,

Here, $x + \frac{1}{x} = 2$

$\Rightarrow x + \frac{1}{x^3} = 2$

9. (1) $\frac{a}{b} + \frac{b}{a} = 1$

$\Rightarrow \frac{a^2 + b^2}{ab} = 1$

$\Rightarrow a^2 + b^2 = ab$

$\Rightarrow a^2 + b^2 - ab = 0$

$\therefore a^3 + b^3$

$= (a + b)\,(a^2 - ab + b^2) = 0$

10. (3) $\frac{x^3 + \frac{1}{x}}{x^2 - x + 1} = \frac{x^2 + \frac{1}{x^2}}{x - 1 + \frac{1}{x}}$

$= \frac{\left(x + \frac{1}{x}\right)^2 - 2}{\left(x + \frac{1}{x}\right) - 1} = \frac{9 - 2}{3 - 1} = \frac{7}{2}$

11. (1) $a + \frac{1}{a} + 1 = 0$

$\Rightarrow a^2 + a + 1 = 0$

$\Rightarrow a^4 - a = a\,(a^3 - 1)$

$= a\,(a - 1)\,(a^2 + a + 1) = 0$

12. (3) $x^4 + y^4 - 2x^2y^2$

$= (x^2 - y^2)^2$

$= [(x + y)\,(x - y)]^2$

$= \left[\left(a + \frac{1}{a} + a - \frac{1}{a}\right)\left(a + \frac{1}{a} - a + \frac{1}{a}\right)\right]^2$

$= \left(2a \times \frac{2}{a}\right)^2 = 16$

13. (3) Using Rule 8,

$$x + \frac{1}{2x} = 2$$

$$\Rightarrow 2x + \frac{2}{2x} = 4$$

$$\Rightarrow 2x + \frac{1}{x} = 4$$

On cubing both sides,

$$8x^3 + \frac{1}{x^3} + 3.2x.\ \frac{1}{x}\left(2x + \frac{1}{x}\right) = 64$$

$$\Rightarrow 8x^3 + \frac{1}{x^3} + 6 \times 4 = 64$$

$$\Rightarrow 8x^3 + \frac{1}{x^3} = 64 - 24 = 40$$

14. (3) $P(x) = ax^3 + 3x^2 - 8x + b$

[$\because$ P (x) is div. by $(x + 2)$ & $(x-2)$]

$\therefore P(-2) = -8a + 12 + 16 + b = 0$

$\Rightarrow -8a + b + 28 = 0$ ...(i)

$\Rightarrow P(2) = 8a + 12 - 16 + b = 2$

$\Rightarrow 8a + b - 4 = 0$ ...(ii)

By equation (i) + (ii)

$2b + 24 = 0$

$$\Rightarrow b = -\frac{24}{2} = -12$$

From equation (i),

$-8a - 12 + 28 = 0$

$\Rightarrow -8a = -16$

$\Rightarrow a = 2$

15. (2) Using Rule 8,

$x^2 - 3x + 1 = 0$

$\Rightarrow x^2 + 1 = 3x$

$$\Rightarrow x + \frac{1}{x} = 3$$

$$\therefore x^3 + \frac{1}{x^3}$$

$$= \left(x + \frac{1}{x}\right)^3 - 3\ x.\frac{1}{x}\left(x + \frac{1}{x}\right)$$

$= 27 - 3 \times 3 = 18$

16. (1) Using Rule 8,

$$x + \frac{1}{4x} = \frac{3}{2}$$

Multiplying both sides by 2

$$\Rightarrow 2x + \frac{1}{2x} = 3$$

Cubing both sides,

$$8x^3 + \frac{1}{8x^3} + 3 \times 2x \times \frac{1}{2x} \times \left(2x + \frac{1}{2x}\right) = 27$$

$$\Rightarrow 8x^3 + \frac{1}{8x^3} + 3 \times 3 = 27$$

$$\Rightarrow 8x^3 + \frac{1}{8x^3} = 27 - 9 = 18$$

17. (1) $\frac{1}{x+y} = \frac{1}{x} + \frac{1}{y} = \frac{y+x}{xy}$

$\Rightarrow (x + y)^2 = xy$

$\Rightarrow x^2 + 2xy + y^2 = xy$

$\Rightarrow x^2 + xy + y^2 = 0$

$\therefore x^3 - y^3 = (x - y)(x^2 + xy + y^2) = 0$

18. (3)

$$\frac{x}{a} = b - c;\ \frac{y}{b} = c - a;\ \frac{z}{c} = a - b$$

Again, $b - c + c - a + a - b = 0$

$$\therefore \left(\frac{x}{a}\right)^3 + \left(\frac{y}{b}\right)^3 + \left(\frac{z}{c}\right)^3$$

$= (b - c)^3 + (c - a)^3 + (a - b)^3$

$= 3(b - c)(c - a)(a - b)$

$$= \frac{3xyz}{abc}$$

19. (3) $xy(x + y) = 1$

$$\Rightarrow x + y = \frac{1}{xy}$$

Cubing both sides,

$$x^3 + y^3 + 3xy(x + y) = \frac{1}{x^3y^3}$$

$$\Rightarrow x^3 + y^3 + 3xy \times \frac{1}{xy} = \frac{1}{x^3y^3}$$

$$\Rightarrow \frac{1}{x^3y^3} - x^3 - y^3 = 3$$

20. (4) Using Rule1 and 8,

$$x^4 + \frac{1}{x^4} = 119$$

$$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 - 2 = 119$$

$$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 = 121$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 11$$

$$\Rightarrow \left(x - \frac{1}{x}\right)^2 + 2 = 11$$

$$\Rightarrow \left(x - \frac{1}{x}\right)^2 = 9 \Rightarrow x - \frac{1}{x} = 3$$

Cubing both sides,

$$\left(x - \frac{1}{x}\right)^3 = 27$$

$$\Rightarrow x^3 - \frac{1}{x^3} - 3\left(x - \frac{1}{x}\right) = 27$$

$$\Rightarrow x^3 - \frac{1}{x^3} - 3 \times 3 = 27$$

$$\Rightarrow x^3 - \frac{1}{x^3} = 27 + 9 = 36$$

21. (2) Using Rule 8,

$$3x + \frac{1}{2x} = 5$$

On multiplying both sides by $\frac{2}{3}$,

$$2x + \frac{1}{3x} = \frac{10}{3}$$

Cubing both sides,

$$8x^3 + \frac{1}{27x^3} + 3 \times 2x \times \frac{1}{3x}\left(2x + \frac{1}{3x}\right) = \frac{1000}{27}$$

$$\Rightarrow 8x^3 + \frac{1}{27x^3} + 2 \times \frac{10}{3} = \frac{1000}{27}$$

$$\Rightarrow 8x^3 + \frac{1}{27x^3} = \frac{1000}{27} - \frac{20}{3}$$

$$= \frac{1000 - 180}{27} = \frac{820}{27} = 30\frac{10}{27}$$

22. (1) Using Rule 20,

$x + y = z \Rightarrow x + y + (-z) = 0$

$\therefore x^3 + y^3 - z^3 + 3xyz$

$= x^3 + y^3 + (-z)^3 - 3x.y(-z) = 0$

23. (1) Using Rule 8,

$$\left(x + \frac{1}{x}\right)^2 = 3$$

$$\Rightarrow x + \frac{1}{x} = \sqrt{3}$$

On cubing both sides,

$$\left(x+\frac{1}{x}\right)^3 = 3\sqrt{3}$$

$$\Rightarrow x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right) = 3\sqrt{3}$$

$$\Rightarrow x^3+\frac{1}{x^3}+3\sqrt{3} = 3\sqrt{3}$$

$$\Rightarrow x^3+\frac{1}{x^3} = 0 \Rightarrow x^6+1 = 0$$

$\therefore x^{72} + x^{66} + x^{54} + x^{36} + x^{24} + x^6 + 1$
$= (x^6)^{12} + (x^6)^{11} + (x^6)^9 + (x^6)^6 + (x^6)^4 + x^6 + 1$
$= 1 - 1 - 1 + 1 + 1 + 0 = 1$

24. (1) Using Rule 8,

$$\left(x+\frac{1}{x}\right)^2 = 3$$

$$\Rightarrow x+\frac{1}{x} = \sqrt{3}$$

On cubing both sides,

$$x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right) = 3\sqrt{3}$$

$$\Rightarrow x^3+\frac{1}{x^3} = 3\sqrt{3}-3\sqrt{3} = 0$$

$\Rightarrow x^6 + 1 = 0$
$\therefore x^{206} + x^{200} + x^{90} + x^{84} + x^{18} + x^{12} + x^6 + 1$
$= x^{200}(x^6+1) + x^{84}(x^6+1) + x^{12}(x^6+1) + (x^6+1)$
$= 0$

25. (2) Using Rule 8,

(2) $a+\frac{1}{a} = \sqrt{3}$

On cubing both sides,

$$a^3+\frac{1}{a^3}+3a.\frac{1}{a}\left(a+\frac{1}{a}\right) = 3\sqrt{3}$$

$$\Rightarrow a^3+\frac{1}{a^3}+3\sqrt{3} = 3\sqrt{3}$$

$$\Rightarrow a^3+\frac{1}{a^3} = 0 \quad \text{....(i)}$$

$$\Rightarrow a^6-\frac{1}{a^6}+2$$

$$= \left(a^3\right)^2-\left(\frac{1}{a^3}\right)^2+2$$

$$=\left(a^3+\frac{1}{a^3}\right)\left(a^3-\frac{1}{a^3}\right)+2 = 2$$

26. (2) Using Rule 8,
$(x + y)^3 = x^3 + y^3 + 3(xy)(x + y)$
$\Rightarrow 125 = 35 + 3(5)xy$
$\Rightarrow 15xy = 125 - 35 = 90$

$$\Rightarrow xy = \frac{90}{15} = 6$$

$$\Rightarrow \frac{x+y}{xy} = \frac{1}{y}+\frac{1}{x} = \frac{5}{6}$$

27. (2) Using Rule 9,
$a^3 - b^3 = 56$
$\Rightarrow (a - b)(a^2 + ab + b^2) = 56$
$\Rightarrow a^2 + ab + b^2 = 28$
$\Rightarrow (a - b)^2 + 3ab = 28$
$\Rightarrow 4 + 3ab = 28$
$\Rightarrow 3ab = 28 - 4 = 24$
$\Rightarrow ab = 8$
$\therefore a^2 + b^2 = (a - b)^2 + 2ab$
$= 4 + 16 = 20$

28. (2) $(a^2 + b^2)^3 = (a^3 + b^3)^2$
$\Rightarrow a^6 + b^6 + 3a^2b^2(a^2 + b^2)$
$= a^6 + b^6 + 2a^3b^3$
$\Rightarrow 3(a^2 + b^2) = 2ab$

$$\Rightarrow \frac{a^2+b^2}{ab} = \frac{2}{3}$$

$$\Rightarrow \frac{a}{b}+\frac{b}{a} = \frac{2}{3}$$

29. (1) Using Rule1 and 8,

$$x+\frac{1}{x} = 5$$

On squaring both sides,

$$x^2+\frac{1}{x^2}+2 = 25$$

$$\Rightarrow x^2+\frac{1}{x^2} = 25 - 2 = 23 \quad \text{...(i)}$$

Expression

$$= \frac{x^4+3x^3+5x^2+3x+1}{x^4+1}$$

$$= \frac{x^4+1+3x^3+3x+5x^2}{x^4+1}$$

$$= \frac{x^2\left(x^2+\frac{1}{x^2}\right)+3x^2\left(x+\frac{1}{x}\right)+5x^2}{x^2\left(x^2+\frac{1}{x^2}\right)}$$

$$= \frac{\left(x^2+\frac{1}{x^2}\right)+3\left(x+\frac{1}{x}\right)+5}{x^2+\frac{1}{x^2}}$$

$$= \frac{23+3\times 5+5}{23} = \frac{43}{23}$$

30. (2) Using Rule 8,

$$\left(x+\frac{1}{x}\right)^3$$

$$= x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)$$

$$= 3\left(x+\frac{1}{x}\right)$$

$$\Rightarrow \left(x+\frac{1}{x}\right)^2 = 3$$

$$\therefore \left(x+\frac{1}{x}\right)^4 = 3 \times 3 = 9$$

31. (3) Using Rule 1 and 8,

$$\left(x+\frac{1}{x}\right)^2 = x^2+\frac{1}{x^2}+2$$

$$\Rightarrow x^2+\frac{1}{x^2} = 9 - 2 = 7$$

Again,

$$\left(x+\frac{1}{x}\right)^3 = x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)$$

$$\Rightarrow 27 = x^3+\frac{1}{x^3}+3\times 3$$

$$\Rightarrow x^3+\frac{1}{x^3} = 18$$

$$\therefore \left(x^2+\frac{1}{x^2}\right)\left(x^3+\frac{1}{x^3}\right)$$

$= 7 \times 18 = 126$

$$\Rightarrow x^5+\left(x+\frac{1}{x}\right)+\frac{1}{x^5} = 126$$

$$\Rightarrow x^5+\frac{1}{x^5} = 126-3 = 123$$

32. (2) Using Rule 9,

$$x-\frac{1}{x} = 3$$

On cubing both sides,

$$\left(x-\frac{1}{x}\right)^3 = 27$$

$$\Rightarrow x^3-\frac{1}{x^3}-3\left(x-\frac{1}{x}\right) = 27$$

$\Rightarrow x^3 - \frac{1}{x^3} - 3 \times 3 = 27$

$\Rightarrow x^3 - \frac{1}{x^3} = 27 + 9 = 36$

33. (1) $m^4 + \frac{1}{m^4} = 119$

$\Rightarrow \left(m^2 + \frac{1}{m^2}\right)^2 - 2 = 119$

$\Rightarrow \left(m^2 + \frac{1}{m^2}\right)^2 = 119 + 2 = 121$

$\Rightarrow m^2 + \frac{1}{m^2} = 11$

$\Rightarrow \left(m - \frac{1}{m}\right)^2 + 2 = 11$

$\Rightarrow \left(m - \frac{1}{m}\right)^2 = 11 - 2 = 9$

$\Rightarrow m - \frac{1}{m} = \pm 3$

34. (4) Using Rule 21,
$x + y + z = 6$
$\Rightarrow x + y + z - 6 = 0$
$\Rightarrow (x - 1) + (y - 2) + (z - 3) = 0$
If $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$
$\therefore (x - 1)^3 + (y - 2)^3 + (z - 3)^3 = 3(x - 1)(y - 2)(z - 3)$

35. (4) $x^2 + 1 = 2x$ (Given)

$\Rightarrow x + \frac{1}{x} = 2$ ...(i)

Expression

$= \frac{x^4 + \frac{1}{x^2}}{x^2 - 3x + 1} = \frac{\frac{x^6 + 1}{x^2}}{(x^2 - 3x + 1)}$

$= \frac{x^6 + 1}{(x^2 + 1 - 3x).x^2}$

$= \frac{x^6 + 1}{(2x - 3x)x^2} = \frac{x^6 + 1}{-x^3}$

$= -\left(\frac{x^6 + 1}{x^3}\right) = -\left(\frac{x^6}{x^3} + \frac{1}{x^3}\right)$

$= -\left(x^3 + \frac{1}{x^3}\right)$

$= -\left[\left(x + \frac{1}{x}\right)^3 - 3\left(x + \frac{1}{x}\right)\right]$

$= -[2^3 - 3 \times 2]$
$= -2$

36. (3) $x = \sqrt{3} + \sqrt{2}$

$\therefore \frac{1}{x} = \frac{1}{\sqrt{3} + \sqrt{2}}$

$= \frac{\sqrt{3} - \sqrt{2}}{(\sqrt{3} + \sqrt{2})(\sqrt{3} - \sqrt{2})}$

$= \sqrt{3} - \sqrt{2}$

$\therefore x - \frac{1}{x} = \sqrt{3} + \sqrt{2} - \sqrt{3} + \sqrt{2}$

$= 2\sqrt{2}$

Cubing both sides,

$\Rightarrow \left(x - \frac{1}{x}\right)^3 = 16\sqrt{2}$

$x^3 - \frac{1}{x^3} - 3\left(x - \frac{1}{x}\right)$

$= 16\sqrt{2}$

$\Rightarrow x^3 - \frac{1}{x^3} - 3 \times 2\sqrt{2} = 16\sqrt{2}$

$\Rightarrow x^3 - \frac{1}{x^3} = 16\sqrt{2} + 6\sqrt{2} = 22\sqrt{2}$

37. (3) $x^2 + \frac{1}{x^2} = 83$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 + 2 = 83$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 = 83 - 2 = 81 = 9^2$

$\Rightarrow x - \frac{1}{x} = 9$

Cubing both sides,

$\left(x - \frac{1}{x}\right)^3 = 9^3 = 729$

$\Rightarrow x^3 - \frac{1}{x^3} - 3\left(x - \frac{1}{x}\right) = 729$

$\Rightarrow x^3 - \frac{1}{x^3} - 3 \times 9 = 729$

$\Rightarrow x^3 - \frac{1}{x^3} = 729 + 27 = 756$

38. (4) Using Rule 8,

$\left(a + \frac{1}{a}\right)^2 = 3 = \left(\sqrt{3}\right)^2$

$\Rightarrow a + \frac{1}{a} = \sqrt{3}$

Cubing both sides,

$\left(a + \frac{1}{a}\right)^3 = 3\sqrt{3}$

$\Rightarrow a^3 + \frac{1}{a^3} + 3\left(a + \frac{1}{a}\right) = 3\sqrt{3}$

$\Rightarrow a^3 + \frac{1}{a^3} + 3\sqrt{3} = 3\sqrt{3}$

$\Rightarrow a^3 + \frac{1}{a^3} = 0$

39. (2) $\frac{x}{x^2 - 2x + 1} = \frac{1}{3}$

$\Rightarrow \frac{x^2 - 2x + 1}{x} = 3$

$\Rightarrow x - 2 + \frac{1}{x} = 3$

$\Rightarrow x + \frac{1}{x} = 5$

On cubing both sides

$x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 125$

$\Rightarrow x^3 + \frac{1}{x^3} = 125 - 3 \times 5 = 110$

40. (2) Using Rule 1,

$\left(x + \frac{1}{x}\right) = 4$

On squaring both sides

$x^2 + \frac{1}{x^2} + 2 = 16$

$\Rightarrow x^2 + \frac{1}{x^2} = 14$

On squaring again

$x^4 + \frac{1}{x^4} + 2 = 196$

$\Rightarrow x^4 + \frac{1}{x^4} = 194$

41. (3) $x + y + z = 6$
On squaring,
$x^2 + y^2 + z^2 + 2xy + 2zy + 2zx = 36$
$\Rightarrow 20 + 2(xy + yz + zx) = 36$
$\Rightarrow xy + yz + zx = 8$
$\therefore x^3 + y^3 + z^3 - 3xyz$
$= (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$
$= 6(20 - 8)$
$= 72$

42. (2) $x = 1 - \sqrt{2}$

$$\therefore \frac{1}{x} = \frac{1}{1-\sqrt{2}} \times \frac{1+\sqrt{2}}{1+\sqrt{2}}$$

$$= -1 - \sqrt{2}$$

$$\therefore \left(x - \frac{1}{x}\right)^3$$

$$= (1 - \sqrt{2} + 1 + \sqrt{2})^3$$
$$= 2^3 = 8$$

43. (2) $x + y + z = a - b + b - c + c - a = 0$
$\therefore x^3 + y^3 + z^3 - 3xyz = 0$

44. (4) $x = \dfrac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

$$= \frac{(\sqrt{3}-\sqrt{2})(\sqrt{3}-\sqrt{2})}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$$

$$= \frac{(\sqrt{3}-\sqrt{2})^2}{3-2}$$

$$= 3 + 2 - 2\sqrt{3}.\sqrt{2}$$

$$= 5 - 2\sqrt{6}$$

$$\therefore y = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} = 5 + 2\sqrt{6}$$

$\therefore x + y$

$$= 5 - 2\sqrt{6} + 5 + 2\sqrt{6} = 10$$

$$xy = (5 - 2\sqrt{6})(5 + 2\sqrt{6})$$

$= 25 - 24 = 1$
$\therefore x^3 + y^3 = (x + y)^3 - 3xy(x + y)$
$= (10)^3 - 3(10)$
$= 1000 - 30 = 970$

45. (4) $(x - a)^3 - \dfrac{1}{(x-a)^3}$

$$= \left(x - a - \frac{1}{x-a}\right)^3 + 3\left(x - a - \frac{1}{x-a}\right)$$

$= (x - a - x + b)^3 + 3(x - a - x + b)$
$= (b - a)^3 + 3(b - a)$
$= 5^3 + 3 \times 5 = 125 + 15 = 140$

46. (1) $a^2 + b^2 + c^2 = 2(a - b - c) - 3$
$\Rightarrow a^2 + b^2 + c^2 - 2a + 2b + 2c + 3 = 0$
$\Rightarrow a^2 - 2a + 1 + b^2 + 2b + 1 + c^2 + 2c + 1 = 0$
$\Rightarrow (a - 1)^2 + (b + 1)^2 + (c + 1)^2 = 0$
$\therefore a - 1 = 0 \Rightarrow a = 1$
$b + 1 = 0 \Rightarrow b = -1$
$c + 1 = 0 \Rightarrow c = -1$
$\therefore 4a - 3b + 5c = 4 \times 1 - 3 \times (-1) + 5(-1) = 4 + 3 - 5 = 2$

47. (3) $2x + \dfrac{2}{x} = 3 \Rightarrow x + \dfrac{1}{x} = \dfrac{3}{2}$
On cubing,

$$x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = \frac{27}{8}$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times \frac{3}{2} = \frac{27}{8}$$

$$\Rightarrow x^3 + \frac{1}{x^3} = \frac{27}{8} - \frac{9}{2}$$

$$= \frac{27 - 36}{8} = -\frac{9}{8}$$

$$\therefore x^3 + \frac{1}{x^3} + 2 = 2 - \frac{9}{8} = \frac{7}{8}$$

48. (2) $a + b + c = 15$
$\therefore (a + b + c)^2 = 225$
$\therefore a^2 + b^2 + c^2 + 2(ab + bc + ca) = 225$
$\Rightarrow 2(ab + bc + ca) = 225 - 83 = 142$
$\Rightarrow ab + bc + ca = 142 \div 2 = 71$
$\therefore a^3 + b^3 + c^3 - 3abc$
$= (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$
$= 15(83 - 71) = 15 \times 12 = 180$

49. (3) $a - b = 3$
$a^3 - b^3 = 117$
$a^3 - b^3 = (a - b)^3 + 3ab(a - b)$
$\Rightarrow 117 = 27 + 3ab(3)$
$\Rightarrow 9ab = 117 - 27 = 90$
$\Rightarrow ab = 10$
$\therefore (a + b)^2 = (a - b)^2 + 4ab$
$= 9 + 40 = 49$
$\therefore |a + b| = 7$

50. (2) $x + \dfrac{1}{x+1} = 1$

$$\Rightarrow (x + 1) + \frac{1}{x+1} = 2$$

On squaring,

$$(x + 1)^2 + \frac{1}{(x+1)^2} + 2 = 4$$

$$\Rightarrow (x + 1)^2 + \frac{1}{(x+1)^2} = 2 \quad \text{...(i)}$$

Again, cubing $(x + 1) + \dfrac{1}{(x+1)} = 2$,

$$(x + 1)^3 + \frac{1}{(x+1)^3} + 3\left((x+1) + \frac{1}{(x+1)}\right) = 8$$

$$\Rightarrow (x + 1)^3 + \frac{1}{(x+1)^3}$$

$= 8 - 3 \times 2 = 2$

$$\therefore \left((x+1)^2 + \frac{1}{(x+1)^2}\right)$$

$$\left((x+1)^3 + \frac{1}{(x+1)^3}\right)$$

$= 2 \times 2 = 4$

$$\Rightarrow (x + 1)^5 + \frac{1}{(x+1)} + \frac{1}{(x+1)^5} + (x + 1) = 4$$

$$\therefore (x + 1)^5 + \frac{1}{(x+1)^5}$$

$= 4 - 2 = 2$

Aliter :
Using Rule 14,

Here, $x + \dfrac{1}{x+1} = 1$

$$\Rightarrow x + 1 + \frac{1}{x+1} = 2$$

$$\therefore (x + 1)^2 + \frac{1}{(x+1)^2} = 2$$

51. (1) $\dfrac{1}{a} - \dfrac{1}{b} = \dfrac{1}{a-b}$

$$\Rightarrow \frac{b-a}{ab} = \frac{1}{a-b}$$

$\Rightarrow (a - b)(a - b) = -ab$
$\Rightarrow a^2 - 2ab + b^2 = -ab$
$\Rightarrow a^2 - ab + b^2 = 0$
$\therefore a^3 + b^3 = (a + b)(a^2 - ab + b)$
$= 0$

52. (4) Using Rule 21,
$a^3 + b^3 + c^3 - 3abc = (a + b + c)$
$(a^2 + b^2 + c^2 - ab - bc - ca)$
If $a + b + c = 0$, then
$a^3 + b^3 + c^3 = 3abc$

53. (3) Using Rule 21,
If a + b + c = 0
then $a^3 + b^3 + c = 3abc$
$\therefore$ When a – b – c = 0,
$a^3 - b^3 - c^3 = 3abc$
i.e., $a^3 - b^3 - c^3 - 3abc = 0$
Here,
a = 4.965, b = 2.343,
c = 2.6222
$\therefore$ a – b – c = 4.965 – 2.343 – 2.622 = 0
Hence, $a^3 - b^3 - c^3 - 3abc = 0$

54. (1) Using Rule 21,
Here, a + b + c
= 1.21 + 2.12 – 3.33 = 0
$a^3 + b^3 + c^3 - 3abc = 0$
($\because$ $a + b + c = 0$)

55. (1) P = 999 (Given)
Now, $\sqrt[3]{P\left(P^2 + 3P + 3\right) + 1}$
$\sqrt[3]{P^3 + 3P^2 + 3P + 1}$
$= \sqrt[3]{(P+1)^3} = P + 1$
= 999 + 1 = 1000

56. (3) Using Rule 21,
Here, $a - b - c$
= 4.36 – 2.39 – 1.97 = 0
$\therefore a^3 - b^3 - c^3 = 3abc$
$\Rightarrow a^3 - b^3 - c^3 - 3abc = 0$

57. (4) $\left(x + \frac{1}{x}\right)\left(x - \frac{1}{x}\right)$
$\left(x^2 + \frac{1}{x^2} - 1\right)\left(x^2 + \frac{1}{x^2} + 1\right)$
$= \left(x^2 - \frac{1}{x^2}\right)\left[\left(x^2 + \frac{1}{x^2}\right)^2 - 1\right]$
$= \left(x^2 - \frac{1}{x^2}\right)\left(x^4 + \frac{1}{x^4} + 1\right)$
$= x^6 - \frac{1}{x^6}$

58. (1) $\frac{a^2 + b^2 + ab}{a^3 - b^3}$
$= \frac{a^2 + b^2 + ab}{(a-b)(a^2 + b^2 + ab)}$
$= \frac{1}{a - b}$
$= \frac{1}{11 - 9} = \frac{1}{2}$

59. (4) $a = \sqrt{7 + 2 \times \sqrt{4} \times \sqrt{3}}$
$= \sqrt{4 + 3 + 2 \times 2 \times \sqrt{3}}$
$= \sqrt{\left(2 + \sqrt{3}\right)^2} = 2 + \sqrt{3}$
$\therefore\ b = \sqrt{7 - 2\sqrt{12}} = 2 - \sqrt{3}$
$\Rightarrow a + b = 2 + \sqrt{3} + 2 - \sqrt{3} = 4$
$ab = (2 + \sqrt{3})(2 - \sqrt{3}) = 1$
$\therefore a^3 + b^3 = (a + b)^3 - 3\,ab\,(a + b)$
$= 64 - 3 \times 4 = 52$

60. (3) According to question,
$\frac{a}{b} + \frac{b}{a} = 1$
$\Rightarrow a^2 + b^2 = ab$
$\Rightarrow a^2 - ab + b^2 = 0$
$\therefore a^3 + b^3$
$= (a + b)(a^2 - ab + b^2) = 0$

61. (3) $x = 2 - 2^{\frac{1}{3}} + 2^{\frac{2}{3}}$
$\Rightarrow x - 2 = 2^{\frac{2}{3}} - 2^{\frac{1}{3}}$
On cubing both sides,
$x^3 - 3x^2 \times 2 + 3x \times 4 - 8$
$= \left(2^{\frac{2}{3}}\right)^3 - \left(2^{\frac{1}{3}}\right)^3$
$- 3.2^{\frac{2}{3}}.2^{\frac{1}{3}}\left(2^{\frac{2}{3}} - 2^{\frac{1}{3}}\right)$
$\Rightarrow x^3 - 6x^2 + 12x - 8$
$= 4 - 2 - 6(x - 2)$
$\Rightarrow x^3 - 6x^2 + 12x - 8$
$= 2 - 6x + 12$
$\Rightarrow x^3 - 6x^2 + 18x + 18$
$= 2 + 12 + 8 + 18 = 40$

62. (4) Using Rule 21,
$a^3 + b^3 + c^3 - 3\,abc = 0$
If $a + b + c = 0$
$a^3 - b^3 - c^3 - 3\,abc = 0$
$\Rightarrow a - b - c = 0$
$\Rightarrow a = b + c$

63. (2) Using Rule 21,
Here, $p - q + q - r + r - p = 0$
$\therefore\ (p - q)^3 + (q - r)^3 + (r - p)^3$
$= 3(p - q)(q - r)(r - p)$
[Formula : If $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$]

64. (2) Using Rule 21,
$a + b + (-c) = 2.361 + 3.263 - 5.624 = 0$
$\therefore a^3 + b^3 + (-c^3 - 3ab(-c) = 0$
i.e. $a^3 + b^3 - c^3 + 3abc = 0$

65. (2) $(a + b + c)^2$
$= a^2 + b^2 + c^2 + 2(ab + bc + ca)$
$\Rightarrow 36 = 14 + 2(ab + bc + ca)$
$\Rightarrow ab + bc + ca = (36 - 14) \div 2$
$\Rightarrow ab + bc + ca = 11$ ....(i)
$\therefore\ a^3 + b^3 + c^3 - 3abc$
$= (a + b + c)$
$(a^2 + b^2 + c^2 - ab - bc - ca)$
$\Rightarrow 36 - 3abc = 6(14 - 11)$ [By (i)]
$\Rightarrow 36 - 3abc = 84 - 66 = 18$
$\Rightarrow 3abc = 36 - 18 = 18$
$\Rightarrow abc = 6$

66. (1) Using Rule 8,
$a + b = 1$
Cubing both sides,
$(a + b)^3 = 1$
$\Rightarrow a^3 + b^3 + 3ab(a + b) = 1$
$\Rightarrow a^3 + b^3 + 3ab = 1 = k$
$\Rightarrow k = 1$

67. (4) Using Rule 22,
$a^3 + b^3 + c^3 - 3\,abc$
$= \frac{1}{2}(a + b + c)[(a - b)^2 + (b - c)^2 + (c - a)^2]$
$= \frac{1}{2} \times 100(1 + 0 + 1) = 100$

68. (3) Using Rule 22,
$x^3 + y^3 + z^3 - 3xyz$
$= \frac{1}{2}(x + y + z)$
$\left[(x - y)^2 + (y - z)^2 + (z - x)^2\right]$
$= \frac{1}{2}(333 + 333 + 334)(0 + 1 + 1)$
= 1000

69. (1) $a^2 - b^2 + b^2 - c^2 + c^2 - a^2 = 0$
$\therefore (a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3$
$= 3(a^2 - b^2)(b^2 - c^2)(c^2 - a^2)$
[If $x + y + z = 0$, $x^3 + y^3 + z^3 = 3xyz$]
$= 3\,\mathbf{(a + b)\,(a - b)}\,(b + c)(b - c)(c + a)(c - a)$

70. (2) $a = \frac{b^2}{b - a} \Rightarrow ab - a^2 = b^2$
$\Rightarrow a^2 + b^2 - ab = 0$
$\therefore a^3 + b^3 = (a + b)(a^2 + b^2 - ab)$
$= (a + b) \times 0 = 0$

71. (4) Using Rule 8,
Expression = $p(p^2 + 3p + 3)$
$= (p^3 + 3p^2 + 3p + 1) - 1$
$= (p + 1)^3 - 1 = (99 + 1)^3 - 1$
$= (100)^3 - 1 = 1000000 - 1$
= 999999

72. (1) Using Rule 9,
Expression

$= \sqrt[3]{p(p^2 - 3p + 3) - 1}$

$= \sqrt[3]{p^3 - 3p^2 + 3p - 1}$

$\sqrt[3]{(p-1)^3} = p - 1 = 101 - 1 = 100$

73. (4) Using Rule 8,
Expression

$= \sqrt[3]{p(p^2 + 3p + 3) + 1}$

$= \sqrt[3]{p^3 + 3p^2 + 3p + 1}$

$= \left[(p+1)^3\right]^{\frac{1}{3}} = (p+1)^{3\times\frac{1}{3}}$

= p +1
When $p = 124$,
$p + 1 = 124 + 1 = 125$

74. (2) Using Rule 9,
$p - 2q = 4$
On cubing both sides,
$(p - 2q)^3 = 64$
$\Rightarrow p^3 - 8q^3 + 3p \cdot 4q^2 - 3p^2 \cdot 2q = 64$
$\Rightarrow p^3 - 8q^3 + 12pq^2 - 6p^2q = 64$
$\Rightarrow p^3 - 8q^3 - 6pq(p - 2q) = 64$
$\Rightarrow p^3 - 8q^3 - 6pq \times 4 = 64$
$\Rightarrow p^3 - 8q^3 - 24pq - 64 = 0$

75. (1) Expression $= \dfrac{x^2 + y^2 + xy}{x^3 - y^3}$

$= \dfrac{x^2 + y^2 + xy}{(x-y)(x^2 + y^2 + xy)} = \dfrac{1}{x - y}$

$= \dfrac{1}{19 - 18} = 1$

76. (3) $x + \dfrac{1}{x} = 2$

$\Rightarrow x^2 - 2x + 1 = 0$
$\Rightarrow (x - 1)^2 = 0 \Rightarrow x = 1$

$\therefore x^{17} + \dfrac{1}{x^{19}} = 1 + 1 = 2$

Aliter :
Using Rule 16,

Here, $x + \dfrac{1}{x} = 2$

$\Rightarrow x^{17} + \dfrac{1}{x^{19}} = 2$

77. (2) If $x = y = z = 1$, then
Expression
$= (3)^3 - (1)^3 - (1)^3 - (1)^3$
$= 27 - 3 = 24 = 24\ xyz$

78. (3) $\dfrac{1}{x^{99}} = \dfrac{1}{(-1)^{99}} = -1$

$\dfrac{1}{x^{98}} = \dfrac{1}{(-1)^{98}} = 1$ and so on.

$\therefore$ Expression = – 1 + 1 – 1 + 1 – 1 + 1 – 1 – 1 = – 2

79. (1) $\dfrac{1}{\sqrt[3]{4} + \sqrt[3]{2} + 1}$

$= a\sqrt[3]{4} + b\sqrt[3]{2} + c$

$\Rightarrow \dfrac{1}{2^{\frac{2}{3}} + 2^{\frac{1}{3}} + 1}$

$= a.2^{\frac{2}{3}} + b.2^{\frac{1}{3}} + c$

$\Rightarrow \dfrac{\left(2^{\frac{1}{3}} - 1\right)}{\left(2^{\frac{1}{3}} - 1\right)\left(2^{\frac{2}{3}} + 2^{\frac{1}{3}} + 1\right)}$

$= a.2^{\frac{2}{3}} + b.2^{\frac{1}{3}} + c$

$\Rightarrow \dfrac{2^{\frac{1}{3}} - 1}{2 - 1} = a.2^{\frac{2}{3}} + b.2^{\frac{1}{3}} + c$

$\left[\because (a-b)(a^2 + ab + b^2) = a^3 - b^3\right]$

$\Rightarrow a = 0,\ b = 1,\ c = -1$
$\therefore a + b + c = 0 + 1 - 1 = 0$

80. (4) $x = \sqrt[3]{2 + \sqrt{3}}$

$\Rightarrow x^3 = 2 + \sqrt{3}$

$\dfrac{1}{x^3} = \dfrac{1}{2 + \sqrt{3}}$

$= \dfrac{1}{2 + \sqrt{3}} \times \dfrac{2 - \sqrt{3}}{2 - \sqrt{3}}$

$= \dfrac{2 - \sqrt{3}}{4 - 3} = 2 - \sqrt{3}$

$\therefore x^3 + \dfrac{1}{x^3} = 2 + \sqrt{3} + 2 - \sqrt{3} = 4$

81. (4) $x = \sqrt[3]{5} + 2$

$\Rightarrow x - 2 = \sqrt[3]{5}$
On cubing,
$x^3 - 3x^2 \times 2 + 3x.(-2)^2 - 2^3 = 5$
$\Rightarrow x^3 - 6x^2 + 12x - 8 = 5$
$\Rightarrow x^3 - 6x^2 + 12x - 13 = 0$

82. (3) $x^3 - x^2y - xy^2 + y^3$
$= x^3 + y^3 - x^2y - xy^2$
$= (x + y)^3 - 3xy(x + y) - xy(x + y)$
$= (x + y)^3 - 4xy(x + y) = a^3 - 4b^2a$

83. (2) Expression $= \dfrac{x^4 - \dfrac{1}{x^2}}{3x^2 + 5x - 3}$

Dividing numerator and denominator by x,

$= \dfrac{x^3 - \dfrac{1}{x^3}}{3x + 5 - \dfrac{3}{x}} = \dfrac{x^3 - \dfrac{1}{x^3}}{3\left(x - \dfrac{1}{x}\right) + 5}$

$= \dfrac{\left(x - \dfrac{1}{x}\right)^3 + 3\left(x - \dfrac{1}{x}\right)}{3\left(x - \dfrac{1}{x}\right) + 5}$

$= \dfrac{1 + 3}{3 + 5} = \dfrac{4}{8} = \dfrac{1}{2}$

84. (4) $x + y = 15$
$\Rightarrow (x - 10) + (y - 5) = 0$
$\therefore (x - 10)^3 + (y - 5)^3$
$= (x - 10 + y - 5)^3 - 3(x - 10)(y - 5)(x - 10 + y - 5) = 0$
$[a^3 + b^3 = (a + b)^3 - 3ab(a + b)]$

85. (2) Using Rule 5,

$x^2 + \dfrac{1}{x^2} = 66$

$\Rightarrow \left(x - \dfrac{1}{x}\right)^2 + 2 = 66$

$\Rightarrow \left(x - \dfrac{1}{x}\right)^2 = 66 - 2 = 64$

$\Rightarrow x - \dfrac{1}{x} = \pm 8$

$\therefore$ Expression $= \dfrac{x^2 - 1 + 2x}{x}$

$= \dfrac{x^2}{x} - \dfrac{1}{x} + 2 = x - \dfrac{1}{x} + 2$

Putting the value of $x - \dfrac{1}{x}$
= 8 + 2 or – 8 + 2 = 10 or –6

86. (3) Using Rule 9,
$a^2 + a + 1 = 0$
$\Rightarrow (a - 1)(a^2 + a + 1) = 0$
$\Rightarrow a^3 - 1 = 0$
$\Rightarrow a^3 = 1 \Rightarrow a = 1$
$\therefore a^9 = 1$

87. (1) Given, $x + \frac{2}{x} = 1$

Expression

$$= \frac{x^2 + x + 2}{x^2(1-x)} = \frac{x + 1 + \frac{2}{x}}{x(1-x)}$$

(Dividing numerator and denominator by x)

$$= \frac{x + \frac{2}{x} + 1}{x(1-x)} = \frac{1+1}{x \times \frac{2}{x}} = \frac{2}{2} = 1$$

88. (2) Using Rule 9,
$x = k^3 - 3k^2$
$y = 1 - 3k$
When $x = y$, then
$k^3 - 3k^2 = 1 - 3k$
$\Rightarrow k^3 - 3k^2 + 3k - 1 = 0$
$\Rightarrow (k-1)^3 = 0 \Rightarrow k - 1 = 0$
$\Rightarrow k = 1$

89. (3) Expression

$$= \frac{\sqrt{(x^2 + y^2 + z)(x + y - 3z)}}{\sqrt[3]{xy^3z^2}}$$

Putting $x = 1$, $y = -3$, $z = -1$

$$= \frac{\sqrt{(1+9-1)(1-3+3)}}{\sqrt[3]{1 \times -27 \times 1}}$$

$$= \frac{3}{-3} = -1$$

Note : Original question is :

$$\sqrt{(x^2 + y^2 + z)(x - y - 3z)} \div \sqrt[3]{xy^3z^2}$$

which gives answer $= -\sqrt{7}$ which is not in options.

90. (2) Expression

$$= \frac{p^2 - p}{2p^3 + 6p^2} \div \frac{p^2 - 1}{p^2 + 3p} \div \frac{p^2}{p+1}$$

$$= \frac{p(p-1)}{2p^2(p+3)} \div \frac{(p+1)(p-1)}{p(p+3)} \div \frac{p^2}{p+1}$$

$$= \frac{p(p-1)}{2p^2(p+3)} \times \frac{p(p+3)}{(p+1)(p-1)} \times \frac{(p+1)}{p^2}$$

$$= \frac{1}{2p^2}$$

91. (2) $x + \frac{1}{x} = 2$

On squaring both sides,

$$x^2 + \frac{1}{x^2} + 2 = 4$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 4 - 2 = 2$$

Again, $x + \frac{1}{x} = 2$

On cubing both sides,

$$\left(x + \frac{1}{x}\right)^3 = 8$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 8$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times 2 = 8$$

$$\Rightarrow x^3 + \frac{1}{x^3} = 8 - 6 = 2$$

$$\therefore \left(x^2 + \frac{1}{x^2}\right)\left(x^3 + \frac{1}{x^3}\right)$$

$= 2 \times 2 = 4$

Aliter :
Using Rule 14,

Here, $x + \frac{1}{x} = 2$

$$x^2 + \frac{1}{x^2} = 2 \text{ and } x^3 + \frac{1}{x^3} = 2$$

$$\therefore \left(x^2 + \frac{1}{x^2}\right)\left(x^3 + \frac{1}{x^3}\right)$$

$= 2 \times 3 = 4$

92. (3) $a^3 + b^3 + c^3 - 3abc$ will be minimum if $a = b = 1$, $c = 2$
$\therefore$ Least value $= 1 + 1 + 8 - 3 \times 1 \times 1 \times 2 = 10 - 6 = 4$

93. (4) By remainder theorem,

Remainder $= f\left(-\frac{2}{3}\right)$

$\because f(x) = 12x^3 - 13x^2 - 5x + 7$

$$\therefore f\left(-\frac{2}{3}\right) = 12\left(\frac{-2}{3}\right)^3 - 13\left(\frac{-2}{3}\right)^2 - 5\left(\frac{-2}{3}\right) + 7$$

$$= -\frac{12 \times 8}{27} - \frac{13 \times 4}{9} + \frac{10}{3} + 7$$

$$= -\frac{32}{9} - \frac{52}{9} + \frac{10}{3} + 7$$

$$= \frac{-32 - 52 + 30 + 63}{9} = \frac{9}{9} = 1$$

Second Method

$3x + 2)12x^3 - 13x^2 - 5x + 7(4x^2 - 7x + 3$
$\underline{12x^3 \pm 8x^2}$
$-21x^2 - 5x$
$\underline{\mp 21x^2 \mp 14x}$
$9x + 7$
$\underline{9x \pm 6}$
1

94. (3) $ab + bc + ca = 0$
$\Rightarrow ab + ca = -bc$
$\therefore a^2 - bc = a^2 + ab + ca$
$= a(a + b + c)$
Similarly,
$b^2 - ac = b(a + b + c)$
$c^2 - ab = c(a + b + c)$

$$\therefore \frac{1}{a^2 - bc} + \frac{1}{b^2 - ac} + \frac{1}{c^2 - ab}$$

$$= \frac{1}{a(a+b+c)} + \frac{1}{b(a+b+c)} + \frac{1}{c(a+b+c)}$$

$$= \frac{bc + ac + ab}{abc(a+b+c)} = 0$$

95. (2) $2x^2 - 7x + 12 = 0$

$$\therefore \alpha + \beta = \frac{7}{2}$$

$$\alpha\beta = \frac{12}{2} = 6$$

[In equation $ax^2 + bx + c = 0$,]

$$\alpha + \beta = \frac{-b}{a}, \alpha\beta = \frac{c}{a}]$$

$$\therefore \frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{\alpha^2 + \beta^2}{\alpha\beta}$$

$$= \frac{(\alpha + \beta)^2 - 2\alpha\beta}{\alpha\beta}$$

$$= \frac{\left(\frac{7}{2}\right)^2 - 2 \times 6}{6}$$

$$= \frac{\frac{49}{4} - 12}{6}$$

$$= \frac{49 - 48}{4 \times 6} = \frac{1}{24}$$

96. (3) $x^3 + \frac{3}{x} = 4(a^3 + b^3)$

$3x + \frac{1}{x^3} = 4(a^3 - b^3)$

On adding,

$x^3 + 3x + \frac{3}{x} + \frac{1}{x^3} = 8a^3$

$\Rightarrow \left(x + \frac{1}{x}\right)^3 = (2a)^3$

$\Rightarrow x + \frac{1}{x} = 2a \Rightarrow a = \frac{1}{2}\left(x + \frac{1}{x}\right)$

Similarly,

$x^3 + \frac{3}{x} - 3x - \frac{1}{x^3} = 8b^3$

$\Rightarrow \left(x - \frac{1}{x}\right)^3 = (2b)^3$

$\Rightarrow b = \frac{1}{2}\left(x - \frac{1}{x}\right)$

$\therefore a^2 - b^2$

$= \frac{1}{4}\left[\left(x + \frac{1}{x}\right)^2 - \left(x - \frac{1}{x}\right)^2\right]$

$= \frac{1}{4} \times 4 = 1$

97. (2) $x = 6 + \frac{1}{x}$

$\Rightarrow x - \frac{1}{x} = 6$

On squaring both sides,

$\Rightarrow x^2 + \frac{1}{x^2} - 2 = 36$

$\Rightarrow x^2 + \frac{1}{x^2} = 36 + 2 = 38$

On squaring again,

$x^4 + \frac{1}{x^4} + 2 = 1444$

$\Rightarrow x^4 + \frac{1}{x^4} = 1444 - 2 = 1442$

98. (1) $x + \frac{1}{x} = 5$

On cubing both sides,

$\left(x + \frac{1}{x}\right)^3 = 5^3$

$\Rightarrow x^3 + \frac{1}{x^3} + 3x \cdot \frac{1}{x}\left(x + \frac{1}{x}\right)$

$= 125$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times 5 = 125$

$\Rightarrow x^3 + \frac{1}{x^3} = 125 - 15 = 110$

On squaring both sides,

$x^6 + \frac{1}{x^6} + 2 \cdot x^3 \cdot \frac{1}{x^3}$

$= 12100$

$\Rightarrow x^6 + \frac{1}{x^6} = 12100 - 2$

$= 12098$

99. (3) $x^2 - 3x + 1 = 0$

$\Rightarrow x^2 + 1 = 3x$

$\Rightarrow \frac{x^2 + 1}{x} = 3$

$\Rightarrow x + \frac{1}{x} = 3$ ..... (i)

$\therefore \frac{x^6 + x^4 + x^2 + 1}{x^3}$

$= \frac{x^6}{x^3} + \frac{x^4}{x^3} + \frac{x^2}{x^3} + \frac{1}{x^3}$

$= x^3 + x + \frac{1}{x} + \frac{1}{x^3}$

$= \left(x^3 + \frac{1}{x^3}\right) + \left(x + \frac{1}{x}\right)$

$= \left(x + \frac{1}{x}\right)^3 - 3 \cdot x \cdot \frac{1}{x}\left(x + \frac{1}{x}\right)$

$+ \left(x + \frac{1}{x}\right)$

$= 3^3 - 3 \times 3 + 3 = 27 - 9 + 3$

$= 21$

100. (3) $x^4 + \frac{1}{x^4} = 119$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 - 2 = 119$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 = 119 + 2 = 121$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 = 11^2$

$\Rightarrow x^2 + \frac{1}{x^2} = 11$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 + 2 = 11$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 = 11 - 2 = 9 = 3^2$

$\Rightarrow x - \frac{1}{x} = 3$

On cubing both sides,

$\left(x - \frac{1}{x}\right)^3 = 3^3$

$\Rightarrow x^3 - \frac{1}{x^3} - 3x \cdot \frac{1}{x}\left(x - \frac{1}{x}\right)$

$= 27$

$\Rightarrow x^3 - \frac{1}{x^3} - 3 \times 3 = 27$

$\Rightarrow x^3 - \frac{1}{x^3} = 27 + 9 = 36$

101. (3) Let $\frac{p}{a} = x, \frac{q}{b} = y, \frac{r}{c} = z$

$\therefore x + y + z = 1$

and $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$

$\Rightarrow \frac{yz + xz + xy}{xyz} = 0$

$\Rightarrow xy + yz + zx = 0$

$\therefore x + y + z = 1$

On squaring both sides

$x^2 + y^2 + z^2 + 2xy + 2yz + 2zx = 1$

$\Rightarrow x^2 + y^2 + z^2 + 0 = 1$

$\Rightarrow x^2 + y^2 + z^2 = 1$

102. (2) $\frac{(x+1)^3 - (x-1)^3}{(x+1)^2 - (x-1)^2} = 2$

$\Rightarrow \frac{(x^3 + 3x^2 + 3x + 1) - (x^3 - 3x^2 + 3x - 1)}{(x^2 + 2x + 1) - (x^2 - 2x + 1)}$

$= 2$

$\Rightarrow \frac{x^3 + 3x^2 + 3x + 1 - x^3 + 3x^2 - 3x + 1}{x^2 + 2x + 1 - x^2 + 2x - 1}$

$= 2$

$\Rightarrow \frac{6x^2 + 2}{4x} = 2$

$\Rightarrow \frac{3x^2 + 1}{4x} = 1 \Rightarrow 3x^2 + 1 = 4x$

$\Rightarrow 3x^2 - 4x + 1 = 0$
$\Rightarrow 3x^2 - 3x - x + 1 = 0$
$\Rightarrow 3x(x-1) - 1(x-1) = 0$
$\Rightarrow (3x-1)(x-1) = 0$
$\Rightarrow 3x - 1 = 0$, or, $x - 1 = 0$

$\Rightarrow x = \frac{1}{3}$ or 1

Hence, sum of the numerator and denominator = 1 + 3 = 4
or, 1 + 1 = 2

103. (3) Expression $= \frac{2x^2 - 3x - 2}{3x^2 - 4x - 3}$

$$= \frac{2(\sqrt{5}+2)^2 - 3(\sqrt{5}+2) - 2}{3(\sqrt{5}+2)^2 - 4(\sqrt{5}+2) - 3}$$

$$= \frac{2(5+4+4\sqrt{5}) - 3(\sqrt{5}+2) - 2}{3(5+4+4\sqrt{5}) - 4(\sqrt{5}+2) - 3}$$

$$= \frac{18 + 8\sqrt{5} - 3\sqrt{5} - 6 - 2}{27 + 12\sqrt{5} - 4\sqrt{5} - 8 - 3}$$

$$= \frac{10 + 5\sqrt{5}}{16 + 8\sqrt{5}} = \frac{5(2+\sqrt{5})}{8(2+\sqrt{5})} = \frac{5}{8}$$

= 0.625

104. (2) Using Rule 21,
$a = 2.234$, $b = 3.121$ and $c = -5.355$
$a + b + c = 2.234 + 3.121 - 5.355 = 0$
$\therefore a^3 + b^3 + c^3 - 3abc = 0$

105. (4) $x^2 + y^2 + 1 = 2x$
$\Rightarrow x^2 + y^2 + 1 - 2x = 0$
$\Rightarrow x^2 - 2x + 1 + y^2 = 0$
$\Rightarrow (x-1)^2 + y^2 = 0$
$\Rightarrow x - 1 = 0$
$\Rightarrow x = 1$ and $y = 0$
$\therefore x^3 + y^5 = 1 + 0 = 1$

106. (1) $3(a^2 + b^2 + c^2) = (a + b + c)^2$
$\Rightarrow 3a^2 + 3b^2 + 3c^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$
$\Rightarrow 2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca = 0$
$\Rightarrow a^2 + b^2 - 2ab + b^2 + c^2 - 2bc + c^2 + a^2 - 2ca = 0$
$\Rightarrow (a-b)^2 + (b-c)^2 + (c-a)^2 = 0$
$\Rightarrow a - b = 0 \Rightarrow a = b$
[If $x^2 + y^2 + z^2 = 0$, $x = 0$, $y = 0$, $z = 0$]
$b - c = 0 \Rightarrow b = c$
$c - a = 0 \Rightarrow c = a$
$\therefore a = b = c$

107. (1) $x(x-3) = -1$
$\Rightarrow x^2 - 3x = -1$
$\Rightarrow x^2 - 3x + 1 = 0$

Expression $= x^3(x^3 - 18)$
$= x^6 - 18x^3$
On dividing $x^6 - 18x^3$ by $x^2 - 3x + 1$

$$\begin{array}{l}
x^2 - 3x + 1 \big)\, x^6 - 18x^3 \big(x^4 + 3x^3 + 8x^2 + 3x \\
\quad\quad -x^6 \mp 3x^5 \pm x^4 \\
\quad\quad \overline{3x^5 - x^4 - 18x^3} \\
\quad\quad -3x^5 \mp 9x^4 \pm 3x^3 \\
\quad\quad \overline{8x^4 - 21x^3} \\
\quad\quad -8x^4 \mp 24x^3 \pm 8x^2 \\
\quad\quad \overline{3x^3 - 8x^2} \\
\quad\quad -3x^3 \mp 9x^2 \pm 3x \\
\quad\quad \overline{x^2 - 3x}
\end{array}$$

$\therefore x^6 - 18x^3 = (x^4 + 3x^3 + 8x^2 + 3x)(x^2 - 3x + 1) + x^2 - 3x$
$= 0 + x(x-3) = -1$

108. (2) $a^2 + b^2 + c^2 = ab + bc + ca$
$\Rightarrow a^2 + b^2 + c^2 - ab - bc - ca = 0$
On multiplying by 2,
$2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca = 0$
$\Rightarrow a^2 + b^2 - 2ab + b^2 + c^2 - 2bc + c^2 + a^2 - 2ac = 0$
$\Rightarrow (a-b)^2 + (b-c)^2 + (c-a)^2 = 0 \Rightarrow a - b = 0$
$\Rightarrow a = b$
$b - c = 0 \Rightarrow b = c$
$c - a = 0 \Rightarrow c = a$

$\therefore \frac{a+c}{b} = \frac{2a}{a} = 2$

109. (1) $ab + bc + ca = 0$
$\Rightarrow ab + ca = -bc$
$\therefore a^2 - bc = a^2 + ab + ac$
$= a(a + b + c)$
Similarly,
$b^2 - ac = b(a + b + c)$
$c^2 - ab = c(a + b + c)$

$$\therefore \frac{1}{a^2 - bc} + \frac{1}{b^2 - ca} + \frac{1}{c^2 - ab}$$

$$= \frac{1}{a(a+b+c)} + \frac{1}{b(a+b+c)} + \frac{1}{c(a+b+c)}$$

$$= \frac{1}{(a+b+c)}\left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right)$$

$$= \frac{1}{a+b+c}\left(\frac{bc + ca + ab}{abc}\right)$$

$$= \frac{1}{a+b+c} \times \frac{0}{abc} = 0$$

110. (2) $3x + \frac{3}{x} = 1$

$\Rightarrow x + \frac{1}{x} = \frac{1}{3}$

On cubing both sides,

$$x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = \frac{1}{27}$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times \frac{1}{3} = \frac{1}{27}$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 1 = \frac{1}{27}$$

111. (1) $a^2 + 4b^2 + 4b - 4ab - 2a - 8$
$= a^2 + 4b^2 - 4ab - 2a + 4b - 8$
$= (a - 2b)^2 - 2(a - 2b) - 8$
Let $(a - 2b) = x$
$\therefore$ Expression $= x^2 - 2x - 8$
$= x^2 - 4x + 2x - 8$
$= x(x-4) + 2(x-4)$
$= (x-4)(x+2)$
$= (a - 2b - 4)(a - 2b + 2)$

112. (4) $\frac{1}{a^2 + ax + x^2} - \frac{1}{a^2 - ax + x^2} + \frac{2ax}{a^4 + a^2x^2 + x^4}$

$$= \frac{a^2 - ax + x^2 - a^2 - ax - x^2}{(a^2 + ax + x^2)(a^2 - ax + x^2)} + \frac{2ax}{a^4 + a^2x^2 + x^4}$$

$$= \frac{-2ax}{a^4 + a^2x^2 + x^4} + \frac{2ax}{a^4 + a^2x^2 + x^4} = 0$$

113. (2) $x = 11$ (Given)
$\therefore x^5 - 12x^4 + 12x^3 - 12x^2 + 12x - 1$
$= x^5 - (11 + 1)x^4 + (11 + 1)x^3 - (11 + 1)x^2 + (11 + 1)x - 1$
$= x^5 - 11x^4 - x^4 + 11x^3 + x^3 - 11x^2 - x^2 + 11x + x - 1$
When $x = 11$,
$= 11^5 - 11^5 - 11^4 + 11^4 + 11^3 - 11^3 - 11^2 + 11^2 + 11 - 1 = 10$

114. (3) Using Rule 8,
$p = 99$ (Given)
$\therefore p(p^2 + 3p + 3) = p^3 + 3p^2 + 3p$
$= p^3 + 3p^2 + 3p + 1 - 1$
$= (p + 1)^3 - 1 = (99 + 1)^3 - 1$
$= (100)^3 - 1 = 999999$

115. (3) According to equality relation $(x + 2)^2 = x^2 + 4x + 4$ is not an identity

116. (4) Expression

$$= \frac{(a-b)^2}{(b-c)(c-a)} + \frac{(b-c)^2}{(c-a)(a-b)}$$

$$+ \frac{(c-a)^2}{(a-b)(b-c)}$$

$$= \frac{(a-b)^3 + (b-c)^3 + (c-a)^3}{(a-b)(b-c)(c-a)}$$

$$= \frac{3(a-b)(b-c)(c-a)}{(a-b)(b-c)(c-a)} = 3$$

[Here, $a - b + b - c + c - a = 0$. If $x + y + z = 0$, $x^3 + y^3 + z^3 = 3xyz$]

117. (1) Using Rule 8,

$$\left(a + \frac{1}{a}\right)^2 = 3$$

$$\Rightarrow a + \frac{1}{a} = \sqrt{3}$$

On cubing both sides,

$$\left(a + \frac{1}{a}\right)^3 = \left(\sqrt{3}\right)^3$$

$$\Rightarrow a^3 + \frac{1}{a^3} + 3\left(a + \frac{1}{a}\right)$$

$$= 3\sqrt{3}$$

$$\Rightarrow a^3 + \frac{1}{a^3} + 3\sqrt{3} = 3\sqrt{3}$$

$$\Rightarrow a^3 + \frac{1}{a^3} = 3\sqrt{3} - 3\sqrt{3} = 0$$

118. (1) Using Rule 1 and 8,

$$a + \frac{1}{a} = \sqrt{3}$$

On squaring both sides.

$$a^2 + \frac{1}{a^2} + 2 = 3$$

$$\Rightarrow a^2 + \frac{1}{a^2} = 3 - 2 = 1$$

On cubing both sides,

$$\left(a^2 + \frac{1}{a^2}\right)^3 = 1^3$$

$$\Rightarrow a^6 + \frac{1}{a^6} + 3\left(a^2 + \frac{1}{a^2}\right) = 1$$

$$\Rightarrow a^6 + \frac{1}{a^6} = 1 - 3 = -2$$

$$\Rightarrow \frac{a^{12}+1}{a^6} = -2$$

$\Rightarrow a^6 + 2a^6 + 1 = 0$

$\Rightarrow (a^6 + 1)^2 = 0$

$\Rightarrow a^6 + 1 = 0$

$\therefore$ Expression

$= a^{18} + a^{12} + a^6 + 1$

$= a^{12}(a^6 + 1) + (a^6 + 1) = 0$

119. (4) $x = 997$

$y = 998$

$z = 999$

$\therefore x - y = 997 - 998 = -1$

$y - z = 998 - 999 = -1$

$z - x = 999 - 997 = 2$

$\therefore x^2 + y^2 + z^2 - xy - yz - zx$

$$= \frac{1}{2}(2x^2 + 2y^2 + 2z^2 - 2xy - 2yz - 2zx)$$

$$= \frac{1}{2}(x^2 + y^2 - 2xy + y^2 + z^2 - 2yz + x^2 + z^2 - 2zx)$$

$$= \frac{1}{2}[(x-y)^2 + (y-z)^2 + (z-x)^2]$$

$$= \frac{1}{2}[(-1)^2 + (-1)^2 + (2)^2]$$

$$= \frac{1}{2}(1 + 1 + 4) = \frac{1}{2} \times 6 = 3$$

120. (3) $x + \frac{1}{x} = 3$ (Given)

$$\text{Expression} = \frac{3x^2 - 4x + 3}{x^2 - x + 1}$$

$$= \frac{(3x^2 - 3x + 3) - x}{x^2 - x + 1}$$

$$= \frac{3(x^2 - x + 1)}{x^2 - x + 1} - \frac{x}{x^2 - x + 1}$$

$$= 3 - \frac{1}{x - 1 + \frac{1}{x}}$$

$$= 3 - \frac{1}{x + \frac{1}{x} - 1}$$

$$= 3 - \frac{1}{3-1} = 3 - \frac{1}{2}$$

$$= \frac{6-1}{2} = \frac{5}{2}$$

121. (4) Expression

$$= \frac{x^6 + x^4 + x^2 + 1}{x^3}$$

$$= \frac{x^6}{x^3} + \frac{x^4}{x^3} + \frac{x^2}{x^3} + \frac{1}{x^3}$$

$$= x^3 + x + \frac{1}{x} + \frac{1}{x^3}$$

$$= \left(x^3 + \frac{1}{x^3}\right) + \left(x + \frac{1}{x}\right)$$

$$= \left(x + \frac{1}{x}\right)^3 - 3\left(x + \frac{1}{x}\right) + \left(x + \frac{1}{x}\right)$$

$$= \left(x + \frac{1}{x}\right)^3 - 2\left(x + \frac{1}{x}\right) \quad \text{---(i)}$$

Now, $x = 3 + 2\sqrt{2}$

$$\therefore \frac{1}{x} = \frac{1}{3 + 2\sqrt{2}}$$

$$= \frac{1}{3+2\sqrt{2}} \times \frac{3-2\sqrt{2}}{3-2\sqrt{2}} = \frac{3-2\sqrt{2}}{9-8}$$

$$= 3 - 2\sqrt{2}$$

$$\therefore x + \frac{1}{x} = 3 + 2\sqrt{2} + 3 - 2\sqrt{2}$$

$= 6$

$\therefore$ Expression $= (6)^3 - 2 \times 6$

$= 216 - 12 = 204$

122. (3) $x = p + \frac{1}{p}$

$$y = p - \frac{1}{p}$$

$$\therefore x + y = p + \frac{1}{p} + p - \frac{1}{p} = 2p$$

$$x - y = p + \frac{1}{p} - p + \frac{1}{p} = \frac{2}{p}$$

$\therefore x^4 - 2x^2y^2 + y^4 = (x^2 - y^2)^2$

$= \{(x + y)(x - y)\}^2$

$$= \left(2p \times \frac{2}{p}\right)^2 = 4^2 = 16$$

123. (3) $a + b + c = 0$ (Given)

$\therefore a + b = -c$

$b + c = -a$

$c + a = -b$

$\therefore (a + b - c)^2 + (b + c - a)^2 + (c + a - b)^2$

$= (-c - c)^2 + (-a - a)^2 + (-b - b)^2$

$= (-2c)^2 + (-2a)^2 + (-2b)^2$

$= 4c^2 + 4a^2 + 4b^2 = 4(c^2 + a^2 + b^2)$

124. (2) Using Rule 8,
$p^3 + 3p^2 + 3p = 7$
$\Rightarrow p^3 + 3p^2 + 3p + 1 = 7 + 1 = 8$
$\Rightarrow (p + 1)^3 = (2)^3$
$\Rightarrow p + 1 = 2 \Rightarrow p = 2 - 1 = 1$
$\therefore p^2 + 2p = 1 + 2 \times 1 = 3$

125. (1) $x - y = 2015 - 2014 = 1$
$y - z = 2014 - 2013 = 1$
$z - x = 2013 - 2015 = -2$
$\therefore x^2 + y^2 + z^2 - xy - yz - zx$

$$= \frac{1}{2}\begin{pmatrix}2x^2 + 2y^2 + 2z^2 - \\ 2xy - 2yz - 2zx\end{pmatrix}$$

$$= \frac{1}{2}\begin{pmatrix}x^2 + y^2 - 2xy + y^2 + z^2 - \\ 2yz + z^2 + x^2 - 2zx\end{pmatrix}$$

$$= \frac{1}{2}\left[(x-y)^2 + (y-z)^2 + (z-x)^2\right]$$

$$= \frac{1}{2}(1+1+4) = \frac{1}{2} \times 6 = 3$$

126. (1) Expression

$$= \frac{(a+b)^3 - (a-b)^3}{(a+b)^2 + (a-b)^2}$$

$$= \frac{a^3 + 3a^2b + 3ab^2 + b^3 - (a^3 - 3a^2b + 3ab^2 - b^3)}{a^2 + b^2 + 2ab + a^2 + b^2 - 2ab}$$

$$= \frac{a^3 + 3a^2b + 3ab^2 + b^3 - a^3 + 3a^2b - 3ab^2 + b^3}{a^2 + b^2 + a^2 + b^2}$$

$$= \frac{6a^2b + 2b^3}{2(a^2 + b^2)} = \frac{2b(3a^2 + b^2)}{2(a^2 + b^2)}$$

$$= \frac{b(b^2 + b^2)}{\left(\frac{b^2}{3} + b^2\right)} = \frac{b \times 2b^2}{\frac{4b^2}{3}}$$

$$= \left(\frac{3 \times 2}{4}\right)b = \frac{3b}{2}$$

127. (1) $x + \frac{1}{x} = 2\frac{1}{12} = \frac{25}{12}$

On squaring both sides,

$$\left(x + \frac{1}{x}\right)^2 = \left(\frac{25}{12}\right)^2$$

$$\Rightarrow x^2 + \frac{1}{x^2} + 2 = \frac{625}{144}$$

$$\Rightarrow x^2 + \frac{1}{x^2} = \frac{625}{144} - 2$$

$$= \frac{625 - 288}{144} = \frac{337}{144}$$

$$\Rightarrow \left(x - \frac{1}{x}\right)^2 + 2 = \frac{337}{144}$$

$$\Rightarrow \left(x - \frac{1}{x}\right)^2 = \frac{337}{144} - 2$$

$$= \frac{337 - 288}{144} = \frac{49}{144}$$

$$\Rightarrow x - \frac{1}{x} = \sqrt{\frac{49}{144}} = \frac{7}{12}$$

$$\therefore x^4 - \frac{1}{x^4} = \left(x^2 + \frac{1}{x^2}\right)\left(x^2 - \frac{1}{x^2}\right)$$

$$= \left(x^2 + \frac{1}{x^2}\right)\left(x + \frac{1}{x}\right)\left(x - \frac{1}{x}\right)$$

$$= \frac{337}{144} \times \frac{25}{12} \times \frac{7}{12} = \frac{58975}{20736}$$

128. (3) Expression

$$= \frac{4x^3 - x}{(2x+1)(6x-3)}$$

$$= \frac{x(4x^2 - 1)}{(2x+1) \times 3(2x-1)}$$

$$= \frac{x(2x+1)(2x-1)}{3(2x+1)(2x-1)}$$

$$= \frac{x}{3} = \frac{9999}{3} = 3333$$

129. (2) $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
$\Rightarrow 9 = 3(a^2 + b^2 - ab)$

$$\Rightarrow a^2 + b^2 - ab = \frac{9}{3} = 3$$

$\Rightarrow (a + b)^2 - 2ab - ab = 3$
$\Rightarrow 9 - 3ab = 3$
$\Rightarrow 3ab = 9 - 3 = 6$
$\Rightarrow ab = 2$

$$\therefore \frac{1}{a} + \frac{1}{b} = \frac{a+b}{ab} = \frac{3}{2}$$

130. (3) $t^2 - 4t + 1 = 0$
$\Rightarrow t^2 + 1 = 4t$

$$\Rightarrow \frac{t^2 + 1}{t} = 4$$

$$\Rightarrow t + \frac{1}{t} = 4$$

On cubing both sides,

$$\left(t + \frac{1}{t}\right)^3 = 4^3$$

$$t^3 + \frac{1}{t^3} + 3\left(t + \frac{1}{t}\right) = 64$$

$$\Rightarrow t^3 + \frac{1}{t^3} + 3 \times 4 = 64$$

$$\Rightarrow t^3 + \frac{1}{t^3} = 64 - 12 = 52$$

131. (4) $\sqrt[3]{a} + \sqrt[3]{b} - \sqrt[3]{c} = 0$

$$\therefore a + b - c = -3(abc)^{\frac{1}{3}}$$

On cubing both sides,
$(a + b - c)^3 = -27abc$
$\therefore (a + b - c)^3 + 27abc = 0$

132. (3) Using Rule 9,

$$27p^3 - \frac{1}{216} - \frac{9}{2}p^2 + \frac{1}{4}p$$

$$= (3p)^3 - \left(\frac{1}{6}\right)^3 - 3.(3p)^2.\left(\frac{1}{6}\right) + 3 \times 3p \times \frac{1}{6} \times \frac{1}{6}$$

$$= \left(3p - \frac{1}{6}\right)^3 = \left(3 \times \frac{5}{18} - \frac{1}{6}\right)^3$$

$$= \left(\frac{5}{6} - \frac{1}{6}\right)^3 = \left(\frac{4}{6}\right)^3$$

$$= \left(\frac{2}{3}\right)^3 = \frac{8}{27}$$

133. (4) $x + \frac{1}{x} = 2$
$\Rightarrow x^2 + 1 = 2x$
$\Rightarrow x^2 - 2x + 1 = 0$
$\Rightarrow (x - 1)^2 = 0 \Rightarrow x = 1$

$$\therefore x^{2013} + \frac{1}{x^{2014}} = 1 + 1 = 2$$

Aliter :
Using Rule 16,

Here, $x + \frac{1}{x} = 2$

$$x^{2013} + \frac{1}{x^{2014}} = 2$$

134. (4) Using Rule 21,
$a + b + c = 331 + 336 - 667 = 0$
$\therefore a^3 + b^3 + c^3 - 3abc = 0$

135. (3) Using Rule 21,
$a = 4.965$, $b = 2.343$,
$c = 2.622$

$a + (-b) + (-c) = 4.965 - 2.343 - 2.622 = 0$

$\therefore a^3 - b^3 - c^3 - 3abc = a^3 + (-b)^3 + (-c)^3 - 3abc = 0$

136. (4) $x + y + z = 0$

$\Rightarrow -x = y + z$

$\Rightarrow (-x)^2 = (y + z)^2$

$\Rightarrow x^2 = y^2 + z^2 + 2yz$ ...(i)

$\therefore$ Expression $= \dfrac{x^2 + y^2 + z^2}{x^2 - yz}$

$= \dfrac{y^2 + z^2 + 2yz + y^2 + z^2}{y^2 + z^2 + 2yz - yz}$

$= \dfrac{2y^2 + 2z^2 + 2yz}{y^2 + z^2 + yz}$

$= \dfrac{2(y^2 + z^2 + yz)}{y^2 + z^2 + yz} = 2$

137. (4) Using Rule 1 and 8,

$x + \dfrac{1}{x} = 0$

On squaring both sides,

$\left(x + \dfrac{1}{x}\right)^2 = 0$

$\Rightarrow x^2 + \dfrac{1}{x^2} + 2 = 0$

$\Rightarrow x^2 + \dfrac{1}{x^2} = -2$..... (i)

(not admissible)

On cubing $\left(x + \dfrac{1}{x}\right) = 0$,

$x^3 + \dfrac{1}{x^3} + 3 \times 0 = 0$

$\Rightarrow x^3 + \dfrac{1}{x^3} = 0$

$\therefore \left(x^2 + \dfrac{1}{x^2}\right)\left(x^3 + \dfrac{1}{x^3}\right) = 0$

$\Rightarrow x^5 + \dfrac{1}{x^5} + x + \dfrac{1}{x} = 0$

$\Rightarrow x^5 + \dfrac{1}{x^5} = 0$

138. (1) $a^2 + b^2 + c^2 - ab - bc - ca = 0$

$\Rightarrow 2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca = 0$

$\Rightarrow a^2 + b^2 - 2ab + b^2 + c^2 - 2bc + c^2 + a^2 - 2ca = 0$

$\Rightarrow (a - b)^2 + (b - c)^2 + (c - a)^2 = 0$

It is possible only when,

$a - b = 0 \Rightarrow a = b$

$b - c = 0 \Rightarrow b = c$

$c - a = 0 \Rightarrow c = a$

$\therefore a = b = c$

139. (1) $x^4 + \dfrac{1}{x^4} = 119$

$\Rightarrow \left(x^2 + \dfrac{1}{x^2}\right)^2 - 2 = 119$

$\Rightarrow \left(x^2 + \dfrac{1}{x^2}\right)^2 = 119 + 2 = 121$

$\Rightarrow x^2 + \dfrac{1}{x^2} = \sqrt{121} = 11$

Again,

$\left(x + \dfrac{1}{x}\right)^2 - 2 = 11$

$\Rightarrow \left(x + \dfrac{1}{x}\right)^2 = 11 + 2 = 13$

$\Rightarrow x + \dfrac{1}{x} = \pm\sqrt{13}$

On cubing both sides,

$x^3 + \dfrac{1}{x^3} + 3\left(x + \dfrac{1}{x}\right) = \pm 13\sqrt{13}$

$\Rightarrow x^3 + \dfrac{1}{x^3} + 3 \times (\pm\sqrt{13}) = \pm 13\sqrt{13}$

$\Rightarrow x^3 + \dfrac{1}{x^3}$

$= \pm\left(13\sqrt{13} - 3\sqrt{13}\right)$

$= \pm 10\sqrt{13}$

140. (4) Using Rule 8,

$x + \dfrac{1}{x} = \sqrt{3}$

On cubing both sides,

$x^3 + \dfrac{1}{x^3} + 3\left(x + \dfrac{1}{x}\right) = 3\sqrt{3}$

$\Rightarrow x^3 + \dfrac{1}{x^3} + 3\sqrt{3} = 3\sqrt{3}$

$\Rightarrow x^3 + \dfrac{1}{x^3} = 0$

$\therefore$ Expression $= x^{30} + x^{24} + x^{18} + x^{12} + x^6 + 1$

$= x^{24}(x^6 + 1) + x^{12}(x^6 + 1) + 1(x^6 + 1)$

$= (x^6 + 1)(x^{24} + x^{12} + 1)$

$= x^3\left(x^3 + \dfrac{1}{x^3}\right)(x^{24} + x^{12} + 1)$

$= 0$

141. (3) Using Rule 8,

$m + n = -2$

On cubing both sides,

$(m + n)^3 = (-2)^3 = -8$

$\Rightarrow m^3 + n^3 + 3mn(m + n) = -8$

$\Rightarrow m^3 + n^3 - 6mn = -8$

142. (4) $u_n = \dfrac{1}{n} - \dfrac{1}{n+1}$

$\therefore u_1 = \dfrac{1}{1} - \dfrac{1}{1+1}$

$= 1 - \dfrac{1}{2}$; $u_2 = \dfrac{1}{2} - \dfrac{1}{3}$

$u_3 = \dfrac{1}{3} - \dfrac{1}{4}$; $u_4 = \dfrac{1}{4} - \dfrac{1}{5}$;

$u_5 = \dfrac{1}{5} - \dfrac{1}{6}$

$\therefore u_1 + u_2 + u_3 + u_4 + u_5$

$= 1 - \dfrac{1}{2} + \dfrac{1}{2} - \dfrac{1}{3} + \dfrac{1}{3} - \dfrac{1}{4} + \dfrac{1}{4} - \dfrac{1}{5} + \dfrac{1}{5} - \dfrac{1}{6}$

$= 1 - \dfrac{1}{6} = \dfrac{6-1}{6} = \dfrac{5}{6}$

143. (4) Using Rule 21,

$x + y + z = 5 + 6 - 11 = 0$

$\therefore x^3 + y^3 + z^3 = 3xyz$

$= 3 \times 5 \times 6 \times (-11) = -990$

144. (4) Using Rule 8,

$(p + m)^3 = p^3 + m^3 + 3pm(p + m)$

$\Rightarrow (6)^3 = 72 + 3pm \times 6$

$\Rightarrow 216 - 72 = 18\,pm$

$\Rightarrow 18\,pm = 144$

$\Rightarrow pm = 144 \div 18 = 8$

145. (2) According to the question,

$\dfrac{x + \dfrac{1}{x}}{2} = A$

$\Rightarrow x + \dfrac{1}{x} = 2A$

On cubing both sides,

$\left(x + \dfrac{1}{x}\right)^3 = (2A)^3 = 8A^3$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 8A^3$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times 2A = 8A^3$

$\Rightarrow x^3 + \frac{1}{x^3} = 8A^3 - 6A$

$\therefore$ Required average

$= \frac{x^3 + \frac{1}{x^3}}{2}$

$= \frac{8A^3 - 6A}{2}$

$= 4A^3 - 3A$

146. (4) $a = 2 + \sqrt{3}$

$\Rightarrow \frac{1}{a} = \frac{1}{2+\sqrt{3}}$

$= \frac{2-\sqrt{3}}{(2+\sqrt{3})(2-\sqrt{3})}$

$= \frac{2-\sqrt{3}}{4-3} = 2 - \sqrt{3}$

$\therefore a + \frac{1}{a} = 2 + \sqrt{3} + 2 - \sqrt{3} = 4$

$\therefore$ Expression $= \frac{a^6 + a^4 + a^2 + 1}{a^3}$

$= a^3 + a + \frac{1}{a} + \frac{1}{a^3}$

$= a^3 + \frac{1}{a^3} + a + \frac{1}{a}$

$= \left(a + \frac{1}{a}\right)^3 - 3\left(a + \frac{1}{a}\right) + \left(a + \frac{1}{a}\right)$

$= \left(a + \frac{1}{a}\right)^3 - 2\left(a + \frac{1}{a}\right)$

$= (4)^3 - 2 \times 4 = 64 - 8 = 56$

147. (1) $x = \sqrt{5} + \sqrt{3}$

$x^2 = \left(\sqrt{5} + \sqrt{3}\right)^2$

$= 5 + 3 + 2\sqrt{15} = 8 + 2\sqrt{15}$

$y = \sqrt{5} - \sqrt{3}$

$\therefore y^2 = \left(\sqrt{5} - \sqrt{3}\right)^2 = 8 - 2\sqrt{15}$

$\therefore x^4 - y^4 = \left(x^2 + y^2\right)(x+y)(x-y)$

$= \left(8 + 2\sqrt{15} + 8 - 2\sqrt{15}\right)$

$\left(\sqrt{5} + \sqrt{3} + \sqrt{5} - \sqrt{3}\right)$

$\left(\sqrt{5} + \sqrt{3} - \sqrt{5} + \sqrt{3}\right)$

$= 16 \times 2\sqrt{5} \times 2\sqrt{3} = 64\sqrt{15}$

148. (1) Using Rule 21,
If. $a + b + c = 0$, then
$a^3 + b^3 + c^3 = 3abc$
Here, $x - 1 + y - 2 + z - 3$
$= x + y + z - 6$
$= 6 - 6 = 0$
$\therefore (x-1)^3 + (y-2)^3 + (z-3)^3$
$= 3(x-1)(y-2)(z-3)$

149. (3) $p^4 = 119 - \frac{1}{p^4}$

$\Rightarrow p^4 + \frac{1}{p^4} = 119$

$\Rightarrow \left(p^2 + \frac{1}{p^2}\right)^2 - 2 = 119$

$\Rightarrow \left(p^2 + \frac{1}{p^2}\right)^2 = 119 + 2 = 121$

$\Rightarrow p^2 + \frac{1}{p^2} = \sqrt{121} = 11$

Again, $\left(p - \frac{1}{p}\right)^2 + 2 = 11$

$\Rightarrow \left(p - \frac{1}{p}\right)^2 = 11 - 2 = 9$

$\Rightarrow p - \frac{1}{p} = \sqrt{9} = \pm 3$

On cubing both sides,

$\left(p - \frac{1}{p}\right)^3 = \pm 27$

$\Rightarrow p^3 - \frac{1}{p^3} - 3(p - q) = \pm 27$

$\Rightarrow p^3 - \frac{1}{p^3} - 3 \times (\pm 3) = \pm 27$

$\Rightarrow p^3 - \frac{1}{p^3} = \pm 27 \pm 9$

$\Rightarrow p^3 - \frac{1}{p^3} = \pm 36$

150. (2) $x + \frac{1}{x} = 2$

$\Rightarrow x^2 + 1 = 2x$
$\Rightarrow x^2 - 2x + 1 = 0$
$\Rightarrow (x-1)^2 = 0$
$\Rightarrow x - 1 = 0 \Rightarrow x = 1$

$\therefore x^7 + \frac{1}{x^5} = 1 + 1 = 2$

Aliter :
Using Rule 16,

Here, $x + \frac{1}{x} = 2$

$\Rightarrow x^7 + \frac{1}{x^5} = 2$

151. (2) Using Rule 22,
$x = 332$, $y = 333$, $z = 335$
$\therefore x + y + z = 332 + 333 + 335$
$= 1000$
$\therefore x^3 + y^3 + z^3 - 3xyz$

$= \frac{1}{2}(x + y + z)[(x-y)^2 + (y-z)^2] + (z-x)^2]$

$= \frac{1000}{2}[(332 - 333)^2 + (333 - 335)^2 + (335 - 332)^2]$
$= 500(1 + 4 + 9) = 500 \times 14$
$= 7000$

152. (1) Using Rule 8 and 9,
Expression $= m^3 - 3m^2 + 3m + 3n + 3n^2 + n^3$
$= m^3 - 3m^2 + 3m - 1 + n^3 + 3n^2 + 3n + 1$
$= (m-1)^3 + (n+1)^3$
$= (-4-1)^3 + (-2+1)^3$
$= (-5)^3 + (-1)^3$
$= -125 - 1 = -126$

153. (1) $x + \frac{1}{x} = 2$

$\Rightarrow \frac{x^2+1}{x} = 2 \Rightarrow x^2 + 1 = 2x$
$\Rightarrow x^2 - 2x + 1 = 0$
$\Rightarrow (x-1)^2 = 0$
$\Rightarrow x - 1 = 0 \Rightarrow x = 1$

$\therefore x^{12} + \frac{1}{x^{12}} = 1 + 1 = 2$

Aliter :
Using Rule 14,

Here, $x + \frac{1}{x} = 2$

$x^{12} + \frac{1}{x^{12}} = 2$

154. (3) $x^3 + y^3 = 72$
$= 64 + 8 = 4^3 + 2^3$
$\therefore x = 4, y = 2 \Rightarrow xy = 8$
$\therefore x - y = 4 - 2 = 2$

155. (1) Using Rule 8,
$x^3 + 27x^2 + 243x + 631$
$= x^3 + 3 . x^2 \times 9 + 3x . 9^2 + 9^3 - 9^3 + 631$
$= (x + 9)^3 - 729 + 631$
$= (2 + 9)^3 - 98$
$= 11^3 - 98 = 1331 - 98 = 1233$

156. (2) $\frac{x^{24}+1}{x^{12}} = 7$

$\Rightarrow \frac{x^{24}}{x^{12}} + \frac{1}{x^{12}} = 7$

$\Rightarrow x^{12} + \frac{1}{x^{12}} = 7$

$\therefore \frac{x^{72}+1}{x^{36}} = \frac{x^{72}}{x^{36}} + \frac{1}{x^{36}}$

$= x^{36} + \frac{1}{x^{36}}$

$= \left(x^{12} + \frac{1}{x^{12}}\right)^3 - 3 \times x^{12} \times \frac{1}{x^{12}} \left(x^{12} + \frac{1}{x^{12}}\right)$

$[\because a^3 + b^3 = (a + b)^3 - 3ab(a + b)]$
$= 7^3 - 3 \times 7 = 343 - 21 = 322$

157. (2) $x^8 - 1 = (x^4)^2 - 1^2$
$= (x^4 + 1)(x^4 - 1)$
$= (x^4 + 1)(x^2 + 1)(x^2 - 1)$
$= (x^4 + 1)(x^2 + 1)(x + 1)(x - 1)$
$[\because a^2 - b^2 = (a + b)(a - b)]$
$x^4 + 2x^3 - 2x - 1$
$= (x^4 - 1) + 2x^3 - 2x$
$= (x^2 + 1)(x^2 - 1) + 2x(x^2 - 1)$
$= (x^2 + 1 + 2x)(x^2 - 1)$
$= (x + 1)^2 (x + 1)(x - 1)$
$\therefore$ H.C.F $= (x + 1)(x - 1)$
$= x^2 - 1$

158. (1) $x^2 + y^2 + z^2 = 2(x + z - 1)$
$\Rightarrow x^2 + y^2 + z^2 = 2x + 2z - 2$
$\Rightarrow x^2 - 2x + y^2 + z^2 - 2z + 2 = 0$
$\Rightarrow x^2 - 2x + 1 + y^2 + z^2 - 2z + 1 = 0$
$\Rightarrow (x - 1)^2 + y^2 + (z - 1)^2 = 0$
$[\because a^2 + b^2 + c^2 = 0 \Rightarrow a = 0, b = 0, c = 0]$
$\therefore x - 1 = 0 \Rightarrow x = 1$
$y = 0$
$z - 1 = 0 \Rightarrow z = 1$
$\therefore x^3 + y^3 + z^3 = 1 + 0 + 1 = 2$

159. (2) $x^2 + x = 5$ (Given)
Let, $x + 3 = a$

$\therefore \frac{1}{x+3} = \frac{1}{a}$

Now,

$a + \frac{1}{a} = (x + 3) + \frac{1}{(x+3)}$

$= \frac{(x+3)^2+1}{x+3}$

$= \frac{x^2+6x+9+1}{x+3}$

$= \frac{x^2+6x+10}{x+3}$

$= \frac{x^2+x+5x+10}{x+3}$

$= \frac{5+5x+10}{x+3}$

$= \frac{5x+15}{x+3} = \frac{5(x+3)}{x+3} = 5$

$\therefore a^3 + \frac{1}{a^3}$

$= \left(a + \frac{1}{a}\right)^3 - 3a \times \frac{1}{a}\left(a + \frac{1}{a}\right)$

$= (5)^3 - 3 \times 5 = 125 - 15 = 110$

160. (2) Using Rule 22,
$x = z = 225, y = 226$
$\therefore x + y + z = 225 + 226 + 225$
$= 676$
$\therefore x^3 + y^3 + z^3 - 3xyz$

$= \frac{1}{2}(x + y + z)[(x - y)^2 + (y - z)^2 + (z - x)^2]$

$= \frac{1}{2} \times 676 [(225 - 226)^2 + (226 - 225)^2 + (225 - 225)^2]$

$= \frac{1}{2} \times 676 \times (1 + 1) = 676$

161. (3) $4a - \frac{4}{a} = -3$

On dividing by 4,

$\Rightarrow a - \frac{1}{a} = \frac{-3}{4}$

$\therefore a^3 - \frac{1}{a^3} = \left(a - \frac{1}{a}\right)^3 + 3a \times \frac{1}{a}\left(a - \frac{1}{a}\right)$

$= \left(\frac{-3}{4}\right)^3 + 3 \times \frac{-3}{4}$

$= -\frac{27}{64} - \frac{9}{4} = \frac{-27-144}{64}$

$= \frac{-171}{64}$

$\therefore a^3 - \frac{1}{a^3} + 3 = \frac{-171}{64} + 3$

$= \frac{-171+192}{64} = \frac{21}{64}$

162. (2) Expression $= 2b^2c^2 + 2c^2a^2 + 2a^2b^2 - a^4 - b^4 - c^4$
$= 4b^2c^2 - (2b^2c^2 - 2c^2a^2 - 2a^2b^2 + a^4 + b^4 + c^4)$
$= (2bc)^2 - (a^2 - b^2 - c^2)^2$
$= (2bc + a^2 - b^2 - c^2)(2bc - a^2 + b^2 + c^2)$
$= (a^2 - (b^2 + c^2 - 2bc))(b^2 + c^2 + 2bc - a^2)$
$= (a^2 - (b - c)^2)((b + c)^2 - a^2)$
$= (a - b + c)(a + b - c)(a + b + c)(b + c - a)$
If $a + b - c = 0$,
$\therefore$ Expression $= 0$.

163. (1) $\frac{p^2}{q^2} + \frac{q^2}{p^2} = 1$

$\Rightarrow \frac{p^4+q^4}{p^2q^2} = 1 \Rightarrow p^4 + q^4 = p^2q^2$

$\Rightarrow p^4 + q^4 - p^2q^2 = 0$ ..... (i)

$\therefore p^6 + q^6 = (p^2)^3 + (q^2)^3$
$= (p^2 + q^2)(p^4 + q^4 - p^2q^2)$

$\left[\because a^3 + b^3 = (a + b)(a^2 - ab + b^2)\right]$

$= (p^2 + q^2) \times 0 = 0$

164. (1) $m + 1 = \sqrt{n} + 3$ (Given)

$\Rightarrow m + 1 - 3 = \sqrt{n}$

$\Rightarrow m - 2 = \sqrt{n}$

On cubing both sides,

$(m - 2)^3 = \left(\sqrt{n}\right)^3$

$\Rightarrow m^3 - 3m^2 \times 2 + 3m(2)^2 - 2^3 = n\sqrt{n}$

$[\because (a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3]$

$\Rightarrow m^3 - 6m^2 + 12m - 8 = n\sqrt{n}$

$$\Rightarrow \frac{m^3-6m^2+12m-8}{\sqrt{n}} = n$$

$$\Rightarrow \frac{m^3-6m^2+12m-8}{\sqrt{n}} - n = 0$$

$$\Rightarrow \frac{1}{2}\left[\frac{m^3-6m^2+12m-8}{\sqrt{n}} - n\right] = 0$$

165. (3) $\frac{3x-2y}{2x+3y} = \frac{5}{6}$

$\Rightarrow 18x - 12y = 10x + 15y$
$\Rightarrow 18x - 10x = 12y + 15y$
$\Rightarrow 8x = 27y$

$\Rightarrow \frac{x}{y} = \frac{27}{8}$

On taking cube root of both sides,

$$\frac{\sqrt[3]{x}}{\sqrt[3]{y}} = \sqrt[3]{\frac{27}{8}} = \frac{3}{2}$$

By componendo and dividendo,

$$\frac{\sqrt[3]{x}+\sqrt[3]{y}}{\sqrt[3]{x}-\sqrt[3]{y}} = \frac{3+2}{3-2} = \frac{5}{1}$$

On squaring both sides,

$$\left(\frac{\sqrt[3]{x}+\sqrt[3]{y}}{\sqrt[3]{x}-\sqrt[3]{y}}\right)^2 = 5 \times 5 = 25$$

166. (4) $a - \frac{1}{(a-3)} = 5$

$\Rightarrow (a-3) - \frac{1}{(a-3)} = 2$

On cubing both sides,

$$\left\{(a-3) - \frac{1}{(a-3)}\right\}^3 = 8$$

$$\Rightarrow (a-3)^3 - \left(\frac{1}{a-3}\right)^3 - 3 \times (a-3)\left(\frac{1}{a-3}\right)\left((a-3) - \frac{1}{(a-3)}\right) = 8$$

$[\because (a-b)^3 = a^3 - b^3 - 3ab(a-b)]$

$$\Rightarrow (a-3)^3 - \left(\frac{1}{a-3}\right)^3 - 3 \times 2 = 8$$

$$\Rightarrow (a-3)^3 - \left(\frac{1}{a-3}\right)^3 = 8 + 6$$

$= 14$

167. (*) $\left(\frac{p^{-1}q^2}{p^3q^{-2}}\right)^{\frac{1}{3}} \div \left(\frac{p^6q^{-3}}{p^{-2}q^3}\right)^{\frac{1}{3}}$

$= p^a q^b$

$\Rightarrow \left(p^{-1-3}\ q^{2+2}\right)^{\frac{1}{3}} \div \left(p^{6+2}\ q^{-3-3}\right)^{\frac{1}{3}}$

$= p^a q^b$

$\Rightarrow \left(p^{-4}q^4\right)^{\frac{1}{3}} \div \left(p^8q^{-6}\right)^{\frac{1}{3}} = p^a q^b$

$\Rightarrow \frac{p^{-\frac{4}{3}}q^{\frac{4}{3}}}{p^{\frac{8}{3}}q^{\frac{-6}{3}}} = p^a q^b$

$\Rightarrow p^{\frac{-4}{3}-\frac{8}{3}}\ q^{\frac{4}{3}+\frac{6}{3}} = p^a q^b$

$\Rightarrow p^{-4}\ q^{\frac{10}{3}} = p^a q^b$

$\Rightarrow a = -4,\ b = \frac{10}{3}$

$\therefore\ a + b = -4 + \frac{10}{3} = \frac{-2}{3}$

168. (3) $a + b = 1$ (Given)

Expression $= a^3 + b^3 - ab - (a^2 - b^2)^2$

$= (a+b)(a^2 - ab + b^2) - ab - (a^2 - b^2)^2$
$= (a^2 - ab + b^2) - ab - (a+b)^2(a-b)^2$
$= a^2 - ab + b^2 - ab - (a^2 - 2ab + b^2)$
$= a^2 - 2ab + b^2 - a^2 + 2ab - b^2 = 0$

169. (1) $x = a^{\frac{1}{2}} + a^{\frac{-1}{2}}$

$y = a^{\frac{1}{2}} - a^{\frac{-1}{2}}$

$\therefore\ x^2 - y^2 = 4\,a^{\frac{1}{2}} . a^{\frac{-1}{2}} = 4$

$[\because (a+b)^2 - (a-b)^2 = 4ab]$

Again, $y^2 - x^2 = -4\ .\ a^{\frac{1}{2}} . a^{\frac{-1}{2}} = -4$

Expression
$= (x^4 - x^2y^2 - 1) + (y^4 - x^2y^2 + 1)$
$x^2(x^2 - y^2) - 1 + y^2(y^2 - x^2) + 1$
$= 4x^2 - 1 - 4y^2 + 1$
$= 4(x^2 - y^2) = 4 \times 4 = 16$

170. (2) $x^2 + y^2 + z^2 = xy + yz + zx$
$\Rightarrow x^2 + y^2 + z^2 - xy - yz - zx = 0$
$\Rightarrow 2x^2 + 2y^2 + 2z^2 - 2xy - 2yz - 2zx = 0$
$\Rightarrow x^2 + y^2 - 2xy + y^2 + z^2 - 2yz + x^2 + z^2 - 2zx = 0$
$\Rightarrow (x-y)^2 + (y-z)^2 + (z-x)^2 = 0$
$\therefore\ x - y = 0 \Rightarrow x = y$
$y - z = 0 \Rightarrow y = z$
$z - x = 0 \Rightarrow z = x$
$\therefore\ x = y = z$
[If $a^2 + b^2 + c^2 = 0$, then $a = 0$, $b = 0$, $c = 0$]
$\therefore$ Expression

$$= \frac{3x^4 + 7y^4 + 5z^4}{5x^2y^2 + 7y^2z^2 + 3z^2x^2}$$

$$= \frac{3x^4 + 7x^4 + 5x^4}{5x^4 + 7x^4 + 3x^4}$$

$$= \frac{15x^4}{15x^4} = 1$$

171. (1) $x - \sqrt{3} - \sqrt{2} = 0$

$\Rightarrow x = \sqrt{3} + \sqrt{2}$

Again,

$y - \sqrt{3} + \sqrt{2} = 0$

$\Rightarrow y = \sqrt{3} - \sqrt{2}$

$\therefore\ x - y = \sqrt{3} + \sqrt{2} - \sqrt{3} + \sqrt{2}$

$= 2\sqrt{2}$

and $xy = \left(\sqrt{3} + \sqrt{2}\right)\left(\sqrt{3} - \sqrt{2}\right)$

$= 3 - 2 = 1$

$\therefore$ Expression

$= x^3 - 20\sqrt{2} - y^3 - 2\sqrt{2}$

$= x^3 - y^3 - 22\sqrt{2}$

$= (x-y)^3 + 3xy(x-y) - 22\sqrt{2}$

$= \left(2\sqrt{2}\right)^3 + 3\left(2\sqrt{2}\right) - 22\sqrt{2}$

$= 16\sqrt{2} + 6\sqrt{2} - 22\sqrt{2} = 0$

172. (2) $p^3 - q^3 = (p-q)\{(p-q)^2 - x\,pq\}$
$\Rightarrow (p-q)(p^2 + q^2 + pq) = (p-q)(p^2 + q^2 - 2pq - x\,pq)$
$\Rightarrow (p^2 + q^2 + pq) = p^2 + q^2 - (2 + x)\,pq.$
$\therefore\ -(2 + x) = 1$
$\Rightarrow x = -2 - 1 = -3$

173. (1) $x + y + z = 6$
$xy + yz + zx = 10$
$\therefore\ (x + y + z)^2 = 36$
$\Rightarrow x^2 + y^2 + z^2 + 2xy + 2yz + 2zx = 36$
$\Rightarrow x^2 + y^2 + z^2 + 2 \times 10 = 36$
$\Rightarrow x^2 + y^2 + z^2 = 36 - 20 = 16$
$\therefore\ x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$
$= 6(16 - 10)$
$= 6 \times 6 = 36$

174. (3) $x - \frac{1}{x} = 2$

On cubing both sides,

$$\left(x - \frac{1}{x}\right)^3 = 2^3$$

$$\Rightarrow x^3 - \frac{1}{x^3} - 3\left(x - \frac{1}{x}\right) = 8$$

$$\Rightarrow x^3 - \frac{1}{x^3} - 3 \times 2 = 8$$

$$\Rightarrow x^3 - \frac{1}{x^3} = 8 + 6 = 14$$

175. (3) $a^2 + a + 1 = 0$

$$\Rightarrow \frac{a^2 + a + 1}{a} = 0$$

$$\Rightarrow a + 1 + \frac{1}{a} = 0 \quad \text{....(i)}$$

Expression $= a^5 + a^4 + 1$
$= a^4 (a + 1) + 1$

$$= a^4 \left(-\frac{1}{a}\right) + 1$$

$= -a^3 + 1 = 1 - a^3$
$= (1 - a)(1 + a + a^2)$
$= (1 - a) \times 0 = 0$

176. (4) $x = a(b - c)$

$$\Rightarrow \frac{x}{a} = b - c$$

Similarly, $y = b(c - a)$

$$\Rightarrow \frac{y}{b} = c - a$$

and, $\frac{z}{c} = a - b$

$$\therefore \frac{x}{a} + \frac{y}{b} + \frac{z}{c} = b - c + c - a + a - b = 0$$

$$\therefore \left(\frac{x}{a}\right)^3 + \left(\frac{y}{b}\right)^3 + \left(\frac{z}{c}\right)^3$$

$$= 3 \times \frac{x}{a} \times \frac{y}{b} \times \frac{z}{c} = \frac{3xyz}{abc}$$

[If $a + b + c = 0$, $a^3 + b^3 + c^3 = 3abc$]

177. (3) $x = y = z$

$$\therefore \text{Expression} = \frac{(x + y + z)^2}{x^2 + y^2 + z^2}$$

$$= \frac{(x + x + x)^2}{x^2 + x^2 + x^2}$$

$$= \frac{9x^2}{3x^2} = 3$$

178. (3) Expression

$$= \frac{\frac{3}{15} a^5 b^6 c^3 \times \frac{5}{9} ab^5 c^4}{\frac{10}{27} a^2 bc^3}$$

$$= \left(\frac{3}{15} \times \frac{5}{9} \times \frac{27}{10}\right)\left(\frac{a^6 b^{11} c^7}{a^2 bc^3}\right)$$

$$= \frac{3}{10} a^{6-2} b^{11-1} c^{7-3}$$

$$= \frac{3}{10} a^4 b^{10} c^4$$

$$\left[\begin{array}{l} \because a^m \times a^n = a^{m+n} \\ a^m \div a^n = a^{m-n} \end{array}\right]$$

179. (4) $(2a - 1)^2 + (4b - 3)^2 + (4c + 5)^2 = 0$

$$\therefore 2a - 1 = 0 \Rightarrow 2a = 1 \Rightarrow a = \frac{1}{2}$$

$$4b - 3 = 0 \Rightarrow 4b = 3 \Rightarrow b = \frac{3}{4}$$

$$4c + 5 = 0 \Rightarrow 4c = -5 \Rightarrow c = \frac{-5}{4}$$

[If $x^2 + y^2 + z^2 = 0$, $x = 0$, $y = 0$, $z = 0$]

$$\therefore a + b + c = \frac{1}{2} + \frac{3}{4} - \frac{5}{4}$$

$$= \frac{6 + 9 - 15}{12} = 0$$

$\therefore a^3 + b^3 + c^3 - 3abc = 0$

$\therefore$ Required answer $= 0$

180. (4) Using Rule 1 and 8,

$$x + \frac{1}{x} = 3$$

On squaring both sides,

$$x^2 + \frac{1}{x^2} + 2 = 9$$

$$\Rightarrow x^2 + \frac{1}{x^2}$$

$= 9 - 2 = 7$ ... (i)

Again,

$$\left(x + \frac{1}{x}\right)^3 = 3^3$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 27$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times 3 = 27$$

$$\therefore x^3 + \frac{1}{x^3} = 27 - 9 = 18 \text{...(ii)}$$

$$\therefore \left(x^3 + \frac{1}{x^3}\right)\left(x^2 + \frac{1}{x^2}\right)$$

$= 18 \times 7 = 126$

$$\Rightarrow x^5 + x + \frac{1}{x^5} + \frac{1}{x} = 126$$

$$\Rightarrow x^5 + \frac{1}{x^5} = 126 - 3 = 123$$

181. (2) $2x + \frac{2}{x} = 3$

On dividing by 2,

$$x + \frac{1}{x} = \frac{3}{2}$$

On cubing both sides,

$$\left(x + \frac{1}{x}\right)^3 = \left(\frac{3}{2}\right)^3$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = \frac{27}{8}$$

$$\Rightarrow x^3 + \frac{1}{x^3} + \frac{3 \times 3}{2} = \frac{27}{8}$$

$$\Rightarrow x^3 + \frac{1}{x^3} = \frac{27}{8} - \frac{9}{2}$$

$$= \frac{27 - 36}{8}$$

$$\Rightarrow x^3 + \frac{1}{x^3} = \frac{-9}{8}$$

$$\therefore x^3 + \frac{1}{x^3} + 2$$

$$= 2 - \frac{9}{8} = \frac{16 - 9}{8} = \frac{7}{8}$$

182. (2) $x = \sqrt[3]{x^2 + 11} - 2$

$$\Rightarrow x + 2 = \sqrt[3]{x^2 + 11}$$

On cubing both sides,
$(x + 2)^3 = x^2 + 11$

$\Rightarrow x^3 + 2^3 + 3x^2 \times 2 + 3x \times 2^2$
$= x^2 + 11$
$\Rightarrow x^3 + 8 + 6x^2 + 12x = x^2 + 11$
$\Rightarrow x^3 + 5x^2 + 12x = 11 - 8 = 3$

183. (4) If $a^2 + b^2 + c^2 = 0$ then, $a = 0$, $b = 0$ and $c = 0$
$\therefore (x-3)^2 + (y-4)^2 + (z-5)^2 = 0$
$\therefore x - 3 = 0 \Rightarrow x = 3$
$y - 4 = 0 \Rightarrow y = 4$
$z - 5 = 0 \Rightarrow z = 5$
$\therefore x + y + z = 3 + 4 + 5 = 12$

184. (3) $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$
$\therefore (x-4)(x^2 + 4x + 4^2)$
$= x^3 - 4^3 = x^3 - 64$
$\Rightarrow x^3 - p = x^3 - 64$
$\Rightarrow p = 64$

185. (2) Expression

$$= \left(1 - \frac{2xy}{x^2+y^2}\right) \div \left(\frac{x^3-y^3}{x-y} - 3xy\right)$$

$$= \left(\frac{x^2+y^2-2xy}{x^2+y^2}\right) \div \left(\frac{(x-y)(x^2+xy+y^2)}{x-y} - 3xy\right)$$

$$= \frac{(x-y)^2}{x^2+y^2} \div (x^2 + xy + y^2 - 3xy)$$

$$= \frac{(x-y)^2}{x^2+y^2} \div (x^2 - 2xy + y^2)$$

$$= \frac{(x-y)^2}{x^2+y^2} \div (x-y)^2 = \frac{1}{x^2+y^2}$$

186. (1) $\dfrac{1}{(a+b)(b+c)} + \dfrac{1}{(b+c)(c+a)}$

$$+ \frac{1}{(c+a)(a+b)}$$

$$= \frac{c+a+a+b+b+c}{(a+b)(b+c)(c+a)}$$

$$= \frac{2(a+b+c)}{(a+b)(b+c)(c+a)} = 0$$

187. (1) $x^2 + y^2 + 2x + 1 = 0$
$\Rightarrow x^2 + 2x + 1 + y^2 = 0$
$\Rightarrow (x+1)^2 + y^2 = 0$
$\therefore x + 1 = 0$
$\Rightarrow x = -1$
$y = 0$
$\therefore x^{31} + y^{35} = (-1)^{35} + 0 = -1$

188. (3) $\left(x - \dfrac{1}{x}\right)^2 = 3$

$$\Rightarrow x^2 + \frac{1}{x^2} - 2 = 3$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 5$$

On cubing both sides,

$$\left(x^2 + \frac{1}{x^2}\right)^3 = (5)^3$$

$$\Rightarrow x^6 + \frac{1}{x^6} + 3\left(x^2 + \frac{1}{x^2}\right) = 125$$

$$\Rightarrow x^6 + \frac{1}{x^6} + 3 \times 5 = 125$$

$$\Rightarrow x^6 + \frac{1}{x^6} = 125 - 15 = 110$$

189. (3) $(a + b + c)^2$
$= a^2 + b^2 + c^2 + 2ab + 2ac + 2bc$
$\therefore (x^2 + x + 3)^2$
$= x^4 + x^2 + 9 + 2x^3 + 6x + 6x^2$
$= x^4 + 2x^3 + 7x^2 + 6x + 9$
On comparing with $x^4 + 2x^3 + ax^2 + bx + 9$
$a = 7,\ b = 6$

190. (3) $(ax + by + cz)^2$
$= (a^2 + b^2 + c^2)(x^2 + y^2 + z^2)$
$= 400$
$\Rightarrow a^2x^2 + b^2y^2 + c^2z^2 + 2abxy + 2bcyz + 2acxz$
$= a^2x^2 + a^2y^2 + a^2z^2 + b^2x^2 + b^2y^2 + b^2z^2 + c^2x^2 + c^2y^2 + c^2z^2$
$\Rightarrow a^2y^2 + a^2z^2 + b^2x^2 + b^2z^2 + c^2x^2 + c^2y^2$
$= 2abxy + 2bcyz + 2acxz$
$\Rightarrow a^2y^2 - 2abxy + b^2x^2 + a^2z^2 + c^2x^2 - 2acxz + b^2z^2 + c^2y^2 - 2bcyz = 0$
$\Rightarrow (ay - bx)^2 + (az - cx)^2 + (bz - cy)^2 = 0$

$$\Rightarrow ay - bx = 0 \Rightarrow ay = bx \Rightarrow \frac{a}{b} = \frac{x}{y}$$

$$az - cx = 0 \Rightarrow az = cx \Rightarrow \frac{a}{c} = \frac{x}{z}$$

$\therefore a = kx;\ b = ky;\ c = kz$
$\therefore a^2 + b^2 + c^2 = 16$
$\Rightarrow k^2(x^2 + y^2 + z^2) = 16$
$\Rightarrow k^2 \times 25 = 16$

$$\Rightarrow k^2 = \frac{16}{25} \Rightarrow k = \frac{4}{5}$$

$$\therefore \frac{a+b+c}{x+y+z} = k = \frac{4}{5}$$

191. (2) Of the given options,
$x = -(a^2 + b^2 + c^2)$

$$\therefore \frac{x + a^2 + 2c^2}{b+c}$$

$$= \frac{-a^2 - b^2 - c^2 + a^2 + 2c^2}{b+c}$$

$$= \frac{c^2 - b^2}{b+c} = c - b$$

$$\frac{x + b^2 + 2a^2}{c+a}$$

$$= \frac{-a^2 - b^2 - c^2 - b^2 + 2a^2}{c+a}$$

$$= \frac{a^2 - c^2}{c+a} = a - c$$

$$\frac{x + c^2 + 2b^2}{a+b}$$

$$= \frac{-a^2 - b^2 - c^2 + c^2 + 2b^2}{a+b}$$

$$= \frac{b^2 - a^2}{a+b} = b - a$$

$\therefore c - b + a - c + b - a = 0$

192. (1) $a^3 - b^3 = 117;\ a - b = 3$
$\Rightarrow (a-b)(a^2 + b^2 + ab) = 117$
$\Rightarrow 3 \times (a^2 + b^2 + ab) = 117$

$$\Rightarrow a^2 + b^2 + ab = \frac{117}{3} = 39$$

$\Rightarrow (a-b)^2 + 3ab = 39$
$\Rightarrow 3^2 + 3ab = 39$
$\Rightarrow 3ab = 39 - 9 = 30$

$$\Rightarrow ab = \frac{30}{3} = 10$$

$\therefore (a+b)^2 = (a-b)^2 + 4ab$
$= 9 + 4 \times 10 = 49$
$\therefore a + b = \sqrt{49} = \pm 7$

193. (1) $a + \dfrac{1}{a} = -2$
$\Rightarrow a^2 + 1 = -2a$
$\Rightarrow a^2 + 2a + 1 = 0$
$\Rightarrow (a+1)^2 = 0$
$\Rightarrow a + 1 = 0$
$\Rightarrow a = -1$
$\therefore (a)^{1000} + (a)^{-1000}$
$= (-1)^{1000} + (-1)^{-1000}$
$= 1 + 1 = 2$

194. (3) $a^2 = b + c$
$\Rightarrow a^2 + a = a + b + c$
$\Rightarrow a(a+1) = a + b + c$

$$\Rightarrow \frac{1}{a+1} = \frac{a}{a+b+c}$$

Similarly,
$b^2 = a + c$

$$\Rightarrow \frac{1}{b+1} = \frac{b}{a+b+c}$$

and
$c^2 = b + a$

$$\Rightarrow \frac{1}{c+1} = \frac{c}{a+b+c}$$

$\therefore \frac{1}{a+1} + \frac{1}{b+1} + \frac{1}{c+1}$

$= \frac{a}{a+b+c} + \frac{b}{a+b+c} +$

$\frac{c}{a+b+c} = \frac{a+b+c}{a+b+c} = 1$

195. (3) $8a + 4b + 6c + 2d = -4$
$2a + 6b + 4c + 8d = 4$
On adding,
$10a + 10b + 10c + 10d = 0$
$\Rightarrow a + b + c + d = 0$
$\Rightarrow a + d = -(b + c)$

$\Rightarrow \frac{a+d}{b+c} = -1$

196. (2) $\frac{x}{(b-c)(b+c-2a)}$

$= \frac{y}{(c-a)(c+a-2b)}$

$= \frac{z}{(a-b)(a+b-2c)} = k$

$\therefore x = k(b - c)(b + c - 2a)$
$= k(b^2 - c^2 - 2a(b-c))$
$y = k(c - a)(c + a - 2b)$
$= k(c^2 - a^2 - 2b(c-a))$
$z = k(a - b)(a + b - 2c)$
$= k(a^2 - b^2 - 2c(a - b))$
$\therefore x + y + z = k(b^2 - c^2 + c^2 - a^2 + a^2 - b^2) - 2\{a(b - c) + b(c - a) + c(a - b)\}$
$= 0 - 2(ab - ac + bc - ab + ac - bc)$
$= 0$

197. (3) $a + \frac{1}{a} = 3$

On cubing both sides,

$\left(a + \frac{1}{a}\right)^3 = 3^3 = 27$

$a^3 + \frac{1}{a^3} + 3a \times \frac{1}{a}\left(a + \frac{1}{a}\right)$

$= 27$

$\Rightarrow a^3 + \frac{1}{a^3} + 3 \times 3 = 27$

$\Rightarrow a^3 + \frac{1}{a^3} = 27 - 9 = 18$

$\therefore a^3 + 1\frac{1}{a^3} = a^3 + \frac{1}{a^3} + 1$

$= 18 + 1 = 19$

198. (2) $c + \frac{1}{c} = 3$

$\Rightarrow c - 3 = -\frac{1}{c}$

$\therefore (c-3)^7 + \frac{1}{c^7} = \left(-\frac{1}{c}\right)^7 + \frac{1}{c^7}$

$= -\frac{1}{c^7} + \frac{1}{c^7} = 0$

199. (1) $x = \sqrt[3]{7} + 3$

$\Rightarrow x - 3 = \sqrt[3]{7}$

On cubing both sides

$(x - 3)^3 = \left(\sqrt[3]{7}\right)^3$

$\Rightarrow x^3 - 3.x^2.3 + 3.x(3)^2 - (3)^3 = 7$
$\Rightarrow x^3 - 9x^2 + 27x - 27 = 7$
$\Rightarrow x^3 - 9x^2 + 27x - 34 = 0$

200. (2) $p(x + y)^2 = 5$

$\Rightarrow (x + y)^2 = \frac{5}{p}$

$q(x - y)^2 = 3 \Rightarrow (x - y)^2 = \frac{3}{q}$

$\therefore (x + y)^2 - (x - y)^2 = \frac{5}{p} - \frac{3}{q}$

$\Rightarrow 4xy = \frac{5}{p} - \frac{3}{q} = \frac{5q - 3p}{pq}$

$\therefore p^2(x + y)^2 + 4pq\,xy - q^2(x - y)^2$

$= p^2.\frac{5}{p} + pq.\frac{(5q - 3p)}{pq} - q^2.\frac{3}{q}$

$= 5p + 5q - 3p - 3q$
$= 2p + 2q$

201. (4) $x + \frac{1}{x} = -2$

$\Rightarrow x^2 + 1 = -2x$
$\Rightarrow x^2 + 2x + 1 = 0$
$\Rightarrow (x + 1)^2 = 0$
$\Rightarrow x = -1$
$\therefore x^p + x^q$
$= (-1)^p + (-1)^q$
$= 1 - 1 = 0$

202. (4)
$(2a - 3)^2 + (3b + 4)^2 + (6c + 1)^2 = 0$

$\therefore 2a - 3 = 0 \Rightarrow a = \frac{3}{2}$,

$3b + 4 = 0 \Rightarrow b = \frac{-4}{3}$

$6c + 1 = 0 \Rightarrow c = -\frac{1}{6}$

$\therefore a + b + c = \frac{3}{2} - \frac{4}{3} - \frac{1}{6}$

$= \frac{9 - 8 - 1}{6} = 0$

$\therefore a^3 + b^3 + c^3 - 3abc = 0$

$\therefore \frac{a^3 + b^3 + c^3 - 3abc}{a^2 + b^2 + c^2} + 3$

$= 0 + 3 = 3$

203. (1) $a + b + c = 1$

$ab + bc + ca = -1$
$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$
$\Rightarrow 1 = a^2 + b^2 + c^2 + 2(-1)$
$\Rightarrow a^2 + b^2 + c^2 = 3$
$\therefore a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca) = 1(3 + 1) = 4$
$\therefore a^3 + b^3 + c^3 = 3abc + 4$
$= -3 + 4 = 1$

204. (1) $3x^2 + 5x + 3 = 0$
$\Rightarrow 3x^2 + 3 = -5x$

$\Rightarrow \frac{3x^2 + 3}{x} = -5$

$\Rightarrow 3x + \frac{3}{x} = -5$

$\Rightarrow x + \frac{1}{x} = -\frac{5}{3}$

On cubing both sides,

$\left(x + \frac{1}{x}\right)^3 = \left(\frac{-5}{3}\right)^3 = \frac{-125}{27}$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right)$

$= \frac{-125}{27}$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times \frac{-5}{3} = \frac{-125}{27}$

$\Rightarrow x^3 + \frac{1}{x^3} = \frac{-125}{27} + 5$

$= \frac{-125 + 135}{27} = \frac{10}{27}$

205. (3) $x + y + z = 9$
$x^2 + y^2 + z^2 = 31$
$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$\Rightarrow 81 = 31 + 2(xy + yz + zx)$
$\Rightarrow 2(xy + yz + zx)$
$= 81 - 31$
$= 50$
$\Rightarrow xy + yz + zx = 25$
$\therefore x^3 + y^3 + z^3 - 3xyz$
$= (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$
$= 9(31 - 25)$
$= 9 \times 6 = 54$

206. (3) $x^2 - y^2 + y^2 - z^2 + z^2 - x^2 = 0$

$\therefore (x^2 - y^2)^3 + (y^2 - z^2)^3 + (z^2 - x^2)^3$

$= 3(x^2 - y^2)(y^2 - z^2)(z^2 - x^2)$

[If $a + b + c = 0$, $a^3 + b^3 + c^3 = 3abc$]

Similarly,

$x - y + y - z + z - x = 0$
$\therefore (x - y)^3 + (y - z)^3 + (z - x)^3$
$= 3(x - y)(y - z)(z - x)$

$$\therefore \frac{(x^2 - y^2)^3 + (y^2 - z^2)^3 + (z^2 - x^2)^3}{(x - y)^3 + (y - z)^3 + (z - x)^3}$$

$$= \frac{3(x^2 - y^2)(y^2 - z^2)(z^2 - x^2)}{3(x - y)(y - z)(z - x)}$$

$= (x + y)(y + z)(z + x)$

207. (3) $\dfrac{x^3 + 3y^2x}{y^3 + 3x^2y} = \dfrac{35}{19}$

By componendo and dividendo,

$$\frac{x^3 + 3y^2x + y^3 + 3x^2y}{x^3 + 3y^2x - y^3 - 3x^2y}$$

$$= \frac{35 + 19}{35 - 19} = \frac{54}{16}$$

$$\Rightarrow \frac{(x + y)^3}{(x - y)^3} = \frac{27}{8} = \left(\frac{3}{2}\right)^3$$

$$\Rightarrow \frac{x + y}{x - y} = \frac{3}{2}$$

By componendo and dividendo again

$$\frac{x + y + x - y}{x + y - x + y} = \frac{3 + 2}{3 - 2} \Rightarrow \frac{x}{y} = 5$$

208. (3) $(a - b)^3 = 2^3$
$\Rightarrow a^3 - b^3 - 3ab(a - b) = 8$
$\Rightarrow 26 - 3ab \times 2 = 8$
$\Rightarrow 6ab = 26 - 8 = 18$

$$\Rightarrow ab = \frac{18}{6} = 3$$

$\Rightarrow (a + b)^2 = (a - b)^2 + 4ab$
$= (2)^2 + 4 \times 3 = 4 + 12 = 16$

209. (3) If $a + b + c = 0$, then $a^3 + b^3 + c^3 - 3abc = 0$
Here, $x - 4 + y - 2 + z - 3$
$= x + y + z - 9 = 9 - 9 = 0$
$\therefore (x - 4)^3 + (y - 2)^3 + (z - 3)^3 - 3(x - 4)(y - 2)(z - 3) = 0$

210. (4) $27a^3 - 54a^2b + 36ab^2 - 8b^3$
$= (3a)^3 - 3(3a)^2(2b) + 3 \times 3a \times (2b)^2 - (2b)^3$
$= (3a - 2b)^3$
$= (3 \times 2 - 2(-3))^3 = (6 + 6)^3$
$= (12)^3 = 1728$

211. (2) $a^3 + \dfrac{1}{a^3} = 2$

$\Rightarrow a^6 + 1 = 2a^3$
$\Rightarrow a^6 - 2a^3 + 1 = 0$
$\Rightarrow (a^3 - 1)^2 = 0$
$\Rightarrow a^3 - 1 = 0$
$\Rightarrow a^3 = 1 \Rightarrow a = 1$

$$\therefore \frac{a^2 + 1}{a} = 1 + 1 = 2$$

212. (3) $pq(p + q) = 1$

$$\Rightarrow p + q = \frac{1}{pq}$$

On cubing both sides,

$$(p + q)^3 = \frac{1}{p^3q^3}$$

$$\Rightarrow p^3 + q^3 + 3pq(p + q) = \frac{1}{p^3q^3}$$

$$\Rightarrow \frac{1}{p^3q^3} - p^3 - q^3$$

$= 3pq(p + q) = 3 \times 1 = 3$

213. (3) $x + \dfrac{1}{x} = \sqrt{3}$

On cubing both sides,

$$\left(x + \frac{1}{x}\right)^3 = (\sqrt{3})^3 = 3\sqrt{3}$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 3\sqrt{3}$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3\sqrt{3} = 3\sqrt{3}$$

$$\Rightarrow x^3 + \frac{1}{x^3} = 3\sqrt{3} - 3\sqrt{3} = 0$$

214. (1) $\dfrac{a}{b} + \dfrac{b}{a} = 1 \Rightarrow \dfrac{a^2 + b^2}{ab} = 1$

$\Rightarrow a^2 + b^2 = ab$
$\Rightarrow a^2 - ab + b^2$
$= 0$
$\therefore a^3 + b^3 = (a + b)(a^2 - ab + b^2) = 0$

215. (3) $l^2 + m^2 + n^2 = 31$;
$l + m + n = 9$
On squaring both sides,
$(l + m + n)^2 = 81$
$\Rightarrow l^2 + m^2 + n^2 + 2(lm + mn + nl) = 81$
$\Rightarrow 31 + 2(lm + mn + nl) = 81$
$\Rightarrow 2(lm + mn + nl) = 81 - 31$
$= 50$

$$\Rightarrow lm + mn + nl = \frac{50}{2} = 25$$

216. (1) $\left(x + \dfrac{1}{x}\right)^2 = 3$

$$\therefore x + \frac{1}{x} = \sqrt{3}$$

On cubing both sides,

$$\left(x + \frac{1}{x}\right)^3 = (\sqrt{3})^3$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 3\sqrt{3}$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3\sqrt{3} = 3\sqrt{3}$$

$$\Rightarrow x^3 + \frac{1}{x^3} = 3\sqrt{3} - 3\sqrt{3} = 0$$

217. (4) $x = \dfrac{3}{2}$ (Given)

$\therefore 27x^3 - 54x^2 + 36x - 11$
$= (3x)^3 - 3 \times (3x)^2 \times 2 + 3 \times 3x(2)^2 - (2)^3 - 3$
$= (3x - 2)^3 - 3$
$[\because (a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3]$

$$= \left(\frac{3 \times 3}{2} - 2\right)^3 - 3$$

$$= \left(\frac{9}{2} - 2\right)^3 - 3$$

$$= \left(\frac{9 - 4}{2}\right)^3 - 3$$

$$= \left(\frac{5}{2}\right)^3 - 3 = \frac{125}{8} - 3$$

$$= \frac{125 - 24}{8} = \frac{101}{8} = 12\frac{5}{8}$$

218. (2) Given,
$a + b + c = 6$ and $ab + bc + ca = 11$
$\therefore$ $bc(b + c) + ca(c + a) + ab(a + b) + 3abc$
$= bc(b + c) + abc + ca(c + a) + abc + ab(a + b) + abc$
$= bc(a + b + c) + ca(a + b + c) + ab(a + b + c)$
$= (a + b + c)(bc + ca + ab)$
$= 6 \times 11 = 66$

219. (3) $\left(a + \frac{1}{a}\right)^2 = 3$

$\Rightarrow a + \frac{1}{a} = \sqrt{3}$

On cubing both sides,

$\left(a + \frac{1}{a}\right)^3 = \left(\sqrt{3}\right)^3$

$\Rightarrow a^3 + \frac{1}{a^3} + 3\left(a + \frac{1}{a}\right) = 3\sqrt{3}$

$\Rightarrow a^3 + \frac{1}{a^3} + 3\sqrt{3} = 3\sqrt{3}$

$\Rightarrow a^3 + \frac{1}{a^3} = 3\sqrt{3} - 3\sqrt{3} = 0$

$\therefore a^6 - \frac{1}{a^6}$

$= \left(a^3 + \frac{1}{a^3}\right)\left(a^3 - \frac{1}{a^3}\right) = 0$

220. (2) $m^3 + n^3 + 3mn$
$= m^3 + n^3 + 3mn(m + n)$
$[\because m + n = 1]$
$= (m + n)^3 = 1$

221. (4) $x^4 + \frac{1}{x^4} = 119$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 - 2 = 119$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 = 119 + 2 = 121$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 = 11^2$

$\Rightarrow x^2 + \frac{1}{x^2} = 11$

$\therefore \left(x - \frac{1}{x}\right)^2 + 2 = 11$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 = 11 - 2 = 9 = 3^2$

$\Rightarrow x - \frac{1}{x} = 3$

222. (4) $a^3 + b^3 = (a + b)^3 - 3ab(a + b)$

$\therefore x^3 + \frac{1}{x^3} = 110$

$\Rightarrow \left(x + \frac{1}{x}\right)^3 - 3\left(x + \frac{1}{x}\right) = 110$

$= 125 - 15$

$\Rightarrow \left(x + \frac{1}{x}\right)^3 - 3\left(x + \frac{1}{x}\right)$

$= (5)^3 - 3 \times 5$

$\Rightarrow x + \frac{1}{x} = 5$

223. (3) Given,
$x^2 + y^2 + z^2 = 14$
$xy + yz + zx = 11$
$\therefore (x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$
$= 14 + 2 \times 11$
$= 14 + 22 = 36$

224. (3) $x = \sqrt[3]{28}$

$\therefore x^3 = \left(\sqrt[3]{28}\right)^3 = 28$

Again, $y = \sqrt[3]{27}$

$\therefore y^3 = \left(\sqrt[3]{27}\right)^3 = 27$

$\therefore$ Expression

$= (x + y) - \frac{1}{x^2 + xy + y^2}$

$= (x + y) - \frac{(x - y)}{(x - y)(x^2 + xy + y^2)}$

$= (x + y) - \frac{(x - y)}{x^3 - y^3}$

$= (x + y) - \frac{(x - y)}{28 - 27}$

$= x + y - x + y$

$= 2y = 2 \times \sqrt[3]{27} = 2 \times 3 = 6$

225. (3) $x = 12$ and $y = 4$

$\therefore (x + y)^{\frac{x}{y}} = (12 + 4)^{\frac{12}{4}} = (16)^3$

$= 16 \times 16 \times 16 = 4096$

226. (4) $2x + \frac{2}{x} = 3$

On dividing by 2,

$x + \frac{1}{x} = \frac{3}{2}$

On cubing both sides,

$\left(x + \frac{1}{x}\right)^3 = \left(\frac{3}{2}\right)^3$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = \frac{27}{8}$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times \frac{3}{2} = \frac{27}{8}$

$\Rightarrow x^3 + \frac{1}{x^3} + \frac{9}{2} = \frac{27}{8}$

$\Rightarrow x^3 + \frac{1}{x^3} = \frac{27}{8} - \frac{9}{2}$

$= \frac{27 - 36}{8} = \frac{9}{8}$

$\therefore x^3 + \frac{1}{x^3} + 2$

$= 2 - \frac{9}{8} = \frac{16 - 9}{8} = \frac{7}{8}$

227. (3) $a + b = 3$
On cubing both sides,
$(a + b)^3 = 3^3$
$\Rightarrow a^3 + b^3 + 3ab(a + b) = 27$
$\Rightarrow a^3 + b^3 + 3ab \times 3 = 27$
$\Rightarrow a^3 + b^3 + 9ab - 27 = 0$

228. (4) $x + \frac{1}{x} = 2$

$\Rightarrow x^2 + 1 = 2x \Rightarrow x^2 - 2x + 1 = 0$
$\Rightarrow (x - 1)^2 = 0 \Rightarrow x - 1 = 0$
$\Rightarrow x = 1$

$\therefore x^2 + \frac{2}{x^6} = 1 + \frac{2}{1} = 1 + 2 = 3$

229. (2) $\frac{a}{b} + \frac{b}{a} = 1$

$\Rightarrow \frac{a^2 + b^2}{ab} = 1$

$\Rightarrow a^2 + b^2 = ab$
$\Rightarrow a^2 - ab + b^2 = 0$
$\therefore a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
$= 0$

230. (2) $a^3 - b^3$
$= (a - b)^3 + 3ab(a - b)$
$\Rightarrow 61 = 1 + 3ab \times 1$
$\Rightarrow 61 - 1 = 3ab = 60$

$\Rightarrow ab = \frac{60}{3} = 20$

231. (1) $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

$= (a - b)\{(a + b)^2 - ab\}$
On comparing with
$p^3 - q^3 = (p - q)\{(p + q)^2 - x\,pq)\}$, $x = 1$

232. (1) $a^2 = by + cz$
$\Rightarrow a^2 + ax = ax + by + cz$
$\Rightarrow a(a + x) = ax + by + cz$
$\Rightarrow \frac{1}{a+x} = \frac{a}{ax+by+cz}$
Similarly,
$b^2 = cz + ax$
$\Rightarrow b^2 + by = by + cz + ax$
$\Rightarrow b(b + y) = ax + by + cz$
$\Rightarrow \frac{1}{b+y} = \frac{b}{ax+by+cz}$
$c^2 = ax + by$
$\Rightarrow c^2 + cz = ax + by + cz$
$\Rightarrow c(c + z) = ax + by + cz)$
$\Rightarrow \frac{1}{c+z} = \frac{c}{ax+by+cz}$
$\therefore \frac{x}{a+x} + \frac{y}{b+y} + \frac{z}{c+z}$
$= \frac{ax}{ax+by+cz} + \frac{by}{ax+by+cz} + \frac{cz}{ax+by+cz}$
$= \frac{ax+by+cz}{ax+by+cz} = 1$

233. (3) $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
$= (a - b)((a - b)^2 + 3ab)$
$\therefore$ On comparing with
$p^3 - q^3 = (p - q)((p - q)^2 + x\,pq)\,x$
$= 3$

234. (3) $\left(a + \frac{1}{a}\right)^2 = 3$
$\Rightarrow a + \frac{1}{a} = \sqrt{3}$
On cubing both sides,
$\left(a + \frac{1}{a}\right)^3 = \left(\sqrt{3}\right)^3$
$\Rightarrow a^3 + \frac{1}{a^3} + 3\left(a + \frac{1}{a}\right) = 3\sqrt{3}$
$\Rightarrow a^3 + \frac{1}{a^3} + 3\sqrt{3} = 3\sqrt{3}$
$\Rightarrow a^3 + \frac{1}{a^3} = 3\sqrt{3} - 3\sqrt{3} = 0$
$\Rightarrow \frac{a^6+1}{a^3} = 0$
$\Rightarrow a^6 + 1 = 0$
$\therefore a^{18} + a^{12} + a^6 + 1$
$= a^{12}(a^6 + 1) + 1(a^6 + 1)$
$= (a^6 + 1)(a^{12} + 1) = 0$

235. (1) $x + 5 + \frac{1}{x+1} = 6$
$\Rightarrow (x + 1) + \frac{1}{(x+1)} = 6 - 4 = 2$
On cubing both sides,
$\left\{(x+1) + \frac{1}{(x+1)}\right\}^3 = 8$
$\Rightarrow (x + 1)^3 + \frac{1}{(x+1)^3} + 3$
$\left\{(x+1) + \frac{1}{(x+1)}\right\} = 8$
$\Rightarrow (x + 1)^3 + \frac{1}{(x+1)^3} + 3 \times 2$
$= 8$
$\Rightarrow (x + 1)^3 + \frac{1}{(x+1)^3} = 8 - 6$
$= 2$

236. (2) $a + b + c = 15$,
$\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = \frac{71}{abc}$
$\Rightarrow \frac{bc+ac+ab}{abc} = \frac{71}{abc}$
$\Rightarrow ab + bc + ca = 71$
$\therefore a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ac)$
$= (a + b + c)\{(a + b + c)^2 - 3(ab + bc + ac)\}$
$= 15(15^2 - 3 \times 71)$
$= 15(225 - 213) = 15 \times 12$
$= 180$

237. (4) $p^4 + q^4 = (p^2)^2 + (q^2)^2$
$= (p^2 + q^2)^2 - 2p^2q^2$
$= (p^2 + q^2)^2 - \left(\sqrt{2}pq\right)^2$
$= (p^2 + q^2 + \sqrt{2}pq)(p^2 + q^2 - \sqrt{2}pq)$
Clearly, $k = \sqrt{2}$

238. (4) $x^4 + 64 = (x^2)^2 + (8)^2$
$= (x^2 + 8)^2 - 2 \times 8x^2$
$[\because a^2 + b^2 = (a + b)^2 - 2ab]$
$= (x^2 + 8)^2 - (4x)^2$
$= (x^2 + 4x + 8)(x^2 - 4x + 8)$

239. (4) $a^4 + b^4 - a^3 - b^3 - 2a^2b^2 + ab$
$= a^4 + b^4 - 2a^2b^2 - a^3 - b^3 + ab$
$= (a^2 - b^2)^2 - (a^3 + b^3) + ab$
$= (a + b)^2(a - b)^2 - (a + b)(a^2 - ab + b^2) + ab$
$= (a - b)^2 - a^2 + ab - b^2 + ab$
$[\because a + b = 1]$
$= (a - b)^2 - (a - b)^2 = 0$

240. (3) $2a^3 + 2b^3 + 2c^3 - 6abc$
$= 2(a^3 + b^3 + c^3 - 3abc)$
$= 2(a + b + c) \times \frac{1}{2}\{(a - b)^2 + (b - c)^2 + (c - a)^2\}$
$= (299 + 298 + 297)\{(299 - 298)^2 + (298 - 297)^2 + (297 - 299)^2\}$
$= 894 \times (1 + 1 + 4)$
$= 894 \times 6 = 5364$

241. (1) $x + \frac{1}{x} = \sqrt{3}$
On cubing both sides,
$\left(x + \frac{1}{x}\right)^3 = 3\sqrt{3}$
$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 3\sqrt{3}$
$\Rightarrow x^3 + \frac{1}{x^3} + 3\sqrt{3} = 3\sqrt{3}$
$\Rightarrow x^3 + \frac{1}{x^3} = 3\sqrt{3} - 3\sqrt{3} = 0$
$\Rightarrow x^6 + 1 = 0$
$\therefore x^{18} + x^{12} + x^6 + 1$
$= x^{12}(x^6 + 1) + 1(x^6 + 1)$
$= (x^6 + 1)(x^{12} + 1) = 0$

242. (4) $x = 1 + \sqrt{2} + \sqrt{3}$
$\Rightarrow x - 1 = \sqrt{3} + \sqrt{2}$
On squaring both sides,
$x^2 - 2x + 1 = 3 + 2 + 2\sqrt{6}$
$\Rightarrow x^2 - 2x + 1 - 5 = 2\sqrt{6}$
$\Rightarrow x^2 - 2x - 4 = 2\sqrt{6}$
On squaring again,
$(x^2 - 2x - 4)^2 = \left(2\sqrt{6}\right)^2$
$\Rightarrow x^4 + 4x^2 + 16 - 4x^3 + 16x - 8x^2 = 24$
$\Rightarrow x^4 - 4x^3 - 4x^2 + 16x - 8 = 0$
$\Rightarrow 2x^4 - 8x^3 - 8x^2 + 32x - 16 = 0$
$\therefore 2x^4 - 8x^3 - 5x^2 + 26x - 28$
$= 2x^4 - 8x^3 - 8x^2 + 32x - 16 + 3x^2 - 6x - 12$
$= 0 + 3(x^2 - 2x - 4) = 3 \times 2\sqrt{6}$
$= 6\sqrt{6}$

243. (2) $x + y = 1 + xy$ (given)
$\therefore x^3 + y^3 - x^3y^3$
$= (x + y)^3 - 3xy(x + y) - x^3y^3$
$= (1 + xy)^3 - 3xy(1 + xy) - x^3y^3$
$= 1 + x^3y^3 + 3xy + 3x^2y^2 - 3xy - 3x^2y^2 - x^3y^3 = 1$

244. (4) $p = 3 + \frac{1}{p}$ (Given)
$\therefore p - \frac{1}{p} = 3$
On squaring both sides,
$\left(p - \frac{1}{p}\right)^2 = (3)^2 = 9$
$\Rightarrow p^2 + \frac{1}{p^2} - 2 = 9$
$\Rightarrow p^2 + \frac{1}{p^2} = 9 + 2 = 11$

On squaring again,

$$\left(p^2+\frac{1}{p^2}\right)^2 = (11)^2$$

$$\Rightarrow p^4+\frac{1}{p^4}+2 = 121$$

$$\Rightarrow p^4+\frac{1}{p^4} = 121 - 2 = 119$$

245. (3) $x^4 + x^2y^2 + y^4 = 6$
$\Rightarrow (x^2 - xy + y^2)(x^2 + xy + y^2) = 6$
$\Rightarrow 2 \times (x^2 + xy + y^2) = 6$

$$\Rightarrow x^2 + xy + y^2 = \frac{6}{2} = 3$$

246. (1) Given, $\left(a+\frac{1}{a}\right)^2 = 3$

$$\Rightarrow a+\frac{1}{a} = \sqrt{3}$$

On cubing both sides,

$$\left(a+\frac{1}{a}\right)^3 = \left(\sqrt{3}\right)^3$$

$$\Rightarrow a^3+\frac{1}{a^3}+3\left(a+\frac{1}{a}\right) = 3\sqrt{3}$$

$$\Rightarrow a^3+\frac{1}{a^3}+3\sqrt{3} = 3\sqrt{3}$$

$$\Rightarrow a^3+\frac{1}{a^3} = 3\sqrt{3}-3\sqrt{3} = 0$$

247. (4)

$$\frac{a^2+b^2}{c^2} = \frac{b^2+c^2}{a^2} = \frac{c^2+a^2}{b^2} = \frac{1}{k}$$

$\Rightarrow c^2 = k(a^2 + b^2)$;
$a^2 = k(b^2 + c^2)$;
$b^2 = k(c^2 + a^2)$
$\therefore a^2 + b^2 + c^2 = k(b^2 + c^2 + c^2 + a^2 + a^2 + b^2)$
$\Rightarrow a^2 + b^2 + c^2 = 2k(a^2 + b^2 + c^2)$
$\Rightarrow 2k = 1$

$$\Rightarrow k = \frac{1}{2}$$

248. (2) $\because 2x+\frac{2}{9x} = 4$

On dividing both sides by 2,

$$x+\frac{1}{9x} = 2$$

On multiplying both sides by 3,

$$3x+\frac{1}{3x} = 6$$

On cubing both sides,

$$\left(3x+\frac{1}{3x}\right)^3 = 6^3$$

$$\therefore 27x^3 + \frac{1}{27x^3} + 3\times 3x\times\frac{1}{3x}$$

$$\left(3x+\frac{1}{3x}\right) = 216$$

$$\Rightarrow 27x^3 + \frac{1}{27x^3} + 3\times 6 = 216$$

$$\Rightarrow 27x^3 + \frac{1}{27x^3} = 216 - 18$$

$= 198$

249. (3) $xy(x + y) = m$ (Given)
$\therefore x^3 + y^3 + 3m$
$= x^3 + y^3 + 3xy(x + y)$

$$= (x+y)^3 = \left(\frac{m}{xy}\right)^3 = \frac{m^3}{x^3y^3}$$

250. (4) Given,

$$p+\frac{1}{p+2} = 1$$

$$\Rightarrow (p+2) + \frac{1}{p+2} = 2 + 1 = 3$$

On cubing both sides,

$$(p+2)^3 + \frac{1}{(p+2)^3} + 3(p+2)\times \frac{1}{(p+2)}\left(p+2+\frac{1}{p+2}\right) = 27$$

$$\Rightarrow (p+2)^3 + \frac{1}{(p+2)^3} + 3\times 3 = 27$$

$$\Rightarrow (p+2)^3 + \frac{1}{(p+2)^3} = 27 - 9 = 18$$

$$\therefore (p+2)^3 + \frac{1}{(p+2)^3} - 3$$

$= 18 - 3 = 15$

251. (1) $x^3+\frac{1}{x^3} = 0$

$$\Rightarrow \left(x+\frac{1}{x}\right)^3 - 3\left(x+\frac{1}{x}\right) = 0$$

$$\Rightarrow \left(x+\frac{1}{x}\right)^3 = 3\left(x+\frac{1}{x}\right)$$

$$\Rightarrow \left(x+\frac{1}{x}\right)^2 = 3$$

On squaring both sides,

$$\left(x+\frac{1}{x}\right)^4 = 3^2 = 9$$

252. (2) $2x-\frac{2}{x} = 1$

On dividing both sides by 2,

$$x-\frac{1}{x} = \frac{1}{2}$$

On cubing both sides,

$$\left(x-\frac{1}{x}\right)^3 = \frac{1}{8}$$

$$\Rightarrow x^3-\frac{1}{x^3}-3\left(x-\frac{1}{x}\right) = \frac{1}{8}$$

$$\Rightarrow x^3-\frac{1}{x^3}-3\times\frac{1}{2} = \frac{1}{8}$$

$$\Rightarrow x^3-\frac{1}{x^3} = \frac{3}{2}+\frac{1}{8}$$

$$\Rightarrow x^3-\frac{1}{x^3} = \frac{12+1}{8} = \frac{13}{8}$$

253. (2) $4b^2c^2 - (b^2 + c^2 - a^2)^2$
$= (2bc)^2 - (b^2 + c^2 - a^2)^2$
$= (2bc + b^2 + c^2 - a^2)(2bc - b^2 - c^2 + a^2)$
$= \{(b + c)^2 - a^2\}\{a^2 - (b^2 + c^2 - 2bc)\}$
$= (b + c + a)(b + c - a)\{a^2 - (b-c)^2\}$
$= (b + c + a)(b + c - a)(a + b - c)(a - b + c)$
$\therefore$ Required sum
$= b + c + a + b + c - a + a + b - c + a - b + c$
$= 2(a + b + c)$

254. (3) $(4a - 3)^2 = 0 \Rightarrow 4a - 3 = 0$

$$\Rightarrow 4a = 3 \Rightarrow a = \frac{3}{4}$$

$\therefore 64a^3 - 48a^2 + 12a + 13$

$$= 64\times\left(\frac{3}{4}\right)^3 - 48\times\left(\frac{3}{4}\right)^2 + 12\times\frac{3}{4} + 13$$

$$= 64\times\frac{27}{64} - \frac{48\times 9}{16} + 9 + 13$$

$= 27 - 27 + 22 = 22$

255. (3) $a = 101$ (Given)
$\therefore a(a^2 - 3a + 3)$
$= a^3 - 3a^2 + 3a - 1 + 1$
$= (a - 1)^3 + 1 = (100)^3 + 1$
$= 1000001$

256. (4) $x+\frac{1}{x} = -2$

$$\Rightarrow \frac{x^2+1}{x} = -2$$

$\Rightarrow x^2 + 1 = -2x$

$\Rightarrow x^2 + 2x + 1 = 0$
$\Rightarrow (x + 1)^2 = 0$
$\Rightarrow x + 1 = 0 \quad \Rightarrow x = -1$

$\therefore x^7 + \frac{1}{x^7} = (-1)^7 + \frac{1}{(-1)^7}$
$= -1 - 1 = -2$

257. (1) $a^2 + b^2 + c^2 = 14$ ..... (i)
$a + b + c = 6$
$\therefore (a + b + c)^2 = 6^2 = 36$
$\Rightarrow a^2 + b^2 + c^2 + 2(ab + bc + ca) = 36$
$\Rightarrow 14 + 2(ab + bc + ca) = 36$
$\Rightarrow 2(ab + bc + ca) = 36 - 14 = 22$

$\Rightarrow ab + bc + ca = \frac{22}{2} = 11$

258. (2) $\frac{a}{b} + \frac{b}{a} = 1$

$\Rightarrow \frac{a^2 + b^2}{ab} = 1$
$\Rightarrow a^2 + b^2 = ab$
$\Rightarrow a^2 - ab + b^2 = 0$
$\therefore a^3 + b^3$
$= (a + b)(a^2 - ab + b^2) = 0$

259. (4) $a + b = 5$
$\Rightarrow a - 3 = 2 - b$
$\Rightarrow (a - 3)^7 = (2 - b)^7$
$\Rightarrow (a - 3)^7 = -(b - 2)^7$
$\Rightarrow (a - 3)^7 + (b - 2)^7 = 0$

260. (3) $x^2 - 2x + 1 = 0$
$\Rightarrow (x - 1)^2 = 0$
$\Rightarrow x - 1 = 0 \Rightarrow x = 1$

$\therefore x^4 + \frac{1}{x^4} = 1 + 1 = 2$

261. (3) $a^2 + b^2 + c^2 = 83$
$a + b + c = 15$
$\therefore (a + b + c)^2$
$= a^2 + b^2 + c^2 + 2(ab + bc + ca)$
$\Rightarrow (15)^2 = 83 + 2(ab + bc + ca)$
$\Rightarrow 225 - 83 = 2(ab + bc + ca)$
$\Rightarrow 142 = 2(ab + bc + ca)$

$\Rightarrow ab + bc + ca = \frac{142}{2} = 71$

262. (4) $m - n = 2;\ mn = 15$
$\therefore (m + n)^2 = (m - n)^2 + 4mn$
$= 4 + 4 \times 15 = 64$
$\Rightarrow m + n = \sqrt{64} = 8$
$\therefore m + n + m - n = 8 + 2 = 10$
$\Rightarrow 2m = 10 \Rightarrow m = 5$
$\therefore m + n = 8$
$\Rightarrow 5 + n = 8$
$\Rightarrow n = 8 - 5 = 3$
$\therefore (m^2 - n^2)(m^3 - n^3)$
$= (5^2 - 3^2)(5^3 - 3^3)$
$= (25 - 9)(125 - 27)$
$= 16 \times 98 = 1568$

263. (4) Given, $xy + yz + zx = 1$

$\therefore$ Expression $= \frac{1 + y^2}{(x + y)(y + z)}$

$= \frac{1 + y^2}{xy + xz + y^2 + yz} = \frac{1 + y^2}{1 + y^2}$
$= 1$

264. (2) $x^2 - 4x + 1 = 0$
$\Rightarrow x^2 + 1 = 4x$

$\Rightarrow \frac{x^2 + 1}{x} = \frac{4x}{x}$

$\Rightarrow x + \frac{1}{x} = 4$

On cubing both sides,

$\left(x + \frac{1}{x}\right)^3 = 64$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 64$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times 4 = 64$

$\Rightarrow x^3 + \frac{1}{x^3} = 64 - 12 = 52$

$\Rightarrow \frac{x^6 + 1}{x^3} = 52$

265. (3) $x = a + \frac{1}{a};\ y = a - \frac{1}{a}$

$\therefore x^2 - y^2 = \left(a + \frac{1}{a}\right)^2 - \left(a - \frac{1}{a}\right)^2$

$= 4a \times \frac{1}{a} = 4$

$[\because (a + b)^2 - (a - b)^2 = 4ab]$
$\therefore x^4 + y^4 - 2x^2y^2 = (x^2 - y^2)^2$
$= 4^2 = 16$

266. (2) $a^3 - b^3 = 56$
$\Rightarrow (a - b)^3 + 3ab(a - b) = 56$
$\Rightarrow (2)^3 + 3ab \times 2 = 56$
$\Rightarrow 6ab = 56 - 8 = 48$

$\Rightarrow ab = \frac{48}{6} = 8$

$\therefore a^2 + b^2 = (a - b)^2 + 2ab$
$= 2^2 + 2 \times 8 = 4 + 16 = 20$

267. (2) $x + y + z = 1$ ..... (i)
Again,

$\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = \frac{yz + zx + xy}{xyz} = 1$

$\Rightarrow xy + yz + zx = xyz = -1$ .. (ii)
$\therefore (x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$
$\Rightarrow 1 = x^2 + y^2 + z^2 - 2$
$\Rightarrow x^2 + y^2 + z^2 = 2 + 1 = 3$.(iii)
$\therefore x^3 + y^3 + z^3 - 3xyz$
$= (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$
$= 1(3 + 1) = 4$
$\Rightarrow x^3 + y^3 + z^3 + 3 = 4$
$\Rightarrow x^3 + y^3 + z^3 = 4 - 3 = 1$

268. (2) $\frac{a^2 + 1}{a} = 3$

$\Rightarrow a + \frac{1}{a} = 3$

On cubing both sides,

$\left(a + \frac{1}{a}\right)^3 = 3^3$

$\Rightarrow a^3 + \frac{1}{a^3} + 3\left(a + \frac{1}{a}\right) = 27$

$\Rightarrow a^3 + \frac{1}{a^3} + 3 \times 3 = 27$

$\Rightarrow \frac{a^6 + 1}{a^3} = 27 - 9 = 18$

269. (2) If c be the third proportional between a and b, then

$\frac{a}{b} = \frac{b}{c}$

$\Rightarrow c = \frac{b^2}{a} = \frac{\left\{\left(x^2 - y^2\right)^2\right\}^2}{(x - y)^2}$

$= \frac{\{(x + y)(x - y)\}^4}{(x - y)^2}$
$= (x + y)^4 (x - y)^2$

270. (3) If $a^2 + b^2 + c^2 = 0$
$\Rightarrow a = 0,\ b = 0,\ c = 0$
$\therefore (x - 5)^2 + (y - 2)^2 + (z - 9)^2 = 0$
$\therefore x - 5 = 0 \Rightarrow x = 5$
$y - 2 = 0 \Rightarrow y = 2$
$z - 9 = 0 \Rightarrow z = 9$
$\therefore x + y - z = 5 + 2 - 9 = -2$

271. (3) $x + \frac{1}{x} = 3$

On squaring both sides,

$\left(x + \frac{1}{x}\right)^2 = 9$

$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 9$

$\Rightarrow x^2 + \frac{1}{x^2} = 9 - 2 = 7$

On squaring again,

$\left(x^2 + \frac{1}{x^2}\right)^2 = 49$

$\Rightarrow x^4 + \frac{1}{x^4} + 2 = 49$

$\Rightarrow x^4 + \frac{1}{x^4} = 49 - 2 = 47$

On squaring again,

$(x^4)^2 + \left(\frac{1}{x^4}\right)^2 + 2 = 47^2 = 2209$

$\Rightarrow x^8 + \frac{1}{x^8} = 2209 - 2 = 2207$

272. (4) $x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}(x + y + z)\{(x - y)^2 + (y - z)^2 + (z - x)^2\}$

$\therefore \frac{x^3 + y^3 + z^3 - 3xyz}{x - y + z}$

$= \frac{\frac{1}{2}(x+y+z)\left\{(x-y)^2 + (y-z)^2 + (z-x)^2\right\}}{x-y+z}$

$\frac{1}{2}(999 + 1000 + 1001)$

$= \frac{\left\{\begin{matrix}(999-1000)^2 + \\ (1000-10001)^2 + (1001-999)^2\end{matrix}\right\}}{(999-1000+1001)}$

$= \frac{3000}{2 \times 1000} \times (1 + 1 + 4)$

$= \frac{18}{2} = 9$

273. (3) If $a + b + c = 0$ then, $a^3 + b^3 + c^3 = 3abc$

$\because a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ac)$

274. (4) $\frac{1}{p} + \frac{1}{q} = \frac{1}{p+q}$

$\Rightarrow \frac{q+p}{pq} = \frac{1}{p+q}$

$\Rightarrow (p + q)^2 = pq$

$\Rightarrow p^2 + 2pq + q^2 = pq$

$\Rightarrow p^2 + pq + q^2 = 0$

$\therefore p^3 - q^3$

$= (p - q)(p^2 + pq + q^2) = 0$

275. (3) $x^2 - y^2 + 10xz + 10yz$

$\Rightarrow (x + y)(x - y) + 10z(x + y)$

$= (x + y)(x - y + 10z)$

$= (93 + 93)(93 - 93 + 10 \times 94)$

$= 186 \times 940 = 174840$

276. (2) $x^3 + y^3 + z^3 - 3xyz$

$= \frac{1}{2}(x + y + z)$

$\left\{(x-y)^2 + (y-z)^2 + (z-x)^2\right\}$

$= \frac{1}{2}(222 + 223 + 225)$

$\left\{(222-223)^2 + (223-225)^2 + (225-222)^2\right\}$

$= \frac{1}{2} \times 670\,(1 + 4 + 9)$

$= \frac{670 \times 14}{2} = 4690$

277. (2) $\frac{a}{b} + \frac{b}{a} = 1$

$\Rightarrow \frac{a^2 + b^2}{ab} = 1$

$\Rightarrow a^2 + b^2 = ab$

$\Rightarrow a^2 - ab + b^2 = 0$

$\therefore a^3 + b^3 - 2 = (a + b)(a^2 - ab + b^2) - 2$

$= -2$

278. (3) $x + \frac{1}{x} = \sqrt{3}$

On cubing both sides,

$\left(x + \frac{1}{x}\right)^3 = \left(\sqrt{3}\right)^3$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 3\sqrt{3}$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\sqrt{3} = 3\sqrt{3}$

$\Rightarrow x^3 + \frac{1}{x^3} = 3\sqrt{3} - 3\sqrt{3} = 0$

279. (1) It is given,

$a + b = 3$

$\therefore a^3 + b^3 + 9ab$

$= a^3 + b^3 + 3ab \times 3$

$= a^3 + b^3 + 3ab(a + b)$

$= (a + b)^3 = (3)^3 = 27$

280. (2) $6x^2 - 12x + 1 = 0$

$\Rightarrow 6x^2 + 1 = 12x$

$\Rightarrow \frac{6x^2 + 1}{2x} = \frac{12x}{2x}$

$\Rightarrow 3x + \frac{1}{2x} = 6$

On cubing both sides,

$\left(3x + \frac{1}{2x}\right)^3 = (6)^3$

$\Rightarrow (3x)^3 + \left(\frac{1}{2x}\right)^3 = 3 \times 3x \times \frac{1}{2x}\left(3x + \frac{1}{2x}\right) = 216$

$\Rightarrow 27x^3 + \frac{1}{8x^3} + \frac{9}{2} \times 6 = 216$

$\Rightarrow 27x^3 + \frac{1}{8x^3} = 216 - 27 = 189$

281. (1) $x^2 + \frac{1}{x^2} = 98$

$\Rightarrow \left(x + \frac{1}{x}\right)^2 - 2 = 98$

$\Rightarrow \left(x + \frac{1}{x}\right)^2 = 98 + 2 = 100$

$\Rightarrow x + \frac{1}{x} = \sqrt{100} = 10$ ...(i)

On cubing both sides,

$\left(x + \frac{1}{x}\right)^3 = (10)^3 = 1000$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 1000$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times 10 = 1000$

$\Rightarrow x^3 + \frac{1}{x^3} = 1000 - 30 = 970$

282. (2) $x = y + z \Rightarrow x - y - z = 0$

If $a + b + c = 0$ then $a^3 + b^3 + c^3 = 3abc$

$\therefore (x)^3 + (-y)^3 + (-z)^3$

$= 3x(-y)(-z) = 3xyz$

283. (2) $x^5 - 12x^4 + 12x^3 - 12x^2 + 12x - 1$

$= x^5 - (11 + 1)x^4 + (11 + 1)x^3 - (11 + 1)x^2 + (11 + 1)x - 1$

$= x^5 - 11x^4 - x^4 + 11x^3 + x^3 - 11x^2 - x^2 + 11x + x - 1$

$= x - 1 = 11 - 1 = 10$ [$\because x = 11$]

284. (1) $a^3 - 7a - 6 = 0$

When $a = -1$

$f(a) = -1 + 7 - 6 = 0$

$\therefore (a + 1)$ is a factor.

$a + 1)\ a^3 - 7a - 6\ (a^2 - a - 6$

$\underline{-a^3 \pm a^2}$

$-a^2 - 7a$

$\underline{-a^2 - a}$

$+ \quad +$

$-6a - 6$

$\underline{-6a - 6}$

$\times$

$\therefore a^2 - a - 6 = a^2 - 3a + 2a - 6$

$= a(a - 3) + 2(a - 3)$

$= (a - 3)(a + 2)$

$\therefore x + y + z$

$= a + 1 + a - 3 + a + 2 = 3a$

TYPE-III

1. (1) $2^x.2^y = 8$

$\Rightarrow 2^{x+y} = 2^3$

$\Rightarrow x + y = 3$ ...(i)

$9^x.3^y = 3^4$

$\Rightarrow 3^{2x} . 3^y = 3^4$

$\Rightarrow 2x + y = 4$ ...(ii)

By equation (ii) – (i),

$x = 1$

From equation (i),

$1 + y = 3$

$\Rightarrow y = 3 - 1 = 2$

Method 2 :

You can check through options also.

$\Rightarrow y = 2$

$\Rightarrow (1, 2)$

2. (2) $2x + y = 5$ ...(i)

$x + 2y = 4$ ...(ii)

By equation (i) × 2 – equation (ii), we have

$4x + 2y = 10$

$x + 2y = 4$

$- \quad - \quad -$

$3x = 6$

$\Rightarrow x = 2$

From equation (i),

$2 \times 2 + y = 5$

$\Rightarrow y = 5 - 4 = 1$

$\therefore$ Point of intersection = (2, 1)

3. (2) OP = 2

$OQ = \frac{3}{2}$

$\therefore PQ = \sqrt{OP^2 + OQ^2}$

$= \sqrt{2^2 + \left(\frac{3}{2}\right)^2}$

$= \sqrt{4 + \frac{9}{4}}$

$= \sqrt{\frac{16+9}{4}} = \sqrt{\frac{25}{4}}$

$= \frac{5}{2} = 2.5$ cm

4. (1)

Putting $x = 0$ in $9x - 12y = 108$,

$0 - 12y = 108$

$y = -9$

Putting $y = 0$ in $9x - 12y = 108$

$9x - 0 = 108$

$\Rightarrow x = 12$

$\therefore$ OA = 12, OB = 9

$\therefore$ AB = $\sqrt{OA^2 + OB^2}$

$= \sqrt{12^2 + 9^2}$

$= \sqrt{144 + 81}$

$= \sqrt{225}$

$\therefore$ AB = 15 units

5. (4) At x-axis, y-co-ordinate = 0

$\therefore$ Putting $y = 0$ in $7x - 3y = 2$,

$7x - 3 \times 0 = 2$

$\Rightarrow 7x = 2$

$\Rightarrow x = \frac{2}{7}$

Similarly, putting $x = 0$ in $7x - 3y = 2$,

$y = -\frac{2}{3}$

6. (3) Putting $x = 2$ in the equation $2x + y = 6$,

$2 \times 2 + y = 6$

$\Rightarrow y = 6 - 4 = 2$

$\therefore$ Required point = (2, 2)

7. (3) Putting $x = 0$ in equation $2x + 3y = 0$, we get $y = 0$

Hence, this straight line passes through the origin.

8. (4)

Hence, the graph of the equation will be a line parallel to y – axis i.e. $x = k$.

9. (2) At y-axis, $x = 0$

$\therefore$ Putting $x = 0$ in $2x - 3y = 6$,

$0 - 3y = 6 \Rightarrow y = -2$

$\therefore$ Co-ordinates of point of intersection = (0, – 2)

10. (2) Putting $x = 9$ in the equation $25x + 75y = 225$,

$\Rightarrow 25 \times 9 + 75y = 225$

$\Rightarrow 75y = 225 - 225 = 0$

$\Rightarrow y = 0$

$\therefore$ Point of intersection = (9, 0)

11. (3)

$x = 0$ is the equation of y-axis.

$y = 0$ is the equation of x-axis.

Putting $x = 0$ in $x + y = 1$, $y = 1$

Putting $y = 0$ in $x + y = 1$, $x = 1$

Putting $x = 0$ in $2x + 3y = 6$

$3y = 6 \Rightarrow y = 2$

Putting $y = 0$ in $2x + 3y = 6$

$2x = 6 \Rightarrow x = 3$

$\therefore$ OB = 1; OA = 1

OD = 3; OC = 2

$\therefore$ Required area = $\Delta OCD - \Delta OAB$

$= \frac{1}{2} \times 3 \times 2 - \frac{1}{2} \times 1 \times 1$

$= 3 - \frac{1}{2} = 2\frac{1}{2}$ sq. units

12. (2) When a straight line cuts x-axis, the coordinates of point of intersection = $(x, 0)$, i.e., $y = 0$.

$\therefore$ Putting $y = 0$ in $4x - 5y = 20$

$4x = 20 \Rightarrow x = 5$

$\therefore$ Point of intersection = (5, 0)

[Note : Putting $y = 0$ in $4x - 5y = 20$, point of intersection on x-axis = (5, 0)

Putting $x = 0$ in $4x - 5y = 20$, point of intersection on y-axis = (0, –4).

Look at the graph of the equation:

13. (2) $2x + 1 = 0 \Rightarrow x = -\frac{1}{2}$

and $3y - 9 = 0 \Rightarrow y = 3$

$\therefore \left(\frac{-1}{2}, 3\right)$

14. (1) $ax + by + c = 0$

When $c = 0$,

$ax + by = 0$

$by = -ax \Rightarrow y = -\frac{a}{b}x$

When $x = 0$, $y = 0$ i.e. this line passes through the origin (0, 0).

15. (2) Check through options

$y = 4x$,

When, $x = 1$, $y = 4$

16. (1) $3x + 2y = 18$ ...(i)

$3y - 2x = 1$ ...(ii)

By equation (i) × 2 + (ii) × 3 gives,

$$\begin{array}{r} 6x + 4y = 36 \\ -6x + 9y = 3 \\ \hline 13y = 39 \end{array}$$

$\Rightarrow y = 3$

Putting $y = 3$ in (ii)

$3(3) - 2x = 1 \Rightarrow x = 4$

$\therefore (p, q) = (4, 3)$

and hence, $p + q = 7$

17. (3) On putting $y = -x$ in the equation $5y + 7x = 24$,

$-5x + 7x = 24$

$\Rightarrow 2x = 24 \Rightarrow x = 12$

& $y = -12$

$\therefore m = x = 12$, $n = y = -12$

$\Rightarrow m + n = 12 - 12 = 0$

18. (3)

x – axis $\Rightarrow y = 0$, putting in equation $3x + 4y = 12$

$3x = 12 \Rightarrow x = 4$

$\Rightarrow$ Co-ordinates of point of intersection on x-axis = (4, 0)

Putting $x = 0$ in the equation $3x + 4y = 12$

$4y = 12 \Rightarrow y = 3$

$\therefore$ Co-ordinates of point of intersection on y – axis = (0, 3)

$\therefore$ OA = 4

OB = 3

$\therefore$ Area of Δ OAB

$= \frac{1}{2} \times OA \times OB = \frac{1}{2} \times 4 \times 3$

= 6 sq. units

19. (3)

Equation of a straight line parallel to x-axis : $y = a$

Here, $a = -3$

$\therefore$ Equation is : $y = -3$

20. (2) Putting $y = 0$ in $4x + 3y = 12$, we get $x = 3$

Putting $x = 0$ in $4x + 3y = 12$, we get, $y = 4$

21. (1) Point of intersection = (a, b)

22. (4) $x = 4$, a straight line parallel to y – axis.

$y = 3$, a straight line parallel to x – axis.

Putting $x = 0$ in $3x + 4y = 12$,

$3 \times 0 + 4y = 12$,

$\Rightarrow 4y = 12 \Rightarrow y = \frac{12}{3} = 4$

$\therefore$ Point of intersection on y – axis = (0, 4)

Again, putting $y = 0$ in $3x + 4y = 12$,

$3x + 4 \times 0 = 12$

$\Rightarrow 3x = 12 \Rightarrow x = \frac{12}{3} = 4$

$\therefore$ Point of intersection on x - axis = (4, 0)

Area of □OACB = OA × OB
= 4 × 3 = 12 sq. units

Area of Δ OAB = $\frac{1}{2}$ × OA × OB

= $\frac{1}{2}$ × 4 × 3 = 6 sq. units

∴ Area of Δ ABC = 12 – 6
= 6 sq. units

23. (3) $3x + 4y = 10$ ---(i)
$-x + 2y = 0$
$\Rightarrow x = 2y$
∴ From equation (i),
$3 \times 2y + 4y = 10 \Rightarrow 10y = 10$

$\Rightarrow y = \frac{10}{10} = 1$

∴ $x = 2$
∴ $(a, b) = (2, 1)$
∴ $a + b = 2 + 1 = 3$

24. (1) On putting $x = 0$ in
$x + y = 2$,
$0 + y = 2 \Rightarrow y = 2$
∴ Point of intersection on y-axis = (0, 2)
Again, putting $y = 0$ in $x + y = 2$,
$x = 2$
∴ Point of intersection on x-axis = (2, 0)
$x - y = 0$ will pass through origin and be equally inclined to axes.

On putting $x = y$ in $x + y = 2$,
$2y = 2 \Rightarrow y = 1$
∴ CD = 1
OA = 2

Area of ΔOAC = $\frac{1}{2} \times$ OA × CD

= $\frac{1}{2} \times 2 \times 1$ = 1 sq. unit

25. (2) $2\left(x^2 + \frac{1}{x^2}\right) - \left(x - \frac{1}{x}\right) - 7 = 0$

$\Rightarrow 2\left\{\left(x - \frac{1}{x}\right)^2 + 2\right\} - \left(x - \frac{1}{x}\right) - 7 = 0$

$\Rightarrow 2\left(x - \frac{1}{x}\right)^2 + 4 - \left(x - \frac{1}{x}\right) - 7 = 0$

$\Rightarrow 2\left(x - \frac{1}{x}\right)^2 - \left(x - \frac{1}{x}\right) - 3 = 0$

If $x - \frac{1}{x} = y$, then

$2y^2 - y - 3 = 0$
$\Rightarrow 2y^2 - 3y + 2y - 3 = 0$
$\Rightarrow y(2y - 3) + 1(2y - 3) = 0$
$\Rightarrow (y + 1)(2y - 3) = 0$

$\Rightarrow y = -1$ or $\frac{3}{2}$

when $y = -1$

$\Rightarrow x - \frac{1}{x} = -1$

$\Rightarrow x^2 + x + = 0$
The value of x will not be real.
Again,

$x - \frac{1}{x} = \frac{3}{2}$

$\Rightarrow \frac{x^2 - 1}{x} = \frac{3}{2}$

$\Rightarrow 2x^2 - 2 = 3x$
$\Rightarrow 2x^2 - 3x - 2 = 0$
$\Rightarrow 2x^2 - 4x + x - 2 = 0$
$\Rightarrow 2x(x - 2) + 1(x - 2) = 0$
$\Rightarrow (2x + 1)(x - 2) = 0$

$\Rightarrow x = -\frac{1}{2}$ or 2

26. (2)

Putting $x = 0$ in $4x + 5y = 40$,
$4 \times 0 + 5y = 40 \Rightarrow 5y = 40$

$\Rightarrow y = \frac{40}{5} = 8$

∴ Point of intersection on y-axis = (0, 8)
Again, putting y
= 0 in $4x + 5y = 40$,
$4x + 5 \times 0 = 40 \Rightarrow 4x = 40$

$\Rightarrow x = \frac{40}{4} = 10$

∴ Point of intersection on x-axis = (10, 0)
OA = 10 units
OD = 5 units = EC
∴ DA = 10 – 5 = 5 units
Again, OB = 8 units
OE = 4 units
BE = 8 – 4 = 4 units
∴ Area of ΔADC

= $\frac{1}{2} \times$ DA × DC

= $\frac{1}{2} \times 5 \times 4$ = 10 sq. units

Area of ΔBEC = $\frac{1}{2} \times$ EC × BE

= $\frac{1}{2} \times 5 \times 4$ = 10 sq. units

∴ Required area = 10 + 10
= 20 sq. units.

27. (4) $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ will be coincident if

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\Rightarrow \frac{k}{3} = \frac{2}{1} = \frac{2}{1}$

$\Rightarrow k = 3 \times 2 = 6$

The system of equations has infinite solutions.

28. (3) On putting $x = 0$ in the equation $3x + 4y = 12$,

$4y = 12, \Rightarrow y = 3$

Again on putting $y = 0$,

$3x = 12 \Rightarrow x = 4$

x	0	4
y	3	0

Area of Δ ABC $= \frac{1}{2} \times AC \times BC$

$= \frac{1}{2} \times 3 \times 4 = 6$ square units

29. (3) Abscissa $= k$,

Ordinate $= 2k - 1$

According to the question,

$k = 2k - 1$

$\Rightarrow 2k - k = 1 \Rightarrow k = 1$

30. (2)

On putting $x = 0$ in the equation $3x + 4y = 24$,

$4y = 24 \Rightarrow y = \frac{24}{4} = 6$

$\therefore$ Co-ordinates of B = (0, 6)

Again, putting y = 0 in the equation $3x + 4y = 24$,

$3x = 24 \Rightarrow x = 8$

$\therefore$ Co-ordinates of A = (8,0)

Similarly, for $x + y = -4$

Co-ordinates of C = (–4, 0)

Co-ordinates of D = (0, –4)

$\therefore$ Area of Δ OAB

$= \frac{1}{2} \times OA \times OB$

$= \frac{1}{2} \times 8 \times 6 = 24$ sq. units

Area of Δ OCD

$= \frac{1}{2} \times OC \times OD$

$= \frac{1}{2} \times 4 \times 4 = 8$ sq. units

Clearly,

Δ OCD $\equiv \frac{1}{3}$ Δ OAB.

31. (4) Putting $y = 0$ in the equation $239x - 239y + 5 = 0$

$\Rightarrow x = \frac{-5}{239}$

$\therefore$ Co-ordinates of A

$= \left(\frac{-5}{239}, 0\right)$

Again putting $x = 0$ in the equation $239x - 239y + 5 = 0$,

$-239y = -5$

$\Rightarrow y = \frac{5}{239}$

$\therefore$ Co-ordinates of B

$= \left(0, \frac{5}{239}\right)$

$\therefore$ OA = OB $= \frac{5}{239}$

$\therefore$ $\angle OAB = \angle OBA = 45°$

because $\angle AOB = 90°$

32. (1)

Putting $x = 0$ in $3x + 4y = 12$

$3 \times 0 + 4y = 12$

$\Rightarrow y = \frac{12}{4} = 3$

$\therefore$ Point of intersection on y – axis = (0, 3)

Again, putting $y = 0$ in $3x + 4y = 12$

$3x + 4 \times 0 = 12$

$\Rightarrow 3x = 12 \Rightarrow x = 4$

$\therefore$ Point of intersection on x – axis = (4,0)

$\therefore$ OA = 4 and OB = 3

$\therefore$ AB $= \sqrt{OA^2 + OB^2}$

$= \sqrt{4^2 + 3^2} = \sqrt{16 + 9}$

$= \sqrt{25} = 5$ units

33. (3) For pair of equations,

$a_1x + b_1y + c_1 = 0$

$a_2x + b_2y + c_2 = 0$, there is no solution if $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\therefore \frac{2}{6} = \frac{-k}{-12}$

$\Rightarrow \frac{1}{3} = \frac{k}{12} \Rightarrow k = \frac{12}{3} = 4$

34. (1) Co-ordinates of origin = (0, 0).
These co-ordinates satisfy the equation $2x - 3y = 0$

35. (2) Vertices of parallel to piped = $v = 8$
Edges = $e = 12$
Surfaces = $f = 6$
$\therefore v - e + f = 8 - 12 + 6 = 2$

36. (3)

$x = 0 \Rightarrow$ Equation of y – axis
Putting $x = 0$ in $2x + 3y = 6$
$0 + 3y = 6 \Rightarrow y = 2$
$\therefore$ Co-ordinates of point of intersection on y – axis
= (0, 2)
Again, putting $y = 0$, $x = 3$
$\therefore$ Point of intersection on x– axis
= (3, 0)
In $x + y = 3$
Putting $x = 0$, $y = 3$
and on putting $y = 0$, $x = 3$
$\therefore$ Required area
= Δ OAC – Δ OAB

$$= \frac{1}{2} \times 3 \times 3 - \frac{1}{2} \times 3 \times 2$$

$$= \frac{9}{2} - \frac{6}{2} = \frac{3}{2}$$

$$= 1\frac{1}{2} \text{ sq. units}$$

37. (2) $5x + 9y = 5$
On cubing both sides,
$(5x)^3 + (9y)^3 + 3 \times 5x \times 9y\,(5x + 9y) = (5)^3$
$[\because (a + b)^3 = a^3 + b^3 + 3ab\,(a + b)]$
$\Rightarrow 125x^3 + 729y^3 + 135xy \times 5 = 125$
$\Rightarrow 120 + 135 \times 5xy = 125$
$\Rightarrow 135 \times 5xy = 125 - 120 = 5$

$$\Rightarrow xy = \frac{5}{135 \times 5} = \frac{1}{135}$$

38. (1)

39. (1) $y = 3x$, passes through the origin (0, 0).

40. (4) Solution of $2x + 3y = k$
= (2, 0)
$\therefore 2 \times 2 + 3 \times 0 = k$
$\Rightarrow k = 4$

41.(2)

Point (1, 1) satisfies the equation $y = x$.

42. (2)

Putting $y = 0$ in $9x + 4y = 36$
$9x = 36 \Rightarrow x = 4$
$\therefore$ Co-ordinates of point A
= (4, 0)
i.e OA = 4 units
Putting $x = 0$ in $9x + 4y = 36$
$4y = 36 \Rightarrow y = 9$
$\therefore$ Co-ordinates of point B
= (0, 9)
i.e. OB = 9 units
$\therefore$ Area of Δ OAB

$$= \frac{1}{2} \times OA \times OB$$

43. (2)

Slope = tan XAB
$\because 90° < \angle XAB < 180°$
$\therefore$ The slope will be negative because $\tan\theta$ is negative in second quadrant.

$$= \frac{1}{2} \times 4 \times 9 = 18 \text{ sq. unit}$$

44. (2)

$(x_1, y_1) = 0, 0$, $(x_2, y_2) = (3, 4)$, $(x_3, y_3) = (4, 3)$
Area of Δ OAB

$$= \left|\frac{x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)}{2}\right|$$

$$= \left|\frac{0(4-3) + 3(3-0) + 4(0-4)}{2}\right|$$

$$= \left|\frac{9-16}{2}\right| = \frac{7}{2} \text{ sq. units}$$

45. (3)

Clearly, OA = 5 units

OB = 8 units

$\therefore$ Area of ΔOAB

$= \frac{1}{2} \times OA \times OB$

$= \frac{1}{2} \times 5 \times 8 = 20$ sq. units

46. (1)

Slope of straight line

$= m = \tan\theta = \tan 45° = 1$

Intercept on Y–axis $= c = \frac{-3}{4}$

$\therefore$ The required equation is :

$y = mx + c$

$\Rightarrow y = 1.x - \frac{3}{4}$

$\Rightarrow 4y = 4x - 3$

$\Rightarrow 4x - 4y = 3$

47. (2)

Let point T divide line segment SU in the ratio $k : 1$.

If the co-ordinates of point T be (x, y) and that of points S an U be (x_1, y_1) and (x_2, y_2) respectively, then

$x = \frac{kx_2 + x_1}{k+1}$; $y = \frac{ky_2 + y_1}{k+1}$

$\therefore 3 = \frac{k \times 1 + 1 \times 4}{k+1}$

$\Rightarrow 3k + 3 = k + 4$

$\Rightarrow 3k - k = 4 - 3 \Rightarrow 2k = 1$

$\Rightarrow k = \frac{1}{2} = 1 : 2$

48. (2)

The diagonals of a rhombus bisect each other at right angles.

$\therefore$ Co-ordinates of point 'O'

$= \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

$= \left(\frac{4-2}{2}, \frac{2+0}{2}\right) = (1, 1)$

Slope of straight line PR

$= \frac{y_2 - y_1}{x_2 - x_1} = \frac{0-2}{-2-4}$

$= \frac{-2}{-6} = \frac{1}{3}$

$\because$ PR $\perp$ QS

$\therefore$ Slope of QS $= -\frac{1}{\frac{1}{3}} = -3$

$[\because m_1 m_2 = -1]$

$\therefore$ Equation of straight line QS passing through point (1, 1) :

$y - 1 = -3(x - 1)$

$\Rightarrow y - 1 = -3x + 3$

$\Rightarrow 3x + y = 4$

49. (1)

Co-ordinates of the mid-point of line segment

$= \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

$\therefore \frac{11 + x}{2} = 2 \Rightarrow 11 + x = 4$

$\Rightarrow x = 4 - 11 = -7$

and $\frac{5 + y}{2} = 1$

$\Rightarrow y + 5 = 2$

$\Rightarrow y = 2 - 5 = -3$

$\therefore$ Co-ordinates of B $\Rightarrow$ (–7, –(3)

TYPE-IV

1. (1) $\frac{a}{b} = \frac{2}{3} = \frac{8}{12}$

$\frac{b}{c} = \frac{4}{5} = \frac{12}{15}$ [Making B equal]

$\therefore$ Required ratio

$= \frac{8+12}{12+15} = \frac{20}{27}$

2. (2) a : b = 2 : 3

b : c = 4 : 5

or a : b = 8 : 12

b : c = 12 : 15

$\therefore$ a : b : c = 8 : 12 : 15

$\therefore a^2 : b^2 : bc$

$= 8^2 : 12^2 : 15 \times 12$

= 64 : 144 : 180

= 16 : 36 : 45

3. (3) $A : B = \frac{1}{2} : \frac{3}{8}$

$= \frac{8}{2} : \frac{8 \times 3}{8} = 4 : 3$

$B : C = \frac{1}{3} : \frac{5}{9}$

$= \frac{9}{3} : \frac{9 \times 5}{9} = 3 : 5$

$C : D = \frac{5}{6} : \frac{3}{4}$

$= \frac{5 \times 6}{6} : \frac{3 \times 6}{4} = 5 : \frac{9}{2}$

$\therefore A : B : C : D = 4 : 3 : 5 : \frac{9}{2}$

= 8 : 6 : 10 : 9

4. (3) Here $\frac{x}{y} = \frac{3}{2}$

$\therefore \frac{x^2}{y^2} = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$

Now, $\frac{2x^2 + 3y^2}{3x^2 - 2y^2} = \frac{2\left(\frac{x^2}{y^2}\right) + 3}{3\left(\frac{x^2}{y^2}\right) - 2}$

[On dividing N^r and D^r by y^2]

$$= \frac{\left(2\times\frac{9}{4}\right)+3}{\left(3\times\frac{9}{4}\right)-2} = \frac{\frac{9}{2}+3}{\frac{27}{4}-2}$$

$$= \frac{\frac{9+6}{2}}{\frac{27-8}{4}} = \frac{15}{2}\times\frac{4}{19}$$

$$= \frac{30}{19} = 30:19$$

5. (3) A : B : C = 2 : 3 : 4

$$\therefore \frac{A}{B}=\frac{2}{3}, \frac{B}{C}=\frac{3}{4}, \frac{C}{A}=\frac{4}{2}$$

Now,

$$\frac{A}{B}:\frac{B}{C}:\frac{C}{A}=\frac{2}{3}:\frac{3}{4}:\frac{4}{2}$$

$$=\frac{2}{3}:\frac{3}{4}:\frac{2}{1}$$

$$=\frac{2}{3}\times 12:\frac{3}{4}\times 12:2\times 12$$

$\because$ [LCM of 3, 4, 1 = 12]

= 8 : 9 : 24

6. (4) C : D = 5 : 6

$\Rightarrow$ D : C = 6 : 5,

C : B = 4 : 3 and B : A = 2 : 1

$\therefore$ D : C : B : A

= 6 × 4 × 2 : 5 × 4 × 2 : 5 × 3 × 2 : 5 × 3 × 1

= 48 : 40 : 30 : 15

7. (3) $\frac{2a-5b}{3a+6b}=\frac{4}{7}$

$\Rightarrow 14a - 35b = 12a + 24b$

$\Rightarrow 2a = 59b$

$$\Rightarrow \frac{a}{b}=\frac{59}{2} = 59:2$$

8. (1) a : b = 7 : 9

b : c = 3 : 5 = 9 : 15

$\therefore$ a : b : c = 7 : 9 : 15

9. (1) $\frac{x}{y}=\frac{7}{3}$ (Given)

Now,

$$\frac{xy+y^2}{x^2-y^2}=\frac{y(x+y)}{(x+y)(x-y)}$$

$$=\frac{y}{x-y}=\frac{1}{\frac{x}{y}-1}=\frac{1}{\frac{7}{3}-1}=\frac{1}{\frac{7-3}{3}}=\frac{3}{4}$$

10. (4) $\frac{3a+5b}{3a-5b}=\frac{5}{1}$

By componendo and dividendo,

$$\frac{3a+5b+3a-5b}{3a+5b-3a+5b}=\frac{5+1}{5-1}$$

$$\Rightarrow \frac{6a}{10b}=\frac{6}{4} \Rightarrow \frac{a}{b}=\frac{6}{4}\times\frac{10}{6}=\frac{5}{2}$$

$\Rightarrow 5 : 2 = a : b$

11. (2) $\frac{p}{q}=\frac{r}{s}=\frac{t}{u}=\frac{2}{3}$

$$\Rightarrow \frac{p}{2}=\frac{q}{3}=k$$

$\Rightarrow p = 2k,\ q = 3k$

Similarly, $r = 2k,\ s = 3k,$

$t = 2k,\ u = 3k$

Now, $\frac{mp+nr+ot}{mq+ns+ou}$

$$=\frac{m.2k+n.2k+o.2k}{m.3k+n.3k+o.3k}$$

$$=\frac{2k(m+n+o)}{3k(m+n+o)}=\frac{2}{3} \text{ or } 2:3$$

12. (3) $\frac{x}{y}=\frac{3}{4} \Rightarrow \frac{7x}{3y}=\frac{7}{3}\times\frac{3}{4}=\frac{7}{4}$

By componendo and dividendo,

$$\frac{7x+3y}{7x-3y}=\frac{7+4}{7-4}=\frac{11}{3} \text{ or } 11:3$$

13. (3) $\frac{a}{y-z}=\frac{b}{z-x}=\frac{c}{x-y}=k$

$\Rightarrow a = k(y-z);\ b = k(z-x);$

$c = k(x-y)$

$\therefore ax + by + cz = k(xy - xz + yz - xy + xz - yz) = 0$

14. (2) $\frac{50}{100}(p-q)=\frac{30}{100}(p+q)$

$\Rightarrow 5(p-q) = 3(p+q)$

$\Rightarrow 5p - 5q = 3p + 3q$

$\Rightarrow 2p = 8q$

$\Rightarrow p = 4q$

$\therefore p : q = 4 : 1$

15. (3) $\frac{x}{y}=2 \Rightarrow x = 2y$

$\Rightarrow x - 2y = 0$ ...(i)

$\therefore 5x^2 - 13xy + 6y^2$

$= 5x^2 - 10xy - 3xy + 6y^2$

$= 5x(x-2y) - 3y(x-2y)$

$= (x-2y)(5x-3y)$

$= 0 \times (5x-3y) = 0$ [Using (i)]

16. (1) $y : x = 4 : 15$

$\Rightarrow x : y = 15 : 4$

By componendo and dividendo,

$$\frac{x-y}{x+y}=\frac{15-4}{15+4}=\frac{11}{19}$$

17. (3) $\frac{x}{y}=\frac{3}{4}$ (Given)

$$\therefore \frac{5x-2y}{7x+2y}=\frac{5\frac{x}{y}-2}{7\frac{x}{y}+2}$$

$$=\frac{5\times\frac{3}{4}-2}{7\times\frac{3}{4}+2}=\frac{\frac{15-8}{4}}{\frac{21+8}{4}}=\frac{7}{29}$$

18. (3) $x^2 + 9y^2 = 6xy$

$\Rightarrow x^2 - 6xy + 9y^2 = 0$

$\Rightarrow x^2 - 2.x.3y + (3y)^2 = 0$

$\Rightarrow (x-3y)^2 = 0$

$\Rightarrow x - 3y = 0$

$\Rightarrow x = 3y$

$\Rightarrow x : y = 3 : 1$

19. (1) $(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

$\Rightarrow (4\sqrt{3})^2 = 16 + 2(ab + bc + ca)$

$\Rightarrow 48 = 16 + 2(ab + bc + ca)$

$\Rightarrow 2(ab + bc + ca) = 48 - 16 = 32$

$\Rightarrow ab + bc + ca = 16$

$$\therefore a = b = c = \frac{4\sqrt{3}}{3} = \frac{4}{\sqrt{3}}$$

$\therefore a : b : c = 1 : 1 : 1$

20. (2) $\frac{3x}{2y}=\frac{21}{22}$

$$\Rightarrow \frac{x}{y}=\frac{21}{22}\times\frac{2}{3}=\frac{7}{11}$$

$\Rightarrow \frac{x}{7} = \frac{y}{11} = k$

$\therefore 4x + 5y = 83$

$\Rightarrow 4 \times 7k + 5 \times 11k = 83$

$\Rightarrow 28k + 55k = 83$

$\Rightarrow 83k = 83 \Rightarrow k = 1$

$\therefore x = 7, y = 11$

$\therefore y - x = 11 - 7 = 4$

21. (4) $\frac{x}{xa + yb + zc} = \frac{y}{ya + zb + xc}$

$= \frac{z}{za + xb + yc}$

$= \frac{x + y + z}{xa + yb + zc + ya + zb + xc + za + xb + yc}$

$= \frac{x + y + z}{xa + ya + za + yb + ya + yc + zc + zb + za}$

$= \frac{x + y + z}{a(x + y + z) + b(x + y + z) + c(x + y + z)}$

$= \frac{x + y + z}{(a + b + c)(x + y + z)}$

$= \frac{1}{a + b + c}$

22. (1) $\frac{x}{y} = \frac{3}{2}$

By componendo and dividend,

$\frac{x + y}{x - y} = \frac{3 + 2}{3 - 2}$

$\Rightarrow \frac{x + y}{x - y} = \frac{5}{1} = 5 : 1$

23. (2) $a^2 + b^2 + c^2 - ab - bc - ca = 0$

$\Rightarrow 2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca = 0$

$\Rightarrow (a^2 + b^2 - 2ab) + (b^2 + c^2 - 2bc) + (c^2 + a^2 - 2ca) = 0$

$\Rightarrow (a - b)^2 + (b - c)^2 + (c - a)^2 = 0$

[If $x^2 + y^2 + z^2 = 0$ then, $x = 0$, $y = 0$, $z = 0$]

$\therefore a - b = 0 \Rightarrow a = b$

$b - c = 0 \Rightarrow b = c$

$c - a = 0 \Rightarrow c = a$

$\therefore a = b = c$

$\therefore a : b : c = 1 : 1 : 1$

24. (3) $a^2 + 13b^2 + c^2 - 4ab - 6bc = 0$

$\Rightarrow a^2 - 4ab + 4b^2 + 9b^2 + c^2 - 6bc = 0$

$\Rightarrow a^2 - 4ab + 4b^2 + c^2 - 6bc + 9b^2 = 0$

$\Rightarrow (a - 2b)^2 + (c - 3b)^2 = 0$

$\Rightarrow a - 2b = 0$ and $c - 3b = 0$

$\Rightarrow a = 2b$ and $c = 3b$

$\Rightarrow \frac{a}{b} = \frac{2}{1}$ and $\frac{b}{c} = \frac{1}{3}$

$\therefore a : b : c = 2 : 1 : 3$

25. (2) If $a^2 + b^2 = 0$

$\Rightarrow a = 0$ and $b = 0$

$\therefore (2x - y)^2 + (3y - 2z)^2 = 0$

$\therefore 2x - y = 0 \Rightarrow 2x = y$

$\Rightarrow x : y = 1 : 2$

and, $3y - 2z = 0 \Rightarrow 3y = 2z$

$\Rightarrow y : z = 2 : 3$

$\therefore x : y : z = 1 : 2 : 3$

TYPE-V

1. (3) Required number of ways = $5P_3 = 5 \times 4 \times 3 = 60$

2. (4) The unit's place will be occupied by 2 or 6 in three digit even numbers.

The remaining two places can be occupied by selecting from remaining four digits in ${}^4P_2$ ways

$${}^4P_2 = \frac{4!}{(4-2)!} = \frac{4 \times 3 \times 2}{2} = 12$$

$\therefore$ Total number of even three digit numbers $= 2 \times 12 = 24$

Total ways = $3 \times 4 \times 2 = 24$ ways.

{$\because$ Total available digits are 1, 2, 5, 6, 9.

Even digits = 2 and 6.

$\Rightarrow$ A can either be filled by 2 or 6 i.e. 2 ways.

B can either be filled by 4 ways [$\because$ Total – digit used at A i.e. 5 – 1]}

and C can either be filled by 3 ways [Total – digit used at A – digit used at B i.e. 5 – 1 – 1]

3. (1) It is to be noted that when two persons shake hands it is counted as one hand shake not two. So this is a problem on combination. The total number of hand shakes is

= The number of ways of selecting 2 persons out of 10 persons

$= 10_{C_2} = \frac{10 \times 9}{1 \times 2} = 45$

4. (3) When 3 lies at hundreds place

$\therefore$Total integers = $10 \times 9 = 90$

When 3 lies at units place

Total integers = 10

When 3 lies at unit's and hundred's place

Total integers = 10

$\therefore$Total integers

= 90 + 10 +10 = 110

TYPE-VI

1. (3) $\left[-\frac{1}{4}\right] + \left[4\frac{1}{4}\right] + [3]$

$= -1 + 4 + 3 = 6$

2. (3) $a \oplus b = 2a$ if $a > b$

$= a + b$ if $a < b$

$= a^2$ if $a = b$

$\therefore \frac{(5 \oplus 7) + (4 \oplus 4)}{3(5 \oplus 5) - (15 \oplus 11) - 3}$

$= \frac{(5 + 7) + 4^2}{3 \times 5^2 - 2 \times 15 - 3}$

$= \frac{12 + 16}{75 - 30 - 3} = \frac{28}{42} = \frac{2}{3}$

3. (3) Given $a \circledast b = a + b$ when a > 0, $b > 0$

a $\circledast$ b = $\sqrt{a^2+b^2}$; for other values of a and b

Expression,

$$= \frac{8 \circledast (7-13) - (3 \circledast 1)}{(3-6) \circledast (9-5)}$$

$$= \frac{8 \circledast (-6) - (3+1)}{(-3) \circledast (-4)}$$

$$= \frac{\sqrt{(8)^2+(-6)^2} - 4}{\sqrt{(-3)^2+(-4)^2}}$$

$$= \frac{\sqrt{64+36} - 4}{\sqrt{9+16}}$$

$$= \frac{\sqrt{100} - 4}{\sqrt{25}} = \frac{10-4}{5} = \frac{6}{5}$$

4. (2) $(a - b)^2 = a^2 - 2ab + b^2$

$x^4 - 2x^2 + k = (x^2)^2 - 2.x^2.1 + k$

$\therefore\ k = (1)^2 = 1$

5. (3) $x = \sqrt[3]{a+\sqrt{a^2+b^3}} + \sqrt[3]{a-\sqrt{a^2+b^3}}$

Cubing both sides,

$$x^3 = \left(\sqrt[3]{a+\sqrt{a^2+b^3}}\right)^3 + \left(\sqrt[3]{a-\sqrt{a^2+b^3}}\right)^3$$

$$+ 3\left(\sqrt[3]{a+\sqrt{a^2+b^3}}\right)\left(\sqrt[3]{a-\sqrt{a^2+b^3}}\right)\left(\sqrt[3]{a+\sqrt{a^2+b^3}} + \sqrt[3]{a-\sqrt{a^2+b^3}}\right)$$

$$= a+\sqrt{a^2+b^3} + a-\sqrt{a^2+b^3} + 3\left(\frac{a+\sqrt{a^2+b^3}}{a-\sqrt{a^2+b^3}} \times \right)^{\frac{1}{3}} x$$

$$= 2a + 3\left(a^2 - a^2 - b^3\right)^{\frac{1}{3}} x$$

$= 2a + (-3bx)$

$\therefore\ x^3 + 3bx = 2a$

6. (3) Let $\frac{1}{3} = a, \frac{1}{4} = b$ and $\frac{1}{5} = c$

$\therefore$ Expression

$$= \frac{a^3+b^3+c^3-3abc}{a^2+b^2+c^2-ab-ac-bc}$$

$$= \frac{(a+b+c)(a^2+b^2+c^2-ab-ac-bc)}{a^2+b^2+c^2-ab-ac-bc} = a+b+c$$

$$= \frac{1}{3}+\frac{1}{4}+\frac{1}{5} = \frac{20+15+12}{60} = \frac{47}{60}$$

7. (4) $x^m \times x^n = 1$

$\Rightarrow x^{m+n} = x^0$

$\Rightarrow m + n = 0$

$\Rightarrow m = -n$

8. (2) $(a + b)^2 = a^2 + 2ab + b^2$

$\therefore\ 4x^2 + 8x + 4 = (2x)^2 + 2 \times 2x \times 2 + (2)^2 = (2x + 2)^2$

$\therefore$ Required number = 4

9. (2) $x + \frac{1}{x} = 2N$

$\therefore$ Mean of x^2 and $\frac{1}{x^2}$

$$= \frac{x^2+\frac{1}{x^2}}{2}$$

$$= \frac{\left(x+\frac{1}{x}\right)^2 - 2}{2} = \frac{(2N)^2-2}{2}$$

$$= \frac{4N^2-2}{2} = 2N^2 - 1$$

10. (4) $3a^2 + 3b^2 + 3c^2 = (a + b + c)^2$

$\Rightarrow 3a^2 + 3b^2 + 3c^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ac$

$\Rightarrow 3a^2 + 3b^2 + 3c^2 - a^2 - b^2 - c^2 - 2ab - 2bc - 2ac = 0$

$\Rightarrow 2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ac = 0$

$\Rightarrow a^2 + b^2 - 2ab + b^2 + c^2 - 2bc + a^2 + c^2 - 2ac = 0$

$\Rightarrow (a - b)^2 + (b - c)^2 + (c - a)^2 = 0$

$\Rightarrow a - b = 0 \Rightarrow a = b$

$b - c = 0 \Rightarrow b = c$

$c - a = 0 \Rightarrow c = a$

$\therefore\ a = b = c$

11. (4) 15! = 15 × 14 × 13 × 12 × 11 × 10 × 9 × 8 × 7 × 6 × 5 × 4 × 3 × 2 × 1

Number of 5's = 3

Number of 2's = More than 3

$\therefore$ Number of zeroes in the product = 3

$\therefore$ Unit's digit in $\frac{15!}{100} = 0$

12. (3) Let three numbers in A.P. be $a - d$, a and $a + d$ respectively.

According to the question,

$a - d + a + a + d = 30$

$\Rightarrow 3a = 30 \Rightarrow a = \frac{30}{3} = 10$

Again, $a(a - d)(a + d) = 910$

$\Rightarrow 10(10 - d)(10 + d) = 910$

$\Rightarrow 100 - d^2 = 91$

$\Rightarrow d^2 = 100 - 91 = 9$

$\Rightarrow d = \sqrt{9} = 3$

$\therefore$ Largest number = $a + d$ = 10 + 3 = 13

13. (2) $U_n = \frac{1}{n} - \frac{1}{n+1}$

$\therefore\ U_1 = \frac{1}{1} - \frac{1}{2}$

$U_2 = \frac{1}{2} - \frac{1}{3}$

$U_3 = \frac{1}{3} - \frac{1}{4}$

$U_4 = \frac{1}{4} - \frac{1}{5}$

$U_5 = \frac{1}{5} - \frac{1}{6}$

$\therefore\ U_1 + U_2 + U_3 + U_4 + U_5$

$$= 1 - \frac{1}{2} + \frac{1}{2} - \frac{1}{3} + \frac{1}{3} - \frac{1}{4} + \frac{1}{4} - \frac{1}{4} + \frac{1}{5} - \frac{1}{6}$$

$$= 1 - \frac{1}{6} = \frac{6-1}{6} = \frac{5}{6}$$

❑❑❑

TEST YOURSELF

1. If $x^2 - 3x + 1 = 0$, find the value of $x^3 + \frac{1}{x^3}$.

(1) 18 (2) 16

(3) 27 (4) 23

2. If $a^2 + b^2 + c^2 = 2(2a - 3b - 5c) - 38$, find the value of $(a - b - c)$.

(1) 9 (2) 10

(3) 11 (4) 12

3. If $a + b + c = 0$, then

$$\frac{2a^2}{b^2+c^2-a^2} + \frac{2b^2}{c^2+a^2-b^2} + \frac{2c^2}{a^2+b^2-c^2} + 3 = ?$$

(1) 3 (2) – 4

(3) 0 (4) – 3

4. What are the factors of the following expression ?

$$a^2 + \frac{1}{a^2} - 13a + \frac{13}{a} + 34 :$$

(1) $\left(a - \frac{1}{a} + 4\right)\left(a - \frac{1}{a} - 9\right)$

(2) $\left(a - \frac{1}{a} - 4\right)\left(a - \frac{1}{a} + 9\right)$

(3) $\left(a + \frac{1}{a} - 4\right)\left(a - \frac{1}{a} + 9\right)$

(4) $\left(a + \frac{1}{a} - 4\right)\left(a + \frac{1}{a} + 9\right)$

5. If $2x - \frac{1}{3x} = 5$, find the value of $\left(27x^3 - \frac{1}{8x^3}\right)$.

(1) $\frac{3645}{8}$ (2) $\frac{3465}{8}$

(3) $\frac{3645}{4}$ (4) 459

6. Resolve into factors :

$(x - 1)(x + 1)(x + 3)(x + 5) + 7$

(1) $(x + 2 + \sqrt{2})(x + 2 - \sqrt{2})$
$(x + 2 + 2\sqrt{2})(x + 2 - 2\sqrt{2})$

(2) $(x - 2 + \sqrt{2})(x - 2 - \sqrt{2})$
$(x + 2 + 2\sqrt{2})(x + 2 - 2\sqrt{2})$

(3) $(x - 2 - \sqrt{2})(x + 2 + \sqrt{2})$
$(x - 2 - 2\sqrt{2})(x - 2 - 2\sqrt{2})$

(4) None of these

7. If $a + b + c = 0$, then

$$\frac{bc}{bc - a^2} + \frac{ca}{ca - b^2} + \frac{ab}{ab - c^2} = ?$$

(1) 1 (2) –1

(3) 0 (4) 2

8. If $a = 2 + \sqrt{3}$, find the value of $\frac{a^3}{a^6 + 3a^3 + 1}$.

(1) 55 (2) $\frac{1}{55}$

(3) $\frac{1}{40}$ (4) $\frac{3}{55}$

9. p and q are positive numbers satisfying $3p + 2pq = 4$ and $5q + pq = 3$. Find the value of p.

(1) 1 or $-\frac{9}{5}$ (2) $\frac{1}{2}$ or $-\frac{20}{3}$

(3) 1 or $-\frac{20}{3}$ (4) $\frac{1}{2}$ or $-\frac{9}{5}$

10. If $a + b + c = 5$, $ab + bc + ca = 7$ and $abc = 3$, find the value of

$$\left(\frac{a}{b} + \frac{b}{a}\right) + \left(\frac{b}{c} + \frac{c}{b}\right) + \left(\frac{c}{a} + \frac{a}{c}\right)$$

(1) $8\frac{2}{3}$ (2) $7\frac{2}{3}$

(3) $9\frac{2}{3}$ (4) $8\frac{1}{3}$

11. If $\frac{a}{b+c} + \frac{b}{c+a} + \frac{c}{a+b} = 1$ then

$$\frac{a^2}{b+c} + \frac{b^2}{c+a} + \frac{c^2}{a+b} = ?$$

(1) 1 (2) –1

(3) 0 (4) 2

12. If $a = 7 + 4\sqrt{3}$, find the value of

$$\frac{3a^6 + 2a^4 + 4a^3 + 2a^2 + 3}{a^4 + a^3 + a^2}.$$

(1) $\frac{8138}{17}$ (2) $\frac{8138}{15}$

(3) $\frac{8238}{15}$ (4) $\frac{8338}{15}$

13. If $x \frac{x - bc}{b + c} + \frac{x - ca}{c + a} + \frac{x - ab}{a + b}$ $= a + b + c$ what is the value of x?

(1) ab (2) $ab + bc$

(3) $bc + ca$ (4) $ab + bc + ca$

14. If $x^4 + \frac{1}{x^4} = 47$, what will be the value of $x^3 + \frac{1}{x^3}$?

(1) 18 (2) 17

(3) 19 (4) 20

15. If $x = \frac{1}{2 - \sqrt{3}}$, what will be the value of $x^3 - 2x^2 - 7x + 5$?

(1) 0 (2) 2

(3) 3 (4) 4

16. If $\frac{5 + 2\sqrt{3}}{7 + 4\sqrt{3}} = a + b\sqrt{3}$, the values of a and b respectively are :

(1) $a = -11$, $b = 6$

(2) $a = 11$, $b = -6$

(3) $a = 6$, $b = 11$

(4) $a = -6$, $b = -11$

17. If $\frac{1}{a + b + x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$; $a + b \neq 0$, then $x = ?$

(1) $x = -a$ (2) $x = -b$

(3) $x = -a$ or $-b$ (4) $x = a$ or b

18. For what value of 'a', the polynomial $2x^3 + ax^2 + 11x + a + 3$, is exactly divisible by $(2x - 1)$?

(1) 7 (2) –7

(3) 5 (4) –5

19. If $a + b + c = 15$ and $a^2 + b^2 + c^2 = 83$, then $a^3 + b^3 + c^3 - 3abc = ?$
(1) 160 (2) 175
(3) 180 (4) 100

20. What will be the value of $(x - a)^3 + (x - b)^3 + (x - c)^3 - 3(x - a)(x - b)(x - c)$ if $a + b + c = 3x$?
(1) 1 (2) 3
(3) 0 (4) 5

21. If $p = 2 - a$, then $a^3 + 6ap + p^3 - 8 = ?$
(1) 0 (2) 8
(3) 6 (4) 5

22. If $4x^2 + 4y^2 + 4z^2 = 12x + 12y - 18$ then $x + y + z = ?$
(1) 3 (2) 4
(3) $\frac{3}{2}$ (4) 2

23. For what value of k, the system of equations
$5x + 2y = k$
$10x + 4y = 3$ has infinite solutions ?
(1) $\frac{3}{2}$ (2) $\frac{1}{2}$
(3) $\frac{5}{2}$ (4) 2

24. ₹120 is divided between x, y and z, so that x's share is ₹20 more than y's and ₹20 less than z's. What is y's share?
(1) ₹25 (2) ₹20
(3) ₹30 (4) None of these

25. The value of x, if the slope of the line joining $(-8, 11)$, $(2, x)$ is $\left(\frac{-4}{3}\right)$ will be
(1) $\frac{-7}{3}$ (2) $\frac{7}{3}$
(3) $\frac{1}{3}$ (4) $\frac{5}{3}$

26. Find the equation of the line which passes through the point (2, 2) and makes an angle of 45° with x-axis ?
(1) $x + y = 2$ (2) $x - y = 0$
(3) $2x + y = 3$ (4) $x - 2y = 4$

27. If the vertices of a quadrilateral are A(– 2, 6), B(1, 2), C(10, 4) and D(7, 8). Then the equation of diagonal AC will be ?
(1) $x + 6y = 34$
(2) $x - 6y = 34$
(3) $x + 2y = 1$
(4) $x - y = 13$

28. What is the slope between the lines $y - \sqrt{3}x - 5 = 0$ and $\sqrt{3}y - x + 6 = 0$
(1) 1 (2) $\frac{1}{\sqrt{3}}$
(3) $\frac{2}{\sqrt{3}}$ (4) $\sqrt{3}$

29. The distance of the point (3, – 1) from the line $12x - 5y - 7 = 0$ will be ?
(1) $\frac{1}{13}$ units (2) $\frac{43}{13}$ units
(3) $\frac{34}{13}$ units (4) $\frac{1}{5}$ units

30. What is the equation of a line, which passes through the points (–1, 1) and (2, –4).
(1) $5x + 3y + 2 = 0$
(2) $-5x + 3y + 4 = 0$
(3) $3x + 5y + 6 = 0$
(4) $5x + 3y + 3 = 0$

31. What is the equation of line which has y-intercept 2 and is inclined at 60° to the x-axis. (1)
$y = -\sqrt{3}x + 2$
(2) $y = x - \sqrt{3}$
(3) $y = x + 2\sqrt{3}$
(4) $y = \sqrt{3}x + 2$

32. What will be the point on the x-axis, which is eduidistant from the points (7, 6) and (–3, 4)
(1) (6, 0) (2) (–2, 0)
(3) (4, 0) (4) (3, 0)

33. Equation of a line is taken as $3x - 4y + 5 = 0$. Its slope and intercept on y-axis
(1) $\left(\frac{3}{4}, \frac{-5}{4}\right)$ (2) $\left(\frac{-3}{4}, \frac{-5}{4}\right)$
(3) $\left(\frac{3}{4}, \frac{5}{4}\right)$ (4) $\left(\frac{5}{4}, \frac{3}{4}\right)$

34. Equation of line $\sqrt{3}x + y - 8 = 0$ can be represented in normal form as
(1) $\frac{\sqrt{3}x}{2} + \frac{y}{2} - \frac{8}{2} = 0$
(2) $\sqrt{3}x + y - 4 = 0$
(3) $\sqrt{3}x - y - 8 = 0$
(4) $\frac{\sqrt{3}x}{2} - \frac{y}{2} - \frac{8}{2} = 0$

35. What will be the angle between the lines $y - x - 7 = 0$ and $\sqrt{3}y - x + 6 = 0$?
(1) $\theta = \tan^{-1}\left(2 + \sqrt{3}\right)$
(2) $\theta = \tan^{-1}\left(2 - \sqrt{3}\right)$
(3) $\theta = \tan^{-1}\left(1 + \sqrt{3}\right)$
(4) $\theta = \tan^{-1}\left(1 - \sqrt{3}\right)$

36. Equation of line $3x + 2y - 5 = 0$ can be written in intercept form as
(1) $\frac{x}{\frac{5}{3}} + \frac{y}{\frac{5}{2}} = 1$ (2) $\frac{x}{5} + \frac{y}{3} = 1$
(3) $\frac{x}{2} + \frac{y}{5} = 1$ (4) $\frac{x}{\frac{5}{3}} - \frac{y}{\frac{5}{2}} = 1$

37. What is the distance between the parllel lines $15x + 8y - 34 = 0$ and $15x + 8y + 31 = 0$?
(1) 2 units (2) 5 units
(3) 6 units (4) $\frac{65}{17}$ units

38. Find the ratio in which the line segment joining the points (1, 2) and (4, 6) is divided by point (2, 0).
(1) 1 : 2 (2) 2 : 1
(3) 1 : 4 (4) 2 : 3

39. What is the distance of the point (2, 3) from the line $2x + 3y + 4 = 0$?
(1) $\frac{15}{\sqrt{13}}$ (2) $\frac{16}{\sqrt{13}}$
(3) $\frac{17}{\sqrt{13}}$ (4) $\frac{8}{\sqrt{13}}$

40. In what ratio, the line joining (–1, 1) and (5, 7) is divided by the line $x + y = 4$?
(1) 2 : 1 (2) 1 : 3
(3) 1 : 2 (4) 1 : 4

41. For what value of x the points $(x, -1)$, $(2, 1)$ and $(4, 5)$ are collinear ?
(1) $x = 2$ (2) $x = -1$
(3) $x = 4$ (4) $x = 1$

42. What is the equation of line, which makes intercepts –5 and 2 on the x and y-axis respectively
(1) $2x - 5y = 10$
(2) $-2x + 5y = -10$
(3) $2x - 5y = -10$
(4) $5x - 2y = 10$

43. For what value of k, the following pair of lines $-kx + 2y + 3 = 0$ and $2x + 4y + 7 = 0$ are perpendicular ?
(1) $k = 2$ (2) $k = 4$
(3) $k = -1$ (4) $k = 3$

44. What will be the equation of line which passes through the point (–2, 3) and parallel to any other line $3x - 4y + 2 = 0$
(1) $3x - 4y + 18 = 0$
(2) $-3x + 4y + 12 = 0$
(3) $x - 3y + 10 = 0$
(4) $2x + 3y + 6 = 0$

45. What will be the equation of a line passing through the point (–4, 3) and having slope $\frac{1}{2}$?
(1) $x - 2y + 5 = 0$
(2) $-x + 2y + 10 = 0$
(3) $x - 2y + 6 = 0$
(4) $x - 2y + 10 = 0$

46. Find the co-ordinates of the mid point of a line segment joining the points (2, 4) and (6, 8) ?
(1) (2, 6) (2) (4, 6)
(3) (6, 4) (4) (–4, –6)

47. For what value of k, the line $kx + 3y + 6 = 0$, will pass through the point (2, 4).
(1) $k = -8$ (2) $k = 7$
(3) $k = -9$ (4) $k = 6$

48. In what ratio the line segment joining the points (2, 3) and (4, 6) is divided by y-axis?
(1) Internally 1 : 2
(2) Externally 2 : 3
(3) Externally 2 : 1
(4) Externally 1 : 2

49. What is the equation of line passes through the point (3, 2) and make an angle of 45° with the line $x - 2y = 3$?
(1) $3x - y - 7 = 0$
(2) $3x + y = 7$
(3) $x - 3y = 7$
(4) $-3x + y = 6$

50. A point R(h, k) divides a line segment between the axis in the ratio 1 : 2 what will be the equation of line ?
(1) $\frac{x}{h} - \frac{2y}{k} = 4$
(2) $\frac{x}{h} + \frac{2y}{k} = 3$
(3) $\frac{x}{k} + \frac{y}{h} = 1$
(4) $\frac{x}{2k} + \frac{y}{h} = 1$

51. What will be the equation of line for which $p = 3$ and $\alpha = 120°$?
(1) $x - \sqrt{3}y = 6$
(2) $\sqrt{3}x + y = 6$
(3) $-x + \sqrt{3}y = 6$
(4) $x - \sqrt{3}y = 5$

52. If the points (h, o), (a, b) and (o, k) lie on a line, then?
(1) $\frac{a}{h} + \frac{b}{k} = 1$ (2) $\frac{a}{k} + \frac{b}{h} = 1$
(3) $\frac{h}{a} + \frac{k}{b} = 1$ (4) $\frac{a}{h} - \frac{b}{k} = 1$

53. What is the equation of line parallel to $2x + 3y + 4 = 0$ and passing through the point (– 4, –5) ?
(1) $2x + 5y - 23 = 0$
(2) $-x + 5y = 20$
(3) $2x - 3y - 30 = 0$
(4) $2x + 3y + 23 = 0$

54. Find the equation of a line which passes through the point of intersection of lines $x + 2y = 5$ and $x - 3y = 7$ and also passes through the point (0, –1)
(1) $3x - 29y + 1 = 0$
(2) $3x - 29y - 29 = 0$
(3) $3x + 4y - 6 = 0$
(4) $-3x + 29y + 7 = 0$

55. If the angle between two lines is $\frac{\pi}{4}$ and the slope of one of the lines is $\frac{1}{2}$, then the slope of other line will be
(1) $m = 1$ (2) $m = 2$
(3) $m = 3$ (4) $m = 4$

56. What point on the x-axis are at a distance of 4 units from the line $3x - 4y - 5 = 0$
(1) $\left(\frac{1}{3}, 0\right)$ (2) $\left(0, \frac{25}{3}\right)$
(3) (5, 1) (4) $\left(\frac{25}{3}, 0\right)$

57. What is the equation of a line perpendicular to the line $x - 7y + 5 = 0$ and having x-intercept 3?
(1) $x + 7y = 21$ (2) $7x + y = 21$
(3) $x + 2y = 10$ (4) $-x + y = 15$

58. For what value of k the line $(k - 3)x - (4 - k^2)y + k^2 - 7k + 6 = 0$ is parallel to x-axis ?
(1) $k = \pm 1$ (2) $k = \pm 4$
(3) $k = \pm 6$ (4) $k = \pm 2$

59. In what ratio, the line joining (–1, 1) and (5, 7) is divided by the line $x + y = 4$?
(1) 5 : 13 (2) 5 : 2
(3) 1 : 3 (4) 4 : 7

60. The distance between the lines $y = mx + c_1$ and $y = mx + c_2$ is
(1) $\frac{c_1 - c_2}{\sqrt{m^2 + 1}}$ (2) $\left|\frac{c_1 - c_2}{\sqrt{1 + m^2}}\right|$
(3) $\frac{c_2 - c_1}{\sqrt{1 + m^2}}$ (4) 0

61. A point equidistant from the lines $4x + 3y + 10 = 0$, $5x - 12y + 26 = 0$ and $7x + 24y - 50 = 0$ is
(1) (1, –1) (2) (1, 1)
(3) (0, 0) (4) (0, 1)

62. If the line $\frac{x}{a}+\frac{y}{b}=1$ passes through the points (2, –3) and (4, –5) then (a, b) is

(1) (1, 1) (2) (–1, 1)

(3) (1, –1) (4) (–1, –1)

63. What will be the co-ordinates of centroid of a triangle whose vertices are A(1, 2), B (2, 4) and C(6, 2).

(1) (3, 1) (2) $\left(3, \frac{8}{3}\right)$

(3) $\left(\frac{8}{3}, 3\right)$ (4) (1, 5)

64. Slope of a line which cuts off intercepts of equal lengths on the axis is

(1) 1 (2) 2

(3) –1 (4) 3

SHORT ANSWERS

1. (1)	**2.** (2)	**3.** (3)	**4.** (2)
5. (1)	**6.** (1)	**7.** (1)	**8.** (2)
9. (3)	**10.** (1)	**11.** (3)	**12.** (2)
13. (4)	**14.** (1)	**15.** (3)	**16.** (2)
17. (3)	**18.** (2)	**19.** (3)	**20.** (3)
21. (1)	**22.** (1)	**23.** (1)	**24.** (2)
25. (1)	**26.** (2)	**27.** (1)	**28.** (2)
29. (3)	**30.** (1)	**31.** (4)	**32.** (4)
33. (3)	**34.** (1)	**35.** (2)	**36.** (1)
37. (4)	**38.** (1)	**39.** (3)	**40.** (3)
41. (4)	**42.** (3)	**43.** (2)	**44.** (1)
45. (4)	**46.** (2)	**47.** (3)	**48.** (4)
49. (1)	**50.** (2)	**51.** (3)	**52.** (1)
53. (4)	**54.** (2)	**55.** (3)	**56.** (4)
57. (2)	**58.** (4)	**59.** (1)	**60.** (2)
61. (3)	**62.** (4)	**63.** (2)	**64.** (3)

EXPLANATIONS

1. (1) $x^2 - 3x + 1 = 0$

$\Rightarrow x^2 + 1 = 3x$

$\Rightarrow \frac{x^2+1}{x} = 3$

$\Rightarrow x + \frac{1}{x} = 3$

On cubing both sides,

$\left(x+\frac{1}{x}\right)^3 = 27$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x+\frac{1}{x}\right) = 27$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\times 3 = 27$

$\Rightarrow x^3 + \frac{1}{x^3} = 27 - 9 = 18$

2. (2) $a^2 + b^2 + c^2 = 4a - 6b - 10c - 38$

$\Rightarrow a^2+b^2+c^2-4a+6b+10c+38 = 0$

$\Rightarrow a^2 - 4a + 4 + b^2 + 6b + 9 + c^2 + 10c + 25 = 0$

$\Rightarrow (a-2)^2 + (b+3)^2 + (c+5)^2 = 0$

$\therefore a - 2 = 0 \Rightarrow a = 2$

$b + 3 = 0 \Rightarrow b = -3$

$c + 5 = 0 \Rightarrow c = -5$

$\therefore a - b - c = 2 + 3 + 5 = 10$

3. (3) If $a + b + c = 0$

$a + b = -c$

On squaring both sides,

$\Rightarrow a^2 + b^2 + 2ab = c^2$

Similarly, $a^2 = b^2 + c^2 + 2ac$

$b^2 = a^2 + c^2 + 2ac$

$\therefore$ Expression $= \frac{2a^2}{b^2+c^2-a^2} + \frac{2b^2}{c^2+a^2-b^2} + \frac{2c^2}{a^2+b^2-c^2} + 3$

L.H.S. $= \frac{2a^2}{b^2+c^2-a^2}+1+\frac{2b^2}{c^2+a^2-b^2}+1+\frac{2c^2}{a^2+b^2-c^2}+1$

$= \frac{a^2+b^2+c^2}{b^2+c^2-a^2} + \frac{a^2+b^2+c^2}{c^2+a^2-b^2} + \frac{a^2+b^2+c^2}{a^2+b^2-c^2} = (a^2 + b^2 + c^2)$

$\left[\frac{1}{b^2+c^2-b^2-c^2-2bc} + \frac{1}{c^2+a^2-c^2-a^2-2ac} + \frac{1}{a^2+b^2-a^2-b^2-2ab}\right]$

$= (a^2 + b^2 + c^2)\left(\frac{1}{-2bc} - \frac{1}{2ac} - \frac{1}{2ab}\right) = (a^2 + b^2 + c^2)\left(\frac{-a-b-c}{2abc}\right) = 0$

4. (2) $a^2 + \frac{1}{a^2} - 13\left(a - \frac{1}{a}\right) + 34$

$= \left(a-\frac{1}{a}\right)^2 + 2 - 13\left(a-\frac{1}{a}\right) + 34$

$= \left(a-\frac{1}{a}\right)^2 - 13\left(a-\frac{1}{a}\right) + 36$

Let $\left(a - \frac{1}{a}\right) = x$

$\therefore$ Expression $= x^2 - 13x + 36$

$= x^2 - 9x - 4x + 36 = x(x-9) - 4(x-9)$

$= (x-4)(x-9)$

$= \left(a-\frac{1}{a}-4\right)\left(a-\frac{1}{a}-9\right)$

5. (1) $2x - \frac{1}{3x} = 5$

On multiplying both sides by $\frac{3}{2}$,

$3x - \frac{1}{2x} = \frac{15}{2}$

On cubing both sides,

$27x^3 - \frac{1}{8x^3} - 3.3x.\frac{1}{2x}$

$\left(3x - \frac{1}{2x}\right) = \frac{3375}{8}$

$\Rightarrow 27x^3 - \frac{1}{8x^3} - \frac{9}{2}\times\frac{15}{2}$

$= \frac{3375}{8}$

$\Rightarrow 27x^3 - \frac{1}{8x^3} = \frac{3375}{8} + \frac{135}{4}$

$= \frac{3375+270}{8} = \frac{3645}{8}$

6. (1) $(x-1)(x+5)(x+1)(x+3) + 7$

$= (x^2 + 5x - x - 5)(x^2 + 3x + x + 3) + 7$

$= (x^2 + 4x - 5)(x^2 + 3x + x + 3) + 7$

Putting $x^2 + 4x = y$, we have,

Expression $= (y-5)(y+3) + 7$

$= y^2 - 5y + 3y - 15 + 7$

$= y^2 - 2y - 8$

$= y^2 - 4y + 2y - 8$

$= y(y-4) + 2(y-4)$

$= (y + 2)(y - 4)$

Now,

$y + 2 = x^2 + 4x + 2$

$= x^2 + 4x + 4 - 2$

$= (x+2)^2 - \left(\sqrt{2}\right)^2$

$= \left(x+2+\sqrt{2}\right)\left(x+2-\sqrt{2}\right)$

Again, $y - 4$

$= x^2 + 4x - 4$

$= x^2 + 4x + 4 - 8$

$= (x + 2)^2 - (2\sqrt{2})^2$

$= \left(x+2+2\sqrt{2}\right)\left(x+2-2\sqrt{2}\right)$

$\therefore$ Factorisation is

$= \left(x+2+\sqrt{2}\right)\left(x+2-\sqrt{2}\right)$

$\left(x+2+2\sqrt{2}\right)\left(x+2-2\sqrt{2}\right)$

7. (1) $a + b + c = 0$

$\Rightarrow a = -b - c$

$\Rightarrow a^2 = -ab - ac$

$\therefore bc - a^2 = bc + ab + ac$

Similarly,

$ca - b^2 = ca + ab + bc$

$ab - c^2 = ab + bc + ca$

$$\therefore \frac{bc}{bc-a^2} + \frac{ca}{ca-b^2} + \frac{ab}{ab-c^2}$$

$$= \frac{bc}{ab+bc+ca} + \frac{ca}{ab+bc+ca} + \frac{ab}{ab+bc+ca}$$

$$= \frac{ab+bc+ca}{ab+bc+ca} = 1$$

8. (2) $a = 2+\sqrt{3}$

$$\therefore \frac{1}{a} = \frac{1}{2+\sqrt{3}}$$

$$= \frac{2-\sqrt{3}}{\left(2+\sqrt{3}\right)\left(2-\sqrt{3}\right)} = \frac{2-\sqrt{3}}{4-3}$$

$= 2 - \sqrt{3}$

Now,

$$\frac{a^3}{a^6+3a^3+1} = \frac{1}{a^3+3+\frac{1}{a^3}}$$

[Dividing numerator and denominator by a^3]

$$= \frac{1}{a^3+\frac{1}{a^3}+3}$$

$$= \frac{1}{\left(a+\frac{1}{a}\right)^3 - 3\left(a+\frac{1}{a}\right)+3}$$

$$= \frac{1}{(4)^3 - 3(4)+3}$$

$$= \frac{1}{64-12+3} = \frac{1}{55}$$

9. (3) $3p + 2pq = 4$

$\Rightarrow p(3 + 2q) = 4$

$$\Rightarrow p = \frac{4}{3+2q} \quad .....(i)$$

Now, putting the value of p in $5q + pq = 3$, we get

$$5q + \frac{4}{3+2q}(q) = 3$$

$$\Rightarrow \frac{15q+10q^2+4q}{3+2q} = 3$$

$\Rightarrow 19q + 10q^2 = 9 + 6q$

$\Rightarrow 10q^2 + 13q - 9 = 0$

$\Rightarrow 10q^2 + 18q - 5q - 9 = 0$

$\Rightarrow 2q(5q + 9) - 1(5q + 9) = 0$

$\Rightarrow (2q - 1)(5q + 9) = 0$

$$\Rightarrow q = \frac{1}{2} \text{ or } -\frac{9}{5}$$

Putting $q = \frac{1}{2}$ in (i),

$$p = \frac{4}{3+2\times\frac{1}{2}} = 1$$

Putting $q = -\frac{9}{5}$

$$p = \frac{4}{3+2.\left(-\frac{9}{5}\right)} = \frac{4\times5}{15-18}$$

$$= -\frac{20}{3}$$

10. (1) $a + b + c = 5$;

$ab + bc + ca = 7$

$abc = 3$

$a^2 + b^2 + c^2 = (a + b + c)^2 - 2(ab + bc + ca)$

$= 25 - 2 \times 7 = 11.$

Clearly, $a = b = 1$, $c = 3$

$a = c = 1$, $b = 3$

$b = c = 1$, $a = 3$

$$\therefore \left(\frac{a}{b}+\frac{b}{a}\right)+\left(\frac{b}{c}+\frac{c}{b}\right)+\left(\frac{c}{a}+\frac{a}{c}\right)$$

$$= (1+1)+\left(\frac{1}{3}+3\right)+\left(3+\frac{1}{3}\right)$$

$$= 8+\frac{1}{3}+\frac{1}{3} = 8\frac{2}{3}$$

11. (3) $$\frac{a}{b+c} = 1 - \frac{b}{c+a} - \frac{c}{a+b}$$

$$\therefore \frac{a^2}{b+c} = a - \frac{ab}{c+a} - \frac{ac}{a+b}$$

$$\frac{b}{a+c} = 1 - \frac{a}{b+c} - \frac{c}{a+b}$$

$$\therefore \frac{b^2}{a+c} = b - \frac{ab}{b+c} - \frac{bc}{a+b}$$

$$\frac{a}{a+b} = 1 - \frac{a}{b+c} - \frac{b}{c+a}$$

$$\therefore \frac{c^2}{a+c} = c - \frac{ac}{b+c} - \frac{bc}{c+a}$$

$$\therefore \frac{a^2}{b+c} + \frac{b^2}{a+c} + \frac{c^2}{a+b}$$

$$= a + b + c - \left(\frac{ab}{c+a} + \frac{bc}{c+a}\right)$$

$$- \left(\frac{ac}{a+b} + \frac{bc}{a+b}\right) - \left(\frac{ab}{b+c} + \frac{ac}{b+c}\right)$$

$$= a + b + c - b\left(\frac{a+c}{c+a}\right) - c\left(\frac{a+b}{a+b}\right)$$

$$- a\left(\frac{b+c}{b+c}\right)$$

$= a + b + c - b - c - a = 0$

12. (2) $a = 7+4\sqrt{3}$

$$\therefore \frac{1}{a} = \frac{1}{7+4\sqrt{3}}$$

$$= \frac{1}{7+4\sqrt{3}} \times \frac{7-4\sqrt{3}}{7-4\sqrt{3}}$$

$$= \frac{7-4\sqrt{3}}{49-48} = 7-4\sqrt{3}$$

Expression

$$= \frac{3a^6+2a^4+4a^3+2a^2+3}{a^4+a^3+a^2}$$

$$= \frac{3a^3+2a+4+\frac{2}{a}+\frac{3}{a^3}}{a+1+\frac{1}{a}}$$

[Dividing numerator and denominator by a^3]

$$= \frac{3\left(a^3+\frac{1}{a^3}\right)+2\left(a+\frac{1}{a}\right)+4}{\left(a+\frac{1}{a}\right)+1}$$

$$= \frac{3\left(\left(a+\frac{1}{a}\right)^3-3\left(a+\frac{1}{a}\right)\right)+2\left(a+\frac{1}{a}\right)+4}{\left(a+\frac{1}{a}\right)+1}$$

$$= \frac{3\left((14)^3-3\times 14\right)+2\times 14+4}{14+1}$$

$$= \frac{3\times 2702+28+4}{15} = \frac{8138}{15}$$

13. (4) $\frac{x-bc}{b+c}+\frac{x-ca}{c+a}+\frac{x-ab}{a+b}$

$= a + b + c$

$\Rightarrow \frac{x-bc}{b+c}-a+\frac{x-ca}{c+a}-b+\frac{x-ab}{a+b}-c=0$

$\Rightarrow \frac{x-bc-ab-ac}{b+c}+\frac{x-ca-bc-ab}{c+a}$

$+ \frac{x-ab-ac-bc}{a+b} = 0$

$\Rightarrow x - bc - ab - ac = 0$

$\Rightarrow x = ab + bc + ac$

14. (1) $x^4 + \frac{1}{x^4} = 47$

$\Rightarrow (x^2)^2 + \left(\frac{1}{x^2}\right)^2 = 47$

$\Rightarrow \left(x^2+\frac{1}{x^2}\right)^2 - 2 = 47$

[$\because a^2 + b^2 = (a + b)^2 - 2ab$]

$\Rightarrow \left(x^2+\frac{1}{x^2}\right)^2 = 47 + 2 = 49$

$\Rightarrow x^2 + \frac{1}{x^2} = \sqrt{49} = 7$

Again, $\left(x+\frac{1}{x}\right)^2 - 2 = 7$

$\Rightarrow \left(x+\frac{1}{x}\right)^2 = 7 + 2 = 9$

$\Rightarrow x + \frac{1}{x} = \sqrt{9} = 3$

On cubing both sides,

$\left(x+\frac{1}{x}\right)^3 = 3^3$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x+\frac{1}{x}\right) = 27$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times 3 = 27$

$\Rightarrow x^3 + \frac{1}{x^3} = 27 - 9 = 18$

15. (3) $x = \frac{1}{2-\sqrt{3}}$

$= \frac{1}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}}$

$= \frac{2+\sqrt{3}}{2^2-\left(\sqrt{3}\right)^2} = \frac{2+\sqrt{3}}{4-3}$

$= 2 + \sqrt{3}$

$\Rightarrow x - 2 = \sqrt{3}$

On squaring both sides,

$\Rightarrow (x - 2)^2 = \left(\sqrt{3}\right)^2$

$\Rightarrow x^2 - 4x + 4 = 3$

$\Rightarrow x^2 - 4x + 1 = 0$

$$\begin{array}{l|l} x^2-4x+1 & x^3-2x^2-7x+5 \ (x+2 \\ & \underline{x^3-4x^2+x} \\ & \quad -\quad +\quad - \\ & \quad 2x^2-8x+5 \\ & \quad \underline{2x^2-8x+2} \\ & \quad -\quad +\quad - \\ & \quad 3 \end{array}$$

$\therefore x^3 - 2x^2 - 7x + 5 = (x^2 - 4x + 1)(x + 2) + 3 = 0 + 3 = 3$

16. (2) Expression $= \frac{5+2\sqrt{3}}{7+4\sqrt{3}}$

$= \frac{5+2\sqrt{3}}{7+4\sqrt{3}} \times \frac{7-4\sqrt{3}}{7-4\sqrt{3}}$

Rationlising the denominator

$= \frac{5\times 7-5\times 4\sqrt{3}+2\sqrt{3}\times 7-2\sqrt{3}\times 4\sqrt{3}}{7^2-\left(4\sqrt{3}\right)^2}$

$= \frac{35-20\sqrt{3}+14\sqrt{3}-24}{49-48}$

$= 11 - 6\sqrt{3}$

$\therefore \frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a + b\sqrt{3}$

$\Rightarrow a + b\sqrt{3} = 11 - 6\sqrt{3}$

$\Rightarrow a = 11,\ b = -6$

17. (3) $\frac{1}{a+b+x} - \frac{1}{x} = \frac{1}{a} + \frac{1}{b}$

$\Rightarrow \frac{x-(a+b+x)}{x(a+b+x)} = \frac{a+b}{ab}$

$\Rightarrow \frac{-(a+b)}{x(a+b+x)} = \frac{a+b}{ab}$

$\Rightarrow -ab(a + b) = (a+b)\,x\,(a+b+x)$

$\Rightarrow (a + b)\{x(a + b + x) + ab\} = 0$

$\Rightarrow x(a + b + x) + ab = 0$

[$\because a + b \neq 0$]

$\Rightarrow x^2 + ax + bx + ab = 0$

$\Rightarrow x(x + a) + b(x + a) = 0$

$\Rightarrow (x + a)(x + b) = 0$

$\Rightarrow x = -a$ or, $-b$

18. (2) Let, $P(x) = 2x^3 + ax^2 + 11x + a + 3$

$(2x - 1)$ is its factor.

$\therefore P\left(\frac{1}{2}\right) = 0$

$\Rightarrow 2 \times \left(\frac{1}{2}\right)^3 + a \times \left(\frac{1}{2}\right)^2 + 11 \times \frac{1}{2} + a + 3 = 0$

$\Rightarrow \frac{1}{4} + \frac{a}{4} + \frac{11}{2} + a + 3 = 0$

$\Rightarrow \frac{1+a+22+4a+12}{4} = 0$

$\Rightarrow \frac{5a+35}{4} = 0$

$\Rightarrow 5a + 35 = 0 \Rightarrow 5a = -35$

$\Rightarrow a = -7$

19. (3) $a^3 + b^3 + c^3 - 3abc = (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)$

Now, $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$\Rightarrow 15^2 = 83 + 2(ab + bc + ca)$

$\Rightarrow 225 = 83 + 2(ab + bc + ca)$

$\Rightarrow 142 = 2(ab + bc + ca)$

$\Rightarrow ab + bc + ca = \frac{142}{2} = 71$

$\therefore a^3 + b^3 + c^3 - 3abc = 15 \times (83 - 71) = 15 \times 12 = 180$

20. (3) $x - a + x - b + x - c$

$= 3x - (a + b + c) = 0$

$\therefore (x - a)^3 + (x - b)^3 + (x - c)^3 - 3(x - a)(x - b)(x - c) = 0$

[$\because a^3 + b^3 + c^3 - 3abc = 0$ when $a + b + c = 0$

21. (1) $p = 2 - a \Rightarrow a + p - 2 = 0$

$\therefore\ a^3 + 6ap + p^3 - 8$

$= a^3 + p^3 + (-2)^3 - 3ap(-2)$

$= (a + p - 2)\{a^2 + p^2 + (-2)^2 - ap - p(-2) - a(-2)\}$

$= (a + p - 2)(a^2 + p^2 + 4 - ap + 2p + 2a) = 0$

22. (1) $4x^2 + 4y^2 + 4z^2 - 12x - 12y + 18 = 0$

$\Rightarrow (2x)^2 - 2 \times 2x \times 3 + 9 + (2y)^2 - 2 \times 2y \times 3 + 9 + 4z^2 = 0$

$\Rightarrow (2x - 3)^2 + (2y - 3)^2 + 4z^2 = 0$

$\Rightarrow 2x - 3 = 0$

$\Rightarrow x = \frac{3}{2}$;

$2y - 3 = 0$

$\Rightarrow y = \frac{3}{2}, z = 0$

$\therefore\ x + y + z = \frac{3}{2} + \frac{3}{2} + 0$

$= \frac{6}{2} = 3$

[If $x^2 + y^2 + z^2 = 0 \Rightarrow x = 0, y = 0, z = 0$]

23. (1) $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ will have infinite solutions if $\frac{a_1}{a_2} = \frac{b_1}{b_2}$

$= \frac{c_1}{c_2}$

$\Rightarrow \frac{5}{10} = \frac{2}{4} = \frac{-k}{-3}$

$\Rightarrow \frac{1}{2} = \frac{k}{3} \Rightarrow k = \frac{3}{2}$

24. (2) x = Rs. $(y + 20)$

z = Rs. $(y + 40)$

$\therefore\ y + y + 20 + y + 40 = 120$

$\Rightarrow 3y = 60$

$\Rightarrow y$ = Rs. 20

25. (1) We know that

Slope of a line $= \frac{y_2 - y_1}{x_2 - x_1}$

$\frac{-4}{3} = \frac{x - 11}{2 + 8}$

$\Rightarrow \frac{-4}{3} = \frac{x - 11}{10}$

$\Rightarrow -40 = 3x - 33$

$\Rightarrow -40 + 33 = 3x$

$\Rightarrow -7 = 3x$

$\Rightarrow x = \frac{-7}{3}$

26. (2) Let the equation of line be

$y - y_1 = m(x - x_1)$

As it passes through (2, 2) and having slope $m = \tan 45° = 1$

$\Rightarrow y - 2 = 1(x - 2)$

$y - x = 0$

or

$x - y = 0$

27. (1) We know that, equation of line is

$$\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$$

Equation of diagonal AC, will be

$$\frac{y - 6}{4 - 6} = \frac{x + 2}{10 + 2}$$

$$\frac{y - 6}{-2} \quad \frac{x + 2}{12}$$

$12y - 72 = -2x - 4$

$2x + 12y = -4 + 72$

$2x + 12y = 68$

$\Rightarrow x + 6y = 34$

28. (2) We know that,

Angle between two lines is

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1m_2}\right|$$

Here,

$m_1 = \sqrt{3}$ and

$m_2 = \frac{1}{\sqrt{3}}$

$$\tan\theta = \left|\frac{\sqrt{3} - \frac{1}{\sqrt{3}}}{1 + \sqrt{3}\,\frac{1}{\sqrt{3}}}\right|$$

$$= \left|\frac{3 - 1}{2\sqrt{3}}\right|$$

$$\tan\theta = \frac{1}{\sqrt{3}}$$

$\therefore$ Slope $= \frac{1}{\sqrt{3}}$

29. (3) Let required distance = d

$$\Rightarrow d_{(3, -1)} = \left|\frac{12x - 5y - 7}{\sqrt{12^2 + 5^2}}\right|$$

$$= \left|\frac{12 \times 3 - 5 \times -1 - 7}{\sqrt{169}}\right|$$

$$= \left|\frac{36 + 5 - 7}{13}\right|$$

$$= \left|\frac{34}{13}\right|$$

$$= \frac{34}{13} \text{ units}$$

30. (1) Equation of required line be

$$\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$$

$$\frac{y - 1}{-4 - 1} = \frac{x + 1}{2 + 1}$$

$$\frac{y - 1}{-5} \quad \frac{x + 1}{3}$$

$3y - 3 = -5x - 5$

$5x + 3y + 2 = 0$

31. (4) Here,

$c = 2$

$m = \tan 60° = \sqrt{3}$

Equation of line be,

$y = mx + c$

$\Rightarrow y = \sqrt{3}x + 2.$

32. (4) Let the point on x-axis be P(x, 0)

A.T.Q

PA = PB

$\Rightarrow PA^2 = PB^2$

$(x + 3)^2 + (4 - 0)^2 = (x - 7)^2 + (6 - 0)^2$

$x^2 + 9 + 6x + 16 = x^2 + 49 - 14x + 36$

$x^2 + 6x + 25 = x^2 - 14x + 85$

$20x = 60$

$x = 3$

$\therefore$ Point P is (3, 0)

33. (3) Here,

$3x - 4y + 5 = 0$

$\Rightarrow -4y = -3x - 5$

$$y = \frac{-3}{-4}x \frac{-5}{-4}$$

$$y = \frac{3}{4}x + \frac{5}{4}$$

Compare it with, $y = mx + c$ we get

$$m = \frac{3}{4} \quad \text{and} \quad c = \frac{5}{4}$$

34. (1) Equation of line in normal form can be written as

$$\frac{ax}{\sqrt{a^2 + b^2}} + \frac{by}{\sqrt{a^2 + b^2}}$$

$$+ \frac{c}{\sqrt{a^2 + b^2}} = 0$$

$$\Rightarrow \frac{\sqrt{3}x}{\sqrt{3}^2 + 1^2} + \frac{y}{\sqrt{\sqrt{3}^2 + 1^1}}$$

$$- \frac{8}{\sqrt{\sqrt{3}^2 + 1^2}} = 0$$

$$\frac{\sqrt{3}x}{\sqrt{4}} + \frac{y}{\sqrt{4}} - \frac{8}{\sqrt{4}} = 0$$

$$\Rightarrow \frac{\sqrt{3}x}{2} + \frac{y}{2} - \frac{8}{2} = 0$$

35. (2) We know that angle between the lines is

$$\tan\theta = \left|\frac{m_1 + m_2}{1 + m_1 m_2}\right|$$

Here, Equation of line is

$y - x - 7 = 0$

$\Rightarrow m_1 = 1$

similarly,

$$m_2 = \frac{1}{\sqrt{3}}$$

Now,

$$\tan\theta = \left|\frac{1 - \frac{1}{\sqrt{3}}}{1 + 1 \cdot \frac{1}{\sqrt{3}}}\right|$$

$$= \left|\frac{1 - \frac{1}{\sqrt{3}}}{1 + \frac{1}{\sqrt{3}}}\right|$$

$$= \left|\frac{\sqrt{3} - 1}{\sqrt{3} + 1}\right|$$

$$= \left|\frac{\sqrt{3} - 1}{\sqrt{3} + 1} \times \frac{(\sqrt{3} - 1)}{(\sqrt{3} - 1)}\right|$$

$$= \left|\frac{(\sqrt{3} - 1)^2}{\sqrt{3}^2 - 1^2}\right|$$

$$= \left|\frac{\sqrt{3}^2 + 1^2 - 2\sqrt{3}}{3 - 1}\right|$$

$$= \left|\frac{4 - 2\sqrt{3}}{2}\right|$$

$$\tan\theta = (2 - \sqrt{3})$$

$$\theta = \tan^{-1}(2 - \sqrt{3})$$

36. (1) When a line cuts an intercept of a and b x-axis. Its equation will be $\frac{x}{a} + \frac{y}{b} = 1$

$\Rightarrow 3x + 2y - 5 = 0$

$\Rightarrow 3x + 2y = 5$

Dividing by 5 on both sides, we get

$$\frac{3}{5}x + \frac{2}{5}y = 1$$

$$\Rightarrow \frac{x}{\frac{5}{3}} + \frac{y}{\frac{5}{2}} = 1 \text{ (Desired Result)}$$

37. (4) Distance between two parallel lines $15x + 8y - 34 = 0$ and $15x + 8y + 31 = 0$ be d

$$\Rightarrow d = \left|\frac{15x + 8y - 34}{\sqrt{15}^2 + 8^2}\right|$$

We know that from second equation

$15x + 8y = -31$

$$\Rightarrow d = \left|\frac{-31 - 34}{\sqrt{225 + 64}}\right|$$

$$= \left|\frac{-65}{\sqrt{289}}\right|$$

$$= \left|\frac{-65}{17}\right|$$

$$d = \frac{65}{17} \text{ units}$$

38. (1) Let the ratio be $k : 1$

Using internal section formula

$$2 = \frac{4 \times k + 1 \times 1}{k + 1}$$

$\Rightarrow 2(k + 1) = 4k + 1$

$2k + 2 = 4k + 1$

$-2k = -1$

$$k = \frac{1}{2}$$

and

$$0 = \frac{6 \times k + 1 \times 2}{k + 1}$$

$0\ (k + 1) = 6k + 2$

$6k = -2$

$$k = \frac{-1}{3}$$

The value of k is not negative.

$\therefore$ Ratio will be 1 : 2

39. (3) Let the distance be d

$$\Rightarrow d = \left|\frac{2x + 3y + 4}{\sqrt{2^2 + 3^2}}\right|$$

$$d_{(2, 3)} = \left|\frac{2 \times 2 + 3 \times 3 + 4}{\sqrt{13}}\right|$$

$$d_{(2,3)} = \left|\frac{17}{\sqrt{13}}\right|$$

$$\Rightarrow d_{(2,3)} = \frac{17}{\sqrt{13}} \text{ units}$$

40. (3) Let the ratio $k : 1$

= Using section formula,

$$x = \frac{5 \times k + 1 \times -1}{k+1}$$

$$\Rightarrow x = \frac{5k-1}{k+1}$$

$$y = \frac{7 \times k + 1 \times 1}{k+1}$$

$$y = \frac{7k+1}{k+1}$$

Putting the value of x and y in the equation of line, we get

$$\frac{5k-1}{k+1} + \frac{7k+1}{k+1} = 4$$

$12k = 4(k + 1)$

$\Rightarrow 12k = 4k + 4$

$8k = 4$

$$k = \frac{1}{2}$$

$\therefore$ Ratio is 1 : 2.

41. (4) When three points are collinear then area of triangle is zero.

$$\Rightarrow ar\ \Delta = \frac{1}{2}\begin{vmatrix} x & -1 & 1 \\ 2 & 1 & 1 \\ 4 & 5 & 1 \end{vmatrix}$$

$= \frac{1}{2}[x\ (1 - 5) + 1(2 - 4) + 1(10 - 4)]$

$\Rightarrow -4x - 2 + 6 = 0$

$\Rightarrow -4x + 4 = 0$

$\Rightarrow x = 1$

42. (3) Here,

$a = -5,\ b = 2$

$\therefore$ Equation of line will be

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\Rightarrow \frac{x}{-5} + \frac{y}{2} = 1$$

$\Rightarrow 2x - 5y = -10$

43. (2) When two lines are perpendicular than the product of their slopes is –1.

i.e $m_1 \times m_2 = -1$

For equation

$-kx + 2y + 3 = 0$

$$m_1 = \frac{k}{2}$$

For equation

$2x + 4y + 7 = 0$

$$m_2 = -\frac{2}{4}$$

$$m_2 = -\frac{1}{2}$$

As lines are perpendicular

$m_1 \times m_2 = -1$

$$\frac{k}{2} \times -\frac{1}{2} = -1$$

$\boxed{k = 4}$

44. (1) When two lines are parallel then their slopes are equal.

i.e. $m_1 = m_2$

Here,

$m_1 = m$

$$m_2 = \frac{-3}{-4}$$

[From equation $3x - 4y + 2 = 0$]

$$m_2 = \frac{3}{4}$$

As lines are parallel.

$\therefore m_1 = m_2$

$$\Rightarrow m = \frac{3}{4}$$

Let the equation of line be

$y - y_1 = m(x - x_1)$

As line passes through (–2, 3)

$\therefore$ Equation of line be

$$(y - 3) = \frac{3}{4}(x + 2)$$

$4y - 12 = 3x + 6$

$3x - 4y + 18 = 0$

45. (4) Let the equation of line be $y - y_1 = m(x - x_1)$

Here, $m = \frac{1}{2}$

and $x_1 = -4,\ y_1 = 3$

$\Rightarrow$ Equation of line be

$$y - 3 = \frac{1}{2}(x + 4)$$

$2y - 6 = x + 4$

$x - 2y + 10 = 0$

46. (2) We know that co-ordinates of

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$\Rightarrow x = \frac{2+6}{2} = 4$$

$$y = \frac{4+8}{2} = 6$$

47. (3) As the line $kx + 3y + 6 = 0$ passes through (2, 4)

$\therefore k \times 2 + 3 \times 4 + 6 = 0$

$2k + 12 + 6 = 0$

$2k + 18 = 0$

$2k = -18$

$k = -9$

48. (4) Let the co-ordinates of point be (0, y) because on y-axis, x is zero.

Let the ratio be $k : 1$

Using internal section formula, we get

$$0 = \frac{4k+2}{k+1}$$

$$k = \frac{-2}{4}$$

$$k = \frac{-1}{2}$$

–ve sign shows that point divides the line segment externally.

49. (1) Let the slope of line be m

Here,

$\theta = 45°$

$$m_2 = \frac{-1}{-2} = \frac{1}{2}$$

We know that,

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1 m_2}\right|$$

$$\tan 45° = \left|\frac{m - \frac{1}{2}}{1 + \frac{m}{2}}\right|$$

$$1 = \frac{2m - 1}{2 + m}$$

$\Rightarrow 2 + m = 2m - 1$

$m = 3$

$\therefore$ Equation of line be

$y - y_1 = m(x - x_1)$

$y - 2 = 3(x - 3)$

$y - 2 = 3x - 9$

$3x - y - 7 = 0$

50. (2) Using internal section formula, we have

$$h = \frac{1 \times a + 2 \times 0}{1 + 2}$$

$\Rightarrow a = 3h$

Similarly,

$$k = \frac{1 \times 0 + 2 \times b}{1 + 2}$$

$$k = \frac{2b}{3}$$

$$b = \frac{3k}{2}$$

$\therefore$ Equation of line be

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\Rightarrow \frac{x}{3h} + \frac{2y}{3k} = 1$$

$$\Rightarrow \frac{x}{h} + \frac{2y}{k} = 3$$

51. (3) Here,

$p = 3$ and $\alpha = 120°$

We know that equation of line is

$x \cos\alpha + y \sin\alpha = p$

$\Rightarrow x \cos 120° + y \sin 120° = 3$

$\Rightarrow x \cos(180° - 60°) + y \sin(180° - 60°) = 3$

$\Rightarrow -x \cos 60° + y \sin 60° = 3$

$\because \cos(180° - \theta) = -\cos\theta$

$\sin(180° - \theta) = \sin\theta$

$$\Rightarrow -\frac{x}{2} + y\frac{\sqrt{3}}{2} = 3$$

$$\Rightarrow -x + \sqrt{3}y = 6$$

52. (1) We know that when three points are collinear than area of triangle is zero.

$$ar\Delta = \frac{1}{2}\begin{vmatrix} h & 0 & 1 \\ a & b & 1 \\ 0 & k & 1 \end{vmatrix}$$

$$\Rightarrow \frac{1}{2}[h(b - k) + 1(ak)] = 0$$

$\Rightarrow bh - hk + ak = 0$

$ak + bh = hk$

Dividing both sides by hk, we get

$$\frac{ak}{hk} + \frac{bh}{hk} = 1$$

$$\frac{a}{h} + \frac{b}{k} = 1$$

53. (4) Let the slope of required line be m.

Also,

$$m_1 = \frac{-2}{3}$$

$m_1 = m_2$

($\because$ lines are parallel)

$$m = \frac{-2}{3}$$

Equation of line be

$y - y_1 = m(x - x_1)$

$$\Rightarrow (y + 5) = \frac{-2}{3}(x + 4)$$

$3y + 15 = -2x - 8$

$2x + 3y + 23 = 0$

54. (2) Let the equation of line be

$(x + 2y - 5) + \lambda(x - 3y - 7) = 0$

As it passes through $(0, -1)$

$\therefore 0 - 2 - 5 + \lambda(0 + 3 - 7) = 0$

$-7 - 4\lambda = 0$

$$\lambda = \frac{-7}{4}$$

$\therefore$ Equation of line is

$$(x + 2y - 5)\frac{-7}{4}(x - 3y - 7) = 0$$

$\Rightarrow 4x + 8y - 20 - 7x + 21y + 49 = 0$

$-3x + 29y + 29 = 0$

$3x - 29y - 29 = 0$

55. (3) Here,

$$\theta = \frac{\pi}{4}$$

$m_1 = m$

$$m_2 = \frac{1}{2}$$

We know that

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1 m_2}\right|$$

$$\tan\frac{\pi}{4} = \left|\frac{m - \frac{1}{2}}{1 + \frac{m}{2}}\right|$$

$$\Rightarrow 1 = \frac{2m - 1}{2 + m}$$

$\Rightarrow 2 + m = 2m - 1$

$\Rightarrow \boxed{m = 3}$

56. (4) Let the co-ordinates of point p be $(x, 0)$

Also,

$PQ = 4$

$$\Rightarrow PQ = \left|\frac{3x - 4y - 5}{\sqrt{3^2 + 4^2}}\right|$$

$$PQ = \left|\frac{3x - 5}{5}\right|$$

$$4 = \frac{3x - 5}{5}$$

$3x - 5 = 20$
$3x = 25$

$$x = \frac{25}{3}$$

$\therefore$ Co-ordinates are $\left(\frac{25}{3}, 0\right)$

57. (2) Let the slope of line be m

Here,

$$m_1 = \frac{-1}{-7} = \frac{1}{7}$$

As lines are perpendicular,
$\therefore m_1 \times m_2 = -1$

$$m \times \frac{1}{7} = -1$$

$m = -7$
$\therefore$ Equation of line is
$(y - y_1) = m(x - x_1)$
$(y - 0) = -7(x - 3)$
$y = -7x + 21$
$\Rightarrow 7x + y = 21$

58. (4) We know that when a line is parallel to x-axis then
Slope = 0

$$\frac{(4 - k^2)}{k - 3} = 0$$

$4 - k^2 = 0$
$k^2 = 4$

$$k = \sqrt{4}$$

$k = \pm 2$

59. (1) Let the ratio be $k : 1$

Using internal section formula,

$$x = \frac{5k - 1}{k + 1}$$

$$y = \frac{7k + 1}{k + 1}$$

Putting the value of x and y in given equation $2x + y = 4$

$$2\left(\frac{5k - 1}{k + 1}\right) + \frac{7k + 1}{k + 1} = 4$$

$10k - 2 + 7k + 1 = 4(k + 1)$
$17k - 1 = 4k + 4$
$13k = 5$

$$k = \frac{5}{13}$$

$\therefore$ The ratio is 5 : 13

60. (2) Let the distance between the lines be d

$$\Rightarrow d = \left|\frac{y - mx - c_1}{\sqrt{1 + m^2}}\right|$$

Also we know that
$y - mx = c_2$

$$\Rightarrow d = \left|\frac{c_2 - c_1}{\sqrt{1 + m^2}}\right|$$

$$= \left|\frac{c_1 - c_2}{\sqrt{1 + m^2}}\right|$$

61. (3) Here, it is clear that distance of the given lines from (0, 0) is equal.

$$d_1 = \left|\frac{4 \times 0 + 3 \times 0 + 10}{\sqrt{4^2 + 3^2}}\right|$$

$$= \left|\frac{10}{5}\right|$$

= 2 units

$$d_2 = \left|\frac{5 \times 0 - 12 \times 0 + 26}{\sqrt{5^2 + 12^2}}\right|$$

$$= \left|\frac{26}{13}\right|$$

= 2 units

$$d_3 = \left|\frac{7 \times 0 + 24 \times 0 - 50}{\sqrt{7^2 + 24^2}}\right|$$

$$d_3 = \left|\frac{-50}{\sqrt{625}}\right|$$

$$= \left|\frac{50}{25}\right|$$

$d_3 = 2$

62. (4) The line $\frac{x}{a} + \frac{y}{b} = 1$, passes through (2, –3)

$$\therefore \frac{2}{a} - \frac{3}{b} = 1 \qquad 1$$

Similarly, The line passes through (4, –5)

$$\frac{4}{a} - \frac{5}{b} = 1 \qquad 2$$

Point (–1, –1) satisfies both the equation.

63. (2) Co-ordinates of centroid

$$x = \frac{x_1 + x_2 + x_3}{3}$$

$$y = \frac{y_1 + y_2 + y_3}{3}$$

$$\Rightarrow x = \frac{1 + 2 + 6}{3}$$

$x = 3$

$$y = \frac{2 + 4 + 2}{3}$$

$$y = \frac{8}{3}$$

Co-ordinates of Centroid

$$= \left(3, \frac{8}{3}\right)$$

64. (3) As the lines have equal intercepts.
$\therefore$ Equation of line is
$x + y = a$
$\therefore$ Slope = –1

18 TRIGONOMETRY

Importance : In almost every competitive exam 1-2 questions are always asked on Trigonometry and being simple questions, marks can be scored easily.

Scope of questions : Questions based on circular measurements (angle between clock hands, conversion between radian to degree and vice versa), trigonometrical formulae, equations or identities or questions based on height and distance [like height of Tree/Building/ Aeroplane, width of river, length of shadow at a particular time] are asked normally.

Way to success : Basic concepts of trigonometric ratio (sin, cos tan) and their values for different angles is must for height and distance questions. For equations and identities all formulae/rules are useful while in circular measurements relation between radian & degree and its practice is necessary.

Measurement of angles :

Systems of Measurement of Angles : There are three systems for measuring angles :

(i) Sexagesimal or English System

(ii) Centesimal or French System

(iii) Circular System

Measure of an angle : The measure of an angle is the amount of rotation from the initial side to the terminal side.

Right angle : If the revolving ray starting from its initial position to final position describes one quarter of a circle, then we say that the angle formed is a right angle.

Sexagesimal System : In this system a right angle is divided into 90 equal parts, called degrees. The symbol 1° is used to denote one degree. Thus, one degree is one–ninetieth part of a right angle. Each degree is divided into 60 equal parts, called minutes. The symbol 1' is used to denote one minute. And each minute is divided into 60 equal parts, called seconds. The symbol 1" is used to denote one second. Thus, one right angle = 90 degree (90°), 1° = 60 minutes (60'), 1' = 60 seconds (60")

Centesimal System : In this system a right angle is divided into 100 equal parts, called grades, each grade is subdivided into 100 minutes, and each minute into 100 seconds.

The symbol 1^g, 1' and 1" are used to denote a grade, a minute and a second respectively. Thus, one right angle = 100 grades = (100^g), 1 grade = 100 minutes = (100'), 1 minute = 100 seconds = (100")

Circular System : One radian, written as 1^C, is the measure of an angle subtended at the centre of a circle by an arc of length equal to the radius of the circle. Radian is a constant angle.

arc AP = radius r (OA) of the circle

$\therefore \angle AOP = 1$ radian ($= 1^C$)

Theorem : Radian is a constant angle.

Proof : Consider a circle with centre O and radius r.

Arc AP = radius r. $\therefore \angle AOP = 1^c$.

Produce AO to meet the circle at B so that $\angle AOB$ = a straight angle = 2 right angles.

Since the angles at the centre of a circle are proportional to the arcs subtending them. Therefore,

$$\frac{\angle AOP}{\angle AOB} = \frac{arc\ AP}{arc\ APB}$$

$$\Rightarrow \frac{\angle AOP}{\angle AOB} = \frac{r}{\pi r} \Rightarrow \angle AOP = \frac{1}{\pi}\angle AOB$$

$$\Rightarrow 1^c = \frac{\text{a straight angle}}{\pi} = \frac{180°}{\pi}$$

$$\therefore\ 1^c = \frac{180°}{\pi} \qquad \Rightarrow \pi^c = 180°$$

- The number of radians in an angle subtended by an arc of a circle at the centre is equal to $\frac{arc}{radius}$

i.e. $\theta = \frac{s}{r}$

Proof : Consider a circle with centre O and radius r. Let $\angle AOQ = \theta^c$ and let arc AQ = s. Let P be a point on the arc AQ such that arc AP = r.

Then, $\angle AOP = 1^c$ Since angles at the centre of a circle are proportional to the arcs subtending them. Therefore,

$$\frac{\angle AOQ}{\angle AOP} = \frac{arc\ AQ}{arc\ AP}$$

$$\Rightarrow \angle AOQ = \left(\frac{arc\ AQ}{arc\ AP} \times 1\right)^c \qquad \left[\because \angle AOP = 1^c\right]$$

$$\Rightarrow \theta = \frac{s}{r} \text{ radians.}$$

Remarks :

Since $180° = \pi$ radians

Therefore, $1° = \frac{\pi}{180}$ radians

Hence, $30° = \frac{\pi}{180} \times 30 = \frac{\pi}{6}$ radians

$45° = \frac{\pi}{180} \times 45 = \frac{\pi}{4}$ radians

$60° = \frac{\pi}{180} \times 60 = \frac{\pi}{3}$ radians

$90° = \frac{\pi}{180} \times 90 = \frac{\pi}{2}$ radians

Degree	30°	45°	60°	90°	120°	135°	150°	180°	270°	360°
Radian	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π	$\frac{3\pi}{2}$	2π

- We have,
  π radians = 180°

  $\therefore$ 1 radian $= \frac{180°}{\pi} = \left(\frac{180}{22} \times 7\right)^{\circ}$

  = 57° 16' 22" (approx).
- We have,
  180° = π radians

  $\therefore 1^0 = \frac{\pi}{180}$ radians

  $= \left(\frac{22}{7 \times 180}\right)$ radian = 0.01746 radian.

Some Useful Points

- The angle between two consecutive digits in a clock is $30° \left(= \frac{\pi}{6} \text{ radians}\right)$.
- The hour hand rotates through an angle of 30° in one hour i.e. $\left(\frac{1}{2}\right)^{\circ}$ in one minute.
- The minute hand rotates through an angle of 6° in one minute.

RULE 1 : $200^g = 180° = \pi^c$ It is the relation among angles.

RULE 2 : The number of radians in an angle subtended by an arc of a circle at the centre is equal to $\frac{\text{arc}}{\text{radius}}$

or, $\theta = \left(\frac{l}{r}\right)^c$ (l is arc length and r is radius)

Trigonometric function :

$\sin\theta = \frac{p}{h}$, $\cos\theta = \frac{b}{h}$, $\tan\theta = \frac{p}{b}$, $\cot\theta = \frac{b}{p}$

$\sec\theta = \frac{h}{b}$ and $\text{cosec}\,\theta = \frac{h}{p}$

$-1 \le \sin\theta$ or $\cos\theta \le 1$

$-\infty \le \tan\theta$ or $\cot\theta \le \infty$

$\sec\theta$ or $\text{cosec}\ \theta \ge 1$ or $\sec\theta$ or $\text{cosec}\,\theta \le -1$

$\sin\theta \,.\, \text{cosec}\,\theta = 1$

$\cos\theta \,.\, \sec\theta = 1$

$\tan\theta \,.\, \cot\theta = 1$

$\sin\theta = \frac{1}{\text{cosec}\,\theta}$ or, $\text{cosec}\,\theta = \frac{1}{\sin\theta}$

$\cos\theta = \frac{1}{\sec\theta}$ or, $\sec\theta = \frac{1}{\cos\theta}$

$\tan\theta = \frac{1}{\cot\theta}$ or, $\cot\theta = \frac{1}{\tan\theta}$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$ and $\cot\theta = \frac{\cos\theta}{\sin\theta}$

Trigonometric Identities :

$\sin^2\theta + \cos^2\theta = 1$ or $\sin^2\theta = 1 - \cos^2\theta$

or, $\cos^2\theta = 1 - \sin^2\theta$

$\sec^2\theta - \tan^2\theta = 1$ or, $\sec^2\theta = 1 + \tan^2\theta$

or, $\tan^2\theta = \sec^2\theta - 1$

$\text{cosec}^2\theta - \cot^2\theta = 1$ or, $\text{cosec}^2\theta = 1 + \cot^2\theta$

or, $\cot^2\theta = \text{cosec}^2\theta - 1$

Some special formulae :

i. $\sin(-\theta) = -\sin\theta$ $\quad$ $\operatorname{cosec}(-\theta) = -\operatorname{cosec}\theta$

$\cos(-\theta) = \cos\theta$ $\quad$ $\sec(-\theta) = \sec\theta$

$\tan(-\theta) = -\tan\theta$ $\quad$ $\cot(-\theta) = -\cot\theta$

ii. $\sin(90° - \theta) = \cos\theta$ $\quad$ $\cos(90° - \theta) = \sin\theta$

$\tan(90° - \theta) = \cot\theta$ $\quad$ $\cot(90° - \theta) = \tan\theta$

$\sec(90° - \theta) = \operatorname{cosec}\theta$ $\quad$ $\operatorname{cosec}(90° - \theta) = \sec\theta$

iii. $\sin(90°+\theta) = \cos\theta$ $\quad$ $\cos(90°+\theta) = -\sin\theta$

$\tan(90° + \theta) = -\cot\theta$ $\quad$ $\cot(90°+\theta) = -\tan\theta$

$\sec(90°+\theta) = -\operatorname{cosec}\theta$ $\quad$ $\operatorname{cosec}(90°+\theta) = \sec\theta$

iv. $\sin(180°-\theta) = \sin\theta$ $\quad$ $\cos(180°-\theta) = -\cos\theta$

$\tan(180°-\theta) = -\tan\theta$ $\quad$ $\cot(180°-\theta) = -\cot\theta$

$\sec(180°-\theta) = -\sec\theta$ $\quad$ $\operatorname{cosec}(180°-\theta) = \operatorname{cosec}\theta$

v. $\sin(180° + \theta) = -\sin\theta$

$\cos(180° + \theta) = -\cos\theta$

$\sec(180° + \theta) = -\sec\theta$

$\operatorname{cosec}(180° + \theta) = -\operatorname{cosec}\theta$

$\cot(180° + \theta) = \cot\theta$

$\tan(180° + \theta) = \tan\theta$

vi. $\sin(270°-\theta) = -\cos\theta$ $\quad$ $\cos(270°-\theta) = -\sin\theta$

$\tan(270°-\theta) = \cot\theta$ $\quad$ $\cot(270°-\theta) = +\tan\theta$

$\operatorname{cosec}(270°-\theta) = -\sec\theta$ $\quad$ $\sec(270°-\theta) = -\operatorname{cosec}\theta$

vii. $\sin(270°+\theta) = -\cos\theta$ $\quad$ $\cos(270°+\theta) = \sin\theta$

$\tan(270°+\theta) = -\cot\theta$ $\quad$ $\cot(270°+\theta) = -\tan\theta$

$\operatorname{cosec}(270°+\theta) = -\sec\theta$ $\quad$ $\sec(270°+\theta) = \operatorname{cosec}\theta$

viii. $\sin(360°-\theta) = -\sin\theta$ $\quad$ $\cos(360°-\theta) = \cos\theta$

$\tan(360°-\theta) = -\tan\theta$ $\quad$ $\operatorname{cosec}(360°-\theta) = -\operatorname{cosec}\theta$

$\sec(360°-\theta) = \sec\theta$ $\quad$ $\cot(360°-\theta) = -\cot\theta$

ix. $\sin(360°+\theta) = \sin\theta$ $\quad$ $\cos(360°+\theta) = \cos\theta$

$\tan(360°+\theta) = \tan\theta$ $\quad$ $\cot(360°+\theta) = \cot\theta$

$\sec(360°+\theta) = \sec\theta$ $\quad$ $\operatorname{cosec}(360°+\theta) = \operatorname{cosec}\theta$

To Calculate the maximum values:

(i) maximum value of $m\sin\theta \pm n\cos\theta$

$$= \sqrt{m^2+n^2}$$

(ii) maximum value of $m\sin\theta \pm n\sin\theta$

$$= \sqrt{m^2+n^2}$$

(iii) maximum value of $m\cos\theta \pm n\cos\theta = \sqrt{m^2+n^2}$

To calculate minimum values take $\left(-\sqrt{m^2+n^2}\right)$

Few Results :

$\tan 1°.\ \tan 2°, \ldots\ldots\ldots, \tan 89° = 1$

$\cot 1°.\cot 2°, \ldots\ldots\ldots, \cot 89° = 1$

$\cos 1°.\ \cos 2°, \ldots\ldots\ldots, \cos 90° = 0$ $[\because \cos 90° = 0]$

$\cos 1°.\ \cos 2°, \ldots\ldots\ldots, \cos(\text{more than } 90°) = 0$

$\sin 1°.\sin 2°.\ \sin 3°, \ldots\ldots\ldots, [\because \sin 180° = 0]$

$\sin 1°.\sin 2°.\ \sin 3°, \ldots\ldots, [\because \sin(\text{more than } 180° = 0]$

RULE 3 : If $\sec\theta + \tan\theta = x$ then $\sec\theta = \dfrac{x^2+1}{2x}$,

$\tan\theta = \dfrac{x^2-1}{2x}$ and $\sin\theta = \dfrac{x^2-1}{x^2+1}$

RULE 4 : If $\sec\theta - \tan\theta = x$ then $\sec\theta = \dfrac{x^2+1}{2x}$,

$\tan\theta = \dfrac{1-x^2}{2x}$ and $\sin\theta = \dfrac{1-x^2}{1+x^2}$

RULE 5 : If $\sin\theta + \cos\theta = x$, then $\sin\theta - \cos\theta = \sqrt{2-x^2}$

RULE 6 : If $\sin x + \operatorname{cosec} x = 2$

then $\sin^n x + \operatorname{cosec}^n x = 2$

If $\cos x + \sec x = 2$ then $\cos^n x + \sec^n x = 2$

If $\tan x + \cot x = 2$

then $\tan^n x + \cot^n x = 2$ where $n \in N$.

RULE 7 : If $A + B = 90°$ then,

$\tan A.\tan B = 1$, $\sin A.\ \sec B = 1$, $\cos A.\ \operatorname{cosec} B = 1$

Angle and its measurement :

Nature of θ from 0 to 90°

$0 \to \theta \to 90$ $\sin\theta$ increases i.e. $\sin 68° > \sin 63°$

or $\sin 71° > \sin 54°$ $\cos\theta$ Decreases, $\tan\theta$ Increases $\cot\theta$ Decreases, $\sec\theta$ Increases $\operatorname{cosec}\theta$ Decreases. At $(90° \pm \theta)$ and $(270° \pm \theta)$ trigo functions will change as $\sin\theta \to \cos$, $\cos \to \sin\theta$, $\tan \to \cot$, $\cot \to \tan$, $\operatorname{cosec} \to \sec$, $\sec \to \operatorname{cosec}$. And at $(180° \pm \theta)$ and $(360° \pm \theta)$ trigo identitics remain same i.e. $\sin \to \sin$, $\cos \to \cos$, $\tan \to \tan$ and so on.

θ	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	∞
cot	∞	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0
sec	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	∞
cosec	∞	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1

Angle Sum formulae :

$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$

$\cos(A \pm B) = \cos A.\cos B \pm \sin A.\sin B$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

$$\cot(A \pm B) = \frac{\cot A.\cot B \mp 1}{\cot B \pm \cot A}$$

$2 \sin A \cos B = \sin(A + B) + \sin(A - B)$,

$2 \cos A. \sin B = \sin(A + B) - \sin(A - B)$,

$2 \cos A.\cos B = \cos(A + B) + \cos(A - B)$,

$2 \sin A \sin B = \cos(A - B) = \cos(A + B)$,

$\sin(A + B) \sin(A - B = \sin^2 A - \sin^2 B = \cos^2 B - \cos^2 A$

$\cos(A + B) \cos(A - B) = \cos^2 A - \sin^2 B = \cos^2 B - \sin^2 A$,

$\sin(A + B + C) = \sin A \cos B \cos C + \cos A \sin B \cos C + \cos A \cos B \sin C - \sin A \sin B \sin C$,

$\cos(A + B + C) = \cos A \cos B \cos C - \cos A \sin B \sin C - \sin A \cos B \sin C - \sin A \sin B \cos C$,

$\tan(A + B + C)$

$$= \frac{\tan A + \tan B + \tan C - \tan A.\tan B.\tan c}{1 - \tan A.\tan B - \tan B.\tan C - \tan C.\tan A}$$

If $A + B = \pi$, then $\sin A = \sin B$, $\cos A = -\cos B$ and $\tan A = -\tan B$

If $A + B = 2\pi$, then $\sin A = -\sin B$, $\cos A = \cos B$ and $\tan A = -\tan B$

RULE 8 : $\sin\theta.\sin 2\theta.\sin 4\theta$

$$= \frac{1}{4} \sin 3\theta, \cos\theta.\cos 2\theta.\cos 4\theta$$

$$= \frac{1}{4} \cos 3\theta, \tan\theta.\tan 2\theta.\tan 4\theta = \tan 3\theta$$

Some values to be remembered :

$$\sin 18° = \frac{\sqrt{5}-1}{4}, \sin 36° = \frac{\sqrt{10-2\sqrt{5}}}{4}$$

$$\cos 18° = \sin 72° = \frac{\sqrt{10+2\sqrt{5}}}{4} \quad \cos 36° = \frac{\sqrt{5}+1}{4}$$

RULE 9 : If $(1 + \tan A)(1 + \tan B) = 2$ then $A + B = 45°$.

Function Sum Formulae :

$$\sin C + \sin D = 2\sin\frac{C+D}{2}\cos\frac{C-D}{2},$$

$$\sin C - \sin D = 2\sin\frac{C-D}{2}.\cos\frac{C+D}{2}.$$

$$\cos C + \cos D = 2\cos\frac{C+D}{2}.\cos\frac{C-D}{2},$$

$$\cos C - \cos D = -2\sin\frac{C+D}{2}\sin\frac{C-D}{2}$$

Double angle formulae : (Multiple angles)

$$\sin 2A = 2\sin A.\cos A = \frac{2\tan A}{1+\tan^2 A}.$$

$\cos 2A = \cos^2 A - \sin^2 A = 2\cos^2 A - 1$

$$= 1 - 2\sin^2 A = \frac{1-\tan^2 A}{1+\tan^2 A},$$

$$2\cos^2 A = 1 + \cos 2A \quad \tan^2 A = \frac{1-\cos 2A}{1+\cos 2A},$$

$2\sin^2 A = 1 - \cos 2A$,

$$\tan 2A = \frac{2\tan A}{1-\tan^2 A}$$

Thrice angle formulae :

$\sin 3A = 3\sin A - 4\sin^3 A$,

$\cos 3A = 4\cos^3 A - 3\cos A$,

$$\tan 3A = \frac{3\tan A - \tan^3 A}{1-3\tan^2 A}$$

Half-angle-formulae : (Sub-multiple angles)

$$\sin A = 2\sin\left(\frac{A}{2}\right).\cos\left(\frac{A}{2}\right) = \frac{2\tan\left(\frac{A}{2}\right)}{1+\tan^2\left(\frac{A}{2}\right)},$$

$$\cos A = \cos^2\left(\frac{A}{2}\right) - \sin^2\left(\frac{A}{2}\right)$$

$$= 2\cos^2\left(\frac{A}{2}\right) - 1$$

$$= 1 - 2\sin^2\left(\frac{A}{2}\right)$$

$$= \frac{1-\tan^2\left(\frac{A}{2}\right)}{1+\tan^2\left(\frac{A}{2}\right)},$$

$$2\cos^2\left(\frac{A}{2}\right) = 1 + \cos A,$$

$$2\sin^2\left(\frac{A}{2}\right) = 1 - \cos A$$

$$\tan^2\left(\frac{A}{2}\right) = \frac{1-\cos A}{1+\cos A},$$

$$\tan A = \frac{2\tan\left(\frac{A}{2}\right)}{1-\tan^2\left(\frac{A}{2}\right)}$$

One-third angle formulae :

$$\sin A = 3\sin\left(\frac{A}{3}\right) - 4\sin^3\left(\frac{A}{3}\right),$$

$$\cos A = 4\cos^3\left(\frac{A}{3}\right) - 3\cos\left(\frac{A}{3}\right)$$

$$\tan A = \frac{3\tan\left(\frac{A}{3}\right)-\tan^3\left(\frac{A}{3}\right)}{1-3\tan^2\left(\frac{A}{3}\right)},$$

$\cos A.\cos 2A.\cos 2^2 A.\cos 2^3 A. \ldots\ldots \cos 2^{n-1} A$

$$= \frac{\sin 2^n A}{2^n \sin A},$$

$$\sin\theta.\sin(60^\circ-\theta)\sin(60^\circ+\theta) = \frac{1}{4}\sin 3\theta,$$

$$\cos\theta\cos(60^\circ-\theta).(60^\circ+\theta) = \frac{1}{4}\cos 3\theta$$

Some formulae related to triangle : Sine formulae

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$$

this may also be expressed as

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} = K$$

In a Δ ABC :

$\sin(B+C) = \sin A$, $\sin(C+A) = \sin B$, $\sin(A+B) = \sin C$, $\cos(B+C) = -\cos A$, $\cos(C+A) = -\cos B$, $\cos(A+B) = -\cos C$, $\tan(B+C) = -\tan A$, $\tan(C+A) = -\tan B$,

$$\tan(A+B) = -\tan C = \sin\left(\frac{B-C}{2}\right) = \left(\frac{b-c}{a}\right)\cos\frac{A}{2}$$

$$\Rightarrow \cos\left(\frac{B-C}{2}\right) = \left(\frac{b+c}{a}\right)\sin\frac{A}{2} \Rightarrow \frac{b-c}{b+c} = \frac{\tan\left(\frac{B-C}{2}\right)}{\tan\left(\frac{B+C}{2}\right)}$$

Cosine formulae :

In any Δ ABC,

(i) $a^2 = b^2 + c^2 - 2bc\cos A$ or, $\cos A = \dfrac{b^2+c^2-a^2}{2bc}$

(ii) $b^2 = c^2 + a^2 - 2ca\cos B$ or, $\cos B = \dfrac{a^2+c^2-b^2}{2ca}$

(iii) $c^2 = a^2 + b^2 - 2ab\cos C$ or, $\cos C = \dfrac{a^2+b^2-c^2}{2ab}$

Projection Formulae :

In any Δ ABC,

(i) $a = b\cos C + c\cos B$

(ii) $b = c\cos A + a\cos C$

(iii) $c = a\cos B + b\cos A$

i.e. any side of a triangle is equal to the sum of the projections of other two sides on it.

Napier's Analogy (Law of Tangents):

In any Δ ABC,

(i) $\tan\left(\frac{B-C}{2}\right) = \left(\frac{b-c}{b+c}\right)\cot\frac{A}{2}$

(ii) $\tan\left(\frac{A-B}{2}\right) = \left(\frac{a-b}{a+b}\right)\cot\frac{C}{2}$

(iii) $\tan\left(\frac{C-A}{2}\right) = \left(\frac{c-a}{c+a}\right)\cot\frac{B}{2}$

Area of a triangle :

In any Δ ABC, Area of $\Delta = \frac{1}{2}bc\sin A = \frac{1}{2}ca\sin B$

$$= \frac{1}{2}ab\sin C$$

RULE 10. The equation $a\cos\theta + b\sin\theta = c$ is solvable for $|c| < \sqrt{a^2+b^2}$.

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. In circular measure, the value of the angle 11°15' is

(1) $\frac{\pi^c}{16}$ (2) $\frac{\pi^c}{8}$

(3) $\frac{\pi^c}{4}$ (4) $\frac{\pi^c}{12}$

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

2. In a triangle ABC, ∠ABC = 75° and ∠ACB = $\frac{\pi^c}{4}$. The circular measure of ∠BAC is

(1) $\frac{5\pi}{12}$ radian (2) $\frac{\pi}{3}$ radian

(3) $\frac{\pi}{6}$ radian (4) $\frac{\pi}{2}$ radian

(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

3. The circular measure of an angle of an isosceles triangle is $\frac{5\pi}{9}$. Circular measure of one of the other angles must be

(1) $\frac{5\pi}{18}$ (2) $\frac{5\pi}{9}$

(3) $\frac{2\pi}{9}$ (4) $\frac{4\pi}{9}$

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

4. The degree measure of 1 radian (taking $\pi = \frac{22}{7}$) is

(1) 57°61'22" (approx.)
(2) 57°16'22" (approx.)
(3) 57°22'16" (approx.)
(4) 57°32'16" (approx.)

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

5. $\left(\frac{3\pi}{5}\right)$ radians is equal to

(1) 100° (2) 120°
(3) 108° (4) 180°

(SSC Graduate Level Tier-I Exam. 19.05.2013)

6. If the sum of two angles is 135° and their difference is $\frac{\pi}{12}$, then the circular measure of the greater angle is

(1) $\frac{2\pi}{3}$ (2) $\frac{3\pi}{5}$

(3) $\frac{5\pi}{12}$ (4) $\frac{\pi}{3}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

7. If $0 \le \theta \le \frac{\pi}{2}$ and $\sec^2\theta + \tan^2\theta = 7$, then θ is

(1) $\frac{5\pi}{12}$ radian (2) $\frac{\pi}{3}$ radian

(3) $\frac{\pi}{5}$ radian (4) $\frac{\pi}{6}$ radian

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

8. If the sum and difference of two angles are $\frac{22}{9}$ radian and 36° respectively, then the value of smaller angle in degree taking the value of π as $\frac{22}{7}$ is :

(1) 52° (2) 60°
(3) 56° (4) 48°

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

9. The circular measure of the included angle formed by the hour hand and minute hand of a clock at 3 p.m. will be

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{3}$

(3) $\frac{5\pi}{12}$ (4) $\frac{\pi}{2}$

(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

10. Which of the following relations is correct for $0 < \theta < 90°$?

(1) $\sin\theta = \sin^2\theta$
(2) $\sin\theta < \sin^2\theta$
(3) $\sin\theta > \sin^2\theta$
(4) $\sin\theta = \operatorname{cosec}\theta$

(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (Ist Sitting)

11. If θ is an acute angle and $\sin(\theta + 18°) = \frac{1}{2}$, then the value of θ in circular measure is :

(1) $\frac{\pi}{12}$ radians

(2) $\frac{\pi}{15}$ radians

(3) $\frac{2\pi}{5}$ radians

(4) $\frac{3\pi}{13}$ radians

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

12. What is the measure of central angle of the arc whose length is 11 cm and radius of the circle is 14 cm ?

(1) 45° (2) 60°
(3) 75° (4) 90°

(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

TYPE–II

1. The minimum value of $2\sin^2\theta + 3\cos^2\theta$ is

(1) 0 (2) 3
(3) 2 (4) 1

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

2. If cosec 39° = x, the value of

$$\frac{1}{\operatorname{cosec}^2 51°} + \sin^2 39° + \tan^2 51° - \frac{1}{\sin^2 51° \sec^2 39°} \text{ is}$$

(1) $\sqrt{x^2 - 1}$ (2) $\sqrt{1 - x^2}$

(3) $x^2 - 1$ (4) $1 - x^2$

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

3. The value of tan 4°.tan 43°.tan 47°.tan 86° is

(1) 2 (2) 3
(3) 1 (4) 4

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I) & (SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting) (North Zone)

4. If $\frac{\tan\theta + \cot\theta}{\tan\theta - \cot\theta} = 2$, $(0 \le \theta \le 90°)$, then the value of $\sin\theta$ is

(1) $\frac{2}{\sqrt{3}}$ (2) $\frac{\sqrt{3}}{2}$

(3) $\frac{1}{2}$ (4) 1

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

5. If $\cos x + \cos y = 2$, the value of $\sin x + \sin y$ is

(1) 0 (2) 1

(3) 2 (4) –1

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

6. The value of $\tan 1° \tan 2° \tan 3° \ldots\ldots \tan 89°$ is :

(1) 1 (2) 0

(3) $\sqrt{3}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CHSL DEO & LDC Exam. 11.12.2011) (Ist Sitting) (Delhi) & (FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting) & (SSC GL Tier-I Exam. 21.04.2013) (Ist Sitting) & (SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

7. The measure of the angles of a triangle are in the ratio 2 : 7 : 11. Measures of angles are

(1) 16°, 56°, 88°

(2) 18°, 63°, 99°

(3) 20°, 70°, 90°

(4) 25°, 175°, 105°

(SSC CPO S.I. Exam. 07.09.2003)

8. The angles of a triangle are $(x + 5)°$, $(2x - 3)°$ and $(3x + 4)°$. The value of x is

(1) 30 (2) 31

(3) 29 (4) 28

(FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

9. The value of $\cot 10° \cdot \cot 20° \cdot \cot 60° \cdot \cot 70° \cdot \cot 80°$ is

(1) 1 (2) –1

(3) $\sqrt{3}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

10. If θ be an acute angle and $7\sin^2\theta + 3\cos^2\theta = 4$, then the value of $\tan\theta$ is

(1) $\sqrt{3}$ (2) $\frac{1}{\sqrt{3}}$

(3) 1 (4) 0

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

11. The value of $\sin^2 1° + \sin^2 5° + \sin^2 9° + \ldots + \sin^2 89°$ is

(1) $11\frac{1}{2}$ (2) $11\sqrt{2}$

(3) 11 (4) $\frac{11}{\sqrt{2}}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

12. The numerical value of $\cot 18° \left(\cot 72° \cos^2 22° + \frac{1}{\tan 72° \sec^2 68°}\right)$ is

(1) 1 (2) $\sqrt{2}$

(3) 3 (4) $\frac{1}{\sqrt{3}}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

13. If $\tan 15° = 2 - \sqrt{3}$, the value of $\tan 15° \cot 75° + \tan 75° \cot 15°$ is

(1) 14 (2) 12

(3) 10 (4) 8

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

14. If x, y are acute angles, $0 < x + y < 90°$ and $\sin(2x - 20°) = \cos(2y + 20°)$, then the value of $\tan(x + y)$ is :

(1) $\frac{1}{\sqrt{3}}$ (2) $\frac{\sqrt{3}}{2}$

(3) $\sqrt{3}$ (4) 1

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

15. If $\angle A$ and $\angle B$ are complementary to each other, then the value of $\sec^2 A + \sec^2 B - \sec^2 A \cdot \sec^2 B$ is

(1) 1 (2) –1

(3) 2 (4) 0

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

16. $\sin^2 5° + \sin^2 6° + \ldots + \sin^2 84° + \sin^2 85° = ?$

(1) $39\frac{1}{2}$ (2) $40\frac{1}{2}$

(3) 40 (4) $39\frac{1}{\sqrt{2}}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

17. $\sin^2 5° + \sin^2 10° + \sin^2 15° + \ldots + \sin^2 85° + \sin^2 90°$ is equal to

(1) $7\frac{1}{2}$ (2) $8\frac{1}{2}$

(3) 9 (4) $9\frac{1}{2}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone) & (SSC CHSL DEO & LDC Exam. 21.10.2012) (IInd Sitting)

18. The value of

$\frac{\sin 39°}{\cos 51°} + 2\tan 11° \tan 31° \tan 45° \tan 59° \tan 79° - 3(\sin^2 21° + \sin^2 69°)$ is :

(1) 2 (2) –1

(3) 1 (4) 0

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

19. If $\frac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3$ and $0° < \theta < 90°$, then the value of θ is :

(1) 30° (2) 45°

(3) 60° (4) None of these

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

20. If $A = \tan 11° \tan 29°$, $B = 2\cot 61° \cot 79°$, then :

(1) A = 2B (2) A = – 2B

(3) 2A = B (4) 2A = – B

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

21. If $\sin 17° = \frac{x}{y}$, then the value of $(\sec 17° - \sin 73°)$ is

(1) $\frac{y^2}{x\sqrt{y^2 - x^2}}$

(2) $\frac{x^2}{y\sqrt{y^2 - x^2}}$

(3) $\frac{x^2}{y\sqrt{x^2 - y^2}}$

(4) $\frac{y^2}{x\sqrt{x^2 - y^2}}$

(FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting) & (SSC Graduate Level Tier-II Exam. 16.09.2012)

22. If $0° < \theta < 90°$, the value of $\sin\theta + \cos\theta$ is
(1) equal to 1
(2) greater than 1
(3) less than 1
(4) equal to 2
(SSC Graduate Level Tier-II Exam. 16.09.2012)

23. The expression
$\frac{\tan 57° + \cot 37°}{\tan 33° + \cot 53°}$ is equal to
(1) tan 33° cot 57°
(2) tan 57° cot 37°
(3) tan 33° cot 53°
(4) tan 53° cot 37°
(SSC Graduate Level Tier-II Exam. 16.09.2012)

24. The value of $\frac{\cot 30° - \cot 75°}{\tan 15° - \tan 60°}$ is :
(1) 0 (2) 1
(3) $\sqrt{3} - 1$ (4) –1
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

25. The value of
$\cot\theta.\tan(90° - \theta) - \sec(90° - \theta)\,\text{cosec}\theta + (\sin^2 25° + \sin^2 65°) + \sqrt{3}(\tan 5° \tan 15°. \tan 30°. \tan 75°. \tan 85°)$ is :
(1) 1 (2) –1
(3) 2 (4) 0
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

26. If $\sin(3x - 20°) = \cos(3y + 20°)$, then the value of $(x + y)$ is
(1) 20° (2) 30°
(3) 40° (4) 45°
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

27. If $\cos\theta\,\text{cosec}\,23° = 1$, the value of θ is
(1) 23° (2) 37°
(3) 63° (4) 67°
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

28. If $2(\cos^2\theta - \sin^2\theta) = 1$, θ is a positive acute angle, then the value of θ is
(1) 60° (2) 30°
(3) 45° (4) $22\frac{1}{2}°$
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

29. The value of $(\tan 35° \tan 45° \tan 55°)$ is
(1) $\frac{1}{2}$ (2) 2
(3) 0 (4) 1
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

30. If $\sec(7\theta + 28°) = \text{cosec}(30° - 3\theta)$ then the value of θ is
(1) 8° (2) 5°
(3) 60° (4) 9°
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

31. If $\tan\left(\frac{\pi}{2} - \frac{\theta}{2}\right) = \sqrt{3}$, the value of $\cos\theta$ is :
(1) 0 (2) $\frac{1}{\sqrt{2}}$
(3) $\frac{1}{2}$ (4) 1
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

32. If $7\sin^2\theta + 3\cos^2\theta = 4$ $(0° \le \theta \le 90°)$, then value of θ is
(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{3}$
(3) $\frac{\pi}{6}$ (4) $\frac{\pi}{4}$
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

33. If $\sec\theta = x + \frac{1}{4x}$ $(0° < \theta < 90°)$, then $\sec\theta + \tan\theta$ is equal to
(1) $\frac{x}{2}$ (2) $2x$
(3) x (4) $\frac{1}{2x}$
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

34. The value of
$\cos 1° \cos 2° \cos 3° \ldots\ldots \cos 177° \cos 178° \cos 179°$ is :
(1) 0 (2) $\frac{1}{2}$
(3) 1 (4) $\frac{1}{\sqrt{2}}$
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

35. The value of
$(\sin^2 25° + \sin^2 65°)$ is :
(1) $\frac{\sqrt{3}}{2}$ (2) 1
(3) 0 (4) $\frac{2}{\sqrt{3}}$
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

36. If $\sec\theta + \tan\theta = \sqrt{3}$ $(0° \le \theta \le 90°)$, then $\tan 3\theta$ is
(1) undefined (2) $\frac{1}{\sqrt{3}}$
(3) $\frac{1}{\sqrt{2}}$ (4) $\sqrt{3}$
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

37. If $\sin(60° - \theta) = \cos(\psi - 30°)$, then the value of $\tan(\psi - \theta)$ is (assume that θ and ψ are both positive acute angles with $\theta < 60°$ and $\psi > 30°$).
(1) $\frac{1}{\sqrt{3}}$ (2) 0
(3) $\sqrt{3}$ (4) 1
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

38. If $a\sin\theta + b\cos\theta = c$ then the value of $a\cos\theta - b\sin\theta$ is :
(1) $\pm\sqrt{-a^2 + b^2 + c^2}$
(2) $\pm\sqrt{a^2 + b^2 - c^2}$
(3) $\pm\sqrt{a^2 - b^2 - c^2}$
(4) $\pm\sqrt{a^2 - b^2 + c^2}$
(SSC Graduate Level Tier-I Exam. 21.04.2013)

39. If $\sin(A - B) = \frac{1}{2}$ and $\cos(A + B) = \frac{1}{2}$ where $A > B > 0$ and $A + B$ is an acute angle, then the value B is
(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{12}$
(3) $\frac{\pi}{4}$ (4) $\frac{\pi}{2}$
(SSC Graduate Level Tier-I Exam. 21.04.2013)

40. Maximum value of (2 sin θ + 3 cos θ) is

(1) 2 (2) $\sqrt{13}$

(3) $\sqrt{15}$ (4) 1

(SSC Graduate Level Tier-I Exam. 21.04.2013)

41. The value of

152 (sin 30° + 2 cos² 45° + 3 sin 30° + 4 cos² 45° + ... + 17 sin 30°+ 18 cos² 45°) is

(1) an integer but not a perfect square

(2) a rational number but not an integer

(3) a perfect square of an integer

(4) irrational

(SSC Graduate Level Tier-I Exam. 21.04.2013)

42. Evaluate : 3 cos 80° cosec 10° + 2 cos 59° cosec 31°

(1) 1 (2) 3

(3) 2 (4) 5

(SSC Graduate Level Tier-I Exam. 19.05.2013)

43. $\sin^2\theta - 3\sin\theta + 2 = 0$ will be true if

(1) $0 \le \theta < 90$ (2) $0 < \theta < 90$

(3) $\theta = 0°$ (4) $\theta = 90°$

(SSC Graduate Level Tier-I Exam. 19.05.2013)

44. If $\tan\alpha = n\tan\beta$ and $\sin\alpha = m\sin\beta$, then $\cos^2\alpha$ is

(1) $\frac{m^2}{n^2+1}$ (2) $\frac{m^2}{n^2}$

(3) $\frac{m^2-1}{n^2-1}$ (4) $\frac{m^2+1}{n^2+1}$

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

45. If $\tan\theta = \frac{3}{4}$ and θ is acute, then cosec θ

(1) $\frac{4}{5}$ (2) $\frac{5}{3}$

(3) 2 (4) $\frac{1}{2}$

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

46. If $\text{cosec}\,\theta - \cot\theta = \frac{7}{2}$, the value of cosecθ is :

(1) $\frac{47}{28}$ (2) $\frac{51}{28}$

(3) $\frac{53}{28}$ (4) $\frac{49}{28}$

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013

47. If $x \sin 45° = y \,\text{cosec}\, 30°$, then $\frac{x^4}{y^4}$ is equal to

(1) 4^3 (2) 6^3

(3) 2^3 (4) 8^3

(SSC Graduate Level Tier-II Exam. 29.09.2013

48. If 5 tan θ = 4, then $\frac{5\sin\theta - 3\cos\theta}{5\sin\theta + 2\cos\theta}$ is equal to

(1) $\frac{2}{3}$ (2) $\frac{1}{4}$

(3) $\frac{1}{6}$ (4) $\frac{1}{3}$

(SSC CHSL DEO & LDC Exam. 20.10.2013)

49. $2\,\text{cosec}^2 23° \cot^2 67° - \sin^2 23° - \sin^2 67° - \cot^2 67°$ is equal to

(1) 1 (2) $\sec^2 23°$

(3) $\tan^2 23°$ (4) 0

(SSC CHSL DEO & LDC Exam. 20.10.2013)

50. The equation

$$\cos^2\theta = \frac{(x+y)^2}{4xy}$$

is only possible when

(1) $x = -y$ (2) $x > y$

(3) $x = y$ (4) $x < y$

(SSC CHSL DEO & LDC Exam. 20.10.2013)

51. The value of $\text{cosec}^2 18° - \frac{1}{\cot^2 72°}$ is

(1) $\frac{1}{\sqrt{3}}$ (2) $\frac{\sqrt{2}}{3}$

(3) $\frac{1}{2}$ (4) 1

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

52. If α + β = 90°, then the value of $(1-\sin^2\alpha)(1-\cos^2\alpha)\times(1+\cot^2\beta)(1+\tan^2\beta)$ is

(1) 1 (2) –1

(3) 0 (4) 2

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

53. $\frac{2\sin 68°}{\cos 22°} - \frac{2\cot 15°}{5\tan 75°} - \frac{3\tan 45°.\tan 20°.\tan 40°.\tan 50°.\tan 70°}{5}$

is equal to

(1) –1 (2) 0

(3) 1 (4) 2

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

54. The value of tan 10° tan 15° tan 75° tan 80° is

(1) 0 (2) 1

(3) –1 (4) 2

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

55. The minimum value of $4\tan^2\theta + 9\cot^2\theta$ is equal to

(1) 0 (2) 5

(3) 12 (4) 13

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

56. If sin 7x = cos 11x , then the value of tan 9x + cot 9x is

(1) 1 (2) 2

(3) 3 (4) 4

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

57. If $\tan^2\alpha = 1 + 2\tan^2\beta$ (α, β are positive acute angles), then $\sqrt{2}\cos\alpha - \cos\beta$ is equal to

(1) 0 (2) $\sqrt{2}$

(3) 1 (4) –1

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

58. The product cos1° cos2° cos3° cos4° .... cos100° is equal to

(1) –1 (2) $\frac{1}{4}$

(3) 1 (4) 0

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

59. If $2(\cos^2\theta - \sin^2\theta) = 1$ (θ is a positive acute angle), then cot θ is equal to

(1) $-\sqrt{3}$ (2) $\frac{1}{\sqrt{3}}$

(3) 1 (4) $\sqrt{3}$

(SSC CHSL DEO & LDC Exam. 20.10.2013)

60. If $\tan(2\theta + 45°) = \cot 3\theta$ where $(2\theta + 45°)$ and 3θ are acute angles, then the value of θ is
(1) 5° (2) 9°
(3) 12° (4) 15°
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

61. If θ be acute angle and $\cos\theta = \frac{15}{17}$, then the value of $\cot(90° - \theta)$ is
(1) $\frac{2\sqrt{8}}{15}$ (2) $\frac{8}{15}$
(3) $\frac{\sqrt{2}}{17}$ (4) $\frac{8\sqrt{2}}{17}$
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

62. If $\sec^2\theta + \tan^2\theta = \frac{7}{12}$, then $\sec^4\theta - \tan^4\theta =$
(1) $\frac{7}{12}$ (2) $\frac{1}{2}$
(3) $\frac{5}{12}$ (4) 1
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

63. If $0 < x < \frac{\pi}{2}$ and $\sec x = \operatorname{cosec} y$, then the value of $\sin(x + y)$ is :
(1) 0 (2) 1
(3) $\frac{1}{2}$ (4) $\frac{1}{\sqrt{3}}$
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

64. If A, B and C be the angles of a triangle, then put of the following, the incorrect relation is :
(1) $\sin\frac{A+B}{2} = \cos\frac{C}{2}$
(2) $\cos\left(\frac{A+B}{2}\right) = \sin\frac{C}{2}$
(3) $\tan\left(\frac{A+B}{2}\right) = \sec\frac{C}{2}$
(4) $\cot\left(\frac{A+B}{2}\right) = \tan\frac{C}{2}$
FCI Assistant Grade-III. Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

65. If $\sin\alpha + \cos\beta = 2$ $(0° \le \beta < \alpha \le 90°)$, then $\sin\left(\frac{2\alpha+\beta}{3}\right) =$
(1) $\sin\frac{\alpha}{2}$ (2) $\cos\frac{\alpha}{3}$
(3) $\sin\frac{\alpha}{3}$ (4) $\cos\frac{2\alpha}{3}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

66. If $\cos^4\theta - \sin^4\theta = \frac{2}{3}$, then the value of $2\cos^2\theta - 1$ is
(1) 0 (2) 1
(3) $\frac{2}{3}$ (4) $\frac{3}{2}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

67. If $\sin\alpha \sec(30° + \alpha) = 1$ $(0 < \alpha < 60°)$, then the value of $\sin\alpha + \cos 2\alpha$ is
(1) 1 (2) $\frac{2+\sqrt{3}}{2\sqrt{3}}$
(3) 0 (4) $\sqrt{2}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

68. If $\tan\theta = 1$, then the value of $\frac{8\sin\theta + 5\cos\theta}{\sin^3\theta - 2\cos^3\theta + 7\cos\theta}$ is
(1) 2 (2) $2\frac{1}{2}$
(3) 3 (4) $\frac{4}{5}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

69. If θ be a positive acute angle satisfying $\cos^2\theta + \cos^4\theta = 1$, then the value of $\tan^2\theta + \tan^4\theta$ is
(1) $\frac{3}{2}$ (2) 1
(3) $\frac{1}{2}$ (4) 0
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

70. If $\tan\theta = \frac{4}{3}$, then the value of $\frac{3\sin\theta + 2\cos\theta}{3\sin\theta - 2\cos\theta}$ is
(1) 0.5 (2) –0.5
(3) 3.0 (4) –3.0
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

71. The simplified value of $(\sec A - \cos A)^2 + (\operatorname{cosec} A - \sin A)^2 - (\cot A - \tan A)^2$ is
(1) 0 (2) $\frac{1}{2}$
(3) 1 (4) 2
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

72. If θ be acute and $\tan\theta + \cot\theta = 2$, then the value of $\tan^5\theta + \cot^{10}\theta$ is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

73. If $\sin\theta - \cos\theta = \frac{7}{13}$ and $0 < \theta < 90°$, then the value of $\sin\theta + \cos\theta$ is
(1) $\frac{17}{13}$ (2) $\frac{13}{17}$
(3) $\frac{1}{13}$ (4) $\frac{1}{17}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

74. If $2\cos\theta - \sin\theta = \frac{1}{\sqrt{2}}$, $(0° < \theta < 90°)$ the value of $2\sin\theta + \cos\theta$ is
(1) $\frac{1}{\sqrt{2}}$ (2) $\sqrt{2}$
(3) $\frac{3}{\sqrt{2}}$ (4) $\frac{\sqrt{2}}{3}$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

75. If $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 3$, then the value of $\sin^4\theta - \cos^4\theta$ is
(1) $\frac{1}{5}$ (2) $\frac{2}{5}$
(3) $\frac{3}{5}$ (4) $\frac{4}{5}$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

76. If $\sec^2\theta + \tan^2\theta = 7$, then the value of θ when $0° \le \theta \le 90°$, is
(1) 60° (2) 30°
(3) 0° (4) 90°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

77. The simplified value of $(\text{see } x \sec y + \tan x \tan y)^2 - (\text{sex } x \tan y + \tan x \sec y)^2$ is :
(1) −1 (2) 0
(3) $\sec^2 x$ (4) 1
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

78. If $\sin\theta + \text{cosec}\theta = 2$, then value of $\sin^{100}\theta + \text{cosec}^{100}\theta$ is equal to :
(1) 1 (2) 2
(3) 3 (4) 100
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

79. If $A = \sin^2\theta + \cos^4\theta$, for any value of θ, then the value of A is
(1) $1 \le A \le 2$ (2) $\frac{3}{4} \le A \le 1$
(3) $\frac{13}{16} \le A \le 1$ (4) $\frac{3}{4} \le A \le \frac{13}{16}$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

80. If $\sin\theta + \text{cosec}\theta = 2$, then the value of $\sin^5\theta + \text{cosec}^5\theta$ when $0° \le \theta \le 90°$, is
(1) 0 (2) 1
(3) 10 (4) 2
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone) & (SSC GL Tier-I 19.05.2013) (Ist Sitting)

81. If $\tan 2\theta \cdot \tan 4\theta = 1$, then the value of $\tan 3\theta$ is
(1) $\sqrt{3}$ (2) 0
(3) 1 (4) $\frac{1}{\sqrt{3}}$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

82. If $\cos^2\alpha + \cos^2\beta = 2$, then the value of $\tan^3\alpha + \sin^5\beta$ is :
(1) −1 (2) 0
(3) 1 (4) $\frac{1}{\sqrt{3}}$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

83. If θ is a positive acute angle and $\tan 2\theta \tan 3\theta = 1$, then the value of $(2\cos^2\frac{5\theta}{2} - 1)$ is
(1) $-\frac{1}{2}$ (2) 1
(3) 0 (4) $\frac{1}{2}$
(SSC Graduate Level Tier-II Exam. 16.09.2012)

84. In a right-angled triangle XYZ, right-angled at Y, if $XY = 2\sqrt{6}$ and XZ − YZ = 2, then sec X + tan X is
(1) $\frac{1}{\sqrt{6}}$ (2) $\sqrt{6}$
(3) $2\sqrt{6}$ (4) $\frac{\sqrt{6}}{2}$
(SSC Graduate Level Tier-II Exam. 16.09.2012)

85. The minimum value of $\sin^2\theta + \cos^2\theta + \sec^2\theta + \text{cosec}^2\theta + \tan^2\theta + \cot^2\theta$ is
(1) 1 (2) 3
(3) 5 (4) 7
(SSC Graduate Level Tier-II Exam. 16.09.2012)

86. If $2\sin\left(\frac{\pi x}{2}\right) = x^2 + \frac{1}{x^2}$, then the value of $\left(x - \frac{1}{x}\right)$ is
(1) −1 (2) 2
(3) 1 (4) 0
(SSC Graduate Level Tier-II Exam. 16.09.2012)

87. If $\cos\theta + \sec\theta = 2$, the value of $\cos^6\theta + \sec^6\theta$ is
(1) 4 (2) 8
(3) 1 (4) 2
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

88. The numerical value of
$$\frac{5}{\sec^2\theta} + \frac{2}{1+\cot^2\theta} + 3\sin^2\theta \text{ is :}$$
(1) 5 (2) 2
(3) 3 (4) 4
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

89. The numerical value of
$$\left(\frac{1}{\cos\theta} + \frac{1}{\cot\theta}\right)\left(\frac{1}{\cos\theta} - \frac{1}{\cot\theta}\right)$$
is
(1) 0 (2) −1
(3) +1 (4) 2
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

90. If $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \frac{5}{4}$, the value of $\frac{\tan^2\theta + 1}{\tan^2\theta - 1}$ is
(1) $\frac{25}{16}$ (2) $\frac{41}{9}$
(3) $\frac{41}{40}$ (4) $\frac{40}{41}$
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

91. If $\tan 7\theta \tan 2\theta = 1$, then the value of $\tan 3\theta$ is
(1) $\sqrt{3}$ (2) $-\frac{1}{\sqrt{3}}$
(3) $\frac{1}{\sqrt{3}}$ (4) $-\sqrt{3}$
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

92. The value of
$$\left(2\cos^2\theta - 1\right)\left(\frac{1+\tan\theta}{1-\tan\theta} + \frac{1-\tan\theta}{1+\tan\theta}\right) \text{ is}$$
(1) 4 (2) 1
(3) 3 (4) 2
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

93. If $\sec\theta + \tan\theta = 2$, then the value of $\sec\theta$ is
(1) $\frac{4}{5}$ (2) 5
(3) $\frac{5}{4}$ (4) $\sqrt{2}$
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

94. If $\text{cosec}\theta - \sin\theta = l$ and $\sec\theta - \cos\theta = m$, then the value of $l^2m^2(l^2 + m^2 + 3)$ is
(1) −1 (2) 0
(3) 1 (4) 2
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

95. If $\frac{2\sin\theta - \cos\theta}{\cos\theta + \sin\theta} = 1$, then value of $\cot\theta$ is :
(1) $\frac{1}{2}$ (2) $\frac{1}{3}$
(3) 3 (4) 2
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

96. If $\tan\theta = 2$, then the value of $\dfrac{8\sin\theta + 5\cos\theta}{\sin^3\theta + 2\cos^3\theta + 3\cos\theta}$ is

(1) $\dfrac{21}{5}$ (2) $\dfrac{8}{5}$

(3) $\dfrac{7}{5}$ (4) $\dfrac{16}{5}$

(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

97. If $\tan\theta + \cot\theta = 2$, then the value of $\tan^{100}\theta + \cot^{100}\theta$ is

(1) 2 (2) 0

(3) 1 (4) $\sqrt{3}$

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

98. $\dfrac{\tan\theta}{1-\cot\theta} + \dfrac{\cot\theta}{1-\tan\theta}$ is equal to

(1) $1 - \tan\theta - \cot\theta$
(2) $1 + \tan\theta - \cot\theta$
(3) $1 - \tan\theta + \cot\theta$
(4) $1 + \tan\theta + \cot\theta$

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

99. If $\sin\theta + \operatorname{cosec}\theta = 2$, then the value of $\sin^9\theta + \operatorname{cosec}^9\theta$ is :

(1) 3 (2) 2
(3) 4 (4) 1

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

100. If $\sec\theta + \tan\theta = 2 + \sqrt{5}$, then the value of $\sin\theta + \cos\theta$ is :

(1) $\dfrac{3}{\sqrt{5}}$ (2) $\sqrt{5}$

(3) $\dfrac{7}{\sqrt{5}}$ (4) $\dfrac{1}{\sqrt{5}}$

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

101. The value of $(1 + \cot\theta - \operatorname{cosec}\theta)(1 + \tan\theta + \sec\theta)$ is equal to

(1) 1 (2) 2
(3) 0 (4) –1

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

102. If $\tan\theta + \cot\theta = 2$, then the value of $\tan^n\theta + \cot^n\theta$ ($0° < \theta < 90°$, n is an integer) is

(1) 2 (2) 2^n
(3) $2n$ (4) 2^{n+1}

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

103. If $\dfrac{\sin\theta}{x} = \dfrac{\cos\theta}{y}$, then $\sin\theta - \cos\theta$ is equal to

(1) $x - y$ (2) $x + y$

(3) $\dfrac{x-y}{\sqrt{x^2+y^2}}$ (4) $\dfrac{y-x}{\sqrt{x^2+y^2}}$

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

104. If $x = a\sec\theta\cos\phi$, $y = b\sec\theta\sin\phi$, $z = c\tan\theta$, then the value of $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} - \dfrac{z^2}{c^2}$ is :

(1) 1 (2) 4
(3) 9 (4) 0

(SSC Graduate Level Tier-I Exam. 21.04.2013)

105. If $\dfrac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = \dfrac{5}{3}$, then $\sin\theta$ is equal to :

(1) $\dfrac{1}{4}$ (2) $\dfrac{1}{3}$

(3) $\dfrac{2}{3}$ (4) $\dfrac{3}{4}$

(SSC Graduate Level Tier-I Exam. 21.04.2013)

106. If $\cos x + \cos^2 x = 1$, the numerical value of $(\sin^{12}x + 3\sin^{10}x + 3\sin^8 x + \sin^6 x - 1)$ is :

(1) –1 (2) 2
(3) 0 (4) 1

(SSC Graduate Level Tier-I Exam. 21.04.2013)

107. If $(1 + \sin\alpha)(1 + \sin\beta)(1 + \sin\gamma) = (1 - \sin\alpha)(1 - \sin\beta)(1 - \sin\gamma)$, then each side is equal to

(1) $\pm\cos\alpha\cos\beta\cos\gamma$
(2) $\pm\sin\alpha\sin\beta\sin\gamma$
(3) $\pm\sin\alpha\cos\beta\cos\gamma$
(4) $\pm\sin\alpha\sin\beta\cos\gamma$

(SSC Graduate Level Tier-I Exam. 21.04.2013)

108. The numerical value of

$$\frac{1}{1+\cot^2\theta} + \frac{3}{1+\tan^2\theta} + 2\sin^2\theta$$

will be

(1) 2 (2) 5
(3) 6 (4) 3

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

109. The value of

$$\frac{4}{1+\tan^2\alpha} + \frac{3}{1+\cot^2\alpha} + 3\sin^2\alpha$$

is

(1) 4 (2) –1
(3) 2 (4) 3

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

110. The value of $3(\sin x - \cos x)^4 + 6(\sin x + \cos x)^2 + 4(\sin^6 x + \cos^6 x)$ is

(1) 14 (2) 11
(3) 12 (4) 13

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

111. The value of

$$\sec\theta\left(\frac{1+\sin\theta}{\cos\theta} + \frac{\cos\theta}{1+\sin\theta}\right) - 2\tan^2\theta$$

is

(1) 4 (2) 1
(3) 2 (4) 0

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

112. If $\tan\theta + \cot\theta = 2$, then the value of $\tan^2\theta + \cot^2\theta$ is

(1) 2 (2) 1

(3) $\sqrt{2}$ (4) 0

(SSC Graduate Level Tier-I Exam. 19.05.2013)

113. The eliminant of θ from $x\cos\theta - y\sin\theta = 2$ and $x\sin\theta + y\cos\theta = 4$ will give

(1) $x^2 + y^2 = 20$

(2) $3x^2 + y^2 = 20$

(3) $x^2 - y^2 = 20$

(4) $3x^2 - y^2 = 10$

(SSC Graduate Level Tier-I Exam. 19.05.2013)

114. The value of

$$\left[\frac{\cos^2 A(\sin A + \cos A)}{\operatorname{cosec}^2 A(\sin A - \cos A)} + \frac{\sin^2 A(\sin A - \cos A)}{\sec^2 A(\sin A + \cos A)}\right]$$

$(\sec^2 A - \operatorname{cosec}^2 A)$

(1) 1 (2) 3
(3) 2 (4) 4

(SSC Graduate Level Tier-I Exam. 19.05.2013)

115. The value of

$$\frac{1}{\operatorname{cosec}\theta - \cot\theta} - \frac{1}{\sin\theta} \text{ is}$$

(1) 1 (2) $\cot\theta$
(3) $\operatorname{cosec}\theta$ (4) $\tan\theta$

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

116. If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$, then $\cos\theta - \sin\theta$ is

(1) $\sqrt{2}\tan\theta$ (2) $-\sqrt{2}\cos\theta$
(3) $-\sqrt{2}\sin\theta$ (4) $\sqrt{2}\sin\theta$

(SSC Graduate Level Tier-I Exam. 19.05.2013 (Ist Sitting) & (SSC GL Tier-II Exam. 29.09.2013)

117. If $\cos^4\theta - \sin^4\theta = \frac{2}{3}$, then the value of $1 - 2\sin^2\theta$ is

(1) $\frac{4}{3}$ (2) 0
(3) $\frac{2}{3}$ (4) $\frac{1}{3}$

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

118. The value of

$$\frac{1}{(1+\tan^2\theta)} + \frac{1}{(1+\cot^2\theta)} \text{ is}$$

(1) $\frac{1}{4}$ (2) 1
(3) $\frac{5}{4}$ (4) $\frac{4}{3}$

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

119. If $\sin\theta - \cos\theta = \frac{1}{2}$ then value of $\sin\theta + \cos\theta$ is :

(1) -2 (2) ± 2
(3) $\frac{\sqrt{7}}{2}$ (4) 2

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

120. The value of $\frac{\sin A}{1+\cos A} + \frac{\sin A}{1-\cos A}$ is
$(0° < A < 90°)$

(1) 2 cosec A (2) 2 sec A
(3) 2 sin A (4) 2 cos A

(SSC Graduate Level Tier-II Exam. 29.09.2013)

121. If $r\sin\theta = 1$, $r\cos\theta = \sqrt{3}$, then the value of $\left(\sqrt{3}\tan\theta + 1\right)$ is

(1) $\sqrt{3}$ (2) $\frac{1}{\sqrt{3}}$
(3) 1 (4) 2

(SSC Graduate Level Tier-II Exam. 29.09.2013)

122. If $x\cos\theta - y\sin\theta = \sqrt{x^2+y^2}$ and

$$\frac{\cos^2\theta}{a^2} + \frac{\sin^2\theta}{b^2} = \frac{1}{x^2+y^2},$$

then the correct relation is

(1) $\frac{x^2}{b^2} - \frac{y^2}{a^2} = 1$

(2) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

(3) $\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$

(4) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

(SSC CHSL DEO & LDC Exam. 20.10.2013)

123. If $\tan\theta - \cot\theta = 0$, find the value of $\sin\theta + \cos\theta$.

(1) 0 (2) 1
(3) $\sqrt{2}$ (4) 2

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

124. The greatest value of $\sin^4\theta + \cos^4\theta$ is

(1) 2 (2) 3
(3) $\frac{1}{2}$ (4) 1

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

125. If $3\sin\theta + 5\cos\theta = 5$, then $5\sin\theta - 3\cos\theta$ is equal to

(1) ± 3 (2) ± 5
(3) 1 (4) ± 2

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

126. If $\sin\theta + \sin^2\theta = 1$, then the value of $\cos^2\theta + \cos^4\theta$ is

(1) 2 (2) 4
(3) 0 (4) 1

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

127. If $\tan\theta + \cot\theta = 2$ then the value of θ is

(1) 45° (2) 60°
(3) 90° (4) 30°

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

128. If $\cos\pi x = x^2 - x + \frac{5}{4}$, the value of x will be

(1) 0 (2) 1
(3) -1 (4) None of the above

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

129. The numerical value of

$$1 + \frac{1}{\cot^2 63°} - \sec^2 27° + \frac{1}{\sin^2 63°} - \operatorname{cosec}^2 27° \text{ is}$$

(1) 1 (2) 2
(3) -1 (4) 0

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

130. If $x = \frac{\cos\theta}{1-\sin\theta}$, then $\frac{\cos\theta}{1+\sin\theta}$ is equal to

(1) $x - 1$ (2) $\frac{1}{x}$
(3) $\frac{1}{x+1}$ (4) $\frac{1}{1-x}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

131. In Δ ABC, $\angle B = 90°$ and AB : BC = 2 : 1. The value of sin A + cot C is

(1) $3+\sqrt{5}$ (2) $\frac{2+\sqrt{5}}{2\sqrt{5}}$
(3) $2+\sqrt{5}$ (4) $3\sqrt{5}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

132. If $\sin\frac{\pi x}{2} = x^2 - 2x + 2$, then the value of x is

(1) 0 (2) 1
(3) -1 (4) None of these

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

133. The value of

$$\frac{\sin 43°}{\cos 47°} + \frac{\cos 19°}{\sin 71°} - 8\cos^2 60° \text{ is}$$

(1) 0 (2) 1
(3) 2 (4) -1

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

134. The value of

$$\left(\begin{array}{l}\sin^2 7\frac{1^\circ}{2}+\sin^2 82\frac{1^\circ}{2}\\ +\tan^2 2^\circ.\tan^2 88^\circ\end{array}\right) \text{ is}$$

(1) 1 (2) 2
(3) 0 (4) 4

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

135. Find the value of $1 - 2\sin^2\theta + \sin^4\theta$.

(1) $\sin^4\theta$ (2) $\cos^4\theta$
(3) $\text{cosec}^4\theta$ (4) $\sec^4\theta$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

136. The simplest value of cot 9° cot 27° cot 63° cot 81° is

(1) 0 (2) 1
(3) –1 (4) $\sqrt{3}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

137. If

(1 + sin A) (1 + sin B) (1 + sin C) = (1 – sin A)

(1 – sin B) (1 – sin C), 0 < A, B, C

$< \frac{\pi}{2}$ then each side is equal to

(1) sin A sin B sin C
(2) cos A cos B cos C
(3) tan A tan B tan C
(4) 1

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

138. The value of θ, which satisfies the equation $\tan^2\theta + 3 = 3\sec\theta$, $0^\circ \le \theta < 90^\circ$ is

(1) 15° or 0° (2) 30° or 0°
(3) 45° or 0° (4) 60° or 0°

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

139. If sin θ = 0.7, then cos θ, $0 \le \theta < 90^\circ$, is

(1) 0.3 (2) $\sqrt{0.49}$
(3) $\sqrt{0.51}$ (4) $\sqrt{0.9}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

140. The value of $\sin^2 65^\circ + \sin^2 25^\circ + \cos^2 35^\circ + \cos^2 55^\circ$ is

(1) 0 (2) 1
(3) 2 (4) $\frac{1}{2}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

141. If $x \sin 60^\circ.\tan 30^\circ = \sec 60^\circ.\cot 45^\circ$, then the value of x is

(1) 2 (2) $2\sqrt{3}$
(3) 4 (4) $4\sqrt{3}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

142. If θ = 60°, then

$$\frac{1}{2}\sqrt{1+\sin\theta}+\frac{1}{2}\sqrt{1-\sin\theta} \text{ is}$$

equal to

(1) $\cot\frac{\theta}{2}$ (2) $\sec\frac{\theta}{2}$
(3) $\sin\frac{\theta}{2}$ (4) $\cos\frac{\theta}{2}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

143. If $\frac{2\tan^2 30^\circ}{1-\tan^2 30^\circ}+\sec^2 45^\circ - \sec^2 0^\circ = x\sec 60^\circ$, then the value of x is

(1) 2 (2) 1
(3) 0 (4) –1

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

144. If $\tan\theta = \frac{\sin\alpha - \cos\alpha}{\sin\alpha + \cos\alpha}$, then sinα + cosα is

(1) $\pm\sqrt{2}\sin\theta$ (2) $\pm\sqrt{2}\cos\theta$
(3) $\pm\frac{1}{\sqrt{2}}\sin\theta$ (4) $\pm\frac{1}{\sqrt{2}}\cos\theta$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

145. If $7\sin^2\theta + 3\cos^2\theta = 4$, ($0^\circ < \theta < 90^\circ$), then the value of tan θ is

(1) $\frac{1}{\sqrt{3}}$ (2) $\frac{1}{2}$
(3) 1 (4) $\sqrt{3}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

146. If $\tan 9^\circ = \frac{p}{q}$, then the value of

$$\frac{\sec^2 81^\circ}{1+\cot^2 81^\circ} \text{ is}$$

(1) $\frac{q}{p}$ (2) 1
(3) $\frac{p^2}{q^2}$ (4) $\frac{q^2}{p^2}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

147. If secθ + tanθ = 5, then the value of $\frac{\tan\theta+1}{\tan\theta-1}$ is

(1) $\frac{11}{7}$ (2) $\frac{13}{7}$
(3) $\frac{15}{7}$ (4) $\frac{17}{7}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

148. If $\tan^2\theta = 1 - e^2$, then the value of $\sec\theta + \tan^3\theta\,\text{cosec}\theta$ is

(1) $\left(2+e^2\right)^{\frac{3}{2}}$ (2) $\left(2-e^2\right)^{\frac{1}{2}}$
(3) $\left(2+e^2\right)^{\frac{1}{2}}$ (4) $\left(2-e^2\right)^{\frac{3}{2}}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

149. Which one of the following is true for $0^\circ < \theta < 90^\circ$?

(1) $\cos\theta \le \cos^2\theta$ (2) $\cos\theta > \cos^2\theta$
(3) $\cos\theta < \cos^2\theta$ (4) $\cos\theta \ge \cos^2\theta$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

150. If $x \sin 60^\circ \tan 30^\circ - \tan^2 45^\circ = \text{cosec}\, 60^\circ \cot 30^\circ - \sec^2 45^\circ$, then x =

(1) 2 (2) –2
(3) 6 (4) –4

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

151. If $x = a\sec\alpha\cos\beta$, $y = b\sec\alpha\sin\beta$, $z = c\tan\alpha$, then the value of $\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}$ is

(1) 2 (2) 0
(3) 1 (4) –1

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

152. If $\frac{\cos\alpha}{\cos\beta} = a$ and $\frac{\sin\alpha}{\sin\beta} = b$, then the value of $\sin^2\beta$ in terms of a and b is

(1) $\frac{a^2+1}{a^2-b^2}$ (2) $\frac{a^2-b^2}{a^2+b^2}$
(3) $\frac{a^2-1}{a^2-b^2}$ (4) $\frac{a^2-1}{a^2+b^2}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

153. The value of

$$\frac{\cos^2 60° + 4\sec^2 30° - \tan^2 45°}{\sin^2 30° + \cos^2 30°} \text{ is}$$

(1) $\frac{64}{\sqrt{3}}$ (2) $\frac{55}{12}$

(3) $\frac{67}{12}$ (4) $\frac{67}{10}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

154. The value of $\sin^2 30° \cos^2 45° + 5\tan^2 30° + \frac{3}{2}\sin^2 90° - 3\cos^2 90°$ is

(1) $3\frac{7}{24}$ (2) $3\frac{3}{24}$

(3) $3\frac{1}{24}$ (4) $3\frac{5}{24}$

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

155. If $\cos^2\theta - \sin^2\theta = \frac{1}{3}$, where $0 \le \theta \le \frac{\pi}{2}$, then the value of $\cos^4\theta - \sin^4\theta$ is

(1) $\frac{1}{3}$ (2) $\frac{2}{3}$

(3) $\frac{1}{9}$ (4) $\frac{2}{9}$

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

156. If $\tan\theta = \frac{1}{\sqrt{11}}$ and $0 < \theta < \frac{\pi}{2}$, then the value of

$$\frac{\operatorname{cosec}^2\theta - \sec^2\theta}{\operatorname{cosec}^2\theta + \sec^2\theta} \text{ is}$$

(1) $\frac{3}{4}$ (2) $\frac{4}{5}$

(3) $\frac{5}{6}$ (4) $\frac{6}{7}$

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

157. The value of

$$\frac{1}{\sqrt{2}}\sin\frac{\pi}{6}\cos\frac{\pi}{4} - \cot\frac{\pi}{3}\sec\frac{\pi}{6} + \frac{5\tan\frac{\pi}{4}}{12\sin\frac{\pi}{2}}$$

is equal to

(1) 0 (2) 1

(3) 2 (4) $\frac{3}{2}$

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

158. If $\sin\theta = \frac{3}{5}$, then the value of

$$\frac{\tan\theta + \cos\theta}{\cot\theta + \operatorname{cosec}\theta} \text{ is equal to}$$

(1) $\frac{29}{60}$ (2) $\frac{31}{60}$

(3) $\frac{34}{60}$ (4) $\frac{37}{60}$

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

159. If $a\cos\theta + b\sin\theta = p$ and $a\sin\theta - b\cos\theta = q$, then the relation between a, b, p and q is

(1) $a^2 - b^2 = p^2 - q^2$

(2) $a^2 + b^2 = p^2 + q^2$

(3) $a + b = p + q$

(4) $a - b = p - q$

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

160. If $(\sin\alpha + \operatorname{cosec}\alpha)^2 + (\cos\alpha + \sec\alpha)^2 = k + \tan^2\alpha + \cot^2\alpha$, then the value of k is

(1) 1 (2) 7

(3) 3 (4) 5

(SSC CGL Tier-I Exam. 19.10.2014)

161. If $\sin 21° = \frac{x}{y}$, then $\sec 21° - \sin 69°$ is equal to

(1) $\frac{x^2}{y\sqrt{y^2 - x^2}}$ (2) $\frac{y^2}{x\sqrt{y^2 - x^2}}$

(3) $\frac{x^2}{y\sqrt{x^2 - y^2}}$ (4) $\frac{y^2}{x\sqrt{x^2 - y^2}}$

(SSC CGL Tier-I Exam. 19.10.2014)

162. If $\sec\alpha + \tan\alpha = 2$, then the value of $\sin\alpha$ is (assume that $0 < \alpha < 90°$)

(1) 0.4 (2) 0.5

(3) 0.6 (4) 0.8

(SSC CGL Tier-I Exam. 19.10.2014)

163. If $3\sin\theta + 5\cos\theta = 5$, then the value of $5\sin\theta - 3\cos\theta$ will be

(1) ± 3 (2) ± 5

(3) ± 2 (4) ± 1

(SSC CGL Tier-I Exam. 19.10.2014)

164. If θ is an acute angle and $\tan\theta + \cot\theta = 2$, then the value of $\tan^5\theta + \cot^5\theta$ is

(1) 1 (2) 2

(3) 3 (4) 4

(SSC CGL Tier-I Exam. 19.10.2014)

165. The simple value of $\tan 1°.\tan 2°.\tan 3°.....\tan 89°$ is

(1) $\frac{1}{2}$ (2) 0

(3) 1 (4) $\frac{2}{3}$

(SSC CGL Tier-I Exam. 19.10.2014)

166. If $x\sin^2 60° - \frac{3}{2}\sec 60° \tan^2 30° + \frac{4}{5}\sin^2 45° \tan^2 60° = 0$ then x is

(1) $-\frac{1}{15}$ (2) -4

(3) $-\frac{4}{15}$ (4) -2

(SSC CGL Tier-I Exam. 26.10.2014)

167. If $7\sin\alpha = 24\cos\alpha$; $0 < \alpha < \frac{\pi}{2}$, then the value of $14\tan\alpha - 75\cos\alpha - 7\sec\alpha$ is equal to

(1) 3 (2) 4

(3) 1 (4) 2

(SSC CGL Tier-I Exam. 26.10.2014)

168. The value of x which satisfies the equation $2\operatorname{cosec}^2 30° + x\sin^2 60° - \frac{3}{4}\tan^2 30° = 10$ is

(1) 2 (2) 3

(3) 0 (4) 1

(SSC CGL Tier-I Exam. 26.10.2014)

169. If $2\sin\theta + \cos\theta = \frac{7}{3}$ then the value of $(\tan^2\theta - \sec^2\theta)$ is

(1) 0 (2) -1

(3) $\frac{3}{7}$ (4) $\frac{7}{3}$

(SSC CGL Tier-I Exam. 26.10.2014)

170. If $29\tan\theta = 31$, then the value of

$$\frac{1 + 2\sin\theta\cos\theta}{1 - 2\sin\theta\cos\theta} \text{ is equal to}$$

(1) 810 (2) 900

(3) 540 (4) 490

(SSC CGL Tier-I Exam. 26.10.2014)

171. ABCD is a rectangle of which AC is a diagonal. The value of $(\tan^2 \angle CAD + 1) \sin^2 \angle BAC$ is

(1) 2 (2) $\frac{1}{4}$

(3) 1 (4) 0

(SSC CGL Tier-II Exam. 21.09.2014)

172. If $\tan x = \sin 45°. \cos 45° + \sin 30°$ then the value of x is

(1) 30° (2) 45°

(3) 60° (4) 90°

(SSC CGL Tier-II Exam. 21.09.2014)

173. For any real values of θ, $\sqrt{\frac{\sec\theta - 1}{\sec\theta + 1}} = ?$

(1) cotθ – cosecθ

(2) secθ – tanθ

(3) cosecθ – cotθ

(4) tanθ – secθ

(SSC CGL Tier-II Exam. 21.09.2014)

174. If the sum and difference of two angles are 135° and $\frac{\pi}{12}$ respectively, then the value of the angles in degree measure are

(1) 70°, 65° (2) 75°, 60°

(3) 45°, 90° (4) 80°, 55°

(SSC CGL Tier-II Exam. 21.09.2014)

175. In a Δ ABC, $\angle B = \frac{\pi}{3}$, $\angle C = \frac{\pi}{4}$ and D divides BC internally in the ratio 1 : 3 then $\frac{\sin\angle BAD}{\sin\angle CAD}$ is equal to

(1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{\sqrt{3}}$

(3) $\frac{1}{\sqrt{6}}$ (4) $\sqrt{6}$

(SSC CGL Tier-II Exam. 21.09.2014)

176. If sin 3A = cos (A – 26°), where 3A is an acute angle then the value of A is

(1) 29° (2) 26°

(3) 23° (4) 28°

(SSC CGL Tier-II Exam. 21.09.2014)

177. Value of $\sec^2\theta - \frac{\sin^2\theta - 2\sin^4\theta}{2\cos^4\theta - \cos^2\theta}$ is

(1) 1 (2) 2

(3) –1 (4) 0

(SSC CGL Tier-II Exam. 21.09.2014)

178. If $x = a(\sin\theta + \cos\theta)$, $y = b(\sin\theta - \cos\theta)$ then the value of $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ is

(1) 0 (2) 1

(3) 2 (4) –2

(SSC CGL Tier-II Exam. 21.09.2014)

179. If sin 5 θ = cos 20° (0° < θ < 90°) then the value of θ is

(1) 4° (2) 22°

(3) 10° (4) 14°

(SSC CGL Tier-II Exam. 21.09.2014)

180. If 0° < θ < 90° and 2 secθ = 3 $\text{cosec}^2\theta$, then θ is

(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{4}$

(3) $\frac{\pi}{3}$ (4) $\frac{\pi}{5}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

181. $\sqrt{\frac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\frac{1-\sin\theta}{1+\sin\theta}}$ is equal to

(1) 2 cos θ (2) 2 sin θ

(3) 2 cot θ (4) 2 sec θ

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

182. If cos θ = $\frac{3}{5}$, then the value of sinθ . secθ . tanθ is

(1) $\frac{9}{16}$ (2) $\frac{16}{9}$

(3) $\frac{3}{4}$ (4) $\frac{4}{3}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

183. If 0° < A < 90°, then the value of $\tan^2 A + \cot^2 A - \sec^2 A \,\text{cosec}^2 A$ is

(1) 0 (2) 1

(3) 2 (4) – 2

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

184. If α and β are positive acute angles, sin (4α – β) = 1 and cos (2 α + β) = $\frac{1}{2}$,

then the value of sin (α + 2β) is

(1) 0 (2) 1

(3) $\frac{\sqrt{3}}{2}$ (4) $\frac{1}{\sqrt{2}}$

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

185. If θ is a positive acute angle and cosec θ = $\sqrt{3}$, then the value of cot θ – cosec θ is

(1) $\frac{3\sqrt{2} - \sqrt{3}}{3}$ (2) $\frac{\sqrt{2}(3+\sqrt{3})}{3}$

(3) $\frac{\sqrt{2}(3-\sqrt{3})}{3}$ (4) $\frac{3\sqrt{2} + \sqrt{3}}{3}$

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

186. If θ is a positive acute angle and $4\cos^2\theta - 4\cos\theta + 1 = 0$, then the value of tan (θ – 15°) is equal to

(1) 0 (2) 1

(3) $\sqrt{3}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CHSL DEO & LDC Exam. 9.11.2014)

187. If $(r\cos\theta - \sqrt{3})^2 + (r\sin\theta - 1)^2 = 0$ then the value of $\frac{r\tan\theta + \sec\theta}{r\sec\theta + \tan\theta}$ is equal to

(1) $\frac{4}{5}$ (2) $\frac{5}{4}$

(3) $\frac{\sqrt{3}}{4}$ (4) $\frac{\sqrt{5}}{4}$

(SSC CHSL DEO & LDC Exam. 9.11.2014)

188. The value of

$$\frac{\sin 25°\cos 65° + \cos 25°\sin 65°}{\tan^2 70° - \text{cosec}^2 20°}$$

(1) – 1 (2) 0

(3) 1 (4) 2

(SSC CHSL DEO & LDC Exam. 9.11.2014)

189. If sin (θ + 18°) = cos 60° (0 < θ < 90°), then the value of cos 5θ is

(1) $\frac{1}{2}$ (2) 0

(3) $\frac{1}{\sqrt{2}}$ (4) 1

(SSC CHSL DEO & LDC Exam. 16.11.2014)

190. If $\tan\theta = \frac{3}{4}$, then the value of $\frac{4\sin^2\theta - 2\cos^2\theta}{4\sin^2\theta + 3\cos^2\theta}$ is equal to

(1) $\frac{1}{21}$ (2) $\frac{2}{21}$

(3) $\frac{4}{21}$ (4) $\frac{8}{21}$

(SSC CHSL DEO & LDC Exam. 16.11.2014)

191. If $\frac{\cos\alpha}{\cos\beta} = a$, $\frac{\sin\alpha}{\sin\beta} = b$, then $\sin^2\beta$ is equal to

(1) $\frac{a^2-1}{a^2+b^2}$ (2) $\frac{a^2+1}{a^2-b^2}$

(3) $\frac{a^2-1}{a^2-b^2}$ (4) $\frac{a^2+1}{a^2+b^2}$

(SSC CHSL DEO & LDC Exam. 16.11.2014)

192. Let A, B, C, D be the angles of a quadrilateral. If they are concyclic, then the value of cos A + cos B + cos C + cos D is

(1) 0 (2) 1

(3) –1 (4) 2

(SSC CHSL DEO & LDC Exam. 16.11.2014)

193. If $\sqrt{3}\tan\theta = 3\sin\theta$, then the value of $(\sin^2\theta - \cos^2\theta)$ is

(1) 1 (2) 3

(3) $\frac{1}{3}$ (4) None

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

194. If sin(A + B) = sin A cos B + cos A sin B, then the value of sin75° is

(1) $\frac{\sqrt{3}+1}{\sqrt{2}}$ (2) $\frac{\sqrt{2}+1}{2\sqrt{2}}$

(3) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ (4) $\frac{\sqrt{3}+1}{2}$

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

195. ABC is a right angled triangle, right angled at B and ∠A = 60° and AB = 20 cm, then the ratio of sides BC and CA is

(1) $\sqrt{3} : 1$ (2) $1 : \sqrt{3}$

(3) $\sqrt{3} : \sqrt{2}$ (4) $\sqrt{3} : 2$

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

196. If tan 2θ . tan 3θ = 1, where 0° < θ < 90° then the value of θ is

(1) $22\frac{1}{2}°$ (2) 18°

(3) 24° (4) 30°

197. If $\cos^2\alpha - \sin^2\alpha = \tan^2\beta$, then the value of $\cos^2\beta - \sin^2\beta$ is

(1) $\cot^2\alpha$ (2) $\cot^2\beta$

(3) $\tan^2\alpha$ (4) $\tan^2\beta$

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

198. If tan (A + B) = $\sqrt{3}$ and $\tan(A - B) = \frac{1}{\sqrt{3}}$, ∠A + ∠B) < 90°, A ≥ B, then ∠A is

(1) 90° (2) 30°

(3) 45° (4) 60°

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

199. The value of $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$ is equal to

(1) sin θ (2) cos θ

(3) tan θ (4) cot θ

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

200. If $r\sin\theta = \frac{7}{2}$ and $r\cos\theta = \frac{7\sqrt{3}}{2}$, then value of r is

(1) 4 (2) 3

(3) 5 (4) 7

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

201. If $\theta + \phi = \frac{\pi}{2}$ and $\sin\theta = \frac{1}{2}$, then the value of sin ϕ is

(1) 1 (2) $\frac{1}{\sqrt{2}}$

(3) $\frac{1}{2}$ (4) $\frac{\sqrt{3}}{2}$

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

202. If 0° < θ < 90° and $2\sin^2\theta + 3\cos\theta = 3$, then the value of θ is

(1) 30° (2) 60°

(3) 45° (4) 75°

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

203. The value of θ (0 ≤ θ ≤ 90°) satisfying $2\sin^2\theta = 3\cos\theta$ is

(1) 60° (2) 30°

(3) 90° (4) 45°

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

204. If $a(\tan\theta + \cot\theta) = 1$, $\sin\theta + \cos\theta = b$ with 0° < θ < 90°, then a relation between a and b is

(1) $b^2 = 2(a + 1)$

(2) $b^2 = 2(a - 1)$

(3) $2a = b^2 - 1$

(4) $2a = b^2 + 1$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

205. If A is an acute angle and cot A + cosec A = 3, then the value of sin A is

(1) 1 (2) $\frac{3}{5}$

(3) $\frac{4}{5}$ (4) 0

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

206. The simplest value of $\sin^2 x + 2\tan^2 x - 2\sec^2 x + \cos^2 x$ is

(1) 1 (2) 0

(3) –1 (4) 2

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

207. If $x = a\sec\theta$ and $y = b\tan\theta$ then $\frac{a^2}{x^2} - \frac{b^2}{y^2} = ?$

(1) 1 (2) 2

(3) 3 (4) 4

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

208. The value of $\sin^2 1° + \sin^2 2° + \sin^2 3° + \ldots + \sin^2 89°$ is

(1) 22 (2) 44

(3) $22\frac{1}{2}$ (4) $44\frac{1}{2}$

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

209. The value of $\frac{\cos^3\theta + \sin^3\theta}{\cos\theta + \sin\theta} + \frac{\cos^3\theta - \sin^3\theta}{\cos\theta - \sin\theta}$ is equal to

(1) -1 (2) 1

(3) 2 (4) 0

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

210. If $\sin 17° = \frac{x}{y}$, then $\sec 17° - \sin 73°$ is equal to

(1) $\frac{y}{\sqrt{y^2 - x^2}}$ (2) $\frac{y^2}{(x\sqrt{y^2 - x^2})}$

(3) $\frac{x}{(y\sqrt{y^2 - x^2})}$ (4) $\frac{x^2}{(y\sqrt{y^2 - x^2})}$

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

211. If θ is a positive acute angle and $\operatorname{cosec}\theta + \cot\theta = \sqrt{3}$, then the value of $\operatorname{cosec}\theta$ is

(1) $\frac{1}{\sqrt{3}}$ (2) $\sqrt{3}$

(3) $\frac{2}{\sqrt{3}}$ (4) 1

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

212. If $\cos\alpha + \sec\alpha = \sqrt{3}$, then the value of $\cos^3\alpha + \sec^3\alpha$ is

(1) 2 (2) 1
(3) 0 (4) 4

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

213. If $\sin\theta + \cos\theta = \sqrt{2}\cos\theta$, then the value of $\cot\theta$ is

(1) $\sqrt{2} + 1$ (2) $\sqrt{2} - 1$

(3) $\sqrt{3} - 1$ (4) $\sqrt{3} + 1$

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

214. If $\cos^4\theta - \sin^4\theta = \frac{2}{3}$, then the value of $1 - 2\sin^2\theta$ is

(1) $\frac{2}{3}$ (2) $\frac{3}{2}$

(3) 1 (4) 0

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

215. The value of $\frac{\cot 30° - \cot 75°}{\tan 15° - \tan 60°}$ is equal to

(1) – 1 (2) 0
(3) 1 (4) 2

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

216. If $\sin\theta + \cos\theta = p$ and $\sec\theta + \operatorname{cosec}\theta = q$, then the value of $q(p^2 - 1)$ is

(1) 1 (2) p
(3) $2p$ (4) 2

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

217. If $\sin(3\alpha - \beta) = 1$ and $\cos(2\alpha+\beta) = \frac{1}{2}$, then the value of $\tan\alpha$ is

(1) 0 (2) $\frac{1}{\sqrt{3}}$

(3) 1 (4) $\sqrt{3}$

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

218. If $\sin(60° - x) = \cos(y + 60°)$, then the value of $\sin(x - y)$ is

(1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{2}$

(3) $\frac{\sqrt{3}}{2}$ (4) 1

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

219. If $x = a\sec\theta$, $y = b\tan\theta$, then $\frac{x^2}{a^2} - \frac{y^2}{b^2}$ is

(1) –1 (2) 0
(3) 1 (4) 2

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

220. a, b, c are the lengths of three sides of a triangle ABC. If a, b, c are related by the relation $a^2 + b^2 + c^2 = ab + bc + ca$, then the value of $\sin^2A + \sin^2B + \sin^2C$ is

(1) $\frac{3}{4}$ (2) $\frac{3\sqrt{3}}{2}$

(3) $\frac{3}{2}$ (4) $\frac{9}{4}$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

221. If $a\sin\theta + b\cos\theta = c$, then $a\cos\theta - b\sin\theta$ is equal to

(1) $\pm\sqrt{a + b - c}$

(2) $\pm\sqrt{a^2 + b^2 + c^2}$

(3) $\pm\sqrt{a^2 + b^2 - c^2}$

(4) $\pm\sqrt{c^2 + a^2 - b^2}$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

222. If $\sin\theta + \cos\theta = \sqrt{2}\sin(90° - \theta)$, then the value of $\cot\theta$ is

(1) $-\sqrt{2} - 1$ (2) $\sqrt{2} - 1$

(3) $\sqrt{2} + 1$ (4) $-\sqrt{2} + 1$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

223. If θ is a positive acute angle and $3(\sec^2\theta + \tan^2\theta) = 5$, then the value of $\cos 2\theta$ is

(1) $\frac{1}{2}$ (2) $\frac{1}{\sqrt{2}}$

(3) $\frac{\sqrt{3}}{2}$ (4) 1

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

224. If $x\cos^2 30°.\sin 60° = \frac{\tan^2 45°.\sec 60°}{\operatorname{cosec} 60°}$ then the value of x is

(1) $\frac{1}{\sqrt{3}}$ (2) $\frac{1}{\sqrt{2}}$

(3) $2\frac{2}{3}$ (4) $\frac{1}{2}$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

225. If $\tan\alpha = 2$, then the value of $\frac{\operatorname{cosec}^2\alpha - \sec^2\alpha}{\operatorname{cosec}^2\alpha + \sec^2\alpha}$ is

(1) $-\frac{15}{9}$ (2) $-\frac{3}{5}$

(3) $\frac{3}{5}$ (4) $\frac{17}{5}$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

226. If $\sin(\theta + 30°) = \frac{3}{\sqrt{12}}$, then the value of $\cos^2\theta$ is

(1) $\frac{1}{4}$ (2) $\frac{\sqrt{3}}{2}$

(3) $\frac{3}{4}$ (4) $\frac{1}{2}$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

227. If $0 \le \theta \le 90°$ and $4\cos^2\theta - 4\sqrt{3}\cos\theta + 3 = 0$ then the value of θ is
(1) 30° (2) 45°
(3) 90° (4) 60°
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

228. If $\sec\theta - \cos\theta = \frac{3}{2}$ where θ is a positive acute angle, then the value of $\sec\theta$ is
(1) $-\frac{1}{2}$ (2) 1
(3) 2 (4) 0
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

229. If $\tan(5x - 10°) = \cot(5y + 20°)$, the value of $(x + y)$ is
(1) 15° (2) 16°
(3) 24° (4) 20°
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

230. If $\sin\theta + \sin^2\theta = 1$, then the value of $\cos^{12}\theta + 3\cos^{10}\theta + 3\cos^8\theta + \cos^6\theta - 1$ is
(1) 1 (2) 2
(3) 3 (4) 0
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

231. The value of tan 11° tan 17° tan 79° tan 73° is
(1) $\frac{1}{2}$ (2) 0
(3) 1 (4) $\frac{1}{\sqrt{2}}$
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

232. If for any acute angle A, $\sin A + \sin^2 A = 1$, then the value of $\cos^2 A + \cos^4 A$ is
(1) –1 (2) 1
(3) 2 (4) 0
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

233. The value of
$(1 + \sec 20° + \cot 70°)(1 - \text{cosec } 20° + \tan 70°)$ is equal to
(1) 0 (2) 1
(3) 2 (4) – 1
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

234. If $0° < A < 90°$, the value of
$\frac{\tan A - \sec A - 1}{\tan A + \sec A + 1}$ is
(1) $\frac{\sin A - 1}{\cos A}$ (2) $\frac{1 - \sin A}{\cos A}$
(3) $\frac{1 - \cos A}{\sin A}$ (4) $\frac{\sin A + 1}{\cos A}$
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

235. If α is an cute angle and $2\sin\alpha + 15\cos^2\alpha = 7$ then the value of $\cot\alpha$ is
(1) $\frac{4}{3}$ (2) $\frac{4}{5}$
(3) $\frac{5}{4}$ (4) $\frac{3}{4}$
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

236. If $\sin(A - B) = \sin A\cos B - \cos A\sin B$, then sin 15° will be
(1) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ (2) $\frac{\sqrt{3}}{2\sqrt{2}}$
(3) $\frac{\sqrt{3}-1}{-\sqrt{2}}$ (4) $\frac{\sqrt{3}-1}{2\sqrt{2}}$
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

237. If $\sec x + \cos x = 2$, then the value of $\sec^{16} x + \cos^{16} x$ will be
(1) $\sqrt{3}$ (2) 2
(3) 1 (4) 0
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

238. If $\sin^4\theta + \cos^4\theta = 2\sin^2\theta\cos^2\theta$, θ is an acute angle, then the value of $\tan\theta$ is
(1) 1 (2) 2
(3) $\sqrt{2}$ (4) 0
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

239. The maximum value of
$\sin^4\theta + \cos^4\theta$ is
(1) $\frac{1}{3}$ (2) 1
(3) 2 (4) 3
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

240. Find the value of
tan 4° tan 43° tan 47° tan 86°
(1) $\frac{2}{3}$ (2) 1
(3) $\frac{1}{2}$ (4) 2
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

241. If $x\cos\theta - \sin\theta = 1$, then $x^2 + (1 + x^2)\sin\theta$ equals
(1) 2 (2) 1
(3) – 1 (4) 0
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

242. If $\sin\theta + \sin^2\theta = 1$ then $\cos^2\theta + \cos^4\theta$ is equal to
(1) None (2) 1
(3) $\frac{\sin\theta}{\cos^2\theta}$ (4) $\frac{\cos^2\theta}{\sin\theta}$
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

243. The numerical value of
$\frac{\cos^2 45°}{\sin^2 60°} + \frac{\cos^2 60°}{\sin^2 45°} - \frac{\tan^2 30°}{\cot^2 45°} - \frac{\sin^2 30°}{\cot^2 30°}$ is
(1) $1\frac{1}{4}$ (2) $\frac{3}{4}$
(3) $\frac{1}{4}$ (4) $\frac{1}{2}$
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

244. The value of tan1°tan2°tan3° .....tan89° is
(1) 1 (2) –1
(3) 0
(4) None of the options
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

245. If $\frac{\cos\alpha}{\sin\beta} = n$ and $\frac{\cos\alpha}{\cos\beta} = m$, then the vlaue of $\cos^2\beta$ is
(1) $\frac{m^2}{m^2+n^2}$ (2) $\frac{1}{m^2+n^2}$
(3) $\frac{n^2}{m^2+n^2}$ (4) 0
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

246. If $0° \le A \le 90°$, the simplified form of the given expression sin A cos A (tan A – cot A) is

(1) 1 (2) $1 - 2\sin^2 A$
(3) $2\sin^2 A - 1$ (4) $1 - \cos^2 A$

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

247. If θ is an acute angle and $\tan^2\theta + \frac{1}{\tan^2\theta} = 2$, then the value of θ is :

(1) 60° (2) 45°
(3) 15° (4) 30°

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

248. If $\tan\theta + \cot\theta = 5$, then $\tan^2\theta + \cot^2\theta$ is

(1) 23 (2) 25
(3) 26 (4) 24

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

249. The value of $\sin^2 22° + \sin^2 68° + \cot^2 30°$ is

(1) 4 (2) 3
(3) $\frac{3}{4}$ (4) $\frac{5}{4}$

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

250. The minimum value of $2\sin^2\theta + 3\cos^2\theta$ is

(1) 3 (2) 4
(3) 2 (4) 1

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

251. If θ be acute angle and $\tan(4\theta - 50°) = \cot(50° - \theta)$, then the value of θ in degrees is :

(1) 20 (2) 50
(3) 40 (4) 30

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

252. If $5\sin\theta = 3$, the numerical velue of $\frac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta}$ is

(1) $\frac{1}{2}$ (2) $\frac{1}{5}$
(3) $\frac{1}{3}$ (4) $\frac{1}{4}$

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

253. If $\sec\theta + \tan\theta = p$, $(p \ne 0)$ then secθ is equal to

(1) $\left(p - \frac{1}{p}\right), p \ne 0$
(2) $2\left(p - \frac{1}{p}\right), p \ne 0$
(3) $\left(p + \frac{1}{p}\right), p \ne 0$
(4) $\frac{1}{2}\left(p + \frac{1}{p}\right), p \ne 0$

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

254. If $1 + \cos^2\theta = 3\sin\theta\cos\theta$, then the integral value of $\cot\theta \left(0 < \theta < \frac{\pi}{2}\right)$ is

(1) 1 (2) 2
(3) 0 (4) 3

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

255. The value of the following is : $3(\sin^4\theta + \cos^4\theta) + 2(\sin^6\theta + \cos^6\theta) + 12\sin^2\theta\cos^2\theta$

(1) 0 (2) 3
(3) 2 (4) 5

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

256. If $\sec\theta + \tan\theta = 2 + \sqrt{5}$, then the value of sinθ is $(0° \le \theta \le 90°)$

(1) $\frac{\sqrt{3}}{2}$ (2) $\frac{2}{\sqrt{5}}$
(3) $\frac{1}{\sqrt{5}}$ (4) $\frac{4}{5}$

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

257. If $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = 2\frac{51}{79}$ then the value of sin θ is

(1) $\frac{39}{72}$ (2) $\frac{65}{144}$
(3) $\frac{35}{72}$ (4) $\frac{91}{144}$

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

258. If tan A + cot A = 2, then the value of $\tan^{10}A + \cot^{10}A$ is

(1) 4 (2) 2
(3) 2^{10} (4) 1

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

259. The value of $\cos^2 30° + \sin^2 60° + \tan^2 45° + \sec^2 60° + \cos 0°$ is

(1) $4\frac{1}{2}$ (2) $5\frac{1}{2}$
(3) $6\frac{1}{2}$ (4) $7\frac{1}{2}$

(SSC CGL Tier-I Re-Exam, 30.08.2015)

260. If $\cos x + \cos^2 x = 1$, then $\sin^8 x + 2\sin^6 x + \sin^4 x$ is equal to

(1) 0 (2) 3
(3) 2 (4) 1

(SSC CGL Tier-I Re-Exam, 30.08.2015)

261. In ΔABC, ∠C = 90° and AB = *c*, BC = *a*, CA = *b*; then the value of (cosec B – cos A) is

(1) $\frac{c^2}{ab}$ (2) $\frac{b^2}{ca}$
(3) $\frac{a^2}{bc}$ (4) $\frac{bc}{a^2}$

(SSC CGL Tier-I Re-Exam, 30.08.2015)

262. If $\tan\theta - \cot\theta = 0$ and θ is positive acute angle, then the value of $\frac{\tan(\theta + 15°)}{\tan(\theta - 15°)}$ is

(1) 3 (2) $\frac{1}{\sqrt{3}}$
(3) $\frac{1}{3}$ (4) $\sqrt{3}$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

263. The value of
cot 41°. cot 42° . cot 43°. cot 44°. cot 45° . cot 46° . cot 47° . cot 48° . cot 49°

(1) 1 (2) 0
(3) $\frac{\sqrt{3}}{2}$ (4) $\frac{1}{\sqrt{2}}$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

264. If $x = a \sin\theta - b\cos\theta$, $y = a\cos\theta + b\sin\theta$, then which of the following is true?

(1) $\frac{x^2}{y^2} + \frac{a^2}{b^2} = 1$

(2) $x^2 + y^2 = a^2 - b^2$

(3) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

(4) $x^2 + y^2 = a^2 + b^2$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

265. If $\sec\theta - \tan\theta = \frac{1}{\sqrt{3}}$, the value of $\sec\theta \cdot \tan\theta$ is

(1) $\frac{2}{3}$ (2) $\frac{2}{\sqrt{3}}$

(3) $\frac{4}{\sqrt{3}}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

266. If $5\cos\theta + 12\sin\theta = 13$, $0° < \theta < 90°$, then the value of $\sin\theta$ is

(1) $\frac{5}{13}$ (2) $-\frac{12}{13}$

(3) $\frac{6}{13}$ (4) $\frac{12}{13}$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

267. If $7\sin^2\theta + 3\cos^2\theta = 4$, then the value of $\tan\theta$ is (θ is acute)

(1) $\frac{1}{\sqrt{3}}$ (2) $\frac{1}{\sqrt{2}}$

(3) $\sqrt{3}$ (4) 1

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

268. The value of $(\operatorname{cosec} a - \sin a)(\sec a - \cos a)(\tan a + \cot a)$ is

(1) 1 (2) 6

(3) 2 (4) 4

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

269. If $\sin A + \sin^2 A = 1$, then the value of $\cos^2 A + \cos^4 A$ is

(1) 2 (2) $1\frac{2}{3}$

(3) $1\frac{1}{2}$ (4) 1

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

270. If $\tan A = n \tan B$ and $\sin A = m \sin B$, then the value of $\cos^2 A$ is

(1) $\frac{m^2-1}{n^2+1}$ (2) $\frac{m^2+1}{n^2-1}$

(3) $\frac{m^2+1}{n^2+1}$ (4) $\frac{m^2-1}{n^2-1}$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

271. If $\sin\theta + \cos\theta = \sqrt{2}\sin(90° - \theta)$ then $\cot\theta$ is equal to :

(1) $\sqrt{2}$ (2) 0

(3) $\sqrt{2} - 1$ (4) $\sqrt{2} + 1$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

272. The value of the following is :

$$\frac{(\tan 20°)^2}{(\operatorname{cosec} 70°)^2} + \frac{(\cot 20°)^2}{(\sec 70°)^2} + 2\tan 15° . \tan 45° . \tan 75°$$

(1) 1 (2) 4

(3) 3 (4) 2

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

273. The value of the following is

$$\left(\frac{\sin 47°}{\cos 43°}\right)^2 + \left(\frac{\cos 43°}{\sin 47°}\right)^2 - 4\cos^2 45°$$

(1) -1 (2) 0

(3) 1 (4) $\frac{1}{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

274. If $0° < \theta < 90°$ and $\operatorname{cosec}\theta = \cot^2\theta$, then the value of the expression $\operatorname{cosec}^4\theta - 2\operatorname{cosec}^3\theta + \cot^2\theta$ is equal to:

(1) 2 (2) 0

(3) 1 (4) 3

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

275. If $4\sin^2\theta - 1 = 0$ and angle θ is less than 90°, the value of $\cos^2\theta + \tan^2\theta$ is :
(Take $0° < \theta < 90°$)

(1) $\frac{17}{15}$ (2) $\frac{13}{12}$

(3) $\frac{11}{9}$ (4) $\frac{12}{11}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

276. Find numerical value of

$$\frac{9}{\operatorname{cosec}^2\theta} + 4\cos^2\theta + \frac{5}{1+\tan^2\theta}.$$

(1) 5 (2) 7

(3) 9 (4) 4

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

277. If $\tan\theta + \sec\theta = 3$, θ being acute, the value of $5\sin\theta$ is :

(1) $\frac{5}{2}$ (2) $\frac{\sqrt{3}}{5}$

(3) $\frac{5}{\sqrt{3}}$ (4) 4

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

278. If $\cos\theta = \frac{p}{\sqrt{p^2+q^2}}$, then the value of $\tan\theta$ is :

(1) $\frac{q}{\sqrt{p^2-q^2}}$ (2) $\frac{q}{p}$

(3) $\frac{p}{p^2+q^2}$ (4) $\frac{q}{\sqrt{p^2+q^2}}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

279. If A, B, and C be the angles of a triangle, then out of the following, the incorrect relation is :

(1) $\cos\left(\frac{A+B}{2}\right) = \sin\frac{C}{2}$

(2) $\tan\left(\frac{A+B}{2}\right) = \cot\frac{C}{2}$

(3) $\cot\left(\frac{A+B}{2}\right) = \tan\frac{C}{2}$

(4) $\sin\frac{A+B}{2} = \cos\frac{C}{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

280. The value of the expression $\sin^2 1° + \sin^2 11° + \sin^2 21° + \sin^2 31° + \sin^2 41° + \sin^2 45° + \sin^2 49° + \sin^2 59° + \sin^2 69° + \sin^2 79° + \sin^2 89°$ is :

(1) 0 (2) $5\frac{1}{2}$

(3) 5 (4) $4\frac{1}{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

281. If $x = a(\sin\theta + \cos\theta)$ and $y = b(\sin\theta - \cos\theta)$, then the value of $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ is :

(1) 4 (2) 3
(3) 1 (4) 2

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

282. If $\cos\theta + \sin\theta = m$ and $\sec\theta + \text{cosec}\,\theta = n$ then the value of $n(m^2 - 1)$ is equal to :

(1) 2m (2) mn
(3) 4mn (4) 2n

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

283. If $\frac{x - x\tan^2 30°}{1 + \tan^2 30°} = \sin^2 30° + 4\cot^2 45° - \sec^2 60°$, then the value of x is :

(1) $\frac{1}{4}$ (2) $\frac{1}{5}$

(3) $\frac{1}{2}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

284. If $\cos A + \sin A = \sqrt{2}\cos A$ then $\cos A - \sin A$ is equal to : (where $0° < A < 90°$)

(1) $\sqrt{2}\sin A$ (2) $2\sin A$

(3) $2\sqrt{\sin A}$ (4) $\sqrt{2\sin A}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

285. If $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 3$ then the value of $\sin^4\theta$ is :

(1) $\frac{2}{5}$ (2) $\frac{1}{5}$

(3) $\frac{4}{5}$ (4) $\frac{3}{5}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

286. If $\sin 2\theta = \frac{\sqrt{3}}{2}$ then the value of $\sin 3\theta$ is equal to (Take $0° \le \theta \le 90°$)

(1) $\frac{1}{2}$ (2) 1

(3) 0 (4) $\frac{\sqrt{3}}{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

287. Value of the expression :

$$\frac{1 + 2\sin 60°\cos 60°}{\sin 60° + \cos 60°} + \frac{1 - 2\sin 60°\cos 60°}{\sin 60° - \cos 60°} \text{ is}$$

(1) $2\sqrt{3}$ (2) 0

(3) $\sqrt{3}$ (4) 2

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

288. If $\alpha + \beta = 90°$, then the expression $\frac{\tan\alpha}{\tan\beta} + \sin^2\alpha + \sin^2\beta$ is equal to :

(1) $\sec^2\beta$ (2) $\tan^2\alpha$

(3) $\tan^2\beta$ (4) $\sec^2\alpha$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

289. The value of x in the equation

$$\tan^2\frac{\pi}{4} - \cos^2\frac{\pi}{3} = x\sin\frac{\pi}{4}\cos\frac{\pi}{4}\tan\frac{\pi}{3} \text{ is :}$$

(1) $\frac{2}{\sqrt{3}}$ (2) $\frac{3\sqrt{3}}{4}$

(3) $\frac{1}{\sqrt{3}}$ (4) $\frac{\sqrt{3}}{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

290. If $\sin A - \cos A = \frac{\sqrt{3} - 1}{2}$, then the value of $\sin A \cdot \cos A$ is

(1) $\frac{\sqrt{3}}{2}$ (2) $\frac{3}{2}$

(3) $\frac{\sqrt{3}}{4}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

291. If $\sin(90° - \theta) + \cos\theta = \sqrt{2}\cos(90° - \theta)$, then the value of $\text{cosec}\,\theta$ is

(1) $\frac{2}{3}$ (2) $\sqrt{\frac{3}{2}}$

(3) $\frac{1}{\sqrt{2}}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

292. If $\tan\left(\frac{\pi}{2} - \frac{\alpha}{2}\right) = \sqrt{3}$, then the value of $\cos\alpha$ is

(1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{2}$

(3) 0 (4) $\frac{\sqrt{3}}{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

293. The value of $\cos 1° \cos 2° \cos 3° \ldots \cos 180°$ is

(1) 0 (2) 1

(3) $\frac{\sqrt{3}}{2}$ (4) $\frac{1}{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

294. If cos 20° = m and cos 70° = n, then the value of $m^2 + n^2$ is

(1) 1 (2) $\frac{3}{2}$

(3) $\frac{1}{\sqrt{2}}$ (4) $\frac{1}{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

295. If tan (5x –10°) = cot (5y + 20°), then the value of (x + y) is

(1) 15° (2) 16°

(3) $22\frac{1}{2}°$ (4) 24°

(SSC CGL Tier-I (CBE) Exam.10.09.2016)

296. If cos 27° = x, the value of tan63° is

(1) $\frac{x}{\sqrt{1-x^2}}$ (2) $\frac{x}{\sqrt{1+x^2}}$

(3) $\frac{\sqrt{1-x^2}}{x}$ (4) $\frac{\sqrt{1+x^2}}{x}$

(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

297. If $\cos^2 x + \cos^4 x = 1$, then $\tan^2 x + \tan^4 x$ = ?

(1) 0 (2) 1

(3) $2\tan^2 x$ (4) $2\tan^4 x$

(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

298. The value of the expression (1 + sec 22° + cot 68°) (1– cosec 22° + tan 68°) is

(1) 0 (2) 1

(3) –1 (4) 2

(SSC CGL Tier-II Online Exam.01.12.2016)

299. If $x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$ and $x\sin\theta - y\cos\theta = 0$, then the value of ($x^2 + y^2$) equals

(1) 1 (2) $\frac{1}{2}$

(3) $\frac{3}{2}$ (4) 2

(SSC CGL Tier-II Online Exam.01.12.2016)

300. If secθ + tanθ = m (>1), then the value of sinθ is (0° < θ < 90°)

(1) $\frac{1-m^2}{1+m^2}$ (2) $\frac{m^2-1}{m^2+1}$

(3) $\frac{m^2+1}{m^2-1}$ (4) $\frac{1+m^2}{1-m^2}$

(SSC CGL Tier-II Online Exam.01.12.2016)

301. If $(a^2 - b^2)\sin\theta + 2ab\cos\theta = a^2 + b^2$, then tanθ = ?

(1) $\frac{2ab}{a^2-b^2}$ (2) $\frac{a^2-b^2}{2ab}$

(3) $\frac{ab}{a^2-b^2}$ (4) $\frac{a^2-b^2}{ab}$

(SSC CGL Tier-II Online Exam.01.12.2016)

302. If $2y\cos\theta = x\sin\theta$ and $2x\sec\theta - y\,\text{cosec}\theta = 3$, then the value of ($x^2 + 4y^2$) is

(1) 1 (2) 2

(3) 3 (4) 4

(SSC CGL Tier-II Online Exam.01.12.2016)

303. The expression of

$\frac{\cot\theta + \text{cosec}\,\theta - 1}{\cot\theta + \text{cosec}\,\theta + 1}$ is equal to

(1) $\frac{1+\cos\theta}{\sin\theta}$ (2) $\frac{1-\cos\theta}{\sin\theta}$

(3) $\frac{\cot\theta + 1}{\text{cosec}\,\theta}$ (4) $\frac{\cot\theta - 1}{\text{cosec}\,\theta}$

(SSC CGL Tier-II Online Exam.01.12.2016)

304. If $\sin\theta = \frac{5}{13}$ and θ is acute, what uis the value of $\sqrt{(\cot\theta + \tan\theta)}$?

(1) $\frac{2}{\sqrt{5}}$ (2) $\frac{13}{2\sqrt{15}}$

(3) $\frac{-2}{\sqrt{5}}$

(4) Cannot be determined

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

305. $\frac{2\sin\theta}{\cos\theta(1+\tan^2\theta)}$ simplifies to:

(1) cos θ (2) cos2θ

(3) sin2θ (4) sinθ

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

306. If $\tan\theta_1 = 1$, $\sin\theta_2 = \frac{1}{\sqrt{2}}$, then the value of sin ($\theta_1 + \theta_2$) equal to

(1) –1 (2) 0

(3) 1 (4) $\frac{1}{2}$

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

307. Find the value of tan θ (1 + sec 2θ) (1 + sec 4θ) (1 + sec8θ).

(1) tan 10θ (2) tan8θ

(3) tan 12θ (4) 1

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

308. If $\frac{\sin x}{1+\cos x} + \frac{\sin x}{1-\cos x} = 4$; and 0° < x < 90°, then find the vlaue of x.

(1) 10° (2) 15°

(3) 45° (4) 30°

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

309. The value of $\frac{\sin 65°}{\cos 25°}$ is

(1) 0 (2) 1

(3) 2

(4) Not defined

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

310. If sinθ + cosecθ = 2, the value of $\sin^{100}\theta + \text{cosec}^{100}\theta$ is :

(1) 1 (2) 2

(3) 3 (4) 4

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

311. If sin 31° = $\frac{x}{y}$ The value of sec 31° – sin 59° is

(1) $\frac{x^2}{y\sqrt{y^2-x^2}}$

(2) $-\frac{x^2}{y\sqrt{y^2-x^2}}$

(3) $-\frac{y^2}{\sqrt{y^2-x^2}}$

(4) $-\frac{x^2}{\sqrt{y^2-x^2}}$

(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

312. The value of ($\sec^2 45° - \cot^2 45°$) – ($\sin^2 30° + \sin^2 60°$) is

(1) 1 (2) $2\sqrt{3}$

(3) 0 (4) $\frac{1}{\sqrt{2}}$

(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

313. The value of the following is :

$$\frac{\sin\theta \cos ec\theta \tan\theta \cot\theta}{\sin^2\theta + \cos^2\theta}$$

(1) 1 (2) tanθ
(3) 0 (4) 2

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

314. If cosθ + secθ = $\sqrt{3}$, then the value of ($\cos^3\theta + \sec^3\theta$) is :

(1) 1 (2) $\frac{1}{\sqrt{2}}$
(3) 0 (4) $\sqrt{2}$

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

315. If $\alpha + \theta = \frac{7\pi}{12}$ and tanθ = $\sqrt{3}$, then the value of tanθ is :

(1) $\sqrt{3}$ (2) 1
(3) 0 (4) $\frac{1}{\sqrt{3}}$

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

316. ∠Y is the right angle of the trianlge XYZ. If XY = $2\sqrt{6}$ cm and XZ–YZ = 2cm, then the value of (secX + tanX) is :

(1) $\frac{1}{\sqrt{6}}$ (2) $\frac{1}{2\sqrt{3}}$
(3) $2\sqrt{6}$ (4) $\sqrt{6}$

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

317. If secθ + tanθ = 2, then the value of sinθ is :

(1) $\frac{4}{5}$ (2) $\frac{\sqrt{3}}{5}$
(3) $\frac{2}{5}$ (4) $\frac{3}{5}$

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

318. Find the value of 8 cos 10° cos 20° cos 40°.

(1) tan80° (2) cot10°
(3) tan80° or cot 10°
(4) None of these

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

319. What is the value of $\frac{(\cot\theta + \text{cosec}\,\theta - 1)}{(\cot\theta - \text{cosec}\,\theta + 1)}$?

(1) cot θ + cosec θ
(2) 1
(3) –1 (4) 0

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

320. A vertical pole AB is standing at the centre B of a square PQRS. If PR subtends an angle of 90° at the top, A of the pole, then the angle subtended by a side of the square at A is :

(1) 30° (2) 45°
(3) 60°
(4) None of these

321. For how many integral values of 'x', $\sin\phi = \frac{(3x-2)}{4}$, where $0° \le \phi \le 90°$

(1) 2 (2) 3
(3) 0 (4) 1

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

322. Find the value of $\cot\frac{\pi}{32} - \tan\frac{\pi}{32} - 2\tan\frac{\pi}{16}$

(1) $4\cot\frac{\pi}{8}$ (2) 0
(3) $2\cot\frac{\pi}{8}$ (4) $\cot\frac{\pi}{8}$

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

323. If sinθ = a cos ϕ and cos θ = b sin ϕ, then the value of $(a^2 - 1)\cot^2\phi + (1 - b^2)\cot^2\theta$ is equal to :

(1) $\frac{a^2+b^2}{a^2}$ (2) $\frac{a^2+b^2}{b^2}$
(3) $\frac{a^2-b^2}{b^2}$ (4) $\frac{a^2-b^2}{a^2}$

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

324. If $\sec^2\theta + \tan^2\theta = \sqrt{3}$, then the value of ($\sec^4\theta - \tan^4\theta$) is

(1) $\frac{1}{\sqrt{3}}$ (2) 1
(3) $\sqrt{3}$ (4) 0

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

325. If π sin θ = 1, π cosθ = 1, then the value of $\left\{\sqrt{3}\tan\left(\frac{2}{3}\theta\right) + 1\right\}$ is

(1) 1 (2) $\sqrt{3}$
(3) 2 (4) $\frac{1}{\sqrt{3}}$

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

326. Find the value of

$$\frac{1}{1+\tan^2\theta} + \frac{1}{1+\cot^2\theta}.$$

(1) $\frac{1}{4}$ (2) 1
(3) $\frac{1}{2}$ (4) 2

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

327. If $\tan\theta + \frac{1}{\tan\theta} = 2$, then the value of $\tan^2\theta + \frac{1}{\tan^2\theta}$ is equal to :

(1) 6 (2) 4
(3) 2 (4) 3

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

328. If in a triangle ABC, sin A = cos B, then the value of cos C is

(1) $\frac{\sqrt{3}}{2}$ (2) 0
(3) 1 (4) $\frac{1}{\sqrt{2}}$

(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

329. If sinθ × cosθ = $\frac{1}{2}$. The value of sinθ – cosθ is where 0° < θ < 90°

(1) 0 (2) $\sqrt{2}$
(3) 2 (4) 1

(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

330. If $\frac{\cos\theta}{1-\sin\theta} + \frac{\cos\theta}{1+\sin\theta} = 4$, then the value of θ(0° < θ < 90°) is

(1) 60° (2) 45°
(3) 30° (4) 35°

(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

331. If $x^2 = \sin^2 30° + 4\cot^2 45° - \sec^2 60°$, then the value of x ($x > 0$) is

(1) $-\frac{1}{2}$ (2) 1
(3) 0 (4) $\frac{1}{2}$

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

332. If $7\sin^2\theta + 3\cos^2\theta = 4$ then the value of $\sec\theta + \operatorname{cosec}\theta$ is

(1) $\frac{2}{\sqrt{3}} - 2$ (2) $\frac{2}{\sqrt{3}} + 2$

(3) $\frac{2}{\sqrt{3}}$ (4) None of these

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

333. If $\tan\theta + \cot\theta = 5$, then the value of $\tan^2\theta + \cot^2\theta$ is

(1) 22 (2) 25
(3) 23 (4) 27

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

334. If θ be positive acute angle and $5\cos\theta + 12\sin\theta = 13$, then the value of $\cos\theta$ is

(1) $\frac{12}{13}$ (2) $\frac{5}{13}$

(3) $\frac{5}{12}$ (4) $\frac{1}{5}$

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

335. If $\tan 45° = \cot\theta$, then the value of θ, in radians is

(1) π (2) $\frac{\pi}{9}$

(3) $\frac{\pi}{2}$ (4) $\frac{\pi}{12}$

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

336. ABC is a triangle. If $\sin\left(\frac{A+B}{2}\right) = \frac{\sqrt{3}}{2}$, then the value of $\sin\frac{C}{2}$ is

(1) $\frac{1}{\sqrt{2}}$ (2) 0

(3) $\frac{1}{2}$ (4) $\frac{\sqrt{3}}{2}$

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

337. If $\cos^4\theta - \sin^4\theta = \frac{1}{3}$, then the value of $\tan^2\theta$ is

(1) $\frac{1}{2}$ (2) $\frac{1}{3}$

(3) $\frac{1}{4}$ (4) $\frac{1}{5}$

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

338. The value of $\tan 80° \tan 10° + \sin^2 70° + \sin^2 20°$ is

(1) 0 (2) 1

(3) 2 (4) $\frac{\sqrt{3}}{2}$

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

339. Find the value of

$$\left(\frac{\sin 27°}{\cos 63°}\right)^2 + \left(\frac{\cos 63°}{\sin 27°}\right)^2.$$

(1) 0 (2) 2
(3) 3 (4) 1

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

340. If $\sqrt{2}\tan 2\theta = \sqrt{6}$ and $0° < \theta < 45°$, then the value of $\sin\theta + \sqrt{3}\cos\theta - 2\tan^2\theta$ is

(1) $\frac{2}{3}$ (2) $\frac{4}{3}$

(3) 2 (4) $\frac{8}{3}$

(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

341. If $\tan\alpha = 2$, then the value of $\frac{\sin\alpha}{\sin^3\alpha + \cos^3\alpha}$ is

(1) $\frac{2}{9}$ (2) $\frac{\sqrt{5}}{9}$

(3) $\frac{10}{9}$ (4) $\frac{5\sqrt{5}}{9}$

(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

342. If $\sin\theta + \cos\theta = 1$, then $\sin\theta . \cos\theta$. is equal to

(1) 0 (2) 1

(3) $\frac{1}{2}$ (4) $-\frac{1}{2}$

(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

343. If $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 3$ then the value of $\sin^4\theta - \cos^4\theta$ is

(1) $\frac{4}{3}$ (2) $\frac{3}{4}$

(3) $\frac{5}{3}$ (4) $\frac{3}{5}$

(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

344. If $\sin C - \sin D = x$, then the value of x is

(1) $2\sin\left[\frac{(C+D)}{2}\right]\cos\left[\frac{(C-D)}{2}\right]$

(2) $2\cos\left[\frac{(C+D)}{2}\right]\cos\left[\frac{(C-D)}{2}\right]$

(3) $2\cos\left[\frac{(C+D)}{2}\right]\sin\left[\frac{(C-D)}{2}\right]$

(4) $2\sin\left[\frac{(C+D)}{2}\right]\sin\left[\frac{(D-C)}{2}\right]$

(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

345. If $\sin A + \sin^2 A = 1$, then what is the value of $\cos^2 A + \cos^4 A$?

(1) 1 (2) 2

(3) $\frac{1}{2}$ (4) $\frac{1}{4}$

(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

346. Which one of the following is true for $0°<\theta<90°$

(1) $\cos\theta > \cos^2\theta$ (2) $\cos\theta < \cos^2\theta$
(3) $\cos\theta \geq \cos^2\theta$ (4) $\cos\theta \leq \cos^2\theta$

(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

347. If $5\sin^2\theta + 4\cos^2\theta = \frac{9}{2}$ and $0 < \theta < \frac{\pi}{2}$ then $\tan\theta$ is equal to

(1) 1 (2) 0

(3) -1 (4) $\frac{1}{4}$

(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

348. The value of $\sec 2\ 17° - \frac{1}{\tan^2 73°} - \sin 17° \sec 73°$ is

(1) 1 (2) 0
(3) -1 (4) 2

(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

349. If $x = a\cos\theta\cos\theta$, $y = a\cos\theta\sin\theta$ and $z = a\sin\theta$, then the value of $(x^2 + y^2 + z^2)$ is

(1) $2a^2$ (2) $4a^2$
(3) $9a^2$ (4) a^2

(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

350. If $\sec 15\theta = \operatorname{cosec} 15\theta$ $(0° < \theta < 10°)$ then value of θ is

(1) 9° (2) 5°
(3) 8° (4) 3°

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

351. If $\tan\theta = \tan 30° . \tan 60°$ and θ is an acute angle, then 2θ is equal to

(1) 30° (2) 45°
(3) 90° (4) 0°

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

352. The value of $(1 + \tan^2\theta)(1 - \sin^2\theta)$ is
(1) 2 (2) 1
(3) –1 (4) –2
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

353. If $r \sin\theta = 1$, $r \cos\theta = \sqrt{3}$ then the value of $(r^2 \tan\theta)$ is
(1) 4 (2) $\frac{1}{\sqrt{3}}$
(3) $\frac{4}{\sqrt{3}}$ (4) $4\sqrt{3}$
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

354. If $\sin\theta = \frac{\sqrt{3}}{2}$ and $0° < \theta < 90°$, then the value of $\tan(\theta - 15°)$ is
(1) 1 (2) $\sqrt{3}$
(3) $\frac{1}{\sqrt{3}}$ (4) $\sqrt{2}$
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

355. If $\frac{\operatorname{cosec}\theta + \sin\theta}{\operatorname{cosec}\theta - \sin\theta} = \frac{5}{3}$ then the value of $\sin\theta$ is equal to
(1) $\frac{1}{2}$ (2) $\frac{1}{\sqrt{2}}$
(3) $\frac{\sqrt{3}}{2}$ (4) 1
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

356. If $y = 2\sec\theta$ and $x = 3\tan\theta$ then $\frac{x^2}{9} - \frac{y^2}{4}$ is
(1) 0 (2) –1
(3) 2 (4) 1
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

357. If $r \sin\theta = \sqrt{3}$ and $r \cos\theta = 1$, rhen values of r and θ are : $(0° \le \theta \le 90°)$
(1) $r = 1, \theta = 30°$
(2) $r = \frac{1}{2}, \theta = 30°$
(3) $r = \sqrt{3}, \theta = 30°$
(4) $r = 2, \theta = 60°$
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

358. If $x \tan 60° + \cos 45° = \sec 45°$ then the value of $(x^2 + 1)$ is
(1) $\frac{6}{7}$ (2) $\frac{7}{6}$
(3) $\frac{5}{6}$ (4) $\frac{6}{5}$
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

359. x, y be two acute angles, $x + y < 90°$ and $\sin(2x - 20°) = \cos(2y + 20°)$, the value of $\tan(x + y)$ is
(1) $\sqrt{3}$ (2) $\frac{1}{\sqrt{3}}$
(3) 1 (4) $2 + \sqrt{2}$
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

360. If $a^2 \sec^2 x - b^2 \tan^2 x = c^2$ then the value of $(\sec^2 x + \tan^2 x)$ is equal to (assume $b^2 \ne a^2$)
(1) $\frac{b^2 - a^2 + 2c^2}{b^2 + a^2}$
(2) $\frac{b^2 + a^2 - 2c^2}{b^2 - a^2}$
(3) $\frac{b^2 - a^2 - 2c^2}{b^2 + a^2}$
(4) $\frac{b^2 - a^2}{b^2 + a^2 + 2c^2}$
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

361. $(1 + \sec 20° + \cot 70°)(1 - \operatorname{cosec} 20° + \tan 70°)$ is equal to
(1) 0 (2) 1
(3) 2 (4) 3
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

362. If $\tan^4\theta + \tan^2\theta = 1$ then the value of $\cos^4\theta + \cos^2\theta$ is
(1) 2 (2) 0
(3) 1 (4) –1
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

363. The value of $8(\sin^6\theta + \cos^6\theta) - 12(\sin^4\theta + \cos^4\theta)$ is equal to
(1) 20 (2) – 20
(3) – 4 (4) 4
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

364. If $\tan 3\theta . \tan 7\theta = 1$, then the value of $\tan(\theta + 36°)$ is :
(1) $\frac{1}{\sqrt{3}}$ (2) 0
(3) 1 (4) $\sqrt{3}$
(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (Ist Sitting)

365. The value of
$\frac{\sin\theta}{1 + \cos\theta} + \frac{\sin\theta}{1 - \cos\theta}$ is :
(1) $2\sin\theta$ (2) $2\cos\theta$
(3) $2\sec\theta$ (4) $2\operatorname{cosec}\theta$
(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (Ist Sitting)

366. If $\tan\theta = \frac{8}{15}$, the value of $\frac{\sqrt{1 - \sin\theta}}{\sqrt{1 + \sin\theta}}$ is :
(1) $\frac{1}{5}$ (2) $\frac{2}{5}$
(3) $\frac{3}{5}$ (4) 0
(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (Ist Sitting)

367. The value of
$\left(\frac{\sin\theta + \sin\phi}{\cos\theta + \cos\phi} + \frac{\cos\theta - \cos\phi}{\sin\theta - \sin\phi}\right)$ is :
(1) 1 (2) 2
(3) $\frac{1}{2}$ (4) 0
(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

368. If $\cot\theta = 4$, then the value of $\frac{5\sin\theta + 3\cos\theta}{5\sin\theta - 3\cos\theta}$ is
(1) $\frac{1}{9}$ (2) $\frac{1}{3}$
(3) 3 (4) 9
(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

369. The value of $\cos^2 20° + \cos^2 70°$ is :
(1) $\sqrt{2}$ (2) 2
(3) $\frac{1}{\sqrt{2}}$ (4) 1
(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

370. If $\cos A + \cos^2 A = 1$, then the value of $(\sin^2 A + \sin^4 A)$ is :
(1) $\frac{1}{2}$ (2) $\frac{1}{4}$
(3) $\frac{1}{3}$ (4) 1
(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

371. If $\sin\theta + \operatorname{cosec}\theta = 2$, then the value of $(\sin^{-7}\theta + \operatorname{cosec}^7\theta)$ is
(1) 2^7 (2) 2^{-7}
(3) 2 (4) 2^{-1}
(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

372. If $2y \cos\theta = x \sin\theta$ and $2x \sec\theta - y \operatorname{cosec}\theta = 3$ then what is the value of $(x^2 + 4y^2)$?
(1) 4 (2) 1
(3) 2 (4) 5
(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

373. If $\sin^2\theta - \cos^2\theta = \frac{1}{4}$, then the value of $(\sin^4\theta - \cos^4\theta)$ is :

(1) $\frac{3}{4}$ (2) $\frac{1}{4}$

(3) $\frac{1}{16}$ (4) $\frac{1}{2}$

(SSC CGL Tier-I (CBE)
Exam. 02.09.2016 (IInd Sitting)

374. The value of

$$\frac{\sin^2 63° + \sin^2 27°}{\cos^2 17° + \cos^2 73°}$$ is :

(1) 0 (2) 1
(3) 2 (4) –1

(SSC CGL Tier-I (CBE)
Exam. 02.09.2016 (IInd Sitting)

375. The value of $\cos^2 20° + \cos^2 70°$ is :

(1) 0 (2) 1

(3) $\frac{1}{2}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CGL Tier-I (CBE)
Exam. 03.09.2016 (IInd Sitting)

376. If $a.\sin 45°.\ \cos 45°.\ \tan 60° = \tan^2 45° - \cos 60°$, then find the value of a.

(1) $\frac{1}{\sqrt{3}}$ (2) $\sqrt{3}$

(3) 1 (4) $\frac{\sqrt{3}}{2}$

(SSC CGL Tier-I (CBE)
Exam. 03.09.2016 (IIIrd Sitting)

377. If $3\sin\theta + 4\cos\theta = 5$, $(0 < \theta < 90°)$ then the value of $\sin\theta$ is :

(1) $\frac{1}{5}$ (2) $\frac{2}{5}$

(3) $\frac{3}{5}$ (4) $\frac{4}{5}$

(SSC CGL Tier-I (CBE)
Exam. 03.09.2016 (IIIrd Sitting)

378. If $\sin x - \cos x = 1$, where 'x' is an acute angle, the value of $(\sin x + \cos x)$ is :

(1) 0 (2) 1

(3) $\frac{1}{2}$ (4) 2

(SSC CGL Tier-I (CBE)
Exam. 04.09.2016 (IInd Sitting)

379. If $\sin(3x - 20°) = \cos(3y + 20°)$, then find the value of $(x + y)$.

(1) 90° (2) 60°
(3) 120° (4) 30°

(SSC CGL Tier-I (CBE)
Exam. 04.09.2016 (IIIrd Sitting)

380. If $\frac{\cos\alpha}{\cos\beta} = m$ and $\frac{\cos\alpha}{\sin\beta} = n$, then the value of $(m^2 + n^2)\cos^2\beta$ is :

(1) n^2 (2) m^2
(3) mn (4) 1

(SSC CGL Tier-I (CBE)
Exam. 04.09.2016 (IIIrd Sitting)

381. The value of $\tan 315° \cot(-405°)$ is equal to

(1) –1 (2) 1
(3) 0 (4) 2

(SSC CGL Tier-I (CBE)
Exam. 06.09.2016 (IInd Sitting)

382. If $\tan(\alpha - \beta) = 1$, $\sec(\alpha + \beta) = \frac{2}{\sqrt{3}}$ and α, β are positive, then the smallest value of α is :

(1) $142\frac{1°}{2}$ (2) $187\frac{1°}{2}$

(3) $7\frac{1°}{2}$ (4) $37\frac{1°}{2}$

(SSC CGL Tier-I (CBE)
Exam. 06.09.2016 (IInd Sitting)

383. If $\tan\theta + \cot\theta = 2$, then the value of $(\tan^n\theta + \cot^n\theta)$ is :

(1) 2^n (2) $2^{\frac{n}{2}}$

(3) $2^{\frac{1}{2}}$ (4) 2

(SSC CGL Tier-I (CBE)
Exam. 06.09.2016 (IIIrd Sitting)

384. If $\cos x = \sin y$ and $\cot(x - 40°) = \tan(50° - y)$, then the values of x and y are :

(1) $x = 70°$, $y = 20°$
(2) $x = 75°$, $y = 15°$
(3) $x = 85°$, $y = 5°$
(4) $x = 80°$, $y = 10°$

(SSC CGL Tier-I (CBE)
Exam. 06.09.2016 (IIIrd Sitting)

385. The value of $\operatorname{cosec}^2 60° + \sec^2 60° - \cot^2 60° + \tan^2 30°$ will be

(1) 5 (2) $5\frac{1}{2}$

(3) $5\frac{1}{3}$ (4) $5\frac{2}{3}$

(SSC CGL Tier-I (CBE)
Exam. 07.09.2016 (IInd Sitting)

386. If $\sin\theta + \operatorname{cosec}\theta = 2$, the value of $\sin^n\theta + \operatorname{cosec}^n\theta$ is :

(1) 2^n (2) $2^{\frac{1}{n}}$
(3) 2 (4) 0

(SSC CGL Tier-I (CBE)
Exam. 07.09.2016 (IInd Sitting)

387. If $\sin A + \sin^2 A = 1$ then what is the value of $\cos^2 A + \cos^4 A$?

(1) $\frac{1}{2}$ (2) 1

(3) 2 (4) 3

(SSC CGL Tier-I (CBE)
Exam. 07.09.2016 (IIIrd Sitting)

388. ABC is a right angled triangle with $\angle A = 90°$. Then the value of $\cos^2 A + \cos^2 B + \cos^2 C$ is :

(1) 2 (2) 1
(3) 0 (4) 3

(SSC CGL Tier-I (CBE)
Exam. 07.09.2016 (IIIrd Sitting)

389. If $r\sin\theta = \frac{7}{2}$ and $r\cos\theta = \frac{7\sqrt{3}}{2}$ then the value of θ is :

(1) 30° (2) 45°
(3) 60° (4) 75°

(SSC CGL Tier-I (CBE)
Exam. 08.09.2016 (IInd Sitting)

390. If $\tan\theta = 1$, then the value of

$$\frac{8\sin\theta + 5\cos\theta}{\sin^2\theta - 2\cos^2\theta + 7\cos\theta}$$ is :

(1) 1 (2) 3

(3) 2 (4) $\frac{1}{2}$

(SSC CGL Tier-I (CBE)
Exam. 08.09.2016 (IInd Sitting)

391. If θ is positive acute angle and $4\sin^2\theta = 3$, then the value of $\left(\tan\theta - \cot\frac{\theta}{2}\right)$ is :

(1) 1 (2) 0

(3) $\sqrt{3}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CGL Tier-I (CBE)
Exam. 08.09.2016 (IIIrd Sitting)

392. If $\theta > 0$, be an acute angle, then the value of θ in degrees stisfying $\frac{\cos^2\theta - 3\cos\theta + 2}{\sin^2\theta} = 1$ is

(1) 90° (2) 30°
(3) 45° (4) 60°

(SSC CGL Tier-I (CBE)
Exam. 09.09.2016 (IInd Sitting)

393. The value of cot 17°

$$\left(\cot 73° \cos^2 22° + \frac{1}{\cot 17° \sec^2 68°}\right)$$ is

(1) 0 (2) 1

(3) 2 (4) $\sqrt{3}$

(SSC CGL Tier-I (CBE)
Exam. 09.09.2016 (IInd Sitting)

394. θ is a positive acute angle and $\sin\theta - \cos\theta = 0$, then the value of $(\sec\theta + \operatorname{cosec}\theta)$ is :

(1) 2 (2) $\sqrt{2}$

(3) $2\sqrt{2}$ (4) $3\sqrt{2}$

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

395. The value of $\frac{2\tan 53°}{\cot 37°} - \frac{\cot 80°}{\tan 10°}$ is :

(1) 3 (2) 2

(3) 1 (4) 0

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

396. The least value of $\tan^2 x + \cot^2 x$ is :

(1) 3 (2) 2

(3) 0 (4) 1

(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

397. If $\cos 21° = \frac{x}{y}$, then $(\operatorname{cosec} 21° - \cos 69°)$ is equal to

(1) $\frac{x^2}{y\sqrt{y^2 - x^2}}$ (2) $\frac{y^2}{x\sqrt{y^2 - x^2}}$

(3) $\frac{y^2}{x\sqrt{x^2 - y^2}}$ (4) $\frac{x^2}{y\sqrt{x^2 - y^2}}$

(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

298. If $\alpha + \beta = 90°$ and $\alpha : \beta = 2 : 1$, then the ratio of $\cos\alpha$ to $\cos\beta$ is :

(1) $1 : \sqrt{3}$ (2) 1 : 3

(3) $1 : \sqrt{2}$ (4) 1 : 2

(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

399. If θ is positive acute angle and $7\cos^2\theta + 3\sin^2\theta = 4$, then the value of θ is :

(1) 60° (2) 30°

(3) 45° (4) 90°

(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

400. If $\tan\theta = \frac{4}{3}$, then the value of $\frac{3\sin\theta + 2\cos\theta}{3\sin\theta - 2\cos\theta}$ is

(1) $\frac{1}{2}$ (2) $1\frac{1}{2}$

(3) 3 (4) –3

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

401. If $\sec(4x - 50°) = \operatorname{cosec}(50° - x)$, then the value of x is

(1) 45° (2) 90°

(3) 30° (4) 60°

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

402. The value of $(\cos 53° - \sin 37°)$ is

(1) 0 (2) 1

(3) $2\sin 37°$ (4) $2\cos 53°$

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

403. If $\operatorname{cosec}\theta + \sin\theta = \frac{5}{2}$, then the value of $(\operatorname{cosec}\theta - \sin\theta)$ is :

(1) $-\frac{3}{2}$ (2) $\frac{3}{2}$

(3) $-\frac{\sqrt{3}}{2}$ (4) $\frac{\sqrt{3}}{2}$

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

404. If $\sin(2a + 45°) = \cos(30° - a)$, where $0° < a < 90°$, then the value of a is :

(1) 0° (2) 15°

(3) 45° (4) 60°

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

405. The value of cot 10°. cot 20°. cot 60°. cot 70°. cot 80° is :

(1) 1 (2) –1

(3) $\sqrt{3}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

406. If $7\sin^2\theta + 3\cos^2\theta = 4$, and $0° < \theta < 90°$, then the value of $\tan\theta$ is :

(1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{\sqrt{3}}$

(3) $\sqrt{\frac{3}{2}}$ (4) 1

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

407. $\frac{(1 + \tan^2 A)\cot A}{\operatorname{cosec}^2 A}$ is equal to

(1) cot A (2) tan A

(3) sin A (4) cos A

(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

408. If $\tan(A - B) = x$, then the value of x is

(1) $\frac{(\tan A + \tan B)}{(1 - \tan A \tan B)}$

(2) $\frac{(\tan A + \tan B)}{(1 + \tan A \tan B)}$

(3) $\frac{(\tan A - \tan B)}{(1 - \tan A \tan B)}$

(4) $\frac{(\tan A - \tan B)}{(1 + \tan A \tan B)}$

(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

409. What is the value of sec 330°?

(1) 2 (2) $\frac{-2}{\sqrt{3}}$

(3) –2 (4) $\frac{2}{\sqrt{3}}$

(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

410. If $\frac{1}{(\tan A + \cot A)} = x$, then the value of x is

(1) cosAsinA (2) $\cos^2 A \sin^2 A$

(3) cosecAsecA (4) $\operatorname{cosec}^2 A \sec^2 A$

(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

411. What is the value of $\sin\left(\frac{11\pi}{6}\right)$?

(1) $\frac{2}{\sqrt{3}}$ (2) $\frac{-2}{\sqrt{3}}$

(3) $\frac{-1}{2}$ (4) $\frac{1}{2}$

(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

412. If sec A + tan A = a, then the value of cosA is

(1) $\frac{a^2 + 1}{2a}$ (2) $\frac{2a}{a^2 + 1}$

(3) $\frac{a^2 - 1}{2a}$ (4) $\frac{2a}{a^2 - 1}$

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

413. If sin P + cosec P = 2, then the value of $\sin^7 P + \operatorname{cosec}^7 P$ is

(1) 1 (2) 2

(3) 3 (4) 0

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

414. If $\cos x \cdot \cos y + \sin x \cdot \sin y = -1$ then $\cos x + \cos y$ is

(1) –2 (2) 1

(3) 0 (4) 2

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

415. The value of the expression $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) + 1$ is

(1) –1 (2) 0

(3) 1 (4) 2

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

416. If $\cos\theta = \dfrac{x^2 - y^2}{x^2 + y^2}$ then the value of $\cot\theta$ is equal to [If $0 \le \theta \le 90°$]

(1) $\dfrac{2xy}{x^2 - y^2}$ (2) $\dfrac{2xy}{x^2 + y^2}$

(3) $\dfrac{x^2 + y^2}{2xy}$ (4) $\dfrac{x^2 - y^2}{2xy}$

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

417. If $x = \operatorname{cosec}\theta - \sin\theta$ and $y = \sec\theta - \cos\theta$, then the relation between x and y is

(1) $x^2 + y^2 + 3 = 1$
(2) $x^2y^2(x^2 + y^2 + 3) = 1$
(3) $x^2(x^2 + y^2 - 5) = 1$
(4) $y^2(x^2 + y^2 - 5) = 1$

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–III

1. If the angle of elevation of the Sun changes from 30° to 45°, the length of the shadow of a pillar decreases by 20 metres. The height of the pillar is

(1) $20(\sqrt{3} - 1)$ m

(2) $20(\sqrt{3} + 1)$ m

(3) $10(\sqrt{3} - 1)$ m

(4) $10(\sqrt{3} + 1)$ m

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

2. One flies a kite with a thread 150 metre long. If the thread of the kite makes an angle of 60° with the horizontal line, then the height of the kite from the ground (assuming the thread to be in a straight line) is

(1) 50 metre (2) $75\sqrt{3}$ metre

(3) $25\sqrt{3}$ metre (4) 80 metre

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

3. The angle of elevation of the top of a tower from two points A and B lying on the horizontal through the foot of the tower are respectively 15° and 30°. If A and B are on the same side of the tower and AB = 48 metre, then the height of the tower is :

(1) $24\sqrt{3}$ metre (2) 24 metre

(3) $24\sqrt{2}$ metre (4) 96 metre

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

4. At a point on a horizontal line through the base of a monument, the angle of elevation of the top of the monument is found to be such that its tangent is $\dfrac{1}{5}$. On walking 138 metres towards the monument the secant of the angle of elevation is found to be $\dfrac{\sqrt{193}}{12}$. The height of the monument (in metre) is

(1) 35 (2) 49
(3) 42 (4) 56

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

5. The distance between two pillars of length 16 metres and 9 metres is x metres. If two angles of elevation of their respective top from the bottom of the other are complementary to each other, then the value of x (in metres) is

(1) 15 (2) 16
(3) 12 (4) 9

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

6. The angle of elevation of the top of a building from the top and bottom of a tree are x and y respectively. If the height of the tree is h metre, then (in metre) the height of the building is

(1) $\dfrac{h\cot x}{\cot x + \cot y}$

(2) $\dfrac{h\cot y}{\cot x + \cot y}$

(3) $\dfrac{h\cot x}{\cot x - \cot y}$

(4) $\dfrac{h\cot y}{\cot x - \cot y}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

7. The angle of elevation of the top of a tower from a point A on the ground is 30°. On moving a distance of 20 metres towards the foot of the tower to a point B, the angle of elevation increases to 60°. The height of the tower is

(1) $\sqrt{3}$ m (2) $5\sqrt{3}$ m

(3) $10\sqrt{3}$ m (4) $20\sqrt{3}$ m

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

8. Two poles of equal height are standing opposite to each other on either side of a road which is 100m wide. From a point between them on road, angle of elevation of their tops are 30° and 60°. The height of each pole (in metre) is

(1) $25\sqrt{3}$ (2) $20\sqrt{3}$

(3) $28\sqrt{3}$ (4) $30\sqrt{3}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

9. A telegraph post is bent at a point above the ground due to storm. Its top just meets the ground at a distance of $8\sqrt{3}$ metres from its foot and makes an angle of 30°, then the height of the post is :

(1) 16 metres (2) 23 metres
(3) 24 metres (4) 10 metres

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

10. The angle of elevation of the top of a building and the top of the chimney on the roof of the building from a point on the ground are x and 45° respectively. The height of building is h metre. Then the height of the chimney, (in metre) is :

(1) $h\cot x + h$ (2) $h\cot x - h$

(3) $h\tan x - h$ (4) $h\tan x + h$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

11. Two posts are x metres apart and the height of one is double that of the other. If from the mid-point of the line joining their feet, an observer finds the angular elevations of their tops to be complementary, then the height (in metres) of the shorter post is

(1) $\dfrac{x}{2\sqrt{2}}$ (2) $\dfrac{x}{4}$

(3) $x\sqrt{2}$ (4) $\dfrac{x}{\sqrt{2}}$

(SSC Graduate Level Tier-II Exam. 16.09.2012)

12. An aeroplane when flying at a height of 5000m from the ground passes vertically above another aeroplane at an instant, when the angles of elevation of the two aeroplanes from the same point on the ground are 60° and 45° respectively. The vertical distance between the aeroplanes at that instant is

(1) $5000(\sqrt{3}-1)$ m

(2) $5000(3-\sqrt{3})$ m

(3) $5000\left(1-\frac{1}{\sqrt{3}}\right)$ m

(4) 4500 m

(SSC Graduate Level Tier-II Exam. 16.09.2012)

13. A man standing at a point P is watching the top of a tower, which makes an angle of elevation of 30°. The man walks some distance towards the tower and then his angle of elevation of the top of the tower is 60°. If the height of the tower is 30 m, then the distance he moves is

(1) 22 m (2) $22\sqrt{3}$ m

(3) 20 m (4) $20\sqrt{3}$ m

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

14. The distance between two vertical poles is 60 m. The height of one of the poles is double the height of the other. The angle of elevation of the top of the poles from the middle point of the line segment joining their feet are complementary to each other. The height of the poles are :

(1) 10 m and 20 m

(2) 20 m and 40 m

(3) 20.9 m and 41.8 m

(4) $15\sqrt{2}$ m and $30\sqrt{2}$ m

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

15. An aeroplane when flying at a height of 3125m from the ground passes vertically below another plane at an instant when the angle of elevation of the two planes from the same point on the ground are 30° and 60° respectively. The distance between the two planes at that instant is

(1) 6520 m (2) 6000 m

(3) 5000 m (4) 6250 m

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

16. The shadow of the tower becomes 60 metres longer when the altitude of the sun changes from 45° to 30°. Then the height of the tower is

(1) $20\left(\sqrt{3}+1\right)$ m (2) $24\left(\sqrt{3}+1\right)$ m

(3) $30\left(\sqrt{3}+1\right)$ m (4) $30\left(\sqrt{3}-1\right)$ m

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

17. A vertical post 15 ft high is broken at a certain height and its upper part, not completely separated, meets the ground at an angle of 30°. Find the height at which the post is broken.

(1) 10ft (2) 5ft

(3) $15(2-\sqrt{3})$ ft (4) $5\sqrt{3}$ ft

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

18. The shadow of a tower is $\sqrt{3}$ times its height. Then the angle of elevation of the top of the tower is

(1) 45° (2) 30°

(3) 60° (4) 90°

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

19. A man 6 ft tall casts a shadow 4 ft long, at the same time when a flag pole casts a shadow 50 ft long. The height of the flag pole is

(1) 80 ft (2) 75 ft

(3) 60 ft (4) 70 ft

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

20. The angle of elevation of an aeroplane from a point on the ground is 60°. After 15 seconds flight, the elevation changes to 30°. If the aeroplane is flying at a height of $1500\sqrt{3}$ m, find the speed of the plane

(1) 300 m/sec (2) 200 m/sec

(3) 100 m/sec (4) 150 m/sec

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

21. The angle of elevation of the top of a tower from the point P and Q at distance of 'a' and 'b' respectively from the base of the tower and in the same straight line with it are complementary. The height of the tower is

(1) $\sqrt{ab}$ (2) $\frac{a}{b}$

(3) ab (4) a^2b^2

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

22. The angle of elevation of a tower from a distance 100 m from its foot is 30°. Height of the tower is :

(1) $\frac{100}{\sqrt{3}}$ m (2) $50\sqrt{3}$ m

(3) $\frac{200}{\sqrt{3}}$ m (4) $100\sqrt{3}$ m

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

23. A kite is flying at a height of 50 metre. If the length of string is 100 metre then the inclination of string to the horizontal ground in degree measure is

(1) 90 (2) 60

(3) 45 (4) 30

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

24. If the angle of elevation of a balloon from two consecutive kilometre-stones along a road are 30° and 60° respectively, then the height of the balloon above the ground will be

(1) $\frac{\sqrt{3}}{2}$ km (2) $\frac{1}{2}$ km

(3) $\frac{2}{\sqrt{3}}$ km (4) $3\sqrt{3}$ km

(SSC Graduate Level Tier-I Exam. 19.05.2013)

25. A vertical stick 12 cm long casts a shadow 8 cm long on the ground. At the same time, a tower casts a shadow 40 m long on the ground. The height of the tower is

(1) 72 m (2) 60 m

(3) 65 m (4) 70 m

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

26. A tower standing on a horizontal plane subtends a certain angle at a point 160 m apart from the foot of the tower. On advancing 100 m towards it, the tower is found to subtend an angle twice as before. The height of the tower is

(1) 80 m (2) 100 m
(3) 160 m (4) 200 m

(SSC Graduate Level Tier-II Exam. 29.09.2013

27. The angle of elevation of a tower from a distance 50 m from its foot is 30°. The height of the tower is

(1) $50\sqrt{3}$ m (2) $\frac{50}{\sqrt{3}}$ m

(2) $75\sqrt{3}$ m (4) $\frac{75}{\sqrt{3}}$ m

(SSC Graduate Level Tier-II Exam. 29.09.2013

28. The length of the shadow of a vertical tower on level ground increases by 10 metres when the altitude of the sun changes from 45° to 30°. Then the height of the tower is

(1) $5\sqrt{3}$ metre

(2) $10\left(\sqrt{3}+1\right)$ metre

(3) $5\left(\sqrt{3}+1\right)$ metre

(4) $10\sqrt{3}$ metre

(SSC CHSL DEO & LDC Exam. 20.10.2013)

29. The elevation of the top of a tower from a point on the ground is 45°. On travelling 60m from the point towards the tower, the elevation of the top becomes 60°. The height of the tower (in metres) is

(1) 30 (2) $30\left(3-\sqrt{3}\right)$

(3) $30\left(3+\sqrt{3}\right)$ (4) $30\sqrt{3}$

(SSC 1CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

30. From two points on the ground lying on a straight line through the foot of a pillar, the two angles of elevation of the top of the pillar are complementary to each other. If the distance of the two points from the foot of the pillar are 9 metres and 16 metres and the two points lie on the same side of the pillar, then the height of the pillar is

(1) 5 m (2) 10 m
(3) 7 m (4) 12 m

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

31. From a point P on the ground the angle of elevation of the top of a 10 m tall building is 30°. A flag is hoisted at the top of the building and the angle of elevation of the top of the flagstaff from P is 45°. Find the length of the flagstaff. (Take $\sqrt{3}$ = 1.732)

(1) $10\left(\sqrt{3}+2\right)$ m

(2) $10\left(\sqrt{3}+1\right)$ m

(3) $10\sqrt{3}$ m

(4) 7.32 m

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

32. The angle of elevation of the top of a vertical tower situated perpendicularly on a plane is observed as 60° from a point P on the same plane. From another point Q, 10m vertically above the point P, the angle of depression of the foot of the tower is 30°. The height of the tower is

(1) 15 m (2) 30 m
(3) 20 m (4) 25 m

(SSC CGL Tier-I Exam. 19.10.2014)

33. From a point 20 m away from the foot of a tower, the angle of elevation of the top of the tower is 30°. The height of the tower is

(1) $10\sqrt{3}$ m (2) $20\sqrt{3}$ m

(3) $\frac{10}{\sqrt{3}}$ m (4) $\frac{20}{\sqrt{3}}$ m

(SSC CGL Tier-I Exam. 26.10.2014)

34. The angle of elevation of a ladder leaning against a house is 60° and the foot of the ladder is 6.5 metres from the house. The length of the ladder is

(1) $\frac{13}{\sqrt{3}}$ metres (2) 13 metres

(3) 15 metres (4) 3.25 metres

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

35. The angle of elevation of sun changes from 30° to 45°, the length of the shadow of a pole decreases by 4 metres, the height of the pole is

(Assume $\sqrt{3}$ = 1.732)

(1) 1.464 m (2) 9.464 m
(3) 3.648 cm (4) 5.464 m

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

36. A vertical pole and a vertical tower are standing on the same level ground. Height of the pole is 10 metres. Fromthe top of the pole the angle of elevation of the top of the tower and angle of depression of the foot of the tower are 60° and 30° respectively. The height of the tower is

(1) 20 m (2) 30 m
(3) 40 m (4) 50 m

(SSC CHSL DEO & LDC Exam. 9.11.2014)

37. The length of the shadow of a vertical tower on level ground increases by 10 metres when the altitude of the sun changes from 45° to 30°. Then the height of the tower is

(1) 5 ($\sqrt{3}$ + 1) metres

(2) 5 ($\sqrt{3}$ – 1) metres

(3) $5\sqrt{3}$ metres

(4) $\frac{5}{\sqrt{3}}$ metres

(SSC CHSL DEO & LDC Exam. 9.11.2014)

38. If a pole of 12 m height casts a shadow of $4\sqrt{3}$ m long on the ground, then the sun's angle of elevation at that instant is

(1) 30° (2) 60°
(3) 45° (4) 90° 16 cm is

(SSC CHSL DEO & LDC Exam. 16.11.2014)

39. The angle of elevation of the top of a tower from a point on the ground is 30° and moving 70 metres towards the tower it becomes 60°. The height of the tower is

(1) 10 metre (2) $\frac{10}{\sqrt{3}}$ metre

(3) $10\sqrt{3}$ metre (4) $35\sqrt{3}$ metre

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

40. The shadow of a tower standing on a level plane is found to be 30 metre longer when the Sun's altitude changes from 60° to 45°. The height of the tower is

(1) $15(3+\sqrt{3})$ metre

(2) $15(\sqrt{3}+1)$ metre

(3) $15(\sqrt{3}-1)$ metre

(4) $15(3-\sqrt{3})$ metre

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

41. The angle of elevation of the top of a tower of height $100\sqrt{3}$ metre from a point at a distance of 100 metre from the foot of the tower on a horizontal plane is

(1) 45° (2) 60°

(3) 30° (4) $22\frac{1}{2}°$

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

42. The shadow of a tower standing on a level plane is found to be 40m longer when the sun's altitude is 45°, than when it is 60°. The height of the tower is

(1) $30\left(3+\sqrt{3}\right)$ metre

(2) $40\left(3+\sqrt{3}\right)$ metre

(3) $20\left(3+\sqrt{3}\right)$ metre

(4) $10\left(3+\sqrt{3}\right)$ metre

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

43. From two points on the ground and lying on a straight line through the foot of a pillar, the two angles of elevation of the top of the pillar are complementary to each other. If the distances of the two points from the foot of the pillar are 12 metres and 27 metres and the two points lie on the same side of the pillar, then the height (in metres) of the pillar is

(1) 12 (2) 18

(3) 15 (4) 16

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

44. If the height of a pole is $2\sqrt{3}$ metre and the length of its shadow is 2 metre, then the angle of elevation of the sun is

(1) 90° (2) 45°

(3) 30° (4) 60°

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

45. A 10 metre long ladder is placed against a wall. It is inclined at an angle of 30° to the ground. The distance (in m) of the foot of the ladder from the wall is (Given $\sqrt{3}$ = 1.732)

(1) 8.16 (2) 7.32

(3) 8.26 (4) 8.66

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

46. The angle of elevation of a tower from a distance of 100 metre from its foot is 30°. Then the height of the tower is

(1) $50\sqrt{3}$ metre (2) $100\sqrt{3}$ metre

(3) $\frac{50}{\sqrt{3}}$ metre (4) $\frac{100}{\sqrt{3}}$ metre

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

47. A kite is flying at the height of 75m from the ground. The string makes an angle θ (where cotθ = $\frac{8}{15}$) with the level ground. Assuming that there is no slack in the string the length of the string is equal to :

(1) 85 metre (2) 65 metre

(3) 75 metre (4) 40 metre

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

48. Two towers A and B have lengths 45m and 15m respectively. The angle of elevation from the bottom of the tower B to the top of the tower A is 60°. If the angle of elevation from the bottom of tower A to the top of the tower B is θ then value of sinθ is :

(1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{2}$

(3) $\frac{\sqrt{3}}{2}$ (4) $\frac{2}{\sqrt{3}}$

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

49. If a 48 m tall building has a shadow of $48\sqrt{3}$ m., then the angle of elevation of the sun is

(1) 15° (2) 60°

(3) 45° (4) 30°

(SSC CGL Tier-I Re-Exam, 30.08.2015)

50. A telegraph post is bent at a point above the ground due to starm. Its top just touches the ground at a distance of $10\sqrt{3}$ metre from its foot and makes an angle of 30° with the horizontal. Then height (in metres) of the telegraph post is

(1) 30 (2) 24

(3) 20 (4) 25

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

51. TF is a tower with F on the ground. The angle of elevation of T from A is $x°$ such that tan $x° = \frac{2}{5}$ and AF = 200m. The angle of elevation of T from a nearer point B is $y°$ with BF = 80m. The value of $y°$ is

(1) 60° (2) 30°

(3) 75° (4) 45°

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

52. If the angle of elevation of the sun changes from 45° to 60°, then the length of the shadow of a pillar decreases by 10 m. The height of the pillar is :

(1) $5\left(3-\sqrt{3}\right)$ metre

(2) $5\left(\sqrt{3}+1\right)$ metre

(3) $15\left(\sqrt{3}+1\right)$ metre

(4) $5\left(3+\sqrt{3}\right)$ metre

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

53. The ratio of the length of a rod and its shadow is $1 : \sqrt{3}$. The angle of elevation of the sun is :

(1) 90° (2) 30°

(3) 45° (4) 60°

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

54. A tower is 50 metre high. Its shadow is x metres shorter when the sun's altitude is 45° than when it is 30°. The value of x in metre is :

(1) $50\sqrt{3}$ (2) $50(\sqrt{3}-1)$

(3) $50(\sqrt{3}+1)$ (4) 50

(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

55. The angle of elevation of an aeroplane from a point on the ground is 45°. After flying for 15 seconds, the elevation changes to 30°. If the aeroplane is flying at a height of 2500 metres, then the speed of the aeroplane in km/hr. is

(1) 600 (2) $600(\sqrt{3}+1)$

(3) $600\sqrt{3}$ (4) $600(\sqrt{3}-1)$

(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

56. A vertical tower stands on a horizontal plane and is surmounted by a vertical flag staff of height h. At a point on the plane, the angle of elevation of the bottom of the flag staff is α and that of the top of the flag staff is β. Then the height of the tower is

(1) $h\tan\alpha$

(2) $\dfrac{h\tan\alpha}{\tan\beta-\tan\alpha}$

(3) $\dfrac{h\tan\alpha}{\tan\alpha-\tan\beta}$

(4) None of these

(SSC CGL Tier-II Online Exam.01.12.2016)

57. A person observes that the angle of elevation at the top of a pole of height 5 metre is 30°. Then the distance of the person from the pole is :

(1) $5\sqrt{3}$ metre (2) $\dfrac{5}{\sqrt{3}}$ metre

(3) $\sqrt{3}$ metre (4) $10\sqrt{3}$ metre

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

58. The angle of elevation of a ladder leaning against a wall is 60° and the foot of the ladder is 4.6 metre away from the wall. The length of the ladder is

(1) 2.3 metre (2) 4.6 metre

(3) 9.2 metre (4) 7.8 metre

(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

59. A ladder is placed along a wall such that its upper end is touching the top of the wall. The foot of the ladder is 10 ft away from the wall and the ladder is making an angle of 60° with the ground. When a man starts climbing on it, it slips and now ladder makes an angle of 30° with ground. How much did the ladder slip from the top of the wall?

(1) 12 ft (2) 20 ft

(3) 7.32 ft (4) 18 ft

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

60. The angle of elevation of the sun when the length of the shadow of a pole is equal to its height is :

(1) 30° (2) 45°

(3) 60° (4) 90°

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

61. The angles of elevation of top and bottom of a flag kept on a flagpost from 30 metres distance, are 45° and 30° respectively. Height of the flat is [taking $\sqrt{3}$ = 1.732]

(1) $12\sqrt{3}$ metre (2) 15 metre

(3) 14.32 metre (4) 12.68 metre

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

62. From 40m away from the foot of a tower, the angle of elevation of the top of the tower is 60^0. What is the height of the tower?

(1) $\dfrac{120}{\sqrt{3}}$ m. (2) $\dfrac{60}{\sqrt{3}}$ m.

(3) $\dfrac{50}{\sqrt{3}}$ m. (4) $\dfrac{130}{\sqrt{7}}$ m.

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

63. A man standing on the bank of river observes that the angle subtended by a tree on the opposite bank is 60°. When he retires 36 m from the bank, he finds that the angle is 30°. The breadth of the river is

(1) 15 metre (2) 18 metre

(3) 16 metre (4) 11 metre

(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

64. Two ships are sailing in the sea on the two sides of a light house. The angles of elevation of the top of the light house as observed from the two ships are 30° and 45° respectively. If the light house is 100m high, the distance between the two ships is : (take $\sqrt{3}=1.73$)

(1) 173 metre (2) 200 metre

(3) 273 metre (4) 300 metre

(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

65. An observer on the top of a mountain, 500 m above the sea level, observes the angles of depression of the two boats in his same place of vision to be 45° and 30° respectively. Then the distance between the boats, if the boats are on the same side of the mountain, is

(1) 456 m (2) 584 m

(3) 366 m (4) 699 m

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

66. The angle of elevation of the top of a pillar from the foot and the top of a building 20 m high, are 60° and 30° respectively. The height of the pillar is

(1) 10 m (2) $10\sqrt{3}$

(3) 60 m (4) 30 m

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

67. The angles of elevation of the top of a temple, from the foot and the top of a building 30 m high, are 60° and 30° respectively. Then, the height of the temple is

(1) 50 metre (2) 43 metre

(3) 40 metre (4) 45 metre

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

68. The height of a tower is $50\sqrt{3}$ metre. The angle of elevation of a tower from a distance 50 metre from its foot is

(1) 30° (2) 45°

(3) 60° (4) 90°

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

69. The respective ratio between the height of tower and the point at some distance from its foot is $5\sqrt{3}:5$. What will be the angle of elevation of the top of the tower?

(1) 30° (2) 60°

(3) 90° (4) 45°

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

70. The thread of a kite makes angle 60° with the horizontal plane. If the length of the thread be 80 m, then the vertical height of the kite will be

(1) $\frac{40}{\sqrt{3}}$ metre (2) $80\sqrt{3}$ metre

(3) 80 metre (4) $40\sqrt{3}$ metre

(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

71. The angle of elevation of the top of a tower from a point A on the ground is 30°. On moving a distance of 20 metres towards the foot of the tower to a point B, the angle of elevation increases to 60°. The height of the tower in metres is

(1) $\sqrt{3}$ (2) $5\sqrt{3}$

(3) $10\sqrt{3}$ (4) $20\sqrt{3}$

(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

72. A 1.6 m tall observer is 45 metres away from a tower. The angle of elevation from his eye to the top of the tower is 30°, then the height of the tower in metres is (Take $\sqrt{3}$ = 1.732)

(1) 25.98 (2) 26.58

(3) 27.58 (4) 27.98

(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

73. A straight tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle of 30° with the ground. The distance from the foot of the tree to the point, where the top touches the ground is 10 m. Find the total height of the tree?

(1) $10\sqrt{3}$ metre

(2) $\frac{10\sqrt{3}}{3}$ metre

(3) $10\left(\sqrt{3}+1\right)$ metre

(4) $10\left(\sqrt{3}-1\right)$ metre

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

74. The top of a broken tree touches the ground at a distance of 15 metre from its base. If the tree is broken at a height of 8 metre from the ground, then the actual height of the tree is

(1) 17 metre (2) 20 metre

(3) 25 metre (4) 30 metre

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

75. From two points, lying on the same horizontal line, the angles of elevation of the top of the pillar are θ and ϕ (θ < ϕ). If the height of the pillar is 'h' m and the two points lie on the same sides of the piller, then the distance between the two points is

(1) h (tanθ – tanϕ) metre

(2) h (cotϕ – cotθ) metre

(3) h (cotθ – cotϕ) metre

(4) $h\,\frac{\tan\theta\tan\phi}{\tan\phi-\tan\theta}$ metre

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

76. The angle of elevation of the top of a tower from two horizontal points (in opposite sides) at distances of 25 metre and 64 metre from the base of tower are x and 90° – x respectively. The height of the tower will be

(1) 39 metre (2) 89 metre

(3) 1.6 metre (4) 40 metre

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

77. If the length of the shadow of a vertical pole be $\sqrt{3}$ times the height of the pole, the angle of elevation of the sun is :

(1) 60° (2) 45°

(3) 30° (4) 90°

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

78. An aeroplane flying horizontally at a height of 3 km. above the ground is observed at a certain point on earth to subtend an angle of 60°. After 15 seconds of flight, its angle of elevation is changed to 30°. The speed of the aeroplane (Take, $\sqrt{3}$ = 1.732) is

(1) 230.63 m./sec.

(2) 230.93 m./sec.

(3) 235.85 m./sec.

(4) 236.25 m./sec.

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

79. If the angle of elevation of the sun decreases from 45° to 30°, then the length of the shadow of a pillar increases by 60m. The height of the pillar is

(1) $60\left(\sqrt{3}+1\right)$ metre

(2) $30\left(\sqrt{3}-1\right)$ metre

(3) $30\left(\sqrt{3}+1\right)$ metre

(4) $60\left(\sqrt{3}-1\right)$ metre

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

80. The angle of elevation of the top of a tower, vertically erected in the middle of a paddy field, from two points on a horizontal line through the foot of the tower are given to be α and β (α > β). The height of the tower is h unit. A possible distance (in the same unit) between the points is

(1) $\frac{h\left(\cot\beta-\cot\alpha\right)}{\cos\left(\alpha+\beta\right)}$

(2) h (cot α – cot β)

(3) $\frac{h(\tan\beta-\tan\alpha)}{\tan\alpha\ \tan\beta}$

(4) h (cot α + cot β)

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

81. The angle of elevation of the top of an unfinished pillar at a point 150 metres from its base is 30°. The height (in metres) that the pillar must be raised so that its angle of elevation at the same point may be 45°, is (Take, $\sqrt{3}$ = 1.732)

(1) 63.4 (2) 86.6

(3) 126.8 (4) 173.2

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

82. If the angle of elevation of a cloud from a point 200m above a lake is 30° and the angle of depression of its reflection in the lake is 60°. Then the height of the cloud above the lake is :

(1) 100 m (2) 200 m

(3) 300 m (4) 400 m

(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (Ist Sitting)

83. At 129 metre away from the foot of a cliff on level of ground, the angle of elevation of the top of the cliff is 30°. The height of this cliff is :

(1) $50\sqrt{3}$ metre

(2) $45\sqrt{3}$ metre

(3) $43\sqrt{3}$ metre

(4) $47\sqrt{3}$ metre

(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (Ist Sitting)

84. Find the angular elevation of the Sun when the shadow of a 15 metre long pole is $\frac{15}{\sqrt{3}}$ metre.

(1) 45° (2) 60°
(3) 30° (4) 90°

(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

85. If the angle of elevation of the top of a pillar from the ground level is raised from 30° to 60°, the length of the shadow of a pillar of height $50\sqrt{3}$ will be decreased by

(1) 60 metre (2) 75 metre
(3) 100 metre (4) 50 metre

(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

86. From a point P on a level ground, the angle of elevation to the top of the tower is 30°. If the tower is 100 metre high, the distance of point P from the foot of the tower is

$\left(\text{Take } \sqrt{3} = 1.73\right)$

(1) 149 metre (2) 156 metre
(3) 173 metre (4) 188 metre

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

87. Two men standing on same side of a pillar 75 metre high, observe the angles of elevation of the top of the pillar to be 30° and 60° respectively. The distance between two men is :

(1) $100\sqrt{3}$ metre

(2) 100 metre

(3) $50\sqrt{3}$ metre

(4) $25\sqrt{3}$ metre

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

88. The angles of elevation of an aeroplane flying vertically above the ground, as observed from the two consecutive stones, 1 km apart; are 45° and 60° aeroplane from the ground is :

(1) $\left(\sqrt{3}+1\right)$ km.

(2) $\left(\sqrt{3}+3\right)$ km.

(3) $\frac{1}{2}\left(\sqrt{3}+1\right)$ km.

(4) $\frac{1}{2}\left(\sqrt{3}+3\right)$ km.

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

89. On a ground, there is a vertical tower with a flagpole on its top. At a point 9 metre away from the foot of the tower, the angles of elevation of the top and bottom of the flagpole are 60° and 30° respectively. The height of the flagpole is :

(1) $5\sqrt{3}$ metre (2) $6\sqrt{3}$ metre
(3) $6\sqrt{2}$ metre (4) $6\sqrt{5}$ metre

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

90. If the elevation of the Sun changes from 30° to 60°, then the difference between the lengths of shadows of a pole 15 metre high, is

(1) 7.5 metre (2) 15 metre
(3) $10\sqrt{3}$ metre (4) $5\sqrt{3}$ metre

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

91. Two persons are on either side of a temple, 75 m high, observe the angle of elevation of the top of the temple to be 30° and 60° respectively. The distance between the persons is :

(1) 173.2 metre (2) 100 metre
(3) 157.7 metre (4) 273.2 metre

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

92. From the top of a 20 metre high building, the angle of elevation of the top of a tower is 60° and the angle of depression of its foot is at 45°, then the height of the tower is

$\left(\sqrt{3} = 1.732\right)$

(1) 45.46 metre (2) 45.64 metre
(3) 54.64 metre (4) 54.46 metre

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

93. The length of shadow of a tower is $\sqrt{3}$ times that of its length. The angle of elevation of the sun is :

(1) 45° (2) 30°
(3) 60° (4) None

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

94. The upper part of a tree broken at a certain height makes an angle of 60° with the ground at a distance of 10 metre from its foot. The original height of the tree was

(1) $20\sqrt{3}$ metre

(2) $10\sqrt{3}$ metre

(3) $10\left(2+\sqrt{3}\right)$ metre

(4) $10\left(2-\sqrt{3}\right)$ metre

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

95. A telegraph post is bent at a point above the ground. Its top just touches the ground at a distance of $8\sqrt{3}$ metre from its foot and makes an angle of 30° with the horizontal. The height (in metre) of the post is :

(1) 12 (2) 16
(3) 18 (4) 24

(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

96. The angles of elevation of the top of a tower from two points at a distance of 4 m and 9 m from the base of the tower and in the same straight line with it are complementary. The height of the tower is :

(1) 4 metre (2) 7 metre
(3) 9 metre (4) 6 metre

(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

97. The shadow of a tower when the angle of elevation of the sun is 45°, is found to be 10 metre longer than when it was 60°. The height of the tower is

(1) $5\left(\sqrt{3}-1\right)$ metre

(2) $5\left(3+\sqrt{3}\right)$ metre

(3) $10\left(\sqrt{3}-1\right)$ metre

(4) $10\left(\sqrt{3}+1\right)$ metre

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

98. Two men are on opposite sides of a tower. They measure the angles of elevation of the top of the tower as 30° and 45° respectively. If the height of the tower is 50 metre, the distance between the two men is (Take $\sqrt{3}$ = 1.73)

(1) 136.5 metre

(2) $50\sqrt{3}$ metre

(3) $100\sqrt{3}$ metre

(4) 135.5 metre

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

99. The shadow of a vertical tower on ground level increases by 10 metre when the altitude of the sun changes form 45° to 30°. The height of the tower is :

(1) $5(\sqrt{3}+1)$ metre

(2) $10(\sqrt{3}-1)$ metre

(3) 9 metre

(4) 13 metre

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

100. A man standing on the bank of a river observes that the angle of elevation of the top of a tree just on the opposite bank is 60°. But angle of elevation is 30° from a point which is at a distance $20\sqrt{3}$ ft away from the bank. Then the height of the tree is :

(1) 60 ft (2) 45 ft

(3) 30 ft (4) 15 ft

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

101. The distance between two pillars is 120 metres. The height of one pillar is thrice the other. The angles of elevation of their tops from the mid point of the line connecting their feet are complementary to each other. The height (in metres) of the taller pillar is

(Use : $\sqrt{3}$ = 1.732)

(1) 34.64 (2) 51.96

(3) 69.28 (4) 103.92

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

102. A hydrogen filled balloon ascending at the rate of 18 kmph was drifted by wind. Its angle of elevation at 10th and 15th minutes were found to be 60° and 45° respectively. The wind speed (in whole numbers) during the last five minutes, approximately, is equal to

(1) 7 km./hr. (2) 11 km./hr.

(3) 26 km./hr. (4) 33 km./hr.

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–IV

1. There are two vertical posts, one on each side of a road, just opposite to each other. One post is108 metre high. From the top of this post, the angle of depression of the top and foot of the other post are 30° and 60° respectively. The height of the other post (in metre) is

(1) 36 (2) 72

(3) 108 (4) 110

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

2. There are two temples, one on each bank of a river, just opposite to each other. One temple is 54m high. From the top of this temple, the angles of depression of the top and the foot of the other temple are 30° and 60° respectively. The length of the temple is :

(1) 18 m (2) 36 m

(3) $36\sqrt{3}$ m (4) $18\sqrt{3}$ m

(SSC & LDC Exam. 21.10.2012 (IInd Sitting)

3. The top of two poles of height 24 m and 36 m are connected by a wire. If the wire makes an angle of 60° with the horizontal, then the length of the wire is

(1) 6 m (2) $8\sqrt{3}$ m

(3) 8 m (4) $6\sqrt{3}$ m

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

4. From the top of a hill 200 m high, the angle of depression of the top and the bottom of a tower are observed to be 30° and 60°. The height of the tower is (in m) :

(1) $\frac{400\sqrt{3}}{3}$ (2) $166\frac{2}{3}$

(3) $133\frac{1}{3}$ (4) $200\sqrt{3}$

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

5. From a tower 125 metres high, the angle of depression of two objects, which are in horizontal line through the base of the tower, are 45° and 30° and they are on the same side of the tower. The distance (in metres) between the objects is

(1) $125\sqrt{3}$

(2) $125(\sqrt{3}-1)$

(3) $125/(\sqrt{3}-1)$

(4) $125(\sqrt{3}+1)$

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

6. From the top of a tower of height 180 m the angles of depression of two objects on either sides of the tower are 30° and 45°. Then the distance between the objects are

(1) $180\left(3+\sqrt{3}\right)$m

(2) $180\left(3-\sqrt{3}\right)$ m

(3) $180\left(\sqrt{3}-1\right)$ m

(4) $180\left(\sqrt{3}+1\right)$ m

(SSC CGL Tier-II Exam. 21.09.2014)

7. From the peak of a hill which is 300 m high, the angle of depression of two sides of a bridge lying on a ground are 45° and 30° (both ends of the bridge are on the same side of the hill). Then the length of the bridge is

(1) $300(\sqrt{3}-1)$ m

(2) $300(\sqrt{3}+1)$ m

(3) $300\sqrt{3}$ m

(4) $\frac{300}{\sqrt{3}}$ m

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014

8. From an aeroplane just over a river, the angle of depression of two palm trees on the opposite bank of the river are found to be 60° and 30° respectively. If the breadth of the river is 400 metres, then the height of the aeroplane above the river at that instant is

(Assume $\sqrt{3}$ = 1.732)

(1) 173.2 metres

(2) 346.4 metres

(3) 519.6 metres

(4) 692.8 metres

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

9. From the top of a light-house at a height 20 metres above sea-level, the angle of depression of a ship is 30°. The distance of the ship from the foot of the light house is

(1) 20 m (2) $20\sqrt{3}$ m

(3) 30 m (4) $30\sqrt{3}$ m

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

10. From an aeroplane just over a straight road, the angles of depression of two consecutive kilometre stones situated at opposite sides of the aeroplane were found to be 60° and 30° respectively. The height (in km) of the aeroplane from the road at that instant, is

(1) $\frac{\sqrt{3}}{2}$ (2) $\frac{\sqrt{3}}{3}$

(3) $\frac{\sqrt{3}}{4}$ (4) $\sqrt{3}$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

11. From an aeroplane just over a straight road, the angles of depression of two consecutive kilometre stones situated at opposite sides of the aeroplane were found to be 60° and 30° respectively. The height (in km) of the aeroplane from the road at that instant was

(Given $\sqrt{3}$ = 1.732)

(1) 0.433 (2) 8.66

(3) 4.33 (4) 0.866

(SSC CGL Tier-I Re-Exam, 30.08.2015)

12. THe angle of depression of a point situated at a distance of 70 m from the base of a tower is 60°. The height of the tower is :

(1) $35\sqrt{3}$ m (2) $70\sqrt{3}$ m

(3) $\frac{70\sqrt{3}}{3}$ m (4) 70 m

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

13. A pilot in an aeroplane at an altitude of 200 metre observes two points lying on either side of a river. If the angles of depression of the two points be 45° and 60°, then the width of the river is

(1) $\left(200+\frac{200}{\sqrt{3}}\right)$ metre

(2) $\left(200-\frac{200}{\sqrt{3}}\right)$ metre

(3) $400\sqrt{3}$ metre

(4) $\left(\frac{400}{\sqrt{3}}\right)$ metre

(SSC CGL Tier-I (CBE) Exam.10.09.2016)

14. A person from the top of a hill observes a vehicle moving towards him at a uniform speed. It takes 10 minutes for the angle of depression to change from 45° to 60°. After this the time required by the vehicle to reach the bottom of the hill is

(1) 12 minutes 20 seconds

(2) 13 minutes

(3) 13 minutes 40 seconds

(4) 14 minutes 24 seconds

(SSC CGL Tier-II Online Exam.01.12.2016)

15. From the top of a cliff 100 metre high, the angles of depression of the top and bottom of a tower are 45° and 60° respectively. The height of the tower is

(1) $\frac{100}{3}\left(3-\sqrt{3}\right)$ metre

(2) $\frac{100}{3}\left(\sqrt{3}-1\right)$ metre

(3) $\frac{100}{3}\left(2\sqrt{3}-1\right)$ metre

(4) $\frac{100}{3}\left(\sqrt{3}-\sqrt{2}\right)$ metre

(SSC CGL Tier-II Online Exam.01.12.2016)

16. A man on the top of a tower, standing on the sea shore, finds that a boat coming towards him takes 10 minutes for the angle of depression to change from 30° to 60°. How soon the boat reach the seashore ?

(1) 5 minutes (2) 7 minutes

(3) 10 minutes (4) 15 minutes

(SSC CGL Tier-II Online Exam.01.12.2016)

17. Two posts are 2 metres apart. Both posts are on same side of a tree. If the angles of depressions of these posts when observed from the top of the tree are 45° and 60° respectively, then the height of the tree is :

(1) $\left(3-\sqrt{3}\right)$ metre

(2) $\left(3+\sqrt{3}\right)$ metre

(3) $\left(-3+\sqrt{3}\right)$ metre

(4) $\left(3-\sqrt{2}\right)$ metre

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

18. The cliff of a mountain is 180 m high and the angles of depression of two ships on the either side of cliff are 30° and 60°. What is the distance between the two ships?

(1) 400 metre

(2) $400\sqrt{3}$ metre

(3) 415.68 metre

(4) 398.6 metre

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

19. From the top of a tower 60 metre high the angle of depression of the top and bottom of a pole are observed to be 45° and 60° respectively. If the pole and tower stand on the same plane, the height of the pole in metre is

(1) $60\ (\sqrt{3}-1)$ (2) $20\ (\sqrt{3}-1)$

(3) $20\ (3-\sqrt{3})$ (4) $20\ (\sqrt{3}+1)$

(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

20. A helicopter, at an altitude of 1500 metre, finds that two ships are sailing towards it, in the same direction. The angles of depression of the ships as observed from the helicopter are 60° and 30° respectively. Distance between the two ships, in metre is

(1) $1000\sqrt{3}$ (2) $\frac{1000}{\sqrt{3}}$

(3) $500\sqrt{3}$ (4) $\frac{500}{\sqrt{3}}$

(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

21. The angles of depression of two ships from the top of a light house are 45° and 30° toward east. If the ships are 200m apart, the height of the light

house is (Take $\sqrt{3}$ =1.73)

(1) 273 metre (2) 270 metre

(3) 253 metre (4) 263 metre

(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

22. From the top of a building 60 metre high, the angles of depression of the top and bottom of a tower are observed to be 30° and 60° respectively. The height of the tower in metre is :

(1) 40 (2) 45

(3) 50 (4) 55

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

23. From a point on a bridge across the river, the angles of depression of the banks on opposite sides of the river are 30° and 45° respectively. If the bridge is at a height of 2.5 m from the banks, then the width of the river is

$\left(\text{Take } \sqrt{3} = 1.732\right)$

(1) 5.83 metre (2) 6.83 metre
(3) 5.76 metre (4) 6.87 metre

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

24. A boat is moving away from an observation tower. It makes an angle of depression of 60° with an observer's eye when at a distance of 50 metre from the tower. After 8 seconds, the angle of depression becomes 30°. By assuming that it is running in still water, the approximate speed of the boat is :

(1) 33 km/hr (2) 42 km/hr
(3) 45 km/hr (4) 50 km/hr

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

25. The angle of elevation of an aeroplane as observed from a point 30 metre above the transparent water-surface of a lake is 30° and the angle of depression of the image of the aeroplane in the water of the lake is 60°. The height of the aeroplane from the water-surface of the lake is

(1) 60 metre (2) 45 metre
(3) 50 metre (4) 75 metre

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

26. The angles of depression of two ships from the top of a light house are 60° and 45° towards east. If the ships are 300 metre apart, the height of the light house is

(1) $200\left(3+\sqrt{3}\right)$ meter

(2) $250\left(3+\sqrt{3}\right)$ meter

(3) $150\left(3+\sqrt{3}\right)$ meter

(4) $160\left(3+\sqrt{3}\right)$ meter

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–V

1. A pole stands vertically, inside a scalene triangular park ABC. If the angle of elevation of the top of the pole from each corner of the park is same, then in Δ ABC, the foot of the pole is at the

(1) centroid (2) circumcentre
(3) incentre (4) orthocentre

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

2. The base of a triangle is $12\sqrt{3}$ cm and two angles at the base are 30° and 60° respectively. The altitude of the triangle is

(1) 12 cm (2) 6 cm
(3) $10\sqrt{3}$ cm (4) 9 cm

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

3. The two banks of a canal are straight and parallel. A, B, C are three persons of whom A stands on one bank and B and C on the opposite banks. B finds the angle ABC is 30°, while C finds that the angle ACB 60°. If B and C are 100 metres apart, the breadth of the canal is

(1) $\frac{25}{\sqrt{3}}$ metres

(2) $20\sqrt{3}$ metres

(3) $25\sqrt{3}$ metres

(4) $\frac{20}{\sqrt{3}}$ metres

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

4. A person of height 6ft. wants to pluck a fruit which is on a $\frac{26}{3}$ ft. high tree. If the person is standing $\frac{8}{\sqrt{3}}$ ft. away from the base of the tree, then at what angle should he throw a stone so that it hits the fruit ?

(1) 75° (2) 30°
(3) 45° (4) 60°

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

5. If $x = a\cos\theta + b\sin\theta$ and $y = b\cos\theta - a\sin\theta$, then $x^2 + y^2$ is equal to

(1) ab (2) $a^2 + b^2$
(3) $a^2 - b^2$ (4) 1

(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

SHORT ANSWERS

TYPE-I

1. (1)	**2.** (2)	**3.** (3)	**4.** (2)
5. (3)	**6.** (3)	**7.** (2)	**8.** (1)
9. (4)	**10.** (3)	**11.** (2)	**12.** (1)

TYPE-II

1. (3)	**2.** (3)	**3.** (3)	**4.** (2)
5. (1)	**6.** (1)	**7.** (2)	**8.** (3)
9. (4)	**10.** (2)	**11.** (1)	**12.** (1)
13. (1)	**14.** (4)	**15.** (4)	**16.** (2)
17. (4)	**18.** (4)	**19.** (3)	**20.** (3)
21. (2)	**22.** (2)	**23.** (2)	**24.** (4)
25. (1)	**26.** (2)	**27.** (4)	**28.** (2)
29. (4)	**30.** (1)	**31.** (3)	**32.** (3)
33. (2)	**34.** (1)	**35.** (2)	**36.** (1)
37. (3)	**38.** (2)	**39.** (2)	**40.** (2)
41. (3)	**42.** (4)	**43.** (4)	**44.** (3)
45. (2)	**46.** (3)	**47.** (1)	**48.** (3)
49. (2)	**50.** (3)	**51.** (4)	**52.** (1)
53. (3)	**54.** (2)	**55.** (3)	**56.** (2)
57. (1)	**58.** (4)	**59.** (4)	**60.** (2)
61. (2)	**62.** (1)	**63.** (2)	**64.** (3)
65. (2)	**66.** (3)	**67.** (1)	**68.** (1)
69. (2)	**70.** (3)	**71.** (3)	**72.** (2)
73. (1)	**74.** (3)	**75.** (3)	**76.** (1)
77. (4)	**78.** (2)	**79.** (2)	**80.** (4)
81. (3)	**82.** (2)	**83.** (3)	**84.** (2)
85. (4)	**86.** (4)	**87.** (4)	**88.** (1)
89. (3)	**90.** (3)	**91.** (3)	**92.** (4)
93. (3)	**94.** (3)	**95.** (1)	**96.** (1)
97. (1)	**98.** (4)	**99.** (2)	**100.** (1)
101. (2)	**102.** (1)	**103.** (3)	**104.** (1)
105. (1)	**106.** (3)	**107.** (1)	**108.** (4)
109. (1)	**110.** (4)	**111.** (3)	**112.** (1)
113. (1)	**114.** (3)	**115.** (2)	**116.** (4)
117. (3)	**118.** (2)	**119.** (3)	**120.** (1)

121. (4)	**122.** (2)	**123.** (3)	**124.** (4)
125. (1)	**126.** (4)	**127.** (1)	**128.** (4)
129. (4)	**130.** (2)	**131.** (2)	**132.** (2)
133. (1)	**134.** (2)	**135.** (2)	**136.** (2)
137. (2)	**138.** (4)	**139.** (3)	**140.** (3)
141. (3)	**142.** (4)	**143.** (2)	**144.** (2)
145. (1)	**146.** (4)	**147.** (4)	**148.** (4)
149. (2)	**150.** (1)	**151.** (3)	**152.** (3)
153. (2)	**154.** (1)	**155.** (1)	**156.** (3)
157. (1)	**158.** (2)	**159.** (2)	**160.** (2)
161. (1)	**162.** (3)	**163.** (1)	**164.** (2)
165. (3)	**166.** (3)	**167.** (4)	**168.** (2)
169. (2)	**170.** (2)	**171.** (3)	**172.** (2)
173. (3)	**174.** (2)	**175.** (3)	**176.** (1)
177. (1)	**178.** (3)	**179.** (4)	**180.** (3)
181. (4)	**182.** (2)	**183.** (4)	**184.** (4)
185. (*)	**186.** (2)	**187.** (1)	**188.** (1)
189. (1)	**190.** (1)	**191.** (3)	**192.** (1)
193. (3)	**194.** (3)	**195.** (4)	**196.** (2)
197. (3)	**198.** (3)	**199.** (3)	**200.** (4)
201. (4)	**202.** (2)	**203.** (1)	**204.** (3)
205. (2)	**206.** (1)	**207.** (1)	**208.** (4)
209. (3)	**210.** (4)	**211.** (3)	**212.** (3)
213. (1)	**214.** (1)	**215.** (1)	**216.** (3)
217. (2)	**218.** (2)	**219.** (3)	**220.** (4)
221. (3)	**222.** (3)	**223.** (1)	**224.** (3)
225. (2)	**226.** (3)	**227.** (1)	**228.** (3)
229. (2)	**230.** (4)	**231.** (3)	**232.** (2)
233. (3)	**234.** (1)	**235.** (4)	**236.** (4)
237. (2)	**238.** (1)	**239.** (2)	**240.** (2)
241. (2)	**242.** (2)	**243.** (2)	**244.** (1)
245. (3)	**246.** (3)	**247.** (2)	**248.** (1)
249. (1)	**250.** (3)	**251.** (4)	**252.** (4)
253. (4)	**254.** (1)	**255.** (4)	**256.** (2)
257. (2)	**258.** (2)	**259.** (4)	**260.** (4)
261. (3)	**262.** (1)	**263.** (1)	**264.** (4)
265. (1)	**266.** (4)	**267.** (1)	**268.** (1)

269. (4)	**270.** (4)	**271.** (4)	**272.** (3)
273. (2)	**274.** (2)	**275.** (2)	**276.** (3)
277. (4)	**278.** (2)	**279.** (2)	**280.** (2)
281. (4)	**282.** (1)	**283.** (3)	**284.** (1)
285. (*)	**286.** (2)	**287.** (3)	**288.** (4)
289. (4)	**290.** (3)	**291.** (2)	**292.** (2)
293. (1)	**294.** (1)	**295.** (2)	**296.** (1)
297. (2)	**298.** (4)	**299.** (1)	**300.** (2)
301. (2)	**302.** (4)	**303.** (*)	**304.** (2)
305. (3)	**306.** (3)	**307.** (2)	**308.** (4)
309. (2)	**310 .** (2)	**311.** (1)	**312.** (3)
313. (1)	**314.** (3)	**315.** (2)	**316.** (4)
317. (4)	**318.** (3)	**319.** (1)	**320.** (3)
321. (1)	**322.** (1)	**323.** (4)	**324.** (3)
325. (3)	**326.** (2)	**327.** (3)	**328.** (2)
329. (1)	**330.** (1)	**331.** (4)	**332.** (2)
333. (3)	**334.** (2)	**335.** (3)	**336.** (3)
337. (1)	**338.** (3)	**339.** (2)	**340.** (2)
341. (3)	**342.** (1)	**343.** (4)	**344.** (3)
345. (1)	**346.** (1)	**347.** (1)	**348.** (2)
349. (4)	**350.** (4)	**351.** (3)	**352.** (2)
353. (3)	**354.** (1)	**355.** (1)	**356.** (2)
357. (4)	**358.** (2)	**359.** (3)	**360.** (2)
361. (3)	**362.** (3)	**363.** (3)	**364.** (3)
365. (4)	**366.** (3)	**367.** (4)	**368.** (*)
369. (4)	**370.** (4)	**371.** (3)	**372.** (1)
373. (2)	**374.** (2)	**375.** (2)	**376.** (1)
377. (3)	**378.** (2)	**379.** (4)	**380.** (1)
381. (2)	**382.** (4)	**383.** (4)	**384.** (3)
385. (3)	**386.** (3)	**387.** (2)	**388.** (2)
389. (1)	**290.** (3)	**391.** (2)	**392.** (4)
393. (2)	**294.** (3)	**395.** (3)	**396.** (2)
397. (1)	**398.** (1)	**399.** (1)	**400.** (3)
401. (3)	**402.** (1)	**403.** (2)	**404.** (2)
405. (4)	**406.** (2)	**407.** (2)	**408.** (4)
409. (4)	**410.** (1)	**411.** (3)	**412.** (2)
413. (2)	**414.** (3)	**415.** (2)	**416.** (4)
417. (2)			

TYPE-III

1. (4)	**2.** (2)	**3.** (2)	**4.** (3)
5. (3)	**6**. (3)	**7.** (3)	**8.** (1)
9. (3)	**10.** (2)	**11.** (1)	**12.** (3)
13. (4)	**14.** (4)	**15.** (4)	**16.** (3)
17. (2)	**18.** (2)	**19.** (2)	**20.** (2)
21. (1)	**22.** (1)	**23.** (4)	**24.** (1)
25. (2)	**26.** (1)	**27.** (2)	**28.** (3)
29. (3)	**30.** (4)	**31**. (4)	**32.** (2)
33. (4)	**34.** (2)	**35.** (4)	**36.** (3)
37. (1)	**38.** (2)	**39.** (4)	**40.** (1)
41. (2)	**42.** (3)	**43.** (2)	**44.** (4)
45. (4)	**46.** (4)	**47.** (1)	**48.** (2)
49. (4)	**50.** (1)	**51.** (4)	**52.** (4)
53. (2)	**54.** (2)	**55.** (4)	**56.** (2)
57. (1)	**58.** (3)	**59.** (3)	**60.** (2)
61. (4)	**62.** (1)	**63.** (2)	**64.** (3)
65. (3)	**66.** (4)	**67.** (4)	**68.** (3)
69. (2)	**70.** (4)	**71.** (3)	**72.** (3)
73. (1)	**74.** (3)	**75.** (3)	**76.** (4)
77. (3)	**78.** (2)	**79.** (3)	**80.** (4)
81. (1)	**82.** (4)	**83.** (3)	**84.** (2)
85. (3)	**86.** (3)	**87.** (3)	**88.** (4)
89. (2)	**90.** (3)	**91.** (1)	**92.** (3)
93. (2)	**94.** (3)	**95.** (4)	**96.** (4)
97. (2)	**98.** (1)	**99.** (1)	**100.** (3)
101. (4)	**102.** (4)		

TYPE-IV

1. (2)	**2.** (2)	**3.** (2)	**4.** (3)
5. (2)	**6.** (4)	**7.** (1)	**8.** (1)
9. (2)	**10.** (3)	**11.** (4)	**12.** (2)
13. (1)	**14.** (3)	**15.** (1)	**16.** (1)
17. (2)	**18.** (3)	**19.** (3)	**20.** (1)
21. (1)	**22.** (1)	**23.** (2)	**24.** (3)
25. (1)	**26.** (3)		

TYPE-V

1. (2)	**2.** (4)	**3.** (3)	**4.** (2)
5. (2)			

EXPLANATIONS

TYPE-I

1. (1) Using Rule 1,

$11°15'$

$= 11° + \frac{15°}{60}$

$= 11° + \frac{1}{4} = \frac{45°}{4}$

$[\because 180° = \pi^c]$

$\therefore \frac{45°}{4} = \frac{\pi}{180} \times \frac{45}{4} = \frac{\pi^c}{16}$

2. (2) Using Rule 1,

$\angle ABC = 75°$

$[\because 180° = \pi$ radian or $\pi^c]$

$75° = \frac{\pi}{180} \times 75 = \frac{5\pi}{12}$ radian

$\therefore \angle BAC = \pi - \frac{\pi}{4} - \frac{5\pi}{12}$

$= \frac{12\pi - 3\pi - 5\pi}{12} = \frac{4\pi}{12}$

$= \frac{\pi}{3}$ radian

3. (3) Using Rule 1,

Sum of remaining two angles

$= \pi - \frac{5\pi}{9} = \frac{4\pi}{9}$

$\therefore$ Each angle $= \frac{1}{2} \times \frac{4\pi}{9} = \frac{2\pi}{9}$

$[\because \Delta$ is isosceles$]$

4. (2) Using Rule 1,

$\pi =$ radian $= 180°$

$\therefore 1$ radian $= \frac{180°}{\pi}$

$= \frac{180 \times 7°}{22}$

$= \frac{630}{11} = 57\frac{3}{11}°$

$= 57°\frac{3}{11} \times 60' = 57°\frac{180'}{11}$

$= 57°16'\frac{4}{11} \times 60'' = 57°16'22''$

5. (3) Using Rule 1,

$\because \pi$ radian $= 180°$

$\therefore \frac{3\pi}{5}$ radian $= \frac{180}{\pi} \times \frac{3\pi}{5}$

$= 108°$

6. (3) Using Rule 1,

Two angles = A and B where A > B.

$\therefore A + B = 135°$

$= \left(\frac{135 \times \pi}{180}\right)$ radian

$\Rightarrow A + B = \left(\frac{3\pi}{4}\right)$ radian ....(i)

$A - B = \frac{\pi}{12}$ ....(ii)

On adding these equations,

$2A = \frac{3\pi}{4} + \frac{\pi}{12}$

$= \frac{9\pi + \pi}{12} = \frac{10\pi}{12} = \frac{5\pi}{6}$

$\therefore A = \frac{5\pi}{12}$ radian

7. (2) Using Rule 1,

$\sec^2\theta + \tan^2\theta = 7$

$\Rightarrow 1 + \tan^2\theta + \tan^2\theta = 7$

$\Rightarrow 2\tan^2\theta = 7 - 1 = 6$

$\Rightarrow \tan^2\theta = 3$

$\Rightarrow \tan\theta = \sqrt{3}$

$= \tan 60°$

$\Rightarrow \theta = 60°$

$\because 180° = \pi$ radian

$\therefore 60° = \frac{\pi}{180} \times 60 = \frac{\pi}{3}$ radian

8. (1) Using Rule 1,

$\because \pi$ radian $= 180°$

$\therefore \frac{22}{9}$ radian $= \frac{180}{\pi} \times \frac{22}{9}$

$= \frac{180}{22} \times \frac{22 \times 7}{9} = 140°$ ....(i)

According to the question,

$A + B = 140°$

and, $A - B = 36°$ ....(ii)

On adding,

$2A = 176° \Rightarrow A = \frac{176}{2} = 88°$

From equation (i),

$\therefore 88° + B = 140°$

$\Rightarrow B = 140° - 88° = 52°$

9. (4) The hour hand of a watch traces an angle of 30° in an hour.

$\therefore$ Angle traced at 3 O'clock

$= 3 \times 30° = 90°$

$\because 180° = \pi$ radian

$\therefore 90° = \frac{\pi}{180} \times 90°$

$= \frac{\pi}{2}$ radian

10. (3) For $0 < \theta < 90°$,

$0 < \sin\theta < 1$

$\sin\theta > \sin^2\theta$

If $\theta = 30°$,

$\sin\theta = \sin 30° = \frac{1}{2}$

$\sin^2\theta = \sin^2 30° = \frac{1}{4}$

Clearly, $\frac{1}{2} > \frac{1}{4}$

11. (2) $\sin(\theta + 18°) = \frac{1}{2} = \sin 30°$

$\Rightarrow \theta + 18° = 30°$

$\Rightarrow \theta = 30° - 18° = 12°$

$\because 180° = \pi$ radian

$\therefore 12° = \frac{\pi}{180} \times 12$

$= \frac{\pi}{15}$ radians

12. (1) $\theta = \frac{l}{r}$ radian

$= \frac{11}{14}$ radian

$\because \pi$ radian $= 180°$

$\therefore 1$ radian $= \frac{180°}{\pi}$

$\therefore \frac{11}{14}$ radian $= \frac{180}{\frac{22}{7}} \times \frac{11}{14}$

$= \frac{180 \times 11 \times 7}{22 \times 14} = 45°$

TYPE-II

1. (3) $2\sin^2\theta + 3\cos^2\theta$
$= 2\sin^2\theta + 2\cos^2\theta + \cos^2\theta$
$= 2(\sin^2\theta + \cos^2\theta) + \cos^2\theta$
$= 2 + \cos^2\theta$ [$\because \sin^2\theta + \cos^2\theta = 1$]
$\because$ Minimum value of $\cos\theta = -1$
But $\cos^2\theta \geq 0$, when $\theta = 90°$
[$\because \cos 0° = 1, \cos 90° = 0$]
$\therefore$ Required minimum value
$= 2 + 0 = 2$

2. (3)
$$\frac{1}{\text{cosec}^2 51°} + \sin^2 39° + \tan^2 51° - \frac{1}{\sin^2 51°.\sec^2 39°}$$
$= \sin^2 51° + \sin^2 39° + \tan^2(90° - 39°) - \dfrac{1}{\sin^2(90°-39°).\sec^2 39°}$
$= \cos^2 39° + \sin^2 39° + \cot^2 39° - \dfrac{1}{\cos^2 39°.\sec^2 39°}$
[$\because \sin(90° - \theta) = \cos\theta$
$\tan(90° - \theta) = \cot\theta$]
$= 1 + \cot^2 39° - 1$
$= \text{cosec}^2 39° - 1 = x^2 - 1$

3. (3) $\tan 4°.\tan 43°.\tan 47°.\tan 86°$
$= \tan 4°.\tan 43°.\tan(90° - 43°).\tan(90° - 4°)$
$= \tan 4° \times \tan 43° \times \cot 43° \times \cot 4° = 1$
[$\tan(90° - \theta) = \cot\theta$; $\tan\theta.\cot\theta = 1$]

4. (2) $\dfrac{\tan\theta + \cot\theta}{\tan\theta - \cot\theta} = \dfrac{2}{1}$
By componendo and dividendo,
$$\frac{2\tan\theta}{2\cot\theta} = \frac{3}{1}$$
$$\Rightarrow \frac{\sin\theta}{\cos\theta}.\frac{\sin\theta}{\cos\theta} = 3$$
$\Rightarrow \sin^2\theta = 3\cos^2\theta$
$\Rightarrow \sin^2\theta = 3(1 - \sin^2\theta)$
$\Rightarrow 4\sin^2\theta = 3$
$$\Rightarrow \sin^2\theta = \frac{3}{4}$$
$$\Rightarrow \sin\theta = \frac{\sqrt{3}}{2}$$

5. (1) $\cos x + \cos y = 2$
$\because \cos x \leq 1$
$\Rightarrow \cos x = 1; \cos y = 1$
$\Rightarrow x = y = 0°$ [$\because \text{Cos } 0° = 1$]
$\therefore \sin x + \sin y = 0$

6. (1) $\tan 1°.\tan 2°.\tan 3° \ldots \tan 45° \ldots \tan 88° \tan 89°$
$= (\tan 1°.\tan 89°)(\tan 2°.\tan 88°) \ldots \tan 45°$
$= (\tan 1°.\cot 1°).(\tan 2°.\cot 2°) \ldots \tan 45° = 1$
[$\because \tan(90° - \theta) = \cot\theta, \tan\theta.\cot\theta = 1$]

7. (2) Let the measure of three angles of triangle are 2x, 7x and 11x respectively.
$\therefore 2x + 7x + 11x = 180°$
$\Rightarrow 20x = 180°$
$$\Rightarrow x = \frac{180}{20} = 9°$$
$\therefore$ First angle $= 2x = 2 \times 9 = 18°$
Second angle $= 7x = 7 \times 9 = 63°$
Third angle $= 11x = 11 \times 9 = 99°$

8. (3) Sum of angles of a triangle = 180°
$\therefore x + 5 + 2x - 3 + 3x + 4 = 180°$
$\Rightarrow 6x + 6 = 180°$
$\Rightarrow 6x = 180 - 6 = 174°$
$$\Rightarrow x = \frac{174}{6} = 29$$

9. (4) $\cot 10°.\cot 80°.\cot 20°.\cot 70°.\cot 60°$
$= \cot 10°.\tan 10°.\cot 20°.\tan 20°.\cot 60°$
$\left[\begin{array}{l}\because \tan(90° - \theta) = \cot\theta \\ \text{and } \tan\theta.\cot\theta = 1\end{array}\right]$
$= 1 \times 1 \times \dfrac{1}{\sqrt{3}}$ $\left[\because \cot 60° = \dfrac{1}{\sqrt{3}}\right]$
$= \dfrac{1}{\sqrt{3}}$

10. (2) $7\sin^2\theta + 3\cos^2\theta = 4$
$$\Rightarrow 7\frac{\sin^2\theta}{\cos^2\theta} + 3 = \frac{4}{\cos^2\theta}$$
$= 4\sec^2\theta$
$\Rightarrow 7\tan^2\theta + 3 = 4(1 + \tan^2\theta)$
$\Rightarrow 7\tan^2\theta - 4\tan^2\theta = 4 - 3$
$\Rightarrow 3\tan^2\theta = 1$
$$\Rightarrow \tan^2\theta = \frac{1}{3}$$
$$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}}$$

11. (1) No. of terms in $1 + 5 + 9 + \ldots + 89 = n$
$\therefore a + (n - 1)d = t_n$
$\Rightarrow 1 + (n - 1)4 = 89$
$\Rightarrow (n - 1)4 = 89 - 1 = 88$
$\Rightarrow n - 1 = 22$
$\Rightarrow n = 23$

Now, $\sin^2 1° + \sin^2 89° + \sin^2 5° + \sin^2 85° + \ldots +$ to 22 terms $+ \sin^2 45°$
$= (\sin^2 1° + \cos^2 1°) + (\sin^2 5° + \cos^2 5°) + \ldots +$ to 11 terms $+ \left(\dfrac{1}{\sqrt{2}}\right)^2 = 11 \times 1 + \dfrac{1}{2}$
$= 11 + \dfrac{1}{2} = 11\dfrac{1}{2}$
$\left[\begin{array}{c}\sin(90° - \theta) = \cos\theta \\ \text{and} \\ \sin^2\theta + \cos^2\theta = 1\end{array}\right]$

12. (1) $\cot 18°$
$$\left(\cot 72°.\cos^2 22° + \frac{1}{\tan 72°.\sec^2 68°}\right)$$
$= \cot 18°.\cot 72°.\cos^2 22° + \dfrac{\cot 18°}{\tan 72°.\sec^2 68°}$
$= \cot 18°.\tan 18°.\cos^2 22° + \dfrac{\cot 18°}{\cot 18°}.\cos^2 68°$
$= \cos^2 22° + \cos^2 68°$
$= \cos^2 22° + \sin^2 22° = 1$
$\left[\begin{array}{l}\because \tan(90° - \theta) = \cot\theta; \\ \sin(90° - \theta) = \cos\theta; \\ \sin^2\theta + \cos^2\theta = 1\end{array}\right]$

13. (1) $\tan 15°.\cot 75° + \tan 75°.\cot 15°$
$= \tan 15°.\cot(90° - 15°) + \tan(90° - 15°).\cot 15°$
$= \tan^2 15° + \cot^2 15°$ .....(i)
$\left[\begin{array}{l}\because \tan(90° - \theta) = \cot\theta \\ \cot(90° - \theta) = \tan\theta\end{array}\right]$
$\tan 15° = 2 - \sqrt{3}$
$\therefore \cot 15°$
$$= \frac{1}{2 - \sqrt{3}} = \frac{2 + \sqrt{3}}{(2 - \sqrt{3})(2 + \sqrt{3})}$$
$= 2 + \sqrt{3}$
$\therefore \tan^2 15° + \cot^2 15°$
$= (2 - \sqrt{3})^2 + (2 + \sqrt{3})^2$
$= 2(4 + 3) = 14$

14. (4) $\sin(2x - 20°) = \cos(2y + 20°)$
$\Rightarrow \sin(2x - 20°) = \sin(90° - 2y - 20°)$

$\Rightarrow$ $2x - 20° = 70° - 2y$
$\Rightarrow$ $2x + 2y = 70 + 20 = 90°$
$\Rightarrow$ $x + y = 45°$
$\therefore$ $\tan(x + y) = \tan 45° = 1$

15. (4) $A + B = 90°$
$\Rightarrow B = 90° - A$
$\therefore \sec^2A + \sec^2B - \sec^2A \cdot \sec^2B$
$= \sec^2A + \text{cosec}^2A - \sec^2A \cdot \text{cosec}^2A$

$$= \frac{1}{\cos^2A} + \frac{1}{\sin^2A} - \frac{1}{\sin^2A.\cos^2A}$$

$$= \frac{\sin^2A + \cos^2A - 1}{\sin^2A.\cos^2A}$$

$$= \frac{1-1}{\sin^2A.\cos^2A} = 0.$$

16. (2) Let the number of terms be n, then
By $t_n = a + (n-1)d$
$85 = 5 + (n-1)$
$\Rightarrow$ $n - 1 = 85 - 5 = 80$
$\Rightarrow$ $n = 81$
$\therefore$ $\sin^2 5° + \sin^2 6° + \ldots + \sin^2 45° + \ldots + \sin^2 84° + \sin^2 85°$
$= (\sin^2 5° + \sin^2 85°) + (\sin^2 6° + \ldots + \sin^2 84°) + \ldots\ldots +$ to (40 terms) $+ \sin^2 45°$
$= (\sin^2 5° + \cos^2 5°) + (\sin^2 6° + \ldots + \cos^2 6°) + \ldots\ldots +$ to 40 terms $+ \sin^2 45°$ $\left[\begin{array}{l}\sin(90°-\theta) = \cos\theta \\ \sin^2\theta + \cos^2\theta = 1\end{array}\right]$

$$= 40 + \left(\frac{1}{\sqrt{2}}\right)^2 = 40 + \frac{1}{2} = 40\frac{1}{2}$$

17. (4) $\sin\theta = \cos(90° - \theta)$;
$\sin(90° - \theta) = \cos\theta$
$\therefore \sin 85° = \sin(90° - 5°) = \cos 5°$
$\therefore (\sin^2 5° + \sin^2 85°) + (\sin^2 10° + \sin^2 80°) + \ldots\ldots$ to 8 terms $+ \sin^2 45° + \sin^2 90°$

$$= 8 \times 1 + \frac{1}{2} + 1 = 9\frac{1}{2}$$

18. (4) $\dfrac{\sin 39°}{\cos 51°} + 2\tan 11°.\tan 79°.\tan 31°.\tan 59°.\tan 45° - 3(\sin^2 21° + \sin^2 69°)$

$$= \frac{\sin 39°}{\cos(90°-39°)} + 2\tan 11°.\tan(90° - 11°).\tan 31°.\tan(90° - 59°).\ 1 - 3(\sin^2 21° + \sin^2(90° - 21°)$$

$$= \frac{\sin 39°}{\sin 39°} + 2\tan 11°.\cot 11°.\tan 31°.\cot 31° - 3(\sin^2 21° + \cos^2 21°)$$
$= 1 + 2 - 3 = 0$

$[\tan\theta.\cot\theta = 1,\ \sin^2\theta + \cos^2\theta = 1]$

19. (3) $\dfrac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3$

$\Rightarrow \cos^2\theta = 3\cot^2\theta - 3\cos^2\theta$

$$\Rightarrow 4\cos^2\theta = 3\cot^2\theta = 3\frac{\cos^2\theta}{\sin^2\theta}$$

$$\Rightarrow 4\cos^2\theta - \frac{3\cos^2\theta}{\sin^2\theta} = 0$$

$$\Rightarrow \cos^2\theta\left(4 - \frac{3}{\sin^2\theta}\right) = 0$$

$$\therefore\ 4 - \frac{3}{\sin^2\theta} = 0\ \&\ \text{Cos}^2\theta = 0$$

$\Rightarrow 4\sin^2\theta = 3$

$$\Rightarrow \sin\theta = \frac{\sqrt{3}}{2} = \sin 60°$$

$\Rightarrow \theta = 60°$
$\cos^2\theta = 0 \Rightarrow \theta = 90°$

20. (3) $A = \tan 11° \cdot \tan 29°$
$B = 2\cot 61° \cdot \cot 79°$
$= 2\cot(90° - 29°)\cot(90° - 11°)$
$= 2\tan 29° \cdot \tan 11°$
$[\because \cot(90° - \theta) = \tan\theta]$
$= 2A$

21. (2) $\sin 17° = \dfrac{x}{y}$

$$\cos 17° = \sqrt{1 - \sin^2 17°}$$

$$= \sqrt{1 - \frac{x^2}{y^2}} = \sqrt{\frac{y^2 - x^2}{y^2}}$$

$$= \frac{\sqrt{y^2 - x^2}}{y}$$

$$\therefore \sec 17° = \frac{y}{\sqrt{y^2 - x^2}}$$

$\sin 73° = \sin(90° - 17°)$
$= \cos 17°$
$\therefore \sec 17° - \sin 73°$

$$= \frac{y}{\sqrt{y^2 - x^2}} - \frac{\sqrt{y^2 - x^2}}{y}$$

$$= \frac{y^2 - y^2 + x^2}{y\sqrt{y^2 - x^2}} = \frac{x^2}{y\sqrt{y^2 - x^2}}$$

22. (2) $Z = \sin\theta + \cos\theta$
$\Rightarrow Z^2 = \sin^2\theta + \cos^2\theta + 2\sin\theta.\cos\theta$
$= 1 + 2\sin\theta.\cos\theta$
$\because 0 < \theta < 90°$
$\therefore \sin\theta < 1;\ \cos\theta < 1$
$\therefore 2\sin\theta \cdot \cos\theta < 1$
and $2\sin\theta\cos\theta > 1$
$\Rightarrow Z^2 < 2$
$\Rightarrow Z < \sqrt{2}$

23. (2) $\dfrac{\tan 57° + \cot 37°}{\tan 33° + \cot 53°}$

$$= \frac{\cot 33° + \tan 53°}{\tan 33° + \cot 53°}$$

$[\because \tan(90° - \theta) = \cot\theta,\ \cot(90° - \theta) = \tan\theta]$

$$= \frac{\dfrac{1}{\tan 33°} + \tan 53°}{\tan 33° + \dfrac{1}{\tan 53°}}$$

$$= \frac{1 + \tan 53°.\tan 33°}{\tan 33°.\tan 53° + 1} \times \frac{\tan 53°}{\tan 33°}$$

$= \tan 53° \cdot \cot 33°$
$= \cot 37° \cdot \tan 57°$

24. (4) $\cot 30° = \cot(90° - 60°)$
$= \tan 60°$
$\cot 75° = \cot(90° - 15°) = \tan 15°$

$$\therefore \frac{\cot 30° - \cot 75°}{\tan 15° - \tan 60°}$$

$$= \frac{\tan 60° - \tan 15°}{\tan 15° - \tan 60°} = -1$$

25. (1) $\cot\theta.\tan(90° - \theta) - \sec(90° - \theta).\text{cosec}\theta + (\sin^2 25° + \sin^2 65°) + \sqrt{3}(\tan 5°.\tan 15°.\tan 30°.\tan 75°.\tan 85°)$
$= \cot\theta.\cot\theta - \text{cosec}\theta.\text{cosec}\theta + (\sin^2 25° + \cos^2 25°) + \sqrt{3}(\tan 5°.\cot 5°.\tan 15°.\cot 15°.\tan 30°)$
$= (\cot^2\theta - \text{cosec}^2\theta) + (\sin^2 25° + \cos^2 25°) + \sqrt{3} \times \dfrac{1}{\sqrt{3}}$
$= -1 + 1 + 1 = 1$
$[\sin(90° - \theta) = \cos\theta;\ \text{cosec}^2\theta - \cot^2\theta = 1;\ \tan(90° - \theta) = \cot\theta;\ \sec(90° - \theta) = \text{cosec}\theta]$

26. (2) $\sin(3x - 20°)$
$= \cos(3y + 20°)$
$\Rightarrow \sin(3x - 20°)$
$= \sin(90° - 3y - 20°)$
$= \sin(70° - 3y)$
$\Rightarrow 3x - 20° = 70° - 3y$
$\Rightarrow 3x + 3y = 90°$
$\Rightarrow 3(x + y) = 90°$
$\Rightarrow x + y = 30°$

27. (4) $\cos\theta.\text{cosec}23° = 1$
$\Rightarrow \text{cosec}23° = \frac{1}{\cos\theta} = \sec\theta$
$\Rightarrow \text{cosec}23° = \text{cosec}(90° - \theta)$
$\Rightarrow 23° = 90° - \theta$
$\Rightarrow \theta = 90° - 23° = 67°$

28. (2) $2(\cos^2\theta - \sin^2\theta) = 1$
$\Rightarrow \cos^2\theta - \sin^2\theta = \frac{1}{2}$
$\Rightarrow 1 - 2\sin^2\theta = \frac{1}{2}$
$\Rightarrow 2\sin^2\theta = 1 - \frac{1}{2}$
$\Rightarrow 2\sin^2\theta = \frac{1}{2} \Rightarrow \sin^2\theta = \frac{1}{4}$
$\Rightarrow \sin\theta = \pm\frac{1}{2} = \sin 30°$
$\left[\begin{array}{l}\because \theta \text{ is } +\text{ve angle} \\ \therefore \theta \neq \frac{-1}{2}\end{array}\right]$
$\Rightarrow \theta = 30°$

29. (4) $\tan 35° . \tan 45° . \tan 55°$
$= \tan 35° . 1 . \tan(90° - 35°)$
$= \tan 35° . 1 . \cot 35° = 1.1 = 1$
$[\tan(90° - \theta) = \cot\theta ; \tan\theta . \cot\theta = 1]$

30. (1) $\sec(7\theta + 28°)$
$= \text{cosec}(30° - 3\theta)$
$\Rightarrow \sec(7\theta + 28°)$
$= \sec(90° - (30° - 3\theta))$
$\Rightarrow 7\theta + 28° = 90° - 30° + 3\theta$
$\Rightarrow 4\theta = 90° - 30° - 28° = 32°$
$\Rightarrow \theta = \frac{32°}{4} = 8°$

31. (3) $\tan\left(\frac{\pi}{2} - \frac{\theta}{2}\right) = \sqrt{3}$
$\Rightarrow \cot\frac{\theta}{2} = \sqrt{3} = \cot 30°$
$\Rightarrow \frac{\theta}{2} = 30° \Rightarrow \theta = 60°$
$\therefore \cos\theta = \cos 60° = \frac{1}{2}$

32. (3) $7\sin^2\theta + 3\cos^2\theta = 4$
$\Rightarrow 7\sin^2\theta + 3(1 - \sin^2\theta) = 4$
$\Rightarrow 7\sin^2\theta + 3 - 3\sin^2\theta = 4$
$\Rightarrow 4\sin^2\theta = 4 - 3 = 1$
$\Rightarrow \sin^2\theta = \frac{1}{4}$
$\Rightarrow \sin\theta = \frac{1}{2} = \sin\frac{\pi}{6}$
$\left[\begin{array}{l}\text{Note}: \sin\theta \neq \frac{-1}{2} \\ \because 0 < \theta < 90\end{array}\right]$
$\Rightarrow \theta = \frac{\pi}{6}$

33. (2) $\sec\theta = \frac{4x^2 + 1}{4x}$
$\tan\theta = \sqrt{\sec^2\theta - 1}$
$= \sqrt{\left(\frac{4x^2 + 1}{4x}\right)^2 - 1}$
$= \sqrt{\frac{(4x^2 + 1)^2 - (4x)^2}{(4x)^2}}$
$= \frac{(2x + 1)(2x - 1)}{4x} = \frac{4x^2 - 1}{4x}$
$\therefore \sec\theta + \tan\theta = \frac{4x^2 + 1}{4x} + \frac{4x^2 - 1}{4x}$
$= \frac{4x^2 + 1 + 4x^2 - 1}{4x}$
$= \frac{8x^2}{4x} = 2x$

34 (1) $\cos 90° = 0$
$\therefore \cos 1°. \cos 2° \ldots \cos 179° = 0$

35. (2) $\sin^2 25° + \sin^2 65°$
$= \sin^2 25° + \sin^2(90° - 25°)$
$= \sin^2 25° + \cos^2 25° = 1$

36. (1) $\sec\theta + \tan\theta = \sqrt{3}$ .....(i)
$\because \sec^2\theta - \tan^2\theta = 1$
$\Rightarrow (\sec\theta - \tan\theta)(\sec\theta + \tan\theta) = 1$
$\Rightarrow \sec\theta - \tan\theta = \frac{1}{\sqrt{3}}$ ....(ii)
By subtracting (ii) from (i)
$\sec\theta + \tan\theta - \sec\theta + \tan\theta$
$= \sqrt{3} - \frac{1}{\sqrt{3}}$
$\Rightarrow 2\tan\theta = \frac{3 - 1}{\sqrt{3}}$
$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}} = \tan 30°$
$\Rightarrow \theta = 30°$
$\therefore \tan 3\theta = \tan 90° = \text{undefined}$

37. (3) $\sin(60° - \theta) = \cos(\psi - 30°)$
$= \sin(90° - \psi + 30°)$
$= \sin(120° - \psi)$
$\Rightarrow 60° - \theta = 120° - \psi$
$\Rightarrow \psi - \theta = 60°$
$\therefore \tan(\psi - \theta) = \tan 60° = \sqrt{3}$

38. (2) $a\sin\theta + b\cos\theta = c$ ...(i)
$a\cos\theta - b\sin\theta = x$ ...(ii)
Squaring both the equations and adding,
$a^2\sin^2\theta + b^2\cos^2\theta + 2ab\sin\theta.\cos\theta + a^2\cos^2\theta + b^2\sin^2\theta - 2ab\sin\theta.\cos\theta = c^2 + x^2$
$\Rightarrow a^2\sin^2\theta + a^2\cos^2\theta + b^2\cos^2\theta + b^2\sin^2\theta = c^2 + x^2$
$\Rightarrow a^2(\sin^2\theta + \cos^2\theta) + b^2(\cos^2\theta + \sin^2\theta) = c^2 + x^2$
$\Rightarrow a^2 + b^2 = c^2 + x^2$
$\Rightarrow x^2 = a^2 + b^2 - c^2$
$\Rightarrow x = \pm\sqrt{a^2 + b^2 - c^2}$

39. (2) $\sin(A - B) = \frac{1}{2} = \sin 30°$
$\Rightarrow A - B = 30°$
Again, $\cos(A + B) = \frac{1}{2} = \cos 60°$
$\Rightarrow A + B = 60°$
$\therefore A + B + A - B = 30° + 60° = 90°$
$\Rightarrow 2A = 90°$
$\Rightarrow A = 45°$
$\therefore A - B = 30°$
$\Rightarrow B = A - 30° = 45° - 30° = 15°$
$= \frac{15 \times \pi}{180} = \frac{\pi}{12}$ radian

40. (2) Maximum value of $a \sin\theta + b \cos\theta = \sqrt{a^2+b^2}$

$\therefore$ Maximum value of $2 \sin\theta + 3 \cos\theta = \sqrt{2^2+3^2} = \sqrt{13}$

41. (3) 152 ($\sin 30° + 2 \cos^2 45° + 3 \sin 30° + 4 \cos^2 45° + ... + 17 \sin 30° + 18 \cos^2 45°$)

$$= 152\left(\frac{1}{2}+2\times\frac{1}{2}+3\times\frac{1}{2}+4\times\frac{1}{2}+.....+17\times\frac{1}{2}+18\times\frac{1}{2}\right)$$

$$= 152\left(\frac{1}{2}+1+\frac{3}{2}+2+.....+\frac{17}{2}+9\right)$$

It is an A.P. whose $a = \frac{1}{2}$, $d = \frac{1}{2}$, $n = 18$

$$= 152\left[\frac{18}{2}\left(2\times\frac{1}{2}+(18-1)\frac{1}{2}\right)\right]$$

$$= 152\left[9\left(1+\frac{17}{2}\right)\right]$$

$$= \frac{152\times 9\times 19}{2} = 12996 \text{ and}$$

$\sqrt{12996} = 114$

i.e. a perfect square of an integer.

42. (4) $3 \cos 80°. \operatorname{cosec} 10° + 2 \cos 59° . \operatorname{cosec} 31°$

$= 3\cos(90°-10°). \operatorname{cosec} 10° + 2 \cos(90°-31°) . \operatorname{cosec} 31°$

$= 3 \sin 10°. \operatorname{cosec} 10° + 2 \sin 31°. \operatorname{cosec} 31°$

$= 3 + 2 = 5$

[$\because \cos(90°-\theta) = \sin\theta$; $\sin\theta . \operatorname{cosec}\theta = 1$]

43. (4) $\sin^2\theta - 3 \sin\theta + 2 = 0$

$\Rightarrow \sin^2\theta - 2 \sin\theta - \sin\theta + 2 = 0$

$\Rightarrow \sin\theta (\sin\theta - 2) - 1 (\sin\theta - 2) = 0$

$\Rightarrow (\sin\theta - 1)(\sin\theta - 2) = 0$

$\Rightarrow \sin\theta = 1 = \sin 90°$

$\Rightarrow \theta = 90°$ and $\sin\theta \neq 2$

44. (3) $\tan\alpha = n \tan\beta$

$\Rightarrow \tan\beta = \frac{1}{n}\tan\alpha$

$\Rightarrow \cot\beta = \frac{n}{\tan\alpha}$ and

$\sin\alpha = m \sin\beta \Rightarrow \sin\beta = \frac{1}{m}\sin\alpha$

$\Rightarrow \operatorname{cosec}\beta = \frac{m}{\sin\alpha}$

[$\because \operatorname{cosec}^2\beta - \cot^2\beta = 1$]

$$\Rightarrow \frac{m^2}{\sin^2\alpha} - \frac{n^2}{\tan^2\alpha} = 1$$

$$\Rightarrow \frac{m^2}{\sin^2\alpha} - \frac{n^2\cos^2\alpha}{\sin^2\alpha} = 1$$

$$\Rightarrow \frac{m^2 - n^2\cos^2\alpha}{\sin^2\alpha} = 1$$

$\Rightarrow m^2 - n^2 \cos^2\alpha = \sin^2\alpha$

$= 1 - \cos^2\alpha$

$\Rightarrow m^2 - 1 = n^2 \cos^2\alpha - \cos^2\alpha$

$= (n^2 - 1) \cos^2\alpha$

$\Rightarrow \cos^2\alpha = \frac{m^2-1}{n^2-1}$

45. (2) $\tan\theta = \frac{3}{4}$

$\therefore \cot\theta = \frac{4}{3}$

$\because \operatorname{cosec}^2\theta - \cot^2\theta = 1$

$\Rightarrow \operatorname{cosec}\theta = \sqrt{1+\cot^2\theta}$

$$= \sqrt{1+\left(\frac{4}{3}\right)^2} = \sqrt{1+\frac{16}{9}} = \sqrt{\frac{25}{9}}$$

$$= \frac{5}{3}$$

46. (3) $\operatorname{cosec}\theta - \cot\theta = \frac{7}{2}$ .....(i)

$\operatorname{cosec}^2\theta - \cot^2\theta = 1$

$\Rightarrow (\operatorname{cosec}\theta + \cot\theta)(\operatorname{cosec}\theta - \cot\theta) = 1$

$\Rightarrow \operatorname{cosec}\theta + \cot\theta$

$$= \frac{1}{\operatorname{cosec}\theta - \cot\theta} = \frac{2}{7} \text{ .....(ii)}$$

On adding both equations,

$$2\operatorname{cosec}\theta = \frac{7}{2}+\frac{2}{7}$$

$$= \frac{49+4}{14} = \frac{53}{14}$$

$$\Rightarrow \operatorname{cosec}\theta = \frac{53}{28}$$

47. (1) $x \sin 45° = y \operatorname{cosec} 30°$

$$\Rightarrow x \times \frac{1}{\sqrt{2}} = y \times 2$$

$$\Rightarrow \frac{x}{y} = 2\sqrt{2}$$

$$\Rightarrow \frac{x^4}{y^4} = \left(2\sqrt{2}\right)^4 = 2^4 \times 2^2$$

$= 2^6 = 4^3$

48. (3) $5\tan\theta = 4 \Rightarrow \tan\theta = \frac{4}{5}$

$$\therefore \frac{5\sin\theta - 3\cos\theta}{5\sin\theta + 2\cos\theta}$$

Dividing numerator and denominator by $\cos\theta$,

$$= \frac{5.\frac{\sin\theta}{\cos\theta} - \frac{3\cos\theta}{\cos\theta}}{5\frac{\sin\theta}{\cos\theta} + \frac{2\cos\theta}{\cos\theta}}$$

$$= \frac{5\tan - 3}{5\tan\theta + 2} = \frac{5\times\frac{4}{5} - 3}{5\times\frac{4}{5}+2}$$

$$= \frac{4-3}{4+2} = \frac{1}{6}$$

49. (2) $2 \operatorname{cosec}^2 23° \times \cot^2 67° - \sin^2 23° - \sin^2 67° - \cot^2 67°$

$= 2 . \operatorname{cosec}^2 (90° - 67°) \times \cot^2 67° - \sin^2 23° - \sin^2 (90° - 23°) - \cot^2 67°$

$= 2 \sec^2 67° \times \cot^2 67° - \sin^2 23° - \cos^2 23° - \cot^2 67°$

$= 2 \operatorname{cosec}^2 67° - 1 - \cot^2 67°$

$= \operatorname{cosec}^2 67° - 1 + \operatorname{cosec}^2 67° - \cot^2 67°$

$= \operatorname{cosec}^2 67° = \sec^2 23°$

$$\left[\begin{array}{l}\because \sec(90°-\theta) = \operatorname{cosec}\theta; \\ \sin(90°-\theta) = \cos\theta \ \& \\ \operatorname{cosec}^2(67) - 1 = \cot^2 67\end{array}\right]$$

50. (3) $\cos^2\theta \leq 1$

$$\therefore \frac{(x+y)^2}{4xy} \leq 1$$

$\Rightarrow (x + y)^2 - 4xy \leq 0$

$\Rightarrow (x - y)^2 \geq 0$

$\Rightarrow x = y$

51. (4) Expression

$$= \operatorname{cosec}^2 18° - \frac{1}{\cot^2 72°}$$

$= \operatorname{cosec}^2 18° - \tan^2 72°$

[$\because$ tan θ . cot θ = 1]
= $\text{cosec}^2 18° - \tan^2(90° - 18°)$
= $\text{cosec}^2\ 18° - \cot^2\ 18°$
= 1
[$\because$ tan (90° − θ = cot θ; $\text{cosec}^2\ \theta - \cot^2\ \theta = 1$]

52. (1) $(1 - \sin^2\ \alpha)\ (1 - \cos^2\alpha)\ (1 + \cot^2\beta)\ (1 + \tan^2\ \beta)$
$= \cos^2\ \alpha\ .\ \sin^2\ \alpha\ .\ \text{cosec}^2\ \beta\ \sec^2\beta$
$= (\cos^2\ \alpha\ .\ \text{cosec}^2\ \beta)\ (\sin^2\ \alpha\ .\ \sec^2\beta)$
$= (\cos^2\ \alpha\ .\ \sec^2\ \alpha)\ (\sin^2\ \alpha\ .\ \text{cosec}^2\ \alpha) = 1$
[$\alpha + \beta = 90° \Rightarrow \beta = 90° - \alpha$
$\text{cosec}\ \beta = \text{cosec}\ (90° - \alpha)$
$= \sec\ \alpha\ ;\ \sec\ \beta = \sec\ (90° - \alpha\ )$
$= \text{cosec}\ \alpha,\ \sin\ \alpha\ .\ \text{cosec}\ \alpha$
$= \cos\ \alpha\ .\ \sec\ \alpha = 1$]

53. (3) $\dfrac{2\sin 68°}{\cos 22°} - \dfrac{2\cot 15°}{5\tan 75°} - \dfrac{3\tan 45°.\tan 20°.\tan 40°}{\tan 50°\tan 70°}$
5

$= 2\dfrac{\cos 22°}{\cos 22°} - \dfrac{2\tan 75°}{5\tan 75°} - \dfrac{3.\tan 20°.\cot 20°\tan 40°.\cot 40°}{5}$

$= 2 - \dfrac{2}{5} - \dfrac{3}{5}$

$= \dfrac{10 - 2 - 3}{5} = 1$

$\left[\begin{array}{l}\sin(90° - \theta) = \cos\theta; \\ \cot(90° - \theta) = \tan\theta; \\ \tan(90° - \theta) = \cot\theta\end{array}\right]$

54. (2) $\tan 10°.\tan 15°.\ \tan 75°\ .\ \tan 80°$
$= (\tan 10°.\ \tan 80°)(\tan 15°.\tan 75°)$
$= (\tan 10°.\ \cot 10°)(\tan 15°.\cot 15°)$
$= 1 \times 1 = 1$
[$\tan(90° - \theta) = \cot\theta$; $\tan\theta\ .\ \cot\theta = 1$]

55. (3) $4\ \tan^2\theta + 9\ \cot^2\theta$
$= (2\tan\theta - 3\cot\theta)^2 + 2 \times 3 \times 2$
$\therefore$ Minimum value = 12
[$\because$ $(2\tan\theta - 3\cot\theta)^2 \geq 0$]

56. (2) $\sin 7x = \cos 11x$
$= \sin (90° - 11x)$
$\Rightarrow 7x = 90° - 11x$
$\Rightarrow 18x = 90°$
$\Rightarrow x = 5°$
$\therefore$ $\tan 9x + \cot 9x$
$= \tan 45° + \cot 45°$
$= 1 + 1 = 2$

57. (1) $\tan^2\ \alpha = 1 + 2\ \tan^2\beta$
$\Rightarrow$ $\sec^2\ \alpha - 1 = 1 + 2(\sec^2\beta - 1)$
$\Rightarrow$ $\sec^2\ \alpha - 1 = 2\ \sec^2\beta - 1$
$\Rightarrow \dfrac{1}{\cos^2\alpha} = \dfrac{2}{\cos^2\beta}$
$\Rightarrow \sqrt{2}\cos\alpha = \cos\beta$
$\therefore$ $\sqrt{2}\cos\alpha - \cos\beta = 0$

58. (4) $\cos 1°.\cos 2°.\cos 3°\ \ldots\ \cos 90°....\cos 100°$
= 0 [cos90° = 0]

59. (4) $2(\cos^2\theta - \sin^2\theta) = 1$
$\Rightarrow \cos^2\theta - (1 - \cos^2\theta) = \dfrac{1}{2}$
$\Rightarrow 2\cos^2\theta = 1 + \dfrac{1}{2} = \dfrac{3}{2}$
$\Rightarrow \cos^2\theta = \dfrac{3}{4}$
$\Rightarrow \sec^2\theta = \dfrac{4}{3}$
$\Rightarrow 1 + \tan^2\theta = \dfrac{4}{3}$
$\Rightarrow \tan^2\theta = \dfrac{4}{3} - 1 = \dfrac{1}{3}$
$\Rightarrow \tan\theta = \dfrac{1}{\sqrt{3}} \Rightarrow \cot\theta = \sqrt{3}$

60. (2) $\tan(2\theta + 45°) = \cot 3\theta$
$= \tan(90° - 3\theta)$
$\Rightarrow 2\theta + 45° = 90° - 3\theta$
$\Rightarrow 5\theta = 90° - 45° = 45°$
$\therefore$ $\theta = 9°$

61. (2) $\cos\theta = \dfrac{15}{17}$
$\Rightarrow \sec\theta = \dfrac{1}{\cos\theta} = \dfrac{17}{15}$
$\therefore$ $\cot(90° - \theta) = \tan\theta$
$= \sqrt{\sec^2\theta - 1}$
$= \sqrt{\left(\dfrac{17}{15}\right)^2 - 1} = \sqrt{\dfrac{289}{225} - 1}$
$= \sqrt{\dfrac{289 - 225}{225}} = \sqrt{\dfrac{64}{225}} = \dfrac{8}{15}$

62. (1) $\sec^2\theta - \tan^2\theta = 1$
$\sec^2\theta + \tan^2\theta = \dfrac{7}{12}$
$\therefore$ $\sec^4\theta - \tan^4\theta$
$= (\sec^2\theta - \tan^2\theta)\ (\sec^2\theta + \tan^2\theta)$
$= 1 \times \dfrac{7}{12} = \dfrac{7}{12}$

63. (2) $\sec x = \text{cosec} y$
$\Rightarrow \cos x = \sin y$
$\Rightarrow \sin\left(\dfrac{\pi}{2} - x\right) = \sin y$
$\Rightarrow y = \dfrac{\pi}{2} - x$
$\Rightarrow x + y = \dfrac{\pi}{2}$
$\therefore$ $\sin\ (x + y) = \sin\dfrac{\pi}{2} = 1$

64. (3) $A + B + C = \pi$
$\Rightarrow \dfrac{A + B}{2} = \dfrac{\pi}{2} - \dfrac{C}{2}$
$\Rightarrow \sin\left(\dfrac{A + B}{2}\right)$
$= \sin\left(\dfrac{\pi}{2} - \dfrac{C}{2}\right) = \cos\dfrac{C}{2}$
Similarly,
$\cos\left(\dfrac{A + B}{2}\right) = \sin\dfrac{C}{2}$
$\cot\left(\dfrac{A + B}{2}\right) = \tan\dfrac{C}{2}$
$\tan\left(\dfrac{A + B}{2}\right) = \cot\dfrac{C}{2}$

65. (2) $\sin\alpha + \cos\beta = 2$
$\sin\alpha \leq 1\ ;\ \cos\beta \leq 1$
$\Rightarrow$ $\alpha = 90°\ ;\ \beta = 0°$
$\therefore$ $\sin\left(\dfrac{2\alpha + \beta}{3}\right) = \sin\left(\dfrac{180°}{3}\right)$
$= \sin 60° = \dfrac{\sqrt{3}}{2}$
Also,
$\cos\dfrac{\alpha}{3} = \cos 30° = \dfrac{\sqrt{3}}{2}$

66. (3) $\cos^4\theta - \sin^4\theta = \frac{2}{3}$

$\Rightarrow (\cos^2\theta + \sin^2\theta)(\cos^2\theta - \sin^2\theta)$

$= \frac{2}{3}$

$\Rightarrow \cos^2\theta - \sin^2\theta = \frac{2}{3}$

$\Rightarrow 2\cos^2\theta - 1 = \frac{2}{3}$

67. (1) $\frac{\sin\alpha}{\cos(30°+\alpha)} = 1$

$\Rightarrow \frac{\sin\alpha}{\sin(90°-30-\alpha)} = 1$

$\Rightarrow \frac{\sin\alpha}{\sin(60°-\alpha)} = 1$

$\Rightarrow \sin\alpha = \sin(60° - \alpha)$

$\Rightarrow 2\alpha = 60° \Rightarrow \alpha = 30°$

$\therefore \sin\alpha + \cos 2\alpha$

$= \sin 30° + \cos 60°$

$= \frac{1}{2} + \frac{1}{2} = 1$

68. (1) $\tan\theta = 1 \Rightarrow \theta = 45°$

$\therefore \frac{8\sin\theta + 5\cos\theta}{\sin^3\theta - 2\cos^3\theta + 7\cos\theta}$

$= \frac{8 \times \frac{1}{\sqrt{2}} + \frac{5}{\sqrt{2}}}{\frac{1}{2\sqrt{2}} - \frac{2}{2\sqrt{2}} + \frac{7}{\sqrt{2}}}$

$= \frac{\frac{13}{\sqrt{2}}}{\frac{13}{2\sqrt{2}}} = \frac{13}{\sqrt{2}} \times \frac{2\sqrt{2}}{13} = 2$

69. (2) $\cos^2\theta + \cos^4\theta = 1$

$\Rightarrow \cos^4\theta = 1 - \cos^2\theta = \sin^2\theta$

$\Rightarrow \tan^2\theta = \cos^2\theta$

$\therefore \tan^2\theta + \tan^4\theta = \cos^2\theta + \cos^4\theta$

$= 1$

70. (3) $\tan\theta = \frac{4}{3}$ (Given)

$\therefore \frac{3\sin\theta + 2\cos\theta}{3\sin\theta - 2\cos\theta} = \frac{3\tan\theta + 2}{3\tan\theta - 2}$

[Dividing N^r & D^r by $\cos\theta$]

$= \frac{3 \times \frac{4}{3} + 2}{3 \times \frac{4}{3} - 2} = \frac{4+2}{4-2} = 3$

71. (3) $(\sec A - \cos A)^2 + (\operatorname{cosec} A - \sin A)^2 - (\cot A - \tan A)^2$

$= \sec^2 A + \cos^2 A - 2\sec A \cos A + \operatorname{cosec}^2 A + \sin^2 A - 2\operatorname{cosec} A . \sin A - \cot^2 A - \tan^2 A + 2 \cot A . \tan A$

$= \sec^2 A - \tan^2 A + \cos^2 A + \sin^2 A + \operatorname{cosec}^2 A - \cot^2 A - 2$

$= 3 - 2 = 1$

$\left[\begin{array}{r} \because \sec A . \cos A = 1; \\ \sin A . \operatorname{cosec} A = 1; \\ \tan A . \cot A = 1 \\ \text{etc} \end{array}\right]$

72. (2) $\tan\theta + \cot\theta = 2$

$\Rightarrow \tan\theta + \frac{1}{\tan\theta} = 2$

$\Rightarrow \tan^2\theta + 1 = 2\tan\theta$

$\Rightarrow \tan^2\theta - 2\tan\theta + 1 = 0$

$\Rightarrow (\tan\theta - 1)^2 = 0$

$\Rightarrow \tan\theta = 1 \Rightarrow \cot\theta = 1$

$\therefore \tan^5\theta + \cot^{10}\theta = 1 + 1 = 2$

73. (1) $\sin\theta - \cos\theta = \frac{7}{13}$ .....(i)

$\sin\theta + \cos\theta = x$ .....(ii)

On squaring both equations and adding,

$2(\sin^2\theta + \cos^2\theta) = \frac{49}{169} + x^2$

$\Rightarrow x^2 = 2 - \frac{49}{169} = \frac{338 - 49}{169}$

$= \frac{289}{169} \Rightarrow x = \frac{17}{13}$

74. (3) $2\cos\theta - \sin\theta = \frac{1}{\sqrt{2}}$

$2\sin\theta + \cos\theta = x$ (Let)

On squaring and adding,

$4\cos^2\theta + \sin^2\theta - 4\sin\theta . \cos\theta + 4\sin^2\theta + \cos^2\theta + 4\sin\theta.\cos\theta$

$= \frac{1}{2} + x^2$

$\Rightarrow 4(\cos^2\theta + \sin^2\theta) + (\cos^2\theta + \sin^2\theta) = \frac{1}{2} + x^2$

$\Rightarrow \frac{1}{2} + x^2 = 5$

$\Rightarrow x^2 = 5 - \frac{1}{2} = \frac{9}{2} \Rightarrow x = \frac{3}{\sqrt{2}}$

75. (3) $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 3$

$\Rightarrow \sin\theta + \cos\theta = 3\sin\theta - 3\cos\theta$

$\Rightarrow 4\cos\theta = 2\sin\theta \Rightarrow \tan\theta = 2$

$\therefore \sin^4\theta - \cos^4\theta$

$= (\sin^2\theta + \cos^2\theta)(\sin^2\theta - \cos^2\theta)$

$= \sin^2\theta - \cos^2\theta$

$= \cos^2\theta(\tan^2\theta - 1)$

$= \frac{\tan^2\theta - 1}{\sec^2\theta}$

$= \frac{\tan^2\theta - 1}{1 + \tan^2\theta} = \frac{4-1}{1+4} = \frac{3}{5}$

76. (1) $\sec^2\theta + \tan^2\theta = 7$

$\Rightarrow 1 + \tan^2\theta + \tan^2\theta = 7$

$\Rightarrow 2\tan^2\theta = 7 - 1 = 6$

$\Rightarrow \tan^2\theta = 3 \Rightarrow \tan\theta = \sqrt{3}$

$\Rightarrow \theta = 60°$

77. (4) $(\sec x . \sec y + \tan x . \tan y)^2 - (\sec x . \tan y + \tan x . \sec y)^2$

$= \sec^2 x . \sec^2 y + \tan^2 x . \tan^2 y + 2\sec x . \sec y . \tan x . \tan y - \sec^2 x . \tan^2 y - \tan^2 x . \sec^2 y - 2\sec x . \sec y . \tan x . \tan y$

$= \sec^2 x . \sec^2 y + \tan^2 x . \tan^2 y - \sec^2 x . \tan^2 y - \tan^2 x . \sec^2 y$

$= \sec^2 x . \sec^2 y - \sec^2 x . \tan^2 y - \tan^2 x . \sec^2 y + \tan^2 x . \tan^2 y$

$= \sec^2 x (\sec^2 y - \tan^2 y) - \tan^2 x (\sec^2 y - \tan^2 y)$

$= \sec^2 x - \tan^2 x = 1$

78. (2) $\sin\theta + \operatorname{cosec}\theta = 2$

$\Rightarrow \sin\theta + \frac{1}{\sin\theta} = 2$

$\Rightarrow \sin^2\theta - 2\sin\theta + 1 = 0$

$\Rightarrow (\sin\theta - 1) = 0$

$\Rightarrow \sin\theta = 1 \quad \Rightarrow \operatorname{cosec}\theta = 1$

$\therefore \sin^{100}\theta + \operatorname{cosec}^{100}\theta$

$= 1 + 1 = 2$

79. (2) When $\theta = 0°$

$\sin^2\theta + \cos^4\theta = 1$

When $\theta = 45°$,

$\left[\sin 45° = \frac{1}{\sqrt{2}} \& \cos 45° = \frac{1}{\sqrt{5}}\right]$

$\sin^2\theta + \cos^4\theta = \frac{1}{2} + \frac{1}{4} = \frac{3}{4}$

When $\theta = 30°$,

$\left[\sin 30° = \frac{1}{2} \& \cos 30° = \frac{\sqrt{3}}{2}\right]$

$\sin^2\theta + \cos^4\theta = \frac{1}{4} + \frac{9}{16}$

$= \frac{4+9}{16} = \frac{13}{16}$

Hence, the value of

$A = \sin^2\theta + \cos^4\theta = \frac{13}{16}$

80. (4) $\sin\theta + \text{cosec}\,\theta = 2$

$\Rightarrow \sin\theta + \frac{1}{\sin\theta} = 2$

$\Rightarrow \sin^2\theta - 2\sin\theta + 1 = 0$

$\Rightarrow (\sin\theta - 1)^2 = 0 \Rightarrow \sin\theta = 1$

$\therefore \sin^5\theta + \text{cosec}^5\theta = 1 + 1 = 2$

81. (3) $\tan 2\theta = \frac{1}{\tan 4\theta} = \cot 4\theta$

$\Rightarrow \tan 2\theta = \tan(90° - 4\theta)$

$\Rightarrow 2\theta = 90° - 4\theta$

$\Rightarrow 6\theta = 90° \Rightarrow \theta = 15°$

$\therefore \tan 3\theta = \tan 45° = 1$

82. (2) $\cos^2\alpha + \cos^2\beta = 2$

$\Rightarrow 1 - \sin^2\alpha + 1 - \sin^2\beta = 2$

$\Rightarrow \sin^2\alpha + \sin^2\beta = 0$

$\Rightarrow \sin^2\alpha = 0$ & $\sin^2\beta = 0$

$\Rightarrow \sin\alpha = \sin\beta = 0$

$\Rightarrow \alpha = \beta = 0$

$\therefore \tan^3\alpha + \sin^5\beta = 0$

83. (3) $\tan 2\theta \,.\, \tan 3\theta = 1$

$\Rightarrow \tan 3\theta = \frac{1}{\tan 2\theta} = \cot 2\theta$

$\Rightarrow \tan 3\theta = \tan(90° - 2\theta)$

$\Rightarrow 3\theta = 90° - 2\theta \Rightarrow 5\theta = 90°$

$\Rightarrow \theta = 18°$

$\therefore 2\cos^2\frac{5\theta}{2} - 1 = 2\cos^2 45° - 1$

$= 2 \times \frac{1}{2} - 1 = 0$

84. (2)

$XZ - YZ = 2$ .... (i)

$\Rightarrow XY^2 + YZ^2 = XZ^2$

$\Rightarrow (2\sqrt{6})^2 = XZ^2 - YZ^2$

$\Rightarrow 24 = (XZ - YZ)(XZ + YZ)$

$\Rightarrow XZ + YZ = 12$ ....(ii)

Adding both the equations,

$2\,X\,Z = 14 \Rightarrow XZ = 7$

$\therefore YZ = 7 - 2 = 5$

$\therefore \sec X = \frac{7}{2\sqrt{6}}$

& $\tan X = \frac{5}{2\sqrt{6}}$

$\therefore \sec X + \tan X = \frac{7}{2\sqrt{6}} + \frac{5}{2\sqrt{6}}$

$= \frac{12}{2\sqrt{6}} = \sqrt{6}$

85. (4) $\sin^2\theta + \cos^2\theta + \sec^2\theta + \text{cosec}^2\theta + \tan^2\theta + \cot^2\theta$

$= 1 + \sec^2\theta - \tan^2\theta + \text{cosec}^2\theta - \cot^2\theta + 2(\tan^2\theta + \cot^2\theta)$

$= 3 + 2\,((\tan\theta - \cot\theta)^2 + 2) > 7$

$[(\tan\theta - \cot\theta)^2 > 0]$

86. (4) $x^2 + \frac{1}{x^2} = 2\sin\left(\frac{\pi x}{2}\right)$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 + 2 = 2\sin\left(\frac{\pi x}{2}\right)$

$\Rightarrow x - \frac{1}{x} = 0$ $[\because \sin\theta \le 1]$

87. (4) $\cos\theta + \sec\theta = 2$

$\Rightarrow \cos\theta + \frac{1}{\cos\theta} = 2$

$\Rightarrow \cos^2\theta - 2\cos\theta + 1 = 0$

$\Rightarrow (\cos\theta - 1)^2 = 0$

$\Rightarrow \cos\theta = 1$

$\Rightarrow \sec\theta = 1$

$\therefore \cos^6\theta + \sec^6\theta = 1 + 1 = 2$

88. (1) Expression

$= \frac{5}{\sec^2\theta} + \frac{2}{1+\cot^2\theta} + 3\sin^2\theta$

$= 5\cos^2\theta + \frac{2}{\text{cosec}^2\theta} + 3\sin^2\theta$

$= 5\cos^2\theta + 2\sin^2\theta + 3\sin^2\theta$

$= 5(\cos^2\theta + \sin^2\theta) = 5$

$\left[\because 1 + \cot^2\theta = \text{cosec}^2\theta,\ \frac{1}{\sec\theta} = \cos\theta;\ \& \frac{1}{\text{cosec}\,\theta} = \sin\theta\right]$

89. (3) Expression

$= \left(\frac{1}{\cos\theta} + \frac{1}{\cot\theta}\right)\left(\frac{1}{\cos\theta} - \frac{1}{\cot\theta}\right)$

$= \left(\frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta}\right)\left(\frac{1}{\cos\theta} - \frac{\sin\theta}{\cos\theta}\right)$

$= \frac{1+\sin\theta}{\cos\theta} \cdot \frac{1-\sin\theta}{\cos\theta}$

$= \frac{1-\sin^2\theta}{\cos^2\theta} = \frac{\cos^2\theta}{\cos^2\theta} = 1$

90. (3) $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \frac{5}{4}$

$\Rightarrow \frac{\cos\theta\left(\frac{\sin\theta}{\cos\theta} + 1\right)}{\cos\theta\left(\frac{\sin\theta}{\cos\theta} - 1\right)} = \frac{5}{4}$

$\Rightarrow \frac{\tan\theta + 1}{\tan\theta - 1} = \frac{5}{4}$

$\Rightarrow 4\tan\theta + 4 = 5\tan\theta - 5$

$\Rightarrow \tan\theta = 9$

$\Rightarrow \frac{2\tan\theta}{2} = \frac{5+4}{5-4}$

(By componendo and dividendo)

$\therefore \frac{\tan^2\theta + 1}{\tan^2\theta - 1} = \frac{(9)^2 + 1}{(9)^2 - 1} = \frac{81+1}{81-1}$

$= \frac{82}{80} = \frac{41}{40}$

91. (3) $\tan 7\theta \,.\, \tan 2\theta = 1$

$\Rightarrow \tan 7\theta = \frac{1}{\tan 2\theta} = \cot 2\theta$

$\Rightarrow \tan 7\theta = \tan(90° - 2\theta)$

$\Rightarrow 7\theta = 90° - 2\theta$

$\Rightarrow 9\theta = 90° \Rightarrow \theta = 10°$

$\therefore \tan 3\theta = \tan 30° = \frac{1}{\sqrt{3}}$

92. (4) $(2\cos^2\theta - 1)$

$\left(\frac{1+\tan\theta}{1-\tan\theta} + \frac{1-\tan\theta}{1+\tan\theta}\right)$

$= (2\cos^2\theta - 1)$

$\left(\frac{(1+\tan\theta)^2 + (1-\tan\theta)^2}{1-\tan^2\theta}\right)$

$= (2\cos^2\theta - 1)$

$$\left(2\left(\frac{1+\tan^2\theta}{1-\tan^2\theta}\right)\right)$$

$$= \frac{2\sec^2\theta(2\cos^2\theta-1)}{1-\frac{\sin^2\theta}{\cos^2\theta}}$$

$$= \frac{2\sec^2\theta(2\cos^2\theta-1)}{\frac{\cos^2\theta-\sin^2\theta}{\cos^2\theta}}$$

$$= \frac{2\sec^2\theta.\cos^2\theta(2\cos^2\theta-1)}{2\cos^2\theta-1}$$

= 2

93. (3) sec θ + tan θ = 2 .....(i)

∴ $\sec^2\theta - \tan^2\theta = 1$

⇒ (sec θ + tan θ) (sec θ – tan θ) = 1

⇒ sec θ – tan θ = $\frac{1}{2}$ .....(ii)

By adding equations (i) and (ii),

∴ sec θ + tan θ + sec θ – tan θ

$= 2 + \frac{1}{2} = \frac{5}{2}$

⇒ 2 sec θ = $\frac{5}{2}$ ⇒ sec θ = $\frac{5}{4}$

94. (3) $(l^2.m^2)(l^2 + m^2 + 3)$

= $(\text{cosec}\,\theta - \sin\theta)^2$

$(\sec\theta - \cos\theta)^2$

$\{(\text{cosec}\,\theta - \sin\theta)^2 + (\sec\theta - \cos\theta)^2 + 3\}$

$$= \left(\frac{1}{\sin\theta}-\sin\theta\right)^2\left(\frac{1}{\cos\theta}-\cos\theta\right)^2$$

$$\left\{\left(\frac{1}{\sin\theta}-\sin\theta\right)^2+\left(\frac{1}{\cos\theta}-\cos\theta\right)^2+3\right\}$$

$$= \left(\frac{1-\sin^2\theta}{\sin\theta}\right)^2\left(\frac{1-\cos^2\theta}{\cos\theta}\right)^2$$

$$\left\{\left(\frac{1-\sin^2\theta}{\sin\theta}\right)^2+\left(\frac{1-\cos^2\theta}{\cos\theta}\right)^2+3\right\}$$

$$= \left(\frac{\cos^2\theta}{\sin\theta}\right)^2\left(\frac{\sin^2\theta}{\cos\theta}\right)^2$$

$$\left\{\left(\frac{\cos^2\theta}{\sin\theta}\right)^2+\left(\frac{\sin^2\theta}{\cos\theta}\right)^2+3\right\}$$

$$= \frac{\cos^4\theta}{\sin^2\theta}\times\frac{\sin^4\theta}{\cos^2\theta}$$

$$\left\{\frac{\cos^4\theta}{\sin^2\theta}+\frac{\sin^4\theta}{\cos^2\theta}+3\right\}$$

$= \cos^2\theta \times \sin^2\theta$

$$\left\{\frac{\cos^6\theta+\sin^6\theta+3\cos^2\theta.\sin^2\theta}{\cos^2\theta.\sin^2\theta}\right\}$$

$= \cos^6\theta + \sin^6\theta + 3\cos^2\theta . \sin^2\theta$

$= \{(\cos^2\theta + \sin^2\theta)^3 - 3\cos^2\theta . \sin^2\theta (\cos^2\theta + \sin^2\theta)\} + 3\cos^2\theta . \sin^2\theta$

$[\because a^3 + b^3 = (a + b)^3 - 3ab(a + b)]$

$= 1 - 3\cos^2\theta . \sin^2\theta + 3\cos^2\theta . \sin^2\theta = 1$

95. (1) $\frac{2\sin\theta-\cos\theta}{\cos\theta+\sin\theta} = 1$

Dividing numerator and denominator by sin θ,

$\frac{2-\cot\theta}{\cot\theta+1} = 1$

⇒ 2 – cot θ = cot θ + 1

⇒ 2 cot θ = 1

⇒ $\cot\theta = \frac{1}{2}$

96. (1) Expression

$$= \frac{8\sin\theta+5\cos\theta}{\sin^3\theta+2\cos^3\theta+3\cos\theta}$$

Dividing numerator and denominator by cos θ,

$$= \frac{8\tan\theta+5}{\tan\theta.\sin^2\theta+2\cos^2\theta+3}$$

$$= \frac{8\tan\theta+5}{2\sin^2\theta+2\cos^2\theta+3}$$

$$= \frac{8\tan\theta+5}{2(\sin^2\theta+\cos^2\theta)+3}$$

$$= \frac{8\times2+5}{5} = \frac{21}{5}$$

97. (1) tan θ + cot θ = 2

⇒ $\tan\theta + \frac{1}{\tan\theta} = 2$

⇒ $\tan^2\theta + 1 = 2\tan\theta$

⇒ $\tan^2\theta - 2\tan\theta + 1 = 0$

⇒ $(\tan\theta - 1)^2 = 0$

⇒ tan θ = 1

∴ $\cot\theta = \frac{1}{\tan\theta} = 1$

∴ $\tan^{100}\theta + \cot^{100}\theta = 1 + 1 = 2$

98. (4) Expression

$$= \frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}$$

$$= \frac{\tan\theta}{1-\frac{1}{\tan\theta}}+\frac{\frac{1}{\tan\theta}}{1-\tan\theta}$$

$$= \frac{\tan^2\theta}{\tan\theta-1}+\frac{1}{\tan\theta(1-\tan\theta)}$$

$$= \frac{\tan^2\theta}{\tan\theta-1}-\frac{1}{\tan\theta(\tan\theta-1)}$$

$$= \frac{\tan^3\theta-1}{\tan\theta(\tan\theta-1)}$$

$$= \frac{(\tan\theta-1)(\tan^2\theta+\tan\theta+1)}{\tan\theta(\tan\theta-1)}$$

$$= \frac{\tan^2\theta+\tan\theta+1}{\tan\theta}$$

= tan θ + cot θ + 1

99. (2) sin θ + cosec θ = 2

⇒ $\sin\theta + \frac{1}{\sin\theta} = 2$

⇒ $\sin^2\theta - 2\sin\theta + 1 = 0$

⇒ $(\sin\theta - 1)^2 = 0$

⇒ sin θ = 1

∴ cosec θ = 1

∴ $\sin^9\theta + \text{cosec}^9\theta = 1 + 1 = 2$

100. (1) $\sec\theta + \tan\theta = 2 + \sqrt{5}$

∴ $\sec\theta - \tan\theta = \frac{1}{\sqrt{5}+2}$

$[\because \sec^2\theta - \tan^2\theta = 1]$

$$= \frac{\sqrt{5}-2}{(\sqrt{5}+2)(\sqrt{5}-2)} = \sqrt{5}-2$$

On adding,

$2\sec\theta = 2 + \sqrt{5} + \sqrt{5} - 2 = 2\sqrt{5}$

⇒ $\sec\theta = \sqrt{5}$ ⇒ $\cos\theta = \frac{1}{\sqrt{5}}$

On subtracting,

$2\tan\theta = 2 + \sqrt{5} - \sqrt{5} + 2 = 4$

⇒ tan θ = 2

$\therefore \dfrac{\tan\theta}{\sec\theta} = \sin\theta = \dfrac{2}{\sqrt{5}}$

$\therefore \sin\theta + \cos\theta = \dfrac{2}{\sqrt{5}} + \dfrac{1}{\sqrt{5}}$

$= \dfrac{3}{\sqrt{5}}$

101. (2) $(1+\cot\theta - \operatorname{cosec}\theta)$

$(1+\tan\theta+\sec\theta)$

$= \left(1+\dfrac{\cos\theta}{\sin\theta} - \dfrac{1}{\sin\theta}\right)\left(1+\dfrac{\sin\theta}{\cos\theta}+\dfrac{1}{\cos\theta}\right)$

$= \dfrac{\sin\theta+\cos\theta-1}{\sin\theta} \times \dfrac{\cos\theta+\sin\theta+1}{\cos\theta}$

$= \dfrac{(\sin\theta+\cos\theta)^2-1}{\sin\theta.\cos\theta}$

$= \dfrac{\sin^2\theta+\cos^2\theta+2\sin\theta.\cos\theta-1}{\sin\theta.\cos\theta}$

$= \dfrac{2\sin\theta.\cos\theta}{\sin\theta.\cos\theta} = 2$

102. (1) $\tan\theta + \cot\theta = 2$

$\Rightarrow \tan\theta + \dfrac{1}{\tan\theta} = 2$

$\Rightarrow \tan^2\theta - 2\tan\theta + 1 = 0$

$\Rightarrow (\tan\theta - 1)^2 = 0$

$\Rightarrow \tan\theta = 1 = 0 \Rightarrow \tan\theta = 1$

$\therefore \cot\theta = 1 \Rightarrow \theta = 45°$

$\therefore \tan^n 45° + \cot^n 45° = 1 + 1 = 2$

103. (3) $\dfrac{\sin\theta}{x} = \dfrac{\cos\theta}{y} = \dfrac{1}{k}$

$\Rightarrow x = k\sin\theta;\ y = k\cos\theta$

$\therefore x^2 + y^2$

$= k^2(\sin^2\theta + \cos^2\theta) = k^2$

$\Rightarrow k = \sqrt{x^2+y^2}$

$\therefore \sin\theta - \cos\theta$

$= \dfrac{x}{k} - \dfrac{y}{k} = \dfrac{x-y}{k}$

$= \dfrac{x-y}{\sqrt{x^2+y^2}}$

104. (1) $x = a\sec\theta.\cos\phi;\ y = b\sec\theta.\sin\phi,\ z = c\tan\theta$

$\therefore \dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} - \dfrac{z^2}{c^2}$

$= \sec^2\theta.\cos^2\phi + \sec^2\theta.\sin^2\phi - \tan^2\theta$

$= \sec^2\theta(\cos^2\phi + \sin^2\phi) - \tan^2\theta$

$= \sec^2\theta - \tan^2\theta = 1$

105. (1) $\dfrac{\sec\theta+\tan\theta}{\sec\theta-\tan\theta} = \dfrac{5}{3}$

$\Rightarrow 5\sec\theta - 5\tan\theta$

$= 3\sec\theta + 3\tan\theta$

$\Rightarrow 2\sec\theta = 8\tan\theta$

$\Rightarrow \dfrac{\tan\theta}{\sec\theta} = \dfrac{2}{8} = \dfrac{1}{4}$

$\Rightarrow \dfrac{\sin\theta}{\cos\theta} \times \cos\theta = \dfrac{1}{4}$

$\Rightarrow \sin\theta = \dfrac{1}{4}$

106. (3) $\cos x + \cos^2 x = 1$

$\Rightarrow \cos x = 1 - \cos^2 x = \sin^2 x$ ...(i)

$\therefore \sin^{12}x + 3\sin^{10}x + 3\sin^8 x + \sin^6 x - 1$

$= (\sin^4 x + \sin^2 x)^3 - 1$

$= (\cos^2 x + \sin^2 x)^3 - 1$ [By (i)]

$= 1 - 1 = 0$

107. (1) $(1+\sin\alpha)(1+\sin\beta)(1+\sin\gamma) = (1-\sin\alpha)(1-\sin\beta)(1-\sin\gamma) = x$

$\therefore x.x = (1+\sin\alpha)(1-\sin\alpha)(1+\sin\beta)(1-\sin\beta)(1+\sin\gamma)(1-\sin\gamma)$

$= (1-\sin^2\alpha)(1-\sin^2\beta)(1-\sin^2\gamma)$

$= \cos^2\alpha.\cos^2\beta.\cos^2\gamma$

$\therefore x = \pm\cos\alpha.\cos\beta.\cos\gamma$

108. (4)

$\dfrac{1}{1+\cot^2\theta} + \dfrac{3}{1+\tan^2\theta} + 2\sin^2\theta$

$= \dfrac{1}{\operatorname{cosec}^2\theta} + \dfrac{3}{\sec^2\theta} + 2\sin^2\theta$

$= \sin^2\theta + 3\cos^2\theta + 2\sin^2\theta$

$= 3(\sin^2\theta + \cos^2\theta) = 3$

109. (1)

$\dfrac{4}{1+\tan^2\alpha} + \dfrac{1}{1+\cot^2\alpha} + 3\sin^2\alpha$

$= \dfrac{4}{\sec^2\alpha} + \dfrac{1}{\operatorname{cosec}^2\alpha} + 3\sin^2\alpha$

$= 4\cos^2\alpha + \sin^2\alpha + 3\sin^2\alpha$

$= 4(\cos^2\alpha + \sin^2\alpha) = 4$

110. (4) $3(\sin x - \cos x)^4 + 6(\sin x + \cos x)^2 + 4(\sin^6 x + \cos^6 x)$

$= 3(\sin^2 x + \cos^2 x - 2\sin x.\cos x)^2 + 6(\sin^2 x + \cos^2 x + 2\sin x.\cos x) + 4[(\sin^2 x + \cos^2 x)^3 - 3\sin^2 x.\cos^2 x(\sin^2 x + \cos^2 x)]$

$= 3(1 - 2\sin x\cos x)^2 + 6(1 + 2\sin x.\cos x) + 4(1 - 3\sin^2 x\cos^2 x)$

$= 3(1 + \sin^2 x.\cos^2 x - 4\sin x\cos x) + 6(1 + 2\sin x\cos x) + 4(1 - 3\sin^2 x\cos^2 x)$

$= 3 + 6 + 4 = 13$

111. (3) Expression

$= \sec\theta\left(\dfrac{1+\sin\theta}{\cos\theta} + \dfrac{\cos\theta}{1+\sin\theta}\right) - 2\tan^2\theta$

$= \dfrac{1+\sin^2\theta+2\sin\theta+\cos^2\theta}{\cos^2\theta(1+\sin\theta)} - 2\tan^2\theta$

$= \dfrac{2+2\sin\theta}{\cos^2\theta(1+\sin\theta)} - 2\tan^2\theta$

$= \dfrac{2}{\cos^2\theta} - 2\tan^2\theta$

$= 2\sec^2\theta - 2\tan^2\theta$

$= 2(\sec^2\theta - \tan^2\theta) = 2$

112. (1) $\tan\theta + \cot\theta = 2$

On squaring both sides,

$(\tan\theta + \cot\theta)^2 = 4$

$\Rightarrow \tan^2\theta + \cot^2\theta + 2\tan\theta.\cot\theta = 4$

$\Rightarrow \tan^2\theta + \cot^2\theta = 4 - 2 = 2$

$[\tan\theta.\cot\theta = 1]$

113. (1) $x\cos\theta - y\sin\theta = 2$

$x\sin\theta + y\cos\theta = 4$

On squaring both the equations and adding

$x^2\cos^2\theta + y^2\sin^2\theta - 2xy\sin\theta.\cos\theta + x^2\sin^2\theta + y^2\cos^2\theta + 2xy\sin\theta.\cos\theta$

$= 4 + 16$

$\Rightarrow x^2(\cos^2\theta + \sin^2\theta) + y^2(\sin^2\theta + \cos^2\theta) = 20$

$\Rightarrow x^2 + y^2 = 20$

114. (3) Expression

$$=\left[\frac{\cos^2 A(\sin A+\cos A)}{\operatorname{cosec}^2 A(\sin A-\cos A)}+\frac{\sin^2 A(\sin A-\cos A)}{\sec^2 A(\sin A+\cos A)}\right]\times\left(\frac{1}{\cos^2 A}-\frac{1}{\sin^2 A}\right)$$

$$=\left[\frac{\cos^2 A.\sin^2 A(\sin A+\cos A)}{\sin A-\cos A}+\frac{\sin^2 A.\cos^2 A(\sin A-\cos A)}{(\sin A+\cos A)}\right]\left(\frac{\sin^2 A-\cos^2 A}{\sin^2 A.\cos^2 A}\right)$$

$$=\left(\frac{\sin A+\cos A}{\sin A-\cos A}+\frac{\sin A-\cos A}{\sin A+\cos A}\right)(\sin^2 A-\cos^2 A)$$

$$=\left[\frac{(\sin A+\cos A)^2+(\sin A-\cos A)^2}{(\sin A-\cos A)(\sin A+\cos A)}\right](\sin^2 A-\cos^2 A)$$

$$=2(\sin^2 A+\cos^2 A)=2$$

115. (2) Expression

$$=\frac{1}{\operatorname{cosec}\theta-\cot\theta}-\frac{1}{\sin\theta}$$

$$=\frac{\operatorname{cosec}^2\theta-\cot^2\theta}{\operatorname{cosec}\theta-\cot\theta}-\operatorname{cosec}\theta$$

$= \operatorname{cosec}\theta+\cot\theta-\operatorname{cosec}\theta=\cot\theta$

$[\operatorname{cosec}^2\theta-\cot^2\theta=1$ & $\frac{1}{\sin\theta}$

$=\operatorname{cosec}\theta]$

Method-2 :

$$\frac{1}{\frac{1}{\sin\theta}-\frac{\cos\theta}{\sin\theta}}-\frac{1}{\sin\theta}$$

$$=\frac{\sin\theta}{1-\cos\theta}-\frac{1}{\sin\theta}-\frac{\sin^2\theta-1+\cos\theta}{\sin\theta(1-\cos\theta)}$$

$$=\frac{1-\cos^2\theta-1+\cos\theta}{\sin\theta(1-\cos\theta)}$$

$$=\frac{\cos\theta(-\cos\theta+1)}{\sin\theta(1-\cos\theta)}=\frac{\cos\theta}{\sin\theta}=\cot\theta.$$

116. (4) $\cos\theta+\sin\theta=\sqrt{2}\cos\theta$

On squaring both sides,

$\cos^2\theta+\sin^2\theta+2\cos\theta.\sin\theta$

$=2\cos^2\theta$

$\Rightarrow \cos^2\theta-\sin^2\theta=2\sin\theta.\cos\theta$

$\Rightarrow (\cos\theta+\sin\theta)(\cos\theta-\sin\theta)$

$=2\sin\theta.\cos\theta$

$\Rightarrow \sqrt{2}\cos\theta(\cos\theta-\sin\theta)$

$=2\sin\theta.\cos\theta$

$\Rightarrow \cos\theta-\sin\theta$

$$=\frac{2\sin\theta.\cos\theta}{\sqrt{2}\cos\theta}=\sqrt{2}\sin\theta$$

117. (3) $\cos^4\theta-\sin^4\theta=\frac{2}{3}$

$$\Rightarrow(\cos^2\theta+\sin^2\theta)(\cos^2\theta-\sin^2\theta)=\frac{2}{3}$$

$$\Rightarrow\cos^2\theta-\sin^2\theta=\frac{2}{3}$$

$$\Rightarrow 1-\sin^2\theta-\sin^2\theta=\frac{2}{3}$$

$$\Rightarrow 1-2\sin^2\theta=\frac{2}{3}$$

118. (2) Expression

$$=\frac{1}{1+\tan^2\theta}+\frac{1}{1+\cot^2\theta}$$

$$=\frac{1}{\sec^2\theta}+\frac{1}{\operatorname{cosec}^2\theta}$$

$=\cos^2\theta+\sin^2\theta=1$

119. (3) $\sin\theta-\cos\theta=\frac{1}{2}$

$\sin\theta+\cos\theta=x$

On squaring and adding,

$$2(\sin^2\theta+\cos^2\theta)=\frac{1}{4}+x^2$$

$$\Rightarrow x^2=2-\frac{1}{4}=\frac{7}{4}$$

$$\Rightarrow x=\frac{\sqrt{7}}{2}$$

120. (1) $\frac{\sin A}{1+\cos A}+\frac{\sin A}{1-\cos A}$

$$=\frac{\sin A(1-\cos A)+\sin A(1+\cos A)}{(1+\cos A)(1-\cos A)}$$

$$=\frac{\sin A-\sin A\cos A+\sin A+\sin A.\cos A}{1-\cos^2 A}$$

$$=\frac{2\sin A}{\sin^2 A}=2\operatorname{cosec}A$$

121. (4) $r\sin\theta=1$

$r\cos\theta=\sqrt{3}$

$$\Rightarrow\frac{\sin\theta}{\cos\theta}=\tan\theta=\frac{1}{\sqrt{3}}$$

$\therefore \sqrt{3}\tan\theta+1$

$$=\sqrt{3}\times\frac{1}{\sqrt{3}}+1=1+1=2$$

122. (2) According to question,

$x\cos\theta-y\sin\theta=\sqrt{x^2+y^2}$ ...(i)

$\frac{\cos^2\theta}{a^2}+\frac{\sin^2\theta}{b^2}=\frac{1}{x^2+y^2}$ ...(ii)

$$\sin\theta=\frac{-y}{\sqrt{x^2+y^2}}$$

$$\cos\theta=\frac{x}{\sqrt{x^2+y^2}}$$

From equation (i)

$$\frac{x}{\sqrt{x^2+y^2}}\cos\theta-\frac{y}{\sqrt{x^2+y^2}}.\sin\theta=1$$

$$\therefore\frac{\cos^2\theta}{a^2}+\frac{\sin^2\theta}{b^2}=\frac{1}{x^2+y^2}$$

$$\Rightarrow\frac{x^2}{(x^2+y^2)a^2}+\frac{y^2}{(x^2+y^2).b^2}$$

$$=\frac{1}{x^2+y^2}$$

$$\Rightarrow\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$$

123. (3) $\tan\theta - \cot\theta = 0$

$\Rightarrow \tan\theta = \cot\theta = \tan(90° - \theta)$

$\Rightarrow \theta = 90° - \theta \Rightarrow 2\theta = 90° \Rightarrow \theta = 45°$

$\therefore \sin\theta + \cos\theta$

$= \sin 45° + \cos 45°$

$= \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} = \frac{2}{\sqrt{2}} = \sqrt{2}$

124. (4) $\cos^4\theta + \sin^4\theta = (\cos^2\theta + \sin^2\theta)^2 - 2\cos^2\theta\sin^2\theta$

From maximum value,

$2\sin^2\theta.\cos^2\theta = 0$

Hence, $\sin^4\theta + \cos^4\theta$

$= (1)^2 - 0$

$= 1$

125. (1) $3\sin\theta + 5\cos\theta = 5$ ...(i)

$5\sin\theta - 3\cos\theta = x$ ...(ii)

On squaring and adding,

$9\sin^2\theta + 25\cos^2\theta + 25\sin^2\theta + 9\cos^2\theta = 25 + x^2$

$\Rightarrow 9(\sin^2\theta + \cos^2\theta) + 25(\cos^2\theta + \sin^2\theta) = 25 + x^2$

$\Rightarrow 9 + 25 = 25 + x^2$

$\Rightarrow x^2 = 9$

$\Rightarrow x = \pm 3$

126. (4) $\sin\theta + \sin^2\theta = 1$

$\Rightarrow \sin\theta = 1 - \sin^2\theta = \cos^2\theta$

$\therefore \cos^2\theta + \cos^4\theta$

$= \cos^2\theta + (\cos^2\theta)^2$

$= \cos^2\theta + \sin^2\theta = 1$

127. (1) $\tan\theta + \cot\theta = 2$

$\Rightarrow \tan\theta + \frac{1}{\tan\theta} = 2$

$\Rightarrow \frac{\tan^2\theta + 1}{\tan\theta} = 2$

$\Rightarrow \tan^2\theta + 1 = 2\tan\theta$

$\Rightarrow \tan^2\theta - 2\tan\theta + 1 = 0$

$\Rightarrow (\tan\theta - 1)^2 = 0$

$\Rightarrow \tan\theta - 1 = 0$

$\Rightarrow \tan\theta = 1 = \tan 45°$

$\Rightarrow \theta = 45°$

128. (4) $\cos\pi x = x^2 - x + \frac{5}{4}$

$= x^2 - 2.x.\frac{1}{2} + \frac{1}{4} - \frac{1}{4} + \frac{5}{4}$

$= \left(x - \frac{1}{2}\right)^2 + 1 > 1$

$-1 \le \cos x \le 1$

129. (4) $1 + \frac{1}{\cot^2 63°} - \sec^2 27° +$

$+ \frac{1}{\sin^2 63°} - \text{cosec}^2 27°$

$= 1 + \tan^2 63° - \sec^2 27°$

$+ \text{cosec}^2 63° - \text{cosec}^2 27°$

$= 1 + \tan^2(90° - 27°) - \sec^2 27°$

$+ \text{cosec}^2(90° - 27°) - \text{cosec}^2 27°$

$= 1 + \cot^2 27° - \sec^2 27°$

$+ \sec^2 27° - \text{cosec}^2 27°$

$= 1 + \cot^2 27° - \text{cosec}^2 27°$

$= 1 - 1 = 0$

$[\because \text{cosec}^2\theta - \cot^2\theta = 1]$

130. (2)

$x = \frac{\cos\theta}{1 - \sin\theta} = \frac{\cos\theta(1 + \sin\theta)}{(1 - \sin\theta)(1 + \sin\theta)}$

$= \frac{\cos\theta(1 + \sin\theta)}{1 - \sin^2\theta}$

$= \frac{\cos\theta(1 + \sin\theta)}{\cos^2\theta}$

$= \frac{1 + \sin\theta}{\cos\theta}$

$\therefore \frac{\cos\theta}{1 + \sin\theta} = \frac{1}{x}$

131. (2)

$\frac{AB}{BC} = \frac{2}{1}$

$\Rightarrow AB = 2k, BC = k$

$\therefore AC = \sqrt{(2k)^2 + k^2} = \sqrt{5k^2}$

$= \sqrt{5}k$

$\therefore \sin A + \cot C = \frac{BC}{AC} + \frac{BC}{AB}$

$= \frac{k}{\sqrt{5}k} + \frac{k}{2k}$

$= \frac{1}{\sqrt{5}} + \frac{1}{2} = \frac{2 + \sqrt{5}}{2\sqrt{5}}$

132. (2) $\sin\frac{\pi x}{2} = x^2 - 2x + 2$

Putting $x = 1$

$\sin\frac{\pi}{2} = 1 - 2 + 2 = 1$

133. (1) Expression

$= \frac{\sin 43°}{\cos 47°} + \frac{\cos 19°}{\sin 71°} - 8\cos^2 60°$

$= \frac{\sin 43°}{\cos(90° - 43°)} + \frac{\cos 19°}{\sin(90° - 19°)}$

$- 8 \times \left(\frac{1}{2}\right)^2$

$= \frac{\sin 43°}{\sin 43°} + \frac{\cos 19°}{\cos 19°} - 8 \times \frac{1}{4}$

$[\sin(90° - \theta) = \cos\theta;$
$\cos(90° - \theta) = \sin\theta]$

$= 1 + 1 - 2 = 0$

134. (2) $\sin^2 7\frac{1}{2}° + \sin^2 82\frac{1}{2}°$

$+ \tan^2 2° . \tan^2 88°$

$= \sin^2 7\frac{1}{2}° + \sin^2\left(90° - 7\frac{1}{2}°\right) +$

$\tan^2 2° . \tan^2(90° - 2°)$

$= \sin^2 7\frac{1}{2}° + \cos^2 7\frac{1}{2}° + \tan^2 2°.$

$. \cot^2 2°$

$[\because \sin(90° - \theta) = \cos\theta;$
$\tan(90° - \theta) = \cot\theta]$

$= 1 + 1 = 2$

135. (2) $1 - 2\sin^2\theta + \sin^4\theta$

$= (1 - \sin^2\theta)^2 = (\cos^2\theta)^2 = \cos^4\theta$

136. (2) Expression

$= \cot 9°. \cot 27°. \cot 63° . \cot 81°$

$= \cot 9°. \cot 27°. \cot(90° - 27°) .$
$\cot(90° - 9°)$

$= \cot 9° . \cot 27° . \tan 27° . \tan 9°$

$[\tan(90° - \theta)$
$= \cot\theta; \cot(90° - \theta) = \tan\theta]$

$= \cot 9° . \tan 9° . \cot 27° \tan 27°$

$= 1 \; [\tan\theta . \cot\theta = 1]$

137. (2) $(1 + \sin A)(1 + \sin B)(1 + \sin C) = (1 - \sin A) . (1 - \sin B)(1 - \sin C) = x$ (Let)

$\therefore x . x = (1 + \sin A)(1 + \sin B)(1 + \sin C)(1 - \sin A)(1 - \sin B)(1 - \sin C)$

$\Rightarrow x^2 = (1 - \sin^2 A)(1 - \sin^2 B)(1 - \sin^2 C)$

$\Rightarrow x^2 = \cos^2 A . \cos^2 B . \cos^2 C$

$\Rightarrow x = \pm \cos A \,.\, \cos B \,.\, \cos C$

$\because\ 0 < A, B, C < \frac{\pi}{2}$

$\therefore\ x = \cos A \,.\, \cos B \,.\, \cos C$

138. (4) $\tan^2\theta + 3 = 3 \sec\theta$

$\Rightarrow \sec^2\theta - 1 + 3 = 3 \sec\theta$

$\Rightarrow \sec^2\theta - 3 \sec\theta + 2 = 0$

$\Rightarrow \sec^2\theta - 2 \sec\theta - \sec\theta + 2 = 0$

$\Rightarrow \sec\theta (\sec\theta - 2) - 1 (\sec\theta - 2) = 0$

$\Rightarrow (\sec\theta - 2)(\sec\theta - 1) = 0$

$\Rightarrow \sec\theta = 2$ or 1

$\Rightarrow \theta = 60°$ or $0°$.

139. (3) $\sin\theta = 0.7$

$\therefore \cos\theta$

$= \sqrt{1 - \sin^2\theta} = \sqrt{1 - (0.7)^2}$

$= \sqrt{1 - 0.49} = \sqrt{0.51}$

140. (3) Expression $= \sin^2 65° + \sin^2 25° + \cos^2 35° + \cos^2 55°$

$= \sin^2 65° + \sin^2 (90° - 65°) + \cos^2 35° + \cos^2 (90° - 35°)$

$= \sin^2 65° + \cos^2 65° + \cos^2 35° + \sin^2 35°$

$= 1 + 1 = 2$

141. (3) $x.\sin 60°.\tan 30°$

$= \sec 60°.\cot 45°$

$\Rightarrow x \times \frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{3}} = 2 \times 1$

$\Rightarrow x = 2 \times 2 = 4$

142. (4) $\frac{1}{2}\sqrt{1+\sin\theta} + \frac{1}{2}\sqrt{1-\sin\theta}$

$= \frac{1}{2}\left(\sqrt{1+\sin 60°} + \sqrt{1-\sin 60°}\right)$

$= \frac{1}{2}\left(\sqrt{1+\frac{\sqrt{3}}{2}} + \sqrt{1-\frac{\sqrt{3}}{2}}\right)$

$= \frac{1}{2\sqrt{2}}\left(\sqrt{2+\sqrt{3}} + \sqrt{2-\sqrt{3}}\right)$

$= \frac{1}{2\sqrt{2}} \times \frac{1}{2}\left(\sqrt{4+2\sqrt{3}} + \sqrt{4-2\sqrt{3}}\right)$

$= \frac{1}{4}\left(\sqrt{\left(\sqrt{3}+1\right)^2} + \sqrt{\left(\sqrt{3}-1\right)^2}\right)$

$= \frac{1}{4}\left(\sqrt{3}+1+\sqrt{3}-1\right)$

$= \frac{2\sqrt{3}}{4} = \frac{\sqrt{3}}{2} = \cos 30°$

$= \cos\frac{\theta}{2}$

143. (2) $\frac{2\tan^2 30°}{1-\tan^2 30°} + \sec^2 45° - \sec^2 0° = x \sec 60°$

$\Rightarrow \frac{2 \times \left(\frac{1}{\sqrt{3}}\right)^2}{1-\left(\frac{1}{\sqrt{3}}\right)^2} + \left(\sqrt{2}\right)^2 - 1 = x \times 2$

$\Rightarrow \frac{\frac{2}{3}}{1-\frac{1}{3}} + 2 - 1 = x \times 2$

$\Rightarrow \frac{2}{3} \times \frac{3}{2} + 1 = x \times 2$

$\Rightarrow 2 = x \times 2 \Rightarrow x = \frac{2}{2} = 1$

144. (2) $\tan\theta = \frac{\sin\alpha - \cos\alpha}{\sin\alpha + \cos\alpha}$

$\therefore 1 + \tan^2\theta$

$= 1 + \frac{(\sin\alpha - \cos\alpha)^2}{(\sin\alpha + \cos\alpha)^2}$

$\Rightarrow \sec^2\theta$

$= \frac{(\sin\alpha + \cos\alpha)^2 + (\sin\alpha - \cos\alpha)^2}{(\sin\alpha + \cos\alpha)^2}$

$\Rightarrow \sec^2\theta = \frac{2(\sin^2\alpha + \cos^2\alpha)}{(\sin\alpha + \cos\alpha)^2}$

$\Rightarrow \frac{1}{\cos^2\theta} = \frac{2}{(\sin\alpha + \cos\alpha)^2}$

$\Rightarrow \frac{1}{\cos\theta} = \frac{\pm\sqrt{2}}{\sin\alpha + \cos\alpha}$

$\Rightarrow \sin\alpha + \cos\alpha = \pm\sqrt{2}\cos\theta$

145. (1) $7\sin^2\theta + 3\cos^2\theta = 4$

On dividing both sides by $\cos^2\theta$

$7\tan^2\theta + 3 = 4\sec^2\theta$

$\Rightarrow 7\tan^2\theta + 3 = 4(1 + \tan^2\theta)$

$\Rightarrow 7\tan^2\theta + 3 = 4 + 4\tan^2\theta$

$\Rightarrow 7\tan^2\theta - 4\tan^2\theta = 4 - 3$

$\Rightarrow 3\tan^2\theta = 1$

$\Rightarrow \tan^2\theta = \frac{1}{3}$

$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}}$

146. (4) $\tan 9° = \frac{p}{q}$

$\therefore \frac{\sec^2 81°}{1+\cot^2 81°} = \frac{\sec^2 81°}{\operatorname{cosec}^2 81°}$

$= \frac{1}{\cos^2 81°} \times \sin^2 81°$

$= \tan^2 81° = \tan^2(90° - 9°)$

$= \cot^2 9° = \frac{q^2}{p^2}$

147. (4) $\sec\theta + \tan\theta = 5$

$\therefore \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta - \tan\theta)(\sec\theta + \tan\theta) = 1$

$\Rightarrow \sec\theta - \tan\theta = \frac{1}{5}$

$\therefore (\sec\theta + \tan\theta) - (\sec\theta - \tan\theta)$

$= 5 - \frac{1}{5} = \frac{25-1}{5}$

$\Rightarrow 2\tan\theta = \frac{24}{5} \Rightarrow \tan\theta = \frac{12}{5}$

$\therefore \frac{\tan\theta + 1}{\tan\theta - 1} = \frac{\frac{12}{5}+1}{\frac{12}{5}-1} = \frac{12+5}{12-5}$

$= \frac{17}{7}$

148. (4) $\tan^2\theta = 1 - e^2$

$\therefore \sec\theta + \tan^3\theta \,.\, \operatorname{cosec}\theta$

$= \sec\theta + \tan^2\theta \,.\, \tan\theta \,.\, \operatorname{cosec}\theta$

$= \sec\theta + \tan^2\theta \,.\, \frac{\sin\theta}{\cos\theta} \cdot \frac{1}{\sin\theta}$

$= \sec\theta + \tan^2\theta \,.\, \sec\theta$

$= \sec\theta \,.(1 + \tan^2\theta)$

$= \left(1 + \tan^2\theta\right)^{\frac{1}{2}} \,.\, (1 + \tan^2\theta)$

$= \left(1 + \tan^2\theta\right)^{\frac{3}{2}} = \left(1 + 1 - e^2\right)^{\frac{3}{2}}$

$= \left(2 - e^2\right)^{\frac{3}{2}}$

149. (2) When $\theta = 60°$

$\cos\theta = \frac{1}{2}$, $\cos^2\theta = \frac{1}{4}$

$\therefore \cos\theta > \cos^2\theta$

150. (1) $x \sin 60° \tan 30° - \tan^2 45°$

$= \operatorname{cosec} 60°.\ \cot 30° - \sec^2 45°$

$\Rightarrow x \,.\, \frac{\sqrt{3}}{2} \cdot \frac{1}{\sqrt{3}} - 1$

$= \frac{2}{\sqrt{3}} \times \sqrt{3} - \left(\sqrt{2}\right)^2$

$\Rightarrow \frac{x}{2} - 1 = 2 - 2 = 0$

$\Rightarrow \frac{x}{2} = 1 \Rightarrow x = 2$

151. (3) $x = a \sec\alpha \,.\, \cos\beta$

$\Rightarrow \frac{x}{\alpha} = \sec\alpha \,.\, \cos\beta$

Similarly,

$\frac{y}{b} = \sec\alpha \,.\, \sin\beta,\ \frac{z}{c} = \tan\alpha$

$\therefore \frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2}$

$= \sec^2\alpha.\ \cos^2\beta + \sec^2\alpha \,.\, \sin^2\beta - \tan^2\alpha$

$= \sec^2\alpha\,(\cos^2\beta + \sin^2\beta) - \tan^2\alpha$

$= \sec^2\alpha - \tan^2\alpha = 1$

152. (3) $\frac{\cos\alpha}{\cos\beta} = a \Rightarrow \cos\alpha = a\cos\beta$

On squaring both sides,

$\cos^2\alpha = a^2 \cos^2\beta$

$\Rightarrow 1 - \sin^2\alpha = a^2\,(1 - \sin^2\beta)$ ...(i)

Again, $\sin\alpha = b\sin\beta$

$\Rightarrow \sin^2\alpha = b^2 \sin^2\beta$

$\therefore$ From equation (i),

$1 - b^2 \sin^2\beta = a^2 - a^2 \sin^2\beta$

$\Rightarrow a^2 \sin^2\beta - b^2 \sin^2\beta = a^2 - 1$

$\Rightarrow \sin^2\beta\,(a^2 - b^2) = a^2 - 1$

$\Rightarrow \sin^2\beta = \frac{a^2 - 1}{a^2 - b^2}$

153. (2) Expression

$= \frac{\cos^2 60° + 4\sec^2 30° - \tan^2 45°}{\sin^2 30° + \cos^2 30°}$

$= \left(\frac{1}{2}\right)^2 + 4\left(\frac{2}{\sqrt{3}}\right)^2 - 1$

$[\because \sin^2\theta + \cos^2\theta = 1]$

$= \frac{1}{4} + \frac{16}{3} - 1$

$= \frac{3 + 64 - 12}{12} = \frac{55}{12}$

154. (1)

$\sin^2 30° \cos^2 45° + 5\tan^2 30° + \frac{3}{2}\sin^2 90° - 3\cos^2 90°$

$= \left(\frac{1}{2}\right)^2 \times \left(\frac{1}{\sqrt{2}}\right)^2 + 5 \times \left(\frac{1}{\sqrt{3}}\right)^2 + \frac{3}{2} \times 1 - 3 \times 0$

$= \frac{1}{4} \times \frac{1}{2} + 5 \times \frac{1}{3} + \frac{3}{2}$

$= \frac{1}{8} + \frac{5}{3} + \frac{3}{2} = \frac{3 + 40 + 36}{24}$

$= \frac{79}{24} = 3\ \frac{7}{24}$

155. (1) $\cos^2\theta - \sin^2\theta = \frac{1}{3}$

$\cos^4\theta - \sin^4\theta$

$= (\cos^2\theta + \sin^2\theta)\,(\cos^2\theta - \sin^2\theta)$

$= 1 \times \frac{1}{3} = \frac{1}{3}$

156. (3) $\tan\theta = \frac{1}{\sqrt{11}}$; $\cot\theta = \sqrt{11}$

$\therefore \frac{\text{cosec}^2\theta - \sec^2\theta}{\text{cosec}^2\theta + \sec^2\theta}$

$= \frac{1 + \cot^2\theta - (1 + \tan^2\theta)}{1 + \cot^2\theta + 1 + \tan^2\theta}$

$= \frac{\cot^2\theta - \tan^2\theta}{\cot^2\theta + \tan^2\theta + 2}$

$= \frac{(\sqrt{11})^2 - \left(\frac{1}{\sqrt{11}}\right)^2}{\left(\sqrt{11}\right)^2 + \left(\frac{1}{\sqrt{11}}\right)^2 + 2}$

$= \frac{11 - \frac{1}{11}}{11 + \frac{1}{11} + 2} = \frac{\frac{121 - 1}{11}}{\frac{121 + 1 + 22}{11}}$

$= \frac{120}{144} = \frac{5}{6}$

157. (1) Expression $= \frac{1}{\sqrt{2}} \sin\frac{\pi}{6} \,.\, \cos\frac{\pi}{4} - \cot\frac{\pi}{3} \,.\, \sec\frac{\pi}{6} + \frac{5\tan\frac{\pi}{4}}{12\sin\frac{\pi}{2}}$

$= \frac{1}{\sqrt{2}} \times \frac{1}{2} \times \frac{1}{\sqrt{2}} - \frac{1}{\sqrt{3}} \times \frac{2}{\sqrt{3}} + \frac{5 \times 1}{12 \times 1}$

$= \frac{1}{4} - \frac{2}{3} + \frac{5}{12}$

$= \frac{3 - 8 + 5}{12} = 0$

158. (2) $\sin\theta = \frac{3}{5}$

$\therefore \cos\theta = \sqrt{1 - \sin^2\theta}$

$= \sqrt{1 - \left(\frac{3}{5}\right)^2} = \sqrt{1 - \frac{9}{25}}$

$= \sqrt{\frac{16}{25}} = \frac{4}{5}$

$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{\frac{3}{5}}{\frac{4}{5}} = \frac{3}{4}$

$\cot\theta = \frac{1}{\tan\theta} = \frac{4}{3}$

$\text{cosec}\,\theta = \frac{1}{\sin\theta} = \frac{5}{3}$

$\therefore \frac{\tan\theta + \cos\theta}{\cot\theta + \text{cosec}\theta} = \frac{\frac{3}{4} + \frac{4}{5}}{\frac{4}{3} + \frac{5}{3}}$

$= \frac{\frac{15 + 16}{20}}{\frac{4 + 5}{3}}$

$= \frac{31}{20} \times \frac{3}{9} = \frac{31}{60}$

159. (2) $a\cos\theta + b\sin\theta = p$

$a\sin\theta - b\cos\theta = q$

On squaring and adding,

$a^2 \cos^2\theta + b^2 \sin^2\theta + 2\,a\,b \sin\theta \,.\, \cos\theta + a^2 \sin^2\theta + b^2 \cos^2\theta - 2\,a\,b\sin\theta.\ \cos\theta$

$= p^2 + q^2$

$\Rightarrow a^2 \cos^2\theta + a^2 \sin^2\theta + b^2 \sin^2\theta + b^2 \cos^2\theta = p^2 + q^2$

$\Rightarrow a^2\,(\cos^2\theta + \sin^2\theta) + b^2\,(\sin^2\theta + \cos^2\theta) = p^2 + q^2$

$\Rightarrow a^2 + b^2 = p^2 + q^2$

160. (2) $(\sin\alpha + \text{cosec}\,\alpha)^2 + (\cos\alpha + \sec\alpha)^2 = k + \tan^2\alpha + \cot^2\alpha$

$\Rightarrow \sin^2\alpha + \text{cosec}^2\alpha + 2\sin\alpha\,.\,\text{cosec}\,\alpha + \cos^2\alpha + \sec^2\alpha + 2\cos\alpha.\sec\alpha = k + \tan^2\alpha + \cot^2\alpha$

$\Rightarrow \sin^2\alpha + \cos^2\alpha + 2 + \text{cosec}^2\alpha + \sec^2\alpha + 2 = k + \tan^2\alpha + \cot^2\alpha$

$\Rightarrow 5 + \text{cosec}^2\alpha + \sec^2\alpha = k + \tan^2\alpha + \cot^2\alpha$

$\Rightarrow 5 + 1 + \cot^2\alpha + 1 + \tan^2\alpha = k + \tan^2\alpha + \cot^2\alpha$

$\Rightarrow 7 + \cot^2\alpha + \tan^2\alpha = k + \tan^2\alpha + \cot^2\alpha$

$\Rightarrow k = 7$

161. (1) $\sin 21° = \dfrac{x}{y}$

$\cos 21° = \sqrt{1 - \sin^2 21°}$

$= \sqrt{1 - \dfrac{x^2}{y^2}} = \dfrac{\sqrt{y^2 - x^2}}{y}$

$\therefore \sec 21° = \dfrac{y}{\sqrt{y^2 - x^2}}$

$\therefore \sec 21° - \sin 69°$

$= \sec 21° - \sin(90° - 21°)$

$= \sec 21° - \cos 21°$

$= \dfrac{y}{\sqrt{y^2 - x^2}} - \dfrac{\sqrt{y^2 - x^2}}{y}$

$= \dfrac{y^2 - (y^2 - x^2)}{y\sqrt{y^2 - x^2}} = \dfrac{x^2}{y\sqrt{y^2 - x^2}}$

162. (3) $\sec\alpha + \tan\alpha = 2$

$\Rightarrow \dfrac{1}{\cos\alpha} + \dfrac{\sin\alpha}{\cos\alpha} = 2$

$\Rightarrow \dfrac{1 + \sin\alpha}{\cos\alpha} = 2$

$\Rightarrow 1 + \sin\alpha = 2\cos\alpha$

$\Rightarrow (1 + \sin\alpha)^2 = 4\cos^2\alpha$

$\Rightarrow 1 + \sin^2\alpha + 2\sin\alpha$

$= 4(1 - \sin^2\alpha)$

$\Rightarrow 1 + \sin^2\alpha + 2\sin\alpha$

$= 4 - 4\sin^2\alpha$

$\Rightarrow 5\sin^2\alpha + 2\sin\alpha + 1 - 4 = 0$

$\Rightarrow 5\sin^2\alpha + 2\sin\alpha - 3 = 0$

$\Rightarrow 5\sin^2\alpha + 5\sin\alpha - 3\sin\alpha - 3 = 0$

$\Rightarrow 5\sin\alpha(\sin\alpha + 1) - 3(\sin\alpha + 1) = 0$

$\Rightarrow (5\sin\alpha - 3)(\sin\alpha + 1) = 0$

$\because \alpha < 90°$,

$\therefore 5\sin\alpha - 3 = 0$

$\Rightarrow 5\sin\alpha = 3$

$\Rightarrow \sin\alpha = \dfrac{3}{5} = 0.6$

163. (1) $3\sin\theta + 5\cos\theta = 5$ --- (i)

$5\sin\theta - 3\cos\theta = x$ (let)-- (ii)

On squaring and adding both the equations,

$(3\sin\theta + 5\cos\theta)^2 + (5\sin\theta - 3\cos\theta)^2 = 5^2 + x^2$

$\Rightarrow 9\sin^2\theta + 25\cos^2\theta + 30\sin\theta.\cos\theta + 25\sin^2\theta + 9\cos^2\theta - 30\sin\theta\,.\cos\theta = 25 + x^2$

$\Rightarrow 9\sin^2\theta + 9\cos^2\theta + 25\cos^2\theta + 25\sin^2\theta = 25 + x^2$

$\Rightarrow 9(\sin^2\theta + \cos^2\theta) + 25(\cos^2\theta + \sin^2\theta) = 25 + x^2$

$\Rightarrow 9 + 25 = 25 + x^2$

$\Rightarrow x^2 = 9 \Rightarrow x = \pm 3$

164. (2) $\tan\theta + \cot\theta = 2$

$\Rightarrow \tan\theta + \dfrac{1}{\tan\theta} = 2$

$\Rightarrow \dfrac{\tan^2\theta + 1}{\tan\theta} = 2$

$\Rightarrow \tan^2\theta + 1 = 2\tan\theta$

$\Rightarrow \tan^2\theta - 2\tan\theta + 1 = 0$

$\Rightarrow (\tan\theta - 1)^2 = 0$

$\Rightarrow \tan\theta - 1 = 0 \Rightarrow \tan\theta = 1$

$\therefore \cot\theta = \dfrac{1}{\tan\theta} = 1$

$\therefore \tan^5\theta + \cot^5\theta = 1 + 1 = 2$

165. (3) $\tan 1°\,.\,\tan 2°\,.\,\tan 3° \ldots \tan 89°$

$= (\tan 1°\,.\,\tan 89°)$

$(\tan 2°.\,\tan 88°) \ldots \tan 45°$

$= (\tan 1°.\,\tan(90° - 1°))$

$(\tan 2°\,\tan(90° - 2°) \ldots \tan 45°$

$= (\tan 1°\,.\,\cot 1°)$

$(\tan 2°.\,\cot 2°) \ldots \tan 45°$

$= 1.1..1. = 1$

$[\tan(90° - \theta) = \cot\theta]$

166. (3) $x\sin^2 60° - \dfrac{3}{2}\sec 60°\,.\,\tan^2 30°$

$+ \dfrac{4}{5}\sin^2 45°\,.\,\tan^2 60° = 0$

$\Rightarrow x\,.\left(\dfrac{\sqrt{3}}{2}\right)^2 - \dfrac{3}{2} \times 2\,.\left(\dfrac{1}{\sqrt{3}}\right)^2$

$+ \dfrac{4}{5} \times \left(\dfrac{1}{\sqrt{2}}\right)^2 \times (\sqrt{3})^2 = 0$

$\Rightarrow \dfrac{3x}{4} - \dfrac{3}{2} \times 2 \times \dfrac{1}{3} + \dfrac{4}{5} \times \dfrac{1}{2} \times 3 = 0$

$\Rightarrow \dfrac{3x}{4} - 1 + \dfrac{6}{5} = 0$

$\Rightarrow \dfrac{3x}{4} = 1 - \dfrac{6}{5} = \dfrac{5 - 6}{5} = \dfrac{-1}{5}$

$\Rightarrow x = -\dfrac{1}{5} \times \dfrac{4}{3} = \dfrac{-4}{15}$

167. (4) $7\sin\alpha = 24\cos\alpha$

$\Rightarrow \dfrac{\sin\alpha}{\cos\alpha} = \dfrac{24}{7} \Rightarrow \tan\alpha = \dfrac{24}{7}$

$\therefore \sec\alpha = \sqrt{1 + \tan^2\alpha} = \sqrt{1 + \left(\dfrac{24}{7}\right)^2}$

$= \sqrt{1 + \dfrac{576}{49}} = \sqrt{\dfrac{49 + 576}{49}}$

$= \sqrt{\dfrac{625}{49}} = \dfrac{25}{7}$

$\therefore \cos\alpha = \dfrac{1}{\sec\alpha} = \dfrac{7}{25}$

$\therefore 14\tan\alpha - 75\cos\alpha - 7\sec\alpha$

$= 14 \times \dfrac{24}{7} - 75 \times \dfrac{7}{25} - 7 \times \dfrac{25}{7}$

$= 48 - 21 - 25 = 2$

168. (2) $2\,\text{cosec}^2 30° + x\sin^2 60° - \dfrac{3}{4}\tan^2 30° = 10$

$\Rightarrow 2 \times (2)^2 + x \times \left(\dfrac{\sqrt{3}}{2}\right)^2 - \dfrac{3}{4} \times \left(\dfrac{1}{\sqrt{3}}\right)^2 = 10$

$\Rightarrow 8 + \dfrac{3x}{4} - \dfrac{3}{4} \times \dfrac{1}{3} = 10$

$\Rightarrow \dfrac{3x}{4} = 10 + \dfrac{1}{4} - 8$

$\Rightarrow \dfrac{3x}{4} = \dfrac{9}{4} \Rightarrow 3x = 9$

$\Rightarrow x = \dfrac{9}{3} = 3$

169. (2) $\tan^2\theta - \sec^2\theta = -(\sec^2\theta - \tan^2\theta) = -1$.

170. (2) $29\tan\theta = 31 \Rightarrow \tan\theta = \frac{31}{29}$

Expression $= \frac{1+2\sin\theta.\cos\theta}{1-2\sin\theta\cos\theta}$

$= \frac{\sin^2\theta+\cos^2\theta+2\sin\theta.\cos\theta}{\sin^2\theta+\cos^2\theta-2\sin.\cos\theta}$

$= \frac{(\sin\theta+\cos\theta)^2}{(\sin\theta-\cos\theta)^2}$

$= \left(\frac{\frac{\sin\theta}{\cos\theta}+\frac{\cos\theta}{\cos\theta}}{\frac{\sin\theta}{\cos\theta}-\frac{\cos\theta}{\cos\theta}}\right)^2 = \left(\frac{\tan\theta+1}{\tan\theta-1}\right)^2$

$= \left(\frac{\frac{31}{29}+1}{\frac{31}{29}-1}\right)^2 = \left(\frac{\frac{31+29}{29}}{\frac{31-29}{29}}\right)^2$

$= \left(\frac{60}{2}\right)^2 = (30)^2 = 900.$

171. (3)

$\angle ACD = 45°$

$\angle BAC = 45°$

$\therefore (\tan^2\angle CAD + 1).\sin^2\angle BAC$

$= (\tan^2 45° + 1)\sin^2 45°$

$= (1+1)\times\left(\frac{1}{\sqrt{2}}\right)^2 = 2\times\frac{1}{2} = 1$

172. (2) $\tan x = \sin 45°.\cos 45° + \sin 30°$

$= \frac{1}{\sqrt{2}}.\frac{1}{\sqrt{2}}+\frac{1}{2} = \frac{1}{2}+\frac{1}{2} = 1$

$\therefore \tan x = \tan 45° \Rightarrow x = 45°$

173. (3) $\sqrt{\frac{\sec\theta-1}{\sec\theta+1}} = \sqrt{\frac{\frac{1}{\cos\theta}-1}{\frac{1}{\cos\theta}+1}}$

$= \sqrt{\frac{\frac{1-\cos\theta}{\cos\theta}}{\frac{1+\cos\theta}{\cos\theta}}}$

$= \sqrt{\frac{1-\cos\theta}{1+\cos\theta}} = \sqrt{\frac{(1-\cos\theta)(1-\cos\theta)}{(1+\cos\theta)(1-\cos\theta)}}$

(Rationalising the numerator and the denominator)

$= \sqrt{\frac{(1-\cos\theta)^2}{1-\cos^2\theta}} = \sqrt{\frac{(1-\cos\theta)^2}{\sin^2\theta}}$

$= \frac{1-\cos\theta}{\sin\theta} = \frac{1}{\sin\theta} - \frac{\cos\theta}{\sin\theta}$

$= \operatorname{cosec}\theta - \cot\theta.$

174. (2) Let the angles be A and B where A > B

$\therefore A + B = 135°$

and, A – B

$= \frac{\pi}{12} = \frac{\pi}{12}\times\frac{180°}{\pi} = 15°$

On adding

A + B + A – B

$= 135° + 15° = 150°$

$\Rightarrow 2A = 150° \Rightarrow A = \frac{150}{2} = 75°$

$\therefore A + B = 135°$

$\Rightarrow B = 135° - 75° = 60°$

175. (3)

$\angle B = \frac{\pi}{3}, \angle = \frac{\pi}{4}$

and $\frac{BD}{DC} = \frac{1}{3}$

From ΔABD,

$\frac{BD}{\sin BAD} = \frac{AD}{\sin ABD}$

$\Rightarrow \frac{BD}{\sin BAD} = \frac{AD}{\sin\frac{\pi}{3}}$

$\Rightarrow \frac{BD}{\sin BAD} = \frac{AD}{\frac{\sqrt{3}}{2}}$

$\Rightarrow AD = \frac{\sqrt{3}}{2}.\frac{BD}{\sin BAD}$ ...(i)

From ΔADC,

$\frac{CD}{\sin DAC} = \frac{AD}{\sin ACD}$

$\Rightarrow \frac{CD}{\sin DAC} = \frac{AD}{\sin\frac{\pi}{4}}$

$\Rightarrow AD = \frac{1}{\sqrt{2}}.\frac{CD}{\sin DAC}$ ...(ii)

From equations (i) and (ii),

$\frac{\sqrt{3}}{2}.\frac{BD}{\sin BAD} = \frac{1}{\sqrt{2}}.\frac{CD}{\sin DAC}$

$\Rightarrow \frac{\sin BAD}{\sin DAC} = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{\sqrt{2}}}\times\frac{BD}{CD}$

$\Rightarrow \frac{\sin BAD}{\sin DAC} = \frac{\sqrt{3}}{2}\times\sqrt{2}\times\frac{1}{3}$

$= \frac{1}{\sqrt{2}\times\sqrt{3}} = \frac{1}{\sqrt{6}}$

176. (1) $\sin 3A = \cos(A - 26°)$

$\Rightarrow \cos(90° - 3A) = \cos(A - 26°)$

$\Rightarrow 90° - 3A = A - 26°$

$\Rightarrow 90° + 26° = 3A + A$

$\Rightarrow 4A = 116$

$\Rightarrow A = \frac{116}{4} = 29°$

177. (1) $\sec^2\theta - \frac{\sin^2\theta - 2\sin^4\theta}{2\cos^4\theta - \cos^2\theta}$

$= \sec^2\theta - \frac{\sin^2\theta(1-2\sin^2\theta)}{\cos^2\theta(2\cos^2\theta-1)}$

$= \sec^2\theta - \frac{\sin^2\theta(1-2(1-\cos^2\theta))}{\cos^2\theta(2\cos^2\theta-1)}$

$= \sec^2\theta - \tan^2\theta\,\frac{(2\cos^2\theta-1)}{2\cos^2\theta-1}$

$= \sec^2\theta - \tan^2\theta = 1$

178. (3) $x = a(\sin\theta + \cos\theta)$ and $y = b(\sin\theta - \cos\theta)$

$\Rightarrow \frac{x}{a} = \sin\theta + \cos\theta$ and

$\frac{y}{b} = \sin\theta - \cos\theta$

$\therefore \frac{x^2}{a^2}+\frac{y^2}{b^2} = (\sin\theta + \cos\theta)^2 + (\sin\theta - \cos\theta)^2$

$= \sin^2\theta + \cos^2\theta + 2\sin\theta.\cos\theta + \sin^2\theta + \cos^2\theta - 2\sin\theta.\cos\theta$

$= 2(\sin^2\theta + \cos^2\theta) = 2$

179. (4) $\sin 5\theta = \cos 20°$

$\Rightarrow \sin 5\theta = \sin(90 - 20)$

$= \sin 70°$

$\Rightarrow 5\theta = 70°$

$\Rightarrow \theta = \frac{70}{5} = 14°$

180. (3) $2\sec\theta = 3\text{cosec}^2\theta$

$\Rightarrow \frac{2}{\cos\theta} = \frac{3}{\sin^2\theta} = \frac{3}{1-\cos^2\theta}$

$\Rightarrow 2 - 2\cos^2\theta = 3\cos\theta$

$\Rightarrow 2\cos^2\theta + 3\cos\theta - 2 = 0$

$\Rightarrow 2\cos^2\theta + 4\cos\theta - \cos\theta - 2 = 0$

$\Rightarrow 2\cos\theta(\cos\theta + 2) - 1(\cos\theta + 2) = 0$

$\Rightarrow (2\cos\theta - 1)(\cos\theta + 2) = 0$

$\therefore 2\cos\theta - 1 = 0$ as $\cos\theta + 2 \neq 0$

$\Rightarrow \cos\theta = \frac{1}{2} = \cos 60°$ or $\cos\frac{\pi}{3}$

$\Rightarrow \theta = \frac{\pi}{3}$

181. (4) Expression

$= \sqrt{\frac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\frac{1-\sin\theta}{1+\sin\theta}}$

$= \sqrt{\frac{(1+\sin\theta)(1+\sin\theta)}{(1-\sin\theta)(1+\sin\theta)}} + \sqrt{\frac{(1-\sin\theta)(1-\sin\theta)}{(1+\sin\theta)(1-\sin\theta)}}$

$= \sqrt{\frac{(1+\sin\theta)^2}{1-\sin^2\theta}} + \sqrt{\frac{(1-\sin\theta)^2}{1-\sin^2\theta}}$

$= \sqrt{\frac{(1+\sin\theta)^2}{\cos^2\theta}} + \sqrt{\frac{(1-\sin\theta)^2}{\cos^2\theta}}$

$= \frac{1+\sin\theta}{\cos\theta} + \frac{1-\sin\theta}{\cos\theta}$

$= \frac{1+\sin\theta+1-\sin\theta}{\cos\theta} = \frac{2}{\cos\theta}$

$= 2\sec\theta$

182. (2) $\cos\theta = \frac{3}{5}$

$\therefore \sec\theta = \frac{5}{3}$

$\therefore \tan\theta = \sqrt{\sec^2\theta - 1}$

$= \sqrt{\left(\frac{5}{3}\right)^2 - 1}$

$= \sqrt{\frac{25}{9} - 1} = \sqrt{\frac{25-9}{9}} = \sqrt{\frac{16}{9}}$

$= \frac{4}{3}$

$\therefore \sin\theta \cdot \sec\theta \cdot \tan\theta = \frac{\sin\theta}{\cos\theta} \cdot \tan\theta$

$= \tan^2\theta = \left(\frac{4}{3}\right)^2 = \frac{16}{9}$

183. (4) $\tan^2A + \cot^2A - \sec^2A \cdot \text{cosec}^2A$

$= \tan^2A + \cot^2A - (1 + \tan^2A)(1 + \cot^2A)$

$= \tan^2A + \cot^2A - (1 + \tan^2A + \cot^2A + \cot^2A.\tan^2A)$

$= \tan^2A + \cot^2A - 1 - \tan^2A - \cot^2A - \cot^2A \cdot \tan^2A$

$= -1 - 1 = -2$

[$\tan A \cdot \cot A = 1$]

184. (4) $\sin(4\alpha - \beta) = 1 = \sin 90°$

$\Rightarrow 4\alpha - \beta = 90°$ ...(i)

$\cos(2\alpha + \beta) = \frac{1}{2} = \cos 60°$

$\Rightarrow 2\alpha + \beta = 60°$ ...(ii)

On adding equations (i) and (ii),

$4\alpha - \beta + 2\alpha + \beta = 90° + 60°$

$\Rightarrow 6\alpha = 150° \Rightarrow \alpha = \frac{150}{6} = 25°$

From equation (ii),

$2 \times 25 + \beta = 60°$

$\Rightarrow \beta = 60° - 50° = 10°$

$\therefore \sin(\alpha + 2\beta)$

$= \sin(25 + 2 \times 10)$

$= \sin 45° = \frac{1}{\sqrt{2}}$

185. (*) $\text{cosec}\theta = \sqrt{3}$

$\cot\theta = \sqrt{\text{cosec}^2\theta - 1}$

$= \sqrt{(\sqrt{3})^2 - 1} = \sqrt{3-1} = \sqrt{2}$

$\therefore \cot\theta - \text{cosec}\theta = \sqrt{2} - \sqrt{3}$

$= \frac{3(\sqrt{2} - \sqrt{3})}{3} = (\sqrt{2} - \sqrt{3})$

186. (2) $4\cos^2\theta - 4\cos\theta + 1 = 0$

$\Rightarrow (2\cos\theta - 1)^2 = 0$

$\Rightarrow 2\cos\theta - 1 = 0$

$\Rightarrow 2\cos\theta = 1$

$\Rightarrow \cos\theta = \frac{1}{2} = \cos 60°$

$\Rightarrow \theta = 60°$

$\therefore \tan(\theta - 15°) = \tan(60° - 15°) = \tan 45° = 1$

187. (1) $(r\cos\theta - \sqrt{3})^2 + (r\sin\theta - 1)^2 = 0$

$\Rightarrow r\cos\theta - \sqrt{3} = 0$ and $r\sin\theta - 1 = 0$

$\Rightarrow r\cos\theta = \sqrt{3}$ and $r\sin\theta = 1$

$\therefore r^2\cos^2\theta + r^2\sin^2\theta = 3 + 1$

$\Rightarrow r^2(\sin^2\theta + \cos^2\theta) = 4$

$\Rightarrow r^2 = 4 \Rightarrow r = 2$

$\therefore \tan\theta = \frac{r\sin\theta}{r\cos\theta} = \frac{1}{\sqrt{3}}$

and $r\cos\theta = \sqrt{3} \Rightarrow \cos\theta = \frac{\sqrt{3}}{r}$

$\Rightarrow \sec\theta = \frac{r}{\sqrt{3}}$

$\therefore \frac{r\tan\theta + \sec\theta}{r\sec\theta + \tan\theta} = \frac{\frac{r}{\sqrt{3}} + \frac{r}{\sqrt{3}}}{\frac{r^2}{\sqrt{3}} + \frac{1}{\sqrt{3}}}$

$= \frac{r\left(\frac{2}{\sqrt{3}}\right)}{\frac{r^2+1}{\sqrt{3}}}$

$= \frac{2r}{r^2+1} = \frac{2 \times 2}{4+1} = \frac{4}{5}$

188. (1)

$\frac{\sin 25°\cos 65° + \cos 25°\sin 65°}{\tan^2 70° - \text{cosec}^2 20°}$

$= \frac{\sin 25°\cos(90° - 25°) + \cos 25°\sin(90° - 25°)}{\tan^2 70° - \text{cosec}^2(90° - 70°)}$

$\left[\begin{array}{l} \because \sin(90° - \theta) = \cos\theta \\ \cos(90° - \theta) = \sin\theta \\ \text{cosec}(90° - \theta) = \sec\theta \end{array}\right]$

$= \frac{\sin 25°\sin 25° + \cos 25° . \cos 25°}{\tan^2 70° - \sec^2 70°}$

$= \frac{\sin^2 25° + \cos^2 25°}{\tan^2 70° - \sec^2 70°}$

$= \frac{1}{-1} = -1$

$\left[\begin{array}{l} \because \sec^2\theta - \tan^2\theta = 1 \\ \sin^2\theta + \cos^2\theta = 1 \end{array}\right]$

189. (1) $\sin(\theta + 18°) = \cos 60°$
$= \cos(90° - 30°) = \sin 30°$
$\Rightarrow \theta + 18° = 30°$
$\Rightarrow \theta = 30° - 18° = 12°$
$\therefore \cos 5\theta = \cos 60° = \frac{1}{2}$

190. (1) $\tan\theta = \frac{3}{4} \Rightarrow \tan^2\theta = \frac{9}{16}$

Expression

$$= \frac{4\sin^2\theta - 2\cos^2\theta}{4\sin^2\theta + 3\cos^2\theta}$$

$$= \frac{4\frac{\sin^2\theta}{\cos^2\theta} - 2\frac{\cos^2\theta}{\cos^2\theta}}{4\frac{\sin^2\theta}{\cos^2\theta} + 3\frac{\cos^2\theta}{\cos^2\theta}}$$

$$= \frac{4\tan^2\theta - 2}{4\tan^2\theta + 3}$$

$$= \frac{4 \times \frac{9}{16} - 2}{4 \times \frac{9}{16} + 3}$$

$$= \frac{\frac{9}{4} - 2}{\frac{9}{4} + 3} = \frac{9-8}{9+12} = \frac{1}{21}$$

191. (3) $\frac{\cos\alpha}{\cos\beta} = a$

$$\Rightarrow \frac{\cos^2\alpha}{\cos^2\beta} = a^2$$

$$\Rightarrow \frac{1-\sin^2\alpha}{1-\sin^2\beta} = a^2$$

$\Rightarrow 1 - \sin^2\alpha = a^2(1 - \sin^2\beta)$
$\Rightarrow 1 - b^2\sin^2\beta = a^2 - a^2\sin^2\beta$
$\Rightarrow 1 - a^2 = b^2\sin^2\beta - a^2\sin^2\beta$
$\Rightarrow 1 - a^2 = (b^2 - a^2)\sin^2\beta$

$$\Rightarrow \sin^2\beta = \frac{1-a^2}{b^2-a^2} = \frac{a^2-1}{a^2-b^2}$$

192. (1)

ABCD is a concyclic quadrilateral.
$\angle A + \angle C = \angle B + \angle D = 180°$
$\therefore \angle A = 180° - \angle C$
$\therefore \cos A = \cos(180° - C)$
$= -\cos C$
and $\cos B = -\cos D$
$\therefore \cos A + \cos B + \cos C + \cos D$
$= \cos A + \cos B - \cos A - \cos B = 0$

193. (3) $\sqrt{3}\tan\theta = 3\sin\theta$

$$\Rightarrow \sqrt{3}\frac{\sin\theta}{\cos\theta} = 3\sin\theta$$

$$\Rightarrow \sqrt{3} = 3\cos\theta$$

$$\Rightarrow \cos\theta = \frac{\sqrt{3}}{3} = \frac{1}{\sqrt{3}}$$

$$\therefore \sin\theta = \sqrt{1-\cos^2\theta}$$

$$= \sqrt{1-\frac{1}{3}} = \sqrt{\frac{2}{3}}$$

$$\therefore \sin^2\theta - \cos^2\theta = \left(\sqrt{\frac{2}{3}}\right)^2 - \left(\frac{1}{\sqrt{3}}\right)^2$$

$$= \frac{2}{3} - \frac{1}{3} = \frac{1}{3}$$

194. (3) $A = 45°$, $B = 30°$ (let)
$\therefore \sin(A + B) = \sin A \cdot \cos B + \cos A \cdot \sin B$
$\Rightarrow \sin(45° + 30°)$
$= \sin 45° \cdot \cos 30° + \cos 45° \cdot \sin 30°$

$$= \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \times \frac{1}{2}$$

$$= \frac{\sqrt{3}}{2\sqrt{2}} + \frac{1}{2\sqrt{2}} = \frac{\sqrt{3}+1}{2\sqrt{2}}$$

195. (4)

$\angle B = 90°$
$\angle A = 60°$
$\angle C = 180° - 90° - 60° = 30°$

$$\cos C = \frac{BC}{CA}$$

$$\Rightarrow \cos 30° = \frac{BC}{CA}$$

$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{BC}{CA} = \sqrt{3}:2$$

196. (2) $\tan 2\theta \cdot \tan 3\theta = 1$

$$\Rightarrow \tan 3\theta = \frac{1}{\tan 2\theta} = \cot 2\theta$$

$\Rightarrow \tan 3\theta = \tan(90° - 2\theta)$
$\Rightarrow 3\theta = 90° - 2\theta$
$\Rightarrow 3\theta + 2\theta = 5\theta = 90°$

$$\Rightarrow \theta = \frac{90°}{5} = 18°$$

197. (3) $\cos^2\alpha - \sin^2\alpha = \tan^2\beta$
$\Rightarrow \cos^2\alpha - (1 - \cos^2\alpha) = \tan^2\beta$
$\Rightarrow 2\cos^2\alpha - 1 = \tan^2\beta$
$\Rightarrow 2\cos^2\alpha = 1 + \tan^2\beta = \sec^2\beta$

$$\Rightarrow \cos^2\beta = \frac{1}{2\cos^2\alpha}$$

$\sin^2\beta = 1 - \cos^2\beta$

$$= 1 - \frac{1}{2\cos^2\alpha}$$

$$= \frac{2\cos^2\alpha - 1}{2\cos^2\alpha}$$

$\therefore \cos^2\beta - \sin^2\beta$

$$= \frac{1}{2\cos^2\alpha} - \frac{2\cos^2\alpha - 1}{2\cos^2\alpha}$$

$$= \frac{1 - 2\cos^2\alpha + 1}{2\cos^2\alpha}$$

$$= \frac{2(1-\cos^2\alpha)}{2\cos^2\alpha} = \frac{\sin^2\alpha}{\cos^2\alpha}$$

$= \tan^2\alpha$

Note : It is an identity.

198. (3) $\tan(A + B) = \sqrt{3} = \tan 60°$
$\Rightarrow A + B = 60°$ ...(i)

$$\tan(A - B) = \frac{1}{\sqrt{3}} = \tan 30°$$

$\Rightarrow A - B = 30°$ ...(ii)
$\therefore A + B + A - B = 60° + 30°$
$\Rightarrow 2A = 90°$

$$\Rightarrow A = \frac{90°}{2} = 45°$$

199. (3) Expression

$$= \frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$$

$$= \frac{\sin\theta(1 - 2\sin^2\theta)}{\cos\theta(2\cos^2\theta - 1)}$$

$= \frac{\sin\theta}{\cos\theta} \cdot \frac{(1-2(1-\cos^2\theta))}{(2\cos^2\theta-1)}$

$= \tan\theta \frac{(1+2\cos^2\theta-2)}{(2\cos^2\theta-1)}$

$= \tan\theta \cdot \frac{2\cos^2\theta-1}{2\cos^2\theta-1} = \tan\theta$

200. (4) $r\sin\theta = \frac{7}{2}$ ...(i)

$r\cos\theta = \frac{7\sqrt{3}}{2}$ ...(ii)

On squaring both equations and adding,

$r^2\sin^2\theta + r^2\cos^2\theta = \left(\frac{7}{2}\right)^2 + \left(\frac{7\sqrt{3}}{2}\right)^2$

$\Rightarrow r^2(\sin^2\theta + \cos^2\theta) = \frac{47}{4} + \frac{147}{4}$

$\Rightarrow r^2 = \frac{49+147}{4} = \frac{196}{4} = 49$

$\therefore r = \sqrt{49} = 7$

201. (4) $\sin\theta = \frac{1}{2} = \sin 30° = \sin\frac{\pi}{6}$

$\Rightarrow \theta = \frac{\pi}{6}$

[$\because$ 180° = π radian]

$\therefore \theta + \phi = \frac{\pi}{2} \Rightarrow \frac{\pi}{6} + \phi = \frac{\pi}{2}$

$\Rightarrow \phi = \frac{\pi}{2} - \frac{\pi}{6} = \frac{3\pi-\pi}{6}$

$= \frac{2\pi}{6} = \frac{\pi}{3}$

$\therefore \sin\phi = \sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$

202. (2) $2\sin^2\theta + 3\cos\theta = 3$

$\Rightarrow 2(1-\cos^2\theta) + 3\cos\theta = 3$

$\Rightarrow 2 - 2\cos^2\theta + 3\cos\theta = 3$

$\Rightarrow 2\cos^2\theta - 3\cos\theta + 1 = 0$

$\Rightarrow 2\cos^2\theta - 2\cos\theta - \cos\theta + 1 = 0$

$\Rightarrow 2\cos\theta(\cos\theta - 1) - 1(\cos\theta - 1) = 0$

$\Rightarrow (2\cos\theta - 1)(\cos\theta - 1) = 0$

$\Rightarrow 2\cos\theta - 1 = 0 \Rightarrow 2\cos\theta = 1$

$\Rightarrow \cos\theta = \frac{1}{2} \Rightarrow \theta = 60°$

or, $\cos\theta - 1 = 0 \Rightarrow \cos\theta = 1$

$\Rightarrow \theta = 0°$

203. (1) $2\sin^2\theta = 3\cos\theta$

$\Rightarrow 2(1-\cos^2\theta) = 3\cos\theta$

$\Rightarrow 2 - 2\cos^2\theta = 3\cos\theta$

$\Rightarrow 2\cos^2\theta + 3\cos\theta - 2 = 0$

$\Rightarrow 2\cos^2\theta + 4\cos\theta - \cos\theta - 2 = 0$

$\Rightarrow 2\cos\theta(\cos\theta + 2) - 1(\cos\theta + 2) = 0$

$\Rightarrow (2\cos\theta - 1)(\cos\theta + 2) = 0$

$\Rightarrow 2\cos\theta - 1 = 0$ because $\cos\theta + 2 \neq 0$

$\Rightarrow 2\cos\theta = 1$

$\Rightarrow \cos\theta = \frac{1}{2} = \cos 60°$

$\Rightarrow \theta = 60°$

204. (3) $a(\tan\theta + \cot\theta) = 1$

$\Rightarrow a\left(\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta}\right) = 1$

$\Rightarrow a\left(\frac{\sin^2\theta + \cos^2\theta}{\sin\theta.\cos\theta}\right) = 1$

$\Rightarrow \sin\theta \cdot \cos\theta = a$ ....(i)

$\sin\theta + \cos\theta = b$

On squaring both sides,

$\sin^2\theta + \cos^2\theta + 2\sin\theta \cdot \cos\theta = b^2$

$\Rightarrow 1 + 2a = b^2$

$\Rightarrow 2a = b^2 - 1$

205. (2) $\text{cosec}^2 A - \cot^2 A = 1$

$(\text{cosec } A + \cot A)(\text{cosec } A - \cot A) = 1$

$\text{cosec } A - \cot A = \frac{1}{3}$

$\text{cosec } A + \cot A = 3$

On adding,

$2\,\text{cosec } A = \frac{1}{3} + 3$

$= \frac{1+9}{3} = \frac{10}{3}$

$\Rightarrow \text{cosec } A = \frac{10}{3\times 2} = \frac{5}{3}$

$\therefore \sin A = \frac{3}{5}$

206. (1) $\sin^2 x + 2\tan^2 x - 2\sec^2 x + \cos^2 x$

$= \sin^2 x + \cos^2 x - 2\sec^2 x + 2\tan^2 x$

$= 1 - 2(\sec^2 x - \tan^2 x)$

$= 1 - 2 = -1$

[$\sec^2 x - \tan^2 x = 1$, $\sin^2 x + \cos^2 x = 1$]

207. (1) $x = a\sec\theta$

$\Rightarrow \frac{x}{a} = \sec\theta$

Again, $y = b\tan\theta$

$\Rightarrow \frac{y}{b} = \tan\theta$

$\therefore \frac{x^2}{a^2} - \frac{y^2}{b^2}$

$= \sec^2\theta - \tan^2\theta = 1$

208. (4) $\sin^2 1° + \sin^2 2° + \sin^2 3° + ... + \sin^2 89°$

$= (\sin^2 1° + \sin^2 89°) + (\sin^2 2° + \sin^2 88°) + ...$ to 44 terms $+ \sin^2 45°$

$= (\sin^2 1° + \sin^2(90° - 1°)) + (\sin^2 2° + \sin^2(90° - 2°)) + ...$to 44 terms $+ \left(\frac{1}{\sqrt{2}}\right)^2$

$= (\sin^2 1° + \cos^2 1°) + (\sin^2 2° + \cos^2 2°) + ...$to 44 terms $+ \frac{1}{2}$

[$\sin(90° - \theta) = \cos\theta$]

$= 1 + 1 + ...$to 44 terms $+ \frac{1}{2}$

[$\sin^2\theta + \cos^2\theta = 1$]

$= 44 + \frac{1}{2} = 44\frac{1}{2}$

209. (3) $\frac{\cos^3\theta + \sin^3\theta}{\cos\theta + \sin\theta} + \frac{\cos^3\theta - \sin^3\theta}{\cos\theta - \sin\theta}$

$= \frac{(\cos\theta + \sin\theta)(\cos^2\theta + \sin^2\theta - \cos\theta.\sin\theta)}{\cos\theta + \sin\theta}$

$+ \frac{(\cos\theta - \sin\theta)(\cos^2\theta + \sin^2\theta + \cos\theta.\sin\theta)}{(\cos\theta - \sin\theta)}$

$= \cos^2\theta + \sin^2\theta - \cos\theta \cdot \sin\theta + \cos^2\theta + \sin^2\theta + \cos\theta \cdot \sin\theta$

$= 1 + 1 = 2$

210. (4) $\sin 17° = \frac{x}{y}$

$\sin 73° = \sin(90° - 17°)$

$= \cos 17°$

$\therefore \cos 17° = \sqrt{1 - \sin^2 17°}$

$= \sqrt{1 - \frac{x^2}{y^2}} = \sqrt{\frac{y^2 - x^2}{y^2}}$

$= \frac{\sqrt{y^2 - x^2}}{y}$

$\therefore \sec 17° = \dfrac{y}{\sqrt{y^2 - x^2}}$

$\therefore \sec 17° - \sin 73°$

$= \sec 17° - \cos 17°$

$= \dfrac{y}{\sqrt{y^2 - x^2}} - \dfrac{\sqrt{y^2 - x^2}}{y}$

$= \dfrac{y^2 - (y^2 - x^2)}{y\sqrt{y^2 - x^2}}$

$= \dfrac{y^2 - y^2 + x^2}{y\sqrt{y^2 - x^2}}$

$= \dfrac{x^2}{y\sqrt{y^2 - x^2}}$

211. (3) $\text{cosec}\theta + \cot\theta = \sqrt{3}$ ...(i)

$\text{cosec}^2\theta - \cot^2\theta = 1$

$\Rightarrow (\text{cosec}\theta + \cot\theta)(\text{cosec}\theta - \cot\theta) = 1$

$\Rightarrow \text{cosec}\theta - \cot\theta = \dfrac{1}{\sqrt{3}}$ ...(ii)

$\therefore \text{cosec}\theta + \cot\theta + \text{cosec}\theta - \cot\theta =$

$\sqrt{3} + \dfrac{1}{\sqrt{3}}$

$\Rightarrow 2\,\text{cosec}\theta = \dfrac{3+1}{\sqrt{3}}$

$\Rightarrow \text{cosec}\theta = \dfrac{4}{2\sqrt{3}} = \dfrac{2}{\sqrt{3}}$

212. (3) $\cos\alpha + \sec\alpha = \sqrt{3}$

$\therefore \cos^3\alpha + \sec^3\alpha = (\cos\alpha + \sec\alpha)^3$

$- 3\cos\alpha \,.\, \sec\alpha\,(\cos\alpha + \sec\alpha)$

$= \left(\sqrt{3}\right)^3 - 3 \times \sqrt{3}$

$= 3\sqrt{3} - 3\sqrt{3} = 0$

213. (1) $\sin\theta + \cos\theta = \sqrt{2}\cos\theta$

$\Rightarrow \sqrt{2}\cos\theta - \cos\theta = \sin\theta$

$\Rightarrow \cos\theta\left(\sqrt{2} - 1\right) = \sin\theta$

$\Rightarrow \dfrac{\cos\theta}{\sin\theta} = \dfrac{1}{\sqrt{2} - 1}$

$= \dfrac{\sqrt{2} + 1}{(\sqrt{2} - 1)(\sqrt{2} + 1)} = \sqrt{2} + 1$

$\cot\theta = \sqrt{2} + 1$

214. (1) $\cos^4\theta - \sin^4\theta = \dfrac{2}{3}$

$\Rightarrow (\cos^2\theta + \sin^2\theta)(\cos^2\theta - \sin^2\theta)$

$= \dfrac{2}{3}$

$[\because \cos^2\theta + \sin^2\theta = 1]$

$\Rightarrow \cos^2\theta - \sin^2\theta = \dfrac{2}{3}$

$\Rightarrow 1 - \sin^2\theta - \sin^2\theta = \dfrac{2}{3}$

$\Rightarrow 1 - 2\sin^2\theta = \dfrac{2}{3}$

215. (1) $\dfrac{\cot 30° - \cot 75°}{\tan 15° - \tan 60°}$

$= \dfrac{\cot(90° - 60°) - \cot(90° - 15°)}{\tan 15° - \tan 60°}$

$= \dfrac{\tan 60° - \tan 15°}{\tan 15° - \tan 60°} = -1$

216. (3) $\sin\theta + \cos\theta = p$

$\sec\theta + \text{cosec}\,\theta = q$

$\Rightarrow \dfrac{1}{\cos\theta} + \dfrac{1}{\sin\theta} = q$

$\Rightarrow \dfrac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta} = q$

$\therefore q\,(p^2 - 1) = \left(\dfrac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta}\right)$

$((\sin\theta + \cos\theta)^2 - 1)$

$= \dfrac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta} \,.\, (\sin^2\theta + \cos^2\theta +$

$2\sin\theta.\cos\theta - 1)$

$= \dfrac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta} \,.\, 2\sin\theta \,.\, \cos\theta$

$= 2p$

217. (2) $\sin(3\alpha - \beta) = 1 = \sin 90°$

$\Rightarrow 3\alpha - \beta = 90°$ ... (i)

$\cos(2\alpha + \beta) = \dfrac{1}{2} = \cos 60°$

$\Rightarrow 2\alpha + \beta = 60°$ .... (ii)

By adding both equations,

$3\alpha + 2\alpha = 90° + 60°$

$\Rightarrow 5\alpha = 150$

$\Rightarrow \alpha = \dfrac{150}{5} = 30°$

$\therefore \tan\alpha = \tan 30° = \dfrac{1}{\sqrt{3}}$

218. (2) $\sin(60° - x) = \cos(y + 60°)$

$\Rightarrow \sin(60° - x) = \sin(90° - y - 60°)$

$[\because \sin(90° - \theta) = \cos\theta)$

$\Rightarrow 60° - x$

$= 90° - y - 60° = 30° - y$

$\Rightarrow x - y = 60° - 30°$

$\Rightarrow x - y = 30°$

$\therefore \sin(x - y) = \sin 30° = \dfrac{1}{2}$

219. (3) $x = a\sec\theta \Rightarrow \dfrac{x}{a} = \sec\theta$

and, $y = b\tan\theta \Rightarrow \dfrac{y}{b} = \tan\theta$

$\therefore \dfrac{x^2}{a^2} - \dfrac{y^2}{b^2} = \sec^2\theta - \tan^2\theta = 1$

220. (4) $a^2 + b^2 + c^2 = ab + bc + ca$

$\Rightarrow 2a^2 + 2b^2 + 2c^2 = 2ab + 2bc + 2ca$

$\Rightarrow a^2 + b^2 + b^2 + c^2 + c^2 + a^2 - 2ab - 2bc - 2ca = 0$

$\Rightarrow a^2 + b^2 - 2ab + b^2 + c^2 - 2bc + c^2 + a^2 - 2ca = 0$

$\Rightarrow (a - b)^2 + (b - c)^2 + (c - a)^2 = 0$

$\Rightarrow a - b = 0 \Rightarrow a = b$

$b - c = 0 \Rightarrow b = c$

$c - a = 0 \Rightarrow c = a$

$\therefore \Delta ABC$ is an equilateral triangle.

$\therefore \angle A = \angle B = \angle C = 60°$

$\therefore \sin^2 A + \sin^2 B + \sin^2 C$

$= 3\sin^2 A = 3 \times \sin^2 60°$

$= 3 \times \left(\dfrac{\sqrt{3}}{2}\right)^2$

$= \dfrac{3 \times 3}{4} = \dfrac{9}{4}$

221. (3) $a\sin\theta + b\cos\theta = c$ .... (i)

$a\cos\theta - b\sin\theta = x$ (let) ... (ii)

On squaring equations (i) and (ii) and adding,

$a^2\sin^2\theta + b^2\cos^2\theta + 2ab\sin\theta.\cos\theta + a^2\cos^2\theta + b^2\sin^2\theta - 2ab\sin\theta.\cos\theta = c^2 + x^2$

$\Rightarrow a^2(\sin^2\theta + \cos^2\theta) + b^2(\cos^2\theta + \sin^2\theta) = c^2 + x^2$

$\Rightarrow a^2 + b^2 = c^2 + x^2$

$\Rightarrow x^2 = a^2 + b^2 - c^2$

$\Rightarrow x = \pm\sqrt{a^2 + b^2 - c^2}$

222. (3) $\sin\theta + \cos\theta = \sqrt{2}\ \sin(90° - \theta)$

$\Rightarrow \sin\theta + \cos\theta = \sqrt{2}\ \cos\theta$

$\Rightarrow \sin\theta = \sqrt{2}\ \cos\theta - \cos\theta$

$\Rightarrow \sin\theta = \cos\theta\ (\sqrt{2} - 1)$

$\Rightarrow \dfrac{\cos\theta}{\sin\theta} = \dfrac{1}{\sqrt{2}-1}$

$\Rightarrow \cot\theta = \dfrac{1}{\sqrt{2}-1}$

$\Rightarrow \cot\theta = \dfrac{1}{\sqrt{2}-1} \times \dfrac{(\sqrt{2}+1)}{(\sqrt{2}+1)}$

$= \dfrac{\sqrt{2}+1}{2-1} = \sqrt{2} + 1$

223. (1) $3(\sec^2\theta + \tan^2\theta) = 5$

$\Rightarrow \sec^2\theta + \tan^2\theta = \dfrac{5}{3}$

$\Rightarrow \sec^2\theta + \sec^2\theta - 1 = \dfrac{5}{3}$

$\Rightarrow 2\sec^2\theta = \dfrac{5}{3} + 1 = \dfrac{8}{3}$

$\Rightarrow \sec^2\theta = \dfrac{4}{3} \Rightarrow \sec\theta = \dfrac{2}{\sqrt{3}}$

$\Rightarrow \cos\theta = \dfrac{\sqrt{3}}{2} = \cos 30°$

$\Rightarrow \theta = 30°$

$\therefore \cos 2\theta = \cos 60° = \dfrac{1}{2}$

224. (3) $x.\cos^2 30° . \sin 60°$

$= \dfrac{\tan^2 45°.\sec 60°}{\operatorname{cosec} 60°}$

$\Rightarrow x.\left(\dfrac{\sqrt{3}}{2}\right)^2 . \dfrac{\sqrt{3}}{2} = \dfrac{1\times 2}{\frac{2}{\sqrt{3}}}$

$\Rightarrow x \times \dfrac{3}{4} \times \dfrac{\sqrt{3}}{2} = \sqrt{3}$

$\Rightarrow x = \dfrac{\sqrt{3}\times 8}{3\sqrt{3}} = \dfrac{8}{3} = 2\dfrac{2}{3}$

225. (2) $\tan\alpha = 2$

$\therefore \dfrac{\operatorname{cosec}^2\alpha - \sec^2\alpha}{\operatorname{cosec}^2\alpha + \sec^2\alpha}$

$= \dfrac{1+\cot^2\alpha - 1 - \tan^2\alpha}{1+\cot^2\alpha + 1 + \tan^2\alpha}$

$= \dfrac{\cot^2\alpha - \tan^2\alpha}{\cot^2\alpha + \tan^2\alpha + 2}$

$= \dfrac{\frac{1}{4} - 4}{\frac{1}{4} + 4 + 2} = \dfrac{\frac{1-16}{4}}{\frac{1+16+8}{4}}$

$= \dfrac{-15}{25} = \dfrac{-3}{5}$

226. (3) $\sin(\theta + 30°) = \dfrac{3}{\sqrt{12}}$

$= \dfrac{3}{2\sqrt{3}} = \dfrac{\sqrt{3}}{2}$

$\Rightarrow \sin(\theta + 30°) = \sin 60°$

$\Rightarrow \theta + 30° = 60°$

$\Rightarrow \theta = 60 - 30 = 30°$

$\therefore \cos^2\theta = \cos^2 30°$

$= \left(\dfrac{\sqrt{3}}{2}\right)^2 = \dfrac{3}{4}$

227. (1) $4\cos^2\theta - 4\sqrt{3}\ \cos\theta + 3 = 0$

$\Rightarrow (2\cos\theta)^2 - 2.2\cos\theta.\sqrt{3} + (\sqrt{3})^2 = 0$

$\Rightarrow (2\cos\theta - \sqrt{3})^2 = 0$

$\Rightarrow 2\cos\theta - \sqrt{3} = 0$

$\Rightarrow 2\cos\theta = \sqrt{3}$

$\Rightarrow \cos\theta = \dfrac{\sqrt{3}}{2} = \cos 30°$

$\Rightarrow \theta = 30°$

228. (3) $\sec\theta - \cos\theta = \dfrac{3}{2}$

$\Rightarrow \sec\theta - \dfrac{1}{\sec\theta} = \dfrac{3}{2}$

$\Rightarrow \dfrac{\sec^2\theta - 1}{\sec\theta} = \dfrac{3}{2}$

$\Rightarrow 2\sec^2\theta - 2 = 3\sec\theta$

$\Rightarrow 2\sec^2\theta - 3\sec\theta - 2 = 0$

$\Rightarrow 2\sec^2\theta - 4\sec\theta + \sec\theta - 2 = 0$

$\Rightarrow 2\sec\theta(\sec\theta - 2) + 1(\sec\theta - 2) = 0$

$\Rightarrow (2\sec\theta + 1)(\sec\theta - 2) = 0$

$\Rightarrow \sec\theta = 2$ because $2\sec\theta + 1 \neq 0$

θ is positive acute angle.

229. (2) $\tan(5x - 10°) = \cot(5y + 20°)$

$\Rightarrow \tan(5x - 10°) = \tan(90° - (5y + 20°))$

$\Rightarrow 5x - 10° = 90° - 5y - 20°$

$\Rightarrow 5x + 5y = 70° + 10°$

$\Rightarrow 5(x + y) = 80°$

$\Rightarrow x + y = \dfrac{80°}{5} = 16°$

230. (4) $\sin\theta + \sin^2\theta = 1$

$\Rightarrow \sin\theta = 1 - \sin^2\theta = \cos^2\theta$

Now, $\cos^{12}\theta + 3\cos^{10}\theta + 3\cos^8\theta + \cos^6\theta - 1$

$= (\cos^4\theta + \cos^2\theta)^3 - 1$

$= (\sin^2\theta + \cos^2\theta)^3 - 1 = 1 - 1 = 0$

231. (3) $\tan 11°.\tan 17°.\tan 79°.\tan 73°$

$= \tan 11°.\tan 17°.\tan(90° - 11°).\tan(90° - 17°)$

$= \tan 11°.\tan 17°.\cot 11°.\cot 17°$

$= \tan 11°.\cot 11°.\tan 17°.\cot 17°$

$= 1 \times 1 = 1$

[$\because \tan(90° - \theta) = \cot\theta$; $\tan\theta . \cot\theta = 1$]

232. (2) $\sin A + \sin^2 A = 1$

$\Rightarrow \sin A = 1 - \sin^2 A = \cos^2 A$

$\therefore \cos^2 A + \cos^4 A$

$= \cos^2 A + (\cos^2 A)^2$

$= \cos^2 A + \sin^2 A = 1$

233. (3) $(1 + \sec 20° + \cot 70°)(1 - \operatorname{cosec} 20° + \tan 70°)$

$= (1 + \sec 20° + \tan 20°)(1 - \operatorname{cosec} 20° + \cot 20°)$

[$\because \tan(90° - \theta) = \cot\theta$; $\cot(90° - \theta) = \tan\theta$]

$= \left(1 + \dfrac{1}{\cos 20°} + \dfrac{\sin 20°}{\cos 20°}\right)$

$\left(1 - \dfrac{1}{\sin 20°} + \dfrac{\cos 20°}{\sin 20°}\right)$

$= \dfrac{\cos 20° + 1 + \sin 20°}{\cos 20°} . \dfrac{\sin 20° - 1 + \cos 20°}{\sin 20°}$

$= \dfrac{(\cos 20° + \sin 20°)^2 - 1}{\sin 20°.\cos 20°}$

$= \dfrac{\cos^2 20° + \sin^2 20° + 2\sin 20°.\cos 20° - 1}{\sin 20°.\cos 20°}$

$= \dfrac{1+2\sin 20°.\cos 20°-1}{\sin 20°.\cos 20°} = 2$

234. (1) $\dfrac{\tan A - \sec A - 1}{\tan A + \sec A + 1}$

$= \dfrac{\tan A - \sec A - (\sec^2 A - \tan^2 A)}{\tan A + \sec A + 1}$

$= \dfrac{(\tan A - \sec A) - (\sec A - \tan A)(\sec A + \tan A)}{\tan A + \sec A + 1}$

$= \dfrac{(\tan A - \sec A) + (\tan A - \sec A)(\sec A + \tan A)}{\tan A + \sec A + 1}$

$= \dfrac{(\tan A - \sec A)(1 + \sec A + \tan A)}{\tan A + \sec A + 1}$

$= \tan A - \sec A = \dfrac{\sin A}{\cos A} - \dfrac{1}{\cos A}$

$= \dfrac{\sin A - 1}{\cos A}$

235. (4) $2 \sin\alpha + 15 \cos^2\alpha = 7$

$\Rightarrow 2 \sin\alpha + 15 (1 - \sin^2\alpha) = 7$

$\Rightarrow 2 \sin\alpha + 15 - 15 \sin^2\alpha = 7$

$\Rightarrow 15 \sin^2\alpha - 2 \sin\alpha - 15 + 7 = 0$

$\Rightarrow 15 \sin^2\alpha - 2 \sin\alpha - 8 = 0$

$\Rightarrow 15 \sin^2\alpha - 12 \sin\alpha + 10 \sin\alpha - 8 = 0$

$\Rightarrow 3 \sin\alpha (5 \sin\alpha - 4) + 2 (5 \sin\alpha - 4) = 0$

$\Rightarrow (3 \sin\alpha + 2) (5 \sin\alpha - 4) = 0$

$\Rightarrow 5 \sin\alpha - 4 = 0 \Rightarrow \sin\alpha = \dfrac{4}{5}$

$\sin\alpha \neq -\dfrac{2}{3}$ because α is acute angle.

$\therefore \operatorname{cosec}\alpha = \dfrac{1}{\sin\alpha} = \dfrac{5}{4}$

$\therefore \cot\alpha = \sqrt{\operatorname{cosec}^2\alpha - 1}$

$= \sqrt{\left(\dfrac{5}{4}\right)^2 - 1} = \sqrt{\dfrac{25}{16} - 1}$

$= \sqrt{\dfrac{25-16}{16}} = \sqrt{\dfrac{9}{16}} = \dfrac{3}{4}$

236. (4) Let, A = 45°

B = 30°

sin (A – B)

= sin A. cos B – cos A. sin B

$\Rightarrow$ sin (45° – 30°)

= sin 45°. cos 30° – cos 45°. sin 30°

$\Rightarrow$ sin 15°

$= \dfrac{1}{\sqrt{2}} \times \dfrac{\sqrt{3}}{2} - \dfrac{1}{\sqrt{2}} \times \dfrac{1}{2}$

$= \dfrac{\sqrt{3}}{2\sqrt{2}} - \dfrac{1}{2\sqrt{2}} = \dfrac{\sqrt{3}-1}{2\sqrt{2}}$

237. (2) $\sec x + \cos x = 2$

$\Rightarrow \dfrac{1}{\cos x} + \cos x = 2$

$\Rightarrow \dfrac{1+\cos^2 x}{\cos x} = 2$

$\Rightarrow \cos^2 x + 1 = 2 \cos x$

$\Rightarrow \cos^2 x - 2 \cos x + 1 = 0$

$\Rightarrow (\cos x - 1)^2 = 0 \Rightarrow \cos -1 = 0$

$\Rightarrow \cos = 1$

$\therefore \sec x = 1$

$\therefore \sec^{16} x + \cos^{16} x = 1 + 1 = 2$

238. (1) $\sin^4\theta + \cos^4\theta = 2 \sin^2\theta. \cos^2\theta$

$\Rightarrow \sin^4\theta + \cos^4\theta - 2 \sin^2\theta. \cos^2\theta = 0$

$\Rightarrow (\sin^2\theta - \cos^2\theta)^2 = 0$

$\Rightarrow \sin^2\theta - \cos^2\theta = 0$

$\Rightarrow \sin^2\theta = \cos^2\theta$

$= \tan^2\theta = 1 \Rightarrow \tan\theta = +1$

$\because$ θ is acute angle.

239. (2) Expression

$= \sin^4\theta + \cos^4\theta$

$= (\sin^2\theta)^2 + (\cos^2\theta)^2$

$= (\sin^2\theta + \cos^2\theta)^2 - 2 \sin^2\theta. \cos^2\theta.$

$= 1 - 2 \sin^2\theta. \cos^2\theta.$

$= 1 - \dfrac{4\sin^2\theta.\cos^2\theta}{2}$

[$\because \sin 2\theta = 2 \sin\theta . \cos\theta$]

$= 1 - \dfrac{\sin^2 2\theta}{2}$

$= 1 - \dfrac{1-\cos 4\theta}{4}$

[$\because 1 - \cos 2\theta = 2\cos^2\theta$]

$= 1 - \dfrac{1}{4} + \dfrac{\cos 4\theta}{4}$

$= 1 - \dfrac{1}{4} + \dfrac{1}{4} = 1$

($\cos 4\theta \leq 1$)

OR

The value of $\sin^4\theta + \cos^4\theta$ will be maximum if $\theta = 0°$

$\therefore$ Required value = $(\sin 0)^4 + (\cos 0)^4 = 0 + 1 = 1$

240. (2) tan 86° = cot (90° – 86°)

= cot 4°.

tan 47° = cot (90° – 47°)

= cot 43°

$\therefore$ (tan 4°. tan 86°) (tan 43°.tan 47°)

= (tan 4° : cot 4°) (tan 43°.cot 43°)

= 1 ($\because$ $\tan\theta . \cot\theta = 1$)

241. (2) $x \cos\theta - \sin\theta = 1$

$\Rightarrow x \cos\theta = 1 + \sin\theta$

$\Rightarrow x = \dfrac{1}{\cos\theta} + \dfrac{\sin\theta}{\cos\theta}$

$\Rightarrow x = \sec\theta + \tan\theta$ --- (i)

$\because \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta + \tan\theta) (\sec\theta - \tan\theta) = 1$

$\Rightarrow \sec\theta - \tan\theta = \dfrac{1}{x}$ (ii)

From equation (i) + (ii),

$2\sec\theta = x + \dfrac{1}{x} = \dfrac{x^2+1}{x}$

$\Rightarrow \sec\theta = \dfrac{x^2+1}{2x}$

From equation (i) – (ii),

$2\tan\theta = x - \dfrac{1}{x} = \dfrac{x^2-1}{x}$

$\therefore \tan\theta = \dfrac{x^2-1}{2x}$

$\therefore \sin\theta = \dfrac{\tan\theta}{\sec\theta}$

$= \dfrac{x^2-1}{2x} \times \dfrac{2x}{x^2+1} = \dfrac{x^2-1}{x^2+1}$

$\therefore$ Expression $= x^2 - (1 + x^2) \sin\theta$

$= x^2 - (1 + x^2) \times \dfrac{x^2-1}{x^2+1}$

$= x^2 - x^2 + 1 = 1$

Note : In the original equation $x^2 + (1 + x^2) \sin\theta$ has been given that seems incorrect.

242. (2) $\sin\theta + \sin^2\theta = 1$

$\Rightarrow \sin\theta = 1 - \sin^2\theta = \cos^2\theta$

$\therefore \cos^2\theta + \cos^4\theta$

$= \cos^2\theta + (\cos^2\theta)^2$

$= \cos^2\theta + \sin^2\theta = 1$

243. (2) $\dfrac{\cos^2 45°}{\sin^2 60°} + \dfrac{\cos^2 60°}{\sin^2 45°} - \dfrac{\tan^2 30°}{\cot^2 45°} - \dfrac{\sin^2 30°}{\cot^2 30°}$

$= \dfrac{\left(\frac{1}{\sqrt{2}}\right)^2}{\left(\frac{\sqrt{3}}{2}\right)^2} + \dfrac{\left(\frac{1}{2}\right)^2}{\left(\frac{1}{\sqrt{2}}\right)^2} - \dfrac{\left(\frac{1}{\sqrt{3}}\right)^2}{(1)^2} - \dfrac{\left(\frac{1}{2}\right)^2}{\left(\sqrt{3}\right)^2}$

$= \dfrac{1}{2} \times \dfrac{4}{3} + \dfrac{1}{4} \times 2 - \dfrac{1}{3} \times 1 - \dfrac{1}{4 \times 3}$

$= \dfrac{2}{3} + \dfrac{1}{2} - \dfrac{1}{3} - \dfrac{1}{12}$

$= \dfrac{8+6-4-1}{12} = \dfrac{9}{12} = \dfrac{3}{4}$

244. (1) $\tan(90° - \theta) = \cot\theta$

$\tan\theta.\cot\theta = 1$

$\tan 89° = \tan(90° - 1°)$

$= \cot 1°.$

$\tan 88° = \tan(90° - 2°)$

$= \cot 2°.$

$\therefore$ Expression = $(\tan 1°.\tan 89°)$ $(\tan 2°.\tan 88°)$ ---- $\tan 45°$

$= (\tan 1°.\cot 1°).(\tan 2°.\cot 2°)$ ---- $\tan 45°$

$= 1.1$ ----$1 = 1$

245. (3) $\dfrac{\cos\alpha}{\sin\beta} = n$ and $\dfrac{\cos\alpha}{\cos\beta} = m$

$\Rightarrow \cos\alpha = n\sin\beta$ and

$\cos\alpha = m\cos\beta.$

$\therefore n^2\sin^2\beta = m^2\cos^2\beta$

$\Rightarrow n^2(1 - \cos^2\beta) = m^2\cos^2\beta$

$\Rightarrow n^2 - n^2\cos^2\beta = m^2\cos^2\beta$

$\Rightarrow m^2\cos^2\beta + n^2\cos^2\beta = n^2$

$\Rightarrow \cos^2\beta\,(m^2 + n^2) = n^2$

$\Rightarrow \cos^2\beta = \dfrac{n^2}{m^2+n^2}$

246. (3)

$\sin A.\cos A(\tan A - \cot A)$

$= \sin A.\cos A\left(\dfrac{\sin A}{\cos A} - \dfrac{\cos A}{\sin A}\right)$

$= \sin A.\cos A\left(\dfrac{\sin^2 A - \cos^2 A}{\sin A.\cos A}\right)$

$= \sin^2 A - \cos^2 A$

$= \sin^2 A - (1 - \sin^2 A)$

$= \sin^2 A - 1 + \sin^2 A$

$= 2\sin^2 A - 1$

247. (2) $\tan^2\theta + \dfrac{1}{\tan^2\theta} = 2$

$\Rightarrow \dfrac{\tan^4\theta + 1}{\tan^2\theta} = 2$

$\Rightarrow \tan^4\theta + 1 = 2\tan^2\theta$

$\Rightarrow \tan^4\theta - 2\tan^2\theta + 1 = 0$

$\Rightarrow (\tan^2\theta - 1)^2 = 0$

$\Rightarrow \tan^2\theta - 1 = 0$

$\Rightarrow \tan^2\theta = 1$

$\Rightarrow \tan\theta = 1 = \tan 45°$

$\Rightarrow \theta = 45°$ $\because$ θ is an acute angle

248. (1) $\tan\theta + \cot\theta = 5$

On squaring both sides,

$(\tan\theta + \cot\theta)^2 = 5^2$

$\Rightarrow \tan^2\theta + \cot^2\theta + 2\tan\theta.\cot\theta$

$= 25$

$\Rightarrow \tan^2\theta + \cot^2\theta = 25 - 2 = 23$

$[\because \tan\theta.\cot\theta = 1]$

249. (1) $\sin^2 22° + \sin^2 68° + \cot^2 30°$

$= \sin^2 22° + \sin^2(90° - 22°) + \left(\sqrt{3}\right)^2$

$= \sin^2 22° + \cos^2 22° + 3$

$[\because \sin^2\theta + \cos^2\theta = 1]$

$= 1 + 3 = 4$

250. (3) $2\sin^2\theta + 3\cos^2\theta$

$= 2\sin^2\theta + 2\cos^2\theta + \cos^2\theta$

$= 2(\sin^2\theta + \cos^2\theta) + \cos^2\theta$

$= 2 + \cos^2\theta$

$\therefore$ Minimum value $= 2 + 0 = 2$

because $\cos^2\theta \geq 0$

251. (4) $\tan(4\theta - 50°) = \cot(50° - \theta)$

$\Rightarrow \tan(4\theta - 50°)$

$= \tan(90° - (50° - \theta))$

$\Rightarrow 4\theta - 50° = 90° - (50° - \theta)$

$\Rightarrow 4\theta - 50° = 90° - 50° + \theta$

$\Rightarrow 4\theta - 50° = 40° + \theta$

$\Rightarrow 4\theta - \theta = 40° + 50°$

$\Rightarrow 3\theta = 90° \Rightarrow \theta = \dfrac{90°}{3} = 30°$

252. (4) $5\sin\theta = 3 \Rightarrow \sin\theta = \dfrac{3}{5}$

Expression $= \dfrac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta}$

$= \dfrac{\frac{1}{\cos\theta} - \frac{\sin\theta}{\cos\theta}}{\frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta}} = \dfrac{\frac{1-\sin\theta}{\cos\theta}}{\frac{1+\sin\theta}{\cos\theta}}$

$= \dfrac{1-\sin\theta}{1+\sin\theta} = \dfrac{1 - \frac{3}{5}}{1 + \frac{3}{5}} = \dfrac{5-3}{5+3}$

$= \dfrac{2}{8} = \dfrac{1}{4}$

253. (4) $\sec\theta + \tan\theta = p$ .....(i)

$\because \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta + \tan\theta)(\sec\theta - \tan\theta)$

$= 1$

$\Rightarrow \sec\theta - \tan\theta = \dfrac{1}{p}$ .....(ii)

On adding both the equations,

$2\sec\theta = p + \dfrac{1}{p}$

$\Rightarrow \sec\theta = \dfrac{1}{2}\left(p + \dfrac{1}{p}\right)$

254. (1) $1 + \cos^2\theta = 3\sin\theta.\cos\theta$

Dividing both sides by $\sin^2\theta$,

$\dfrac{1}{\sin^2\theta} + \dfrac{\cos^2\theta}{\sin^2\theta} = \dfrac{3\sin\theta\cos\theta}{\sin^2\theta}$

$\Rightarrow \operatorname{cosec}^2\theta + \cot^2\theta = 3\cot\theta$

$\Rightarrow 1 + \cot^2\theta + \cot^2\theta = 3\cot\theta$

$\Rightarrow 2\cot^2\theta - 3\cot\theta + 1 = 0$

$\Rightarrow 2\cot^2\theta - 2\cot\theta - \cot\theta + 1 = 0$

$\Rightarrow 2\cot^2\theta(\cot\theta - 1) - 1(\cot\theta - 1) = 0$

$\Rightarrow (2\cot\theta - 1)(\cot\theta - 1) = 0$

$\Rightarrow \cot\theta = \dfrac{1}{2}$ or 1

255. (4) Expression

$= 3(\sin^4\theta + \cos^4\theta) + 2(\sin^6\theta + \cos^6\theta) + 12\sin^2\theta.\cos^2\theta$

$= 3\{(\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta.\cos^2\theta\}$

$+ 2\{(\sin^2\theta + \cos^2\theta)^3 - 3\sin^2\theta.\cos^2\theta(\sin^2\theta + \cos^2\theta) + 12\sin^2\theta.\cos^2\theta$

$[\because a^2 + b^2 = (a+b)^2 - 2ab$; $a^3 + b^3 = (a+b)^3 - 3ab(a+b)]$

$= 3(1 - 2\sin^2\theta.\cos^2\theta) + 2(1 - 3\sin^2\theta.\cos^2\theta) + 12\sin^2\theta.\cos^2\theta = 3 - 6\sin^2\theta.\cos^2\theta + 2 - 6$

$\sin^2\theta \cos^2\theta + 12 \sin^2\theta . \cos^2\theta = 5$

256. (2) $\sec\theta + \tan\theta = 2 + \sqrt{5}$

$\because \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

$\Rightarrow \sec\theta - \tan\theta = \dfrac{1}{\sqrt{5}+2}$

$= \dfrac{1}{\sqrt{5}+2} \times \dfrac{\sqrt{5}-2}{\sqrt{5}-2} = \dfrac{\sqrt{5}-2}{5-4}$

$= \sqrt{5} - 2$

$\therefore \sec\theta + \tan\theta + \sec\theta - \tan\theta$

$= 2 + \sqrt{5} + \sqrt{5} - 2$

$\Rightarrow 2\sec\theta = 2\sqrt{5}$

$\Rightarrow \sec\theta = \sqrt{5}$ ....(i)

Again,

$\sec\theta + \tan\theta - (\sec\theta - \tan\theta)$

$= 2 + \sqrt{5} - \sqrt{5} + 2$

$\Rightarrow 2\tan\theta = 4 \Rightarrow \tan\theta = 2$ ....(ii)

$\therefore \sin\theta = \dfrac{\tan\theta}{\sec\theta} = \dfrac{2}{\sqrt{5}}$

257. (2) $\dfrac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = 2\dfrac{51}{79}$

$= \dfrac{158+51}{79} = \dfrac{209}{79}$

By componendo and dividendo,

$\dfrac{\sec\theta + \tan\theta + \sec\theta - \tan\theta}{\sec\theta + \tan\theta - \sec\theta + \tan\theta}$

$= \dfrac{209+79}{209-79}$

$\Rightarrow \dfrac{2\sec\theta}{2\tan\theta} = \dfrac{288}{130}$

$\Rightarrow \dfrac{\sec\theta}{\tan\theta} = \dfrac{144}{65}$

$\therefore \sin\theta = \dfrac{\tan\theta}{\sec\theta} = \dfrac{65}{144}$

258. (2) $\tan A + \cot A = 2$

$\Rightarrow \tan A + \dfrac{1}{\tan A} = 2$

$\Rightarrow \dfrac{\tan^2 A + 1}{\tan A} = 2$

$\Rightarrow \tan^2 A + 1 = 2\tan A$

$\Rightarrow \tan^2 A - 2\tan A + 1 = 0$

$\Rightarrow (\tan A - 1)^2 = 0$

$\Rightarrow \tan A - 1 = 0 \quad \Rightarrow \tan A = 1$

$\Rightarrow \cot A = 1$

$\therefore \tan^{10} A + \cot^{10} A = 1 + 1 = 2$

259. (4) $\cos^2 30° + \sin^2 60° + \tan^2 45° + \sec^2 60° + \cos 0°$

$= \left(\dfrac{\sqrt{3}}{2}\right)^2 + \left(\dfrac{\sqrt{3}}{2}\right)^2 + (1)^2 + (2)^2 + 1$

$= \dfrac{3}{4} + \dfrac{3}{4} + 1 + 4 + 1$

$= 6 + \dfrac{3+3}{4}$

$= 6 + \dfrac{6}{4} = 6 + \dfrac{3}{2} = \dfrac{12+3}{2}$

$= \dfrac{15}{2} = 7\dfrac{1}{2}$

260. (4) $\cos x + \cos^2 x = 1$

$\Rightarrow \cos x = 1 - \cos^2 x$

$= \sin^2 x$ ..... (i)

$\therefore \sin^8 x + 2\sin^6 x + \sin^4 x$

$= (\sin^4 x + \sin^2 x)^2$

$= ((\cos x)^2 + \sin^2 x)^2$

$= (\cos^2 x + \sin^2 x)^2 = 1$

261. (3)

In ΔABC,

$AB^2 = AC^2 + BC^2$

$\Rightarrow c^2 = a^2 + b^2$ ..... (i)

From ΔABC,

$\text{cosec } B = \dfrac{AB}{AC} = \dfrac{c}{b}$ ..... (ii)

$\cos A = \dfrac{AC}{AB} = \dfrac{b}{c}$

$\therefore \text{cosec } B - \cos A = \dfrac{c}{b} - \dfrac{b}{c}$

$= \dfrac{c^2 - b^2}{bc} = \dfrac{a^2}{bc}$

262. (1) $\tan\theta - \cot\theta = 0$

$\Rightarrow \tan\theta = \cot\theta$

$\Rightarrow \tan\theta = \tan(90° - \theta)$

$\Rightarrow \theta = 90° - \theta$

$\Rightarrow 2\theta = 90°$

$\Rightarrow \theta = 45°$

$\therefore \dfrac{\tan(\theta + 15°)}{\tan(\theta - 15°)}$

$= \dfrac{\tan(45° + 15°)}{\tan(45° - 15°)} = \dfrac{\tan 60°}{\tan 30°}$

$= \dfrac{\sqrt{3}}{\frac{1}{\sqrt{3}}} = \sqrt{3} \times \sqrt{3} = 3$

263. (1) Expression = $(\cot 41° . \cot 49°) . (\cot 42° . \cot 48°) (\cot 43° . \cot 47°) . (\cot 44° . \cot 46°) . \cot 45°$

$= \cot 41° . \tan(90° - 49°) . \cot 42° . \tan(90° - 48°) . \cot 43° . \tan(90° - 47°) . \cot 44° . \tan(90° - 46°).1$

$= (\cot 41° . \tan 41°)(\cot 42° . \tan 42°) . (\cot 43° . \tan 43°). (\cot 44° . \tan 44°) . 1 = 1$

[$\because \tan(90° - \theta) = \cot\theta$; $\tan\theta . \cot\theta = 1$]

264. (4) $x = a\sin\theta - b\cos\theta$ --- (i)

$y = a\cos\theta + b\sin\theta$ - (ii)

On squaring and adding both the equations,

$x^2 + y^2 = (a\sin\theta - b\cos\theta)^2 + (a\cos\theta + b\sin\theta)^2$

$= a^2\sin^2\theta + b^2\cos^2\theta - 2ab\sin\theta . \cos\theta + a^2\cos^2\theta + b^2\sin^2\theta + 2ab\sin\theta . \cos\theta$

$= a^2(\sin^2\theta + \cos^2\theta) + b^2(\cos^2\theta + \sin^2\theta)$

$= a^2 + b^2$

[$\because \sin^2\theta + \cos^2\theta = 1$]

265. (1) $\sec\theta - \tan\theta = \dfrac{1}{\sqrt{3}}$ ....(i)

$\because \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

$\Rightarrow \sec\theta + \tan\theta = \sqrt{3}$ ....(ii)

On adding equations (i) and (ii),

$2\sec\theta = \sqrt{3} + \dfrac{1}{\sqrt{3}}$

$= \dfrac{3+1}{\sqrt{3}} = \dfrac{4}{\sqrt{3}}$

$\Rightarrow \sec\theta = \dfrac{2}{\sqrt{3}}$

Again, by equation (ii) – (i),

$2\tan\theta = \sqrt{3} - \dfrac{1}{\sqrt{3}}$

$= \dfrac{3-1}{\sqrt{3}} = \dfrac{2}{\sqrt{3}}$

$\Rightarrow \tan\theta = \dfrac{1}{\sqrt{3}}$

$\therefore$ $\sec\theta \cdot \tan\theta$

$= \frac{2}{\sqrt{3}} \times \frac{1}{\sqrt{3}} = \frac{2}{3}$

266. (4) $5\cos\theta + 12\sin\theta = 13$

$\Rightarrow \frac{5}{13}\cos\theta + \frac{12}{13}\sin\theta = 1$

$\because \sin^2\theta + \cos^2\theta = 1$

$\therefore \sin\theta = \frac{12}{13}, \cos\theta = \frac{5}{13}$

267. (1) $7\sin^2\theta + 3\cos^2\theta = 4$

On dividing both sides by $\cos^2\theta$,

$7\frac{\sin^2\theta}{\cos^2\theta} + \frac{3\cos^2\theta}{\cos^2\theta} = \frac{4}{\cos^2\theta}$

$\Rightarrow 7\tan^2\theta + 3 = 4\sec^2\theta$

$\Rightarrow 7\tan^2\theta + 3 = 4(1 + \tan^2\theta)$

$\Rightarrow 7\tan^2\theta + 3 = 4 + 4\tan^2\theta$

$\Rightarrow 7\tan^2\theta - 4\tan^2\theta = 4 - 3$

$\Rightarrow 3\tan^2\theta = 1 \Rightarrow \tan^2\theta = \frac{1}{3}$

$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}}$

268. (1) Expression

$= (\text{cosec } a - \sin a)(\sec a - \cos a)(\tan a + \cot a)$

$= \left(\frac{1}{\sin a} - \sin a\right)\left(\frac{1}{\cos a} - \cos a\right)$

$\left(\frac{\sin a}{\cos a} + \frac{\cos a}{\sin a}\right)$

$= \left(\frac{1-\sin^2 a}{\sin a}\right)\left(\frac{1-\cos^2 a}{\cos a}\right) \cdot$

$\frac{\sin^2 a + \cos^2 a}{\cos a . \sin a}$

$= \frac{\cos^2 a}{\sin a} \times \frac{\sin^2 a}{\cos a} \times \frac{1}{\cos a . \sin a}$

$= 1$

269. (4) $\sin A + \sin^2 A = 1$

$\Rightarrow \sin A = 1 - \sin^2 A = \cos^2 A$

$\therefore \cos^2 A + \cos^4 A$

$= \cos^2 A + (\cos^2 A)^2$

$= \cos^2 A + \sin^2 A = 1$

270. (4) $\tan A = n \tan B$

$\Rightarrow \tan B = \frac{1}{n}\tan A$

$\Rightarrow \cot B = \frac{n}{\tan A}$

and, $\sin A = m \sin B$

$\Rightarrow \sin B = \frac{1}{m}\sin A$

$\Rightarrow \text{cosec } B = \frac{m}{\sin A}$

$\because \text{cosec}^2 B - \cot^2 B = 1$

$\Rightarrow \frac{m^2}{\sin^2 A} - \frac{n^2}{\tan^2 A} = 1$

$\Rightarrow \frac{m^2}{\sin^2 A} - \frac{n^2\cos^2 A}{\sin^2 A} = 1$

$\Rightarrow \frac{m^2 - n^2\cos^2 A}{\sin^2 A} = 1$

$\Rightarrow m^2 - n^2\cos^2 A = \sin^2 A$

$\Rightarrow m^2 - n^2\cos^2 A = 1 - \cos^2 A$

$\Rightarrow m^2 - 1 = n^2\cos^2 A - \cos^2 A$

$\Rightarrow m^2 - 1 = (n^2 - 1)\cos^2 A$

$\Rightarrow \cos^2 A = \frac{m^2 - 1}{n^2 - 1}$

271. (4) $\sin\theta + \cos\theta = \sqrt{2}\sin(90° - \theta)$

$\Rightarrow \sin\theta + \cos\theta = \sqrt{2}\cos\theta$

$\Rightarrow \sqrt{2}\cos\theta - \cos\theta = \sin\theta$

$\Rightarrow \cos\theta\left(\sqrt{2} - 1\right) = \sin\theta$

$\Rightarrow \frac{\cos\theta}{\sin\theta} = \frac{1}{\sqrt{2} - 1}$

$\Rightarrow \cot\theta = \frac{1}{\sqrt{2} - 1} \times \frac{\sqrt{2} + 1}{\sqrt{2} + 1}$

$= \frac{\sqrt{2} + 1}{2 - 1} = \sqrt{2} + 1$

272. (3) $\tan 20° = \tan(90° - 70°)$

$= \cot 70°$

$\therefore \cot 20° = \tan 70°$

$\tan 15° = \tan(90° - 75°)$

$= \cot 75°$

$\therefore$ Expression $= \cot^2 70° . \sin^2 70° + \tan^2 70° . \cos^2 70° + 2\cot 75° . \tan 75° . \tan 45°$

$= \frac{\cos^2 70°}{\sin^2 70°} . \sin^2 70° + \frac{\sin^2 70°}{\cos^2 70°} . \cos^2 70° + 2 \times 1 \times 1$

$= \cos^2 70° + \sin^2 70° + 2$

$= 1 + 2 = 3$

$[\because \sin\theta . \text{cosec}\theta = 1 ; \cos\theta . \sec\theta = 1; \tan\theta . \cot\theta = 1]$

273. (2) $\sin 47° = \sin(90° - 43°)$

$= \cos 43°$

$\therefore \left(\frac{\sin 47°}{\cos 43°}\right)^2 + \left(\frac{\cos 43°}{\sin 47°}\right)^2 - 4\cos^2 45°$

$= \left(\frac{\cos 43°}{\cos 43°}\right)^2 + \left(\frac{\sin 47°}{\sin 47°}\right)^2 - 4 \times \left(\frac{1}{\sqrt{2}}\right)^2$

$\left[\because \sin(90° - \theta) = \cos\theta, \cos(90° - \theta) = \sin\theta\right]$

$= 1 + 1 - 4 \times \frac{1}{2} = 2 - 2 = 0$

274. (2) $\text{cosec}\theta = \cot^2\theta$

$\Rightarrow \text{cosec}\theta = \text{cosec}^2\theta - 1$

$\Rightarrow \text{cosec}^2\theta - \text{cosec}\theta = 1$ .....(i)

Expression

$= \text{cosec}^4\theta - 2\text{cosec}^3\theta + \cot^2\theta$

$= \text{cosec}^4\theta - \text{cosec}^3\theta - \text{cosec}^3\theta + \text{cosec}\theta$

$= \text{cosec}^2\theta(\text{cosec}^2\theta - \text{cosec}\theta) - \text{cosec}\theta(\text{cosec}^2\theta - 1)$

$= \text{cosec}^2\theta - \text{cosec}^2\theta = 0$

275. (2) $4\sin^2\theta - 1 = 0$

$\Rightarrow 4\sin^2\theta = 1$

$\Rightarrow \sin^2\theta = \frac{1}{4}$

$\Rightarrow \sin\theta = \frac{1}{2}$ $(\because \theta < 90°)$

$\therefore \sin\theta = \sin 30° \Rightarrow \theta = 30°$

$\therefore \cos^2\theta + \tan^2\theta$

$= \cos^2 30° + \tan^2 30°$

$= \left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{\sqrt{3}}\right)^2 = \frac{3}{4} + \frac{1}{3}$

$= \frac{9 + 4}{12} = \frac{13}{12}$

276. (3)

$\frac{9}{\text{cosec}^2\theta} + 4\cos^2\theta + \frac{5}{1 + \tan^2\theta}$

$= 9\sin^2\theta + 4\cos^2\theta + \frac{5}{\sec^2\theta}$

$= 9\sin^2\theta + 4\cos^2\theta + 5\cos^2\theta$

$= 9\sin^2\theta + 9\cos^2\theta$

$= 9(\sin^2\theta + \cos^2\theta) = 9 \times 1 = 9$

277. (4) $\tan\theta + \sec\theta = 3$ .....(i)

$\because \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta - \tan\theta)(\sec\theta + \tan\theta) = 1$

$\Rightarrow \sec\theta - \tan\theta = \frac{1}{3}$ .... (ii)

On adding equations (i) and (ii),

$2\sec\theta = 3 + \frac{1}{3} = \frac{10}{3}$

On subtracting equation (ii) from (i),

$2\tan\theta = 3 - \frac{1}{3}$

$= \frac{9-1}{3} = \frac{8}{3}$

$\therefore \sin\theta = \frac{\tan\theta}{\sec\theta}$

$= \frac{8}{3} \times \frac{3}{10} = \frac{4}{5}$

$\therefore 5\sin\theta = 5 \times \frac{4}{5} = 4$

278. (2) $\cos\theta = \frac{p}{\sqrt{p^2+q^2}}$

$\therefore \sin\theta = \sqrt{1-\cos^2\theta}$

$= \sqrt{1 - \frac{p^2}{p^2+q^2}}$

$= \sqrt{\frac{p^2+q^2-p^2}{p^2+q^2}} = \frac{q}{\sqrt{p^2+q^2}}$

$\therefore \tan\theta = \frac{\sin\theta}{\cos\theta}$

$= \frac{q}{\sqrt{p^2+q^2}} \times \frac{\sqrt{p^2+q^2}}{p} = \frac{q}{p}$

279. (2) In a triangle ABC,
A + B + C = 180°

$\Rightarrow \frac{A}{2} + \frac{B}{2} + \frac{C}{2} = 90°$

$\Rightarrow \frac{A+B}{2} = 90° - \frac{C}{2}$

$\Rightarrow \tan\left(\frac{A+B}{2}\right)$

$= \tan\left(90° - \frac{C}{2}\right) = \cot\frac{C}{2}$

280. (2) $\sin 89° = \sin(90°-1°)$
$= \cos 1°$
$\sin 79° = \sin(90°-11°)$
$= \cos 11°$
$\sin 69° = \sin(90°-21°)$
$= \cos 21°$
$\sin 59° = \sin(90°-31°)$
$= \cos 31°$
$\sin 49° = \sin(90°-41°)$
$= \cos 41°$
$\therefore$ Expression
$= (\sin^2 1° + \cos^2 1°) + (\sin^2 11° + \cos^2 11°) + (\sin^2 21° + \cos^2 21°) + (\sin^2 31° + \cos^2 31°) + (\sin^2 41° + \cos^2 41°) + \sin^2 45°$

$= 5 + \left(\frac{1}{\sqrt{2}}\right)^2 = 5 + \frac{1}{2} = 5\frac{1}{2}$

$[\because \sin^2\theta + \cos^2\theta = 1]$

281. (4) $x = a(\sin\theta + \cos\theta)$

$\Rightarrow \frac{x}{a} = \sin\theta + \cos\theta$

and, $y = b(\sin\theta - \cos\theta)$

$\Rightarrow \frac{y}{b} = \sin\theta - \cos\theta$

$\therefore \frac{x^2}{a^2} + \frac{y^2}{b^2}$

$= (\sin\theta + \cos\theta)^2 + (\sin\theta - \cos\theta)^2$

$= 2(\sin^2\theta + \cos^2\theta) = 2$

$[\because (a+b)^2 + (a-b)^2 = 2(a^2+b^2)]$

282. (1) $\cos\theta + \sin\theta = m$ --- (i)
$\sec\theta + \operatorname{cosec}\theta = n$

$\Rightarrow \frac{1}{\cos\theta} + \frac{1}{\sin\theta} = n$

$\Rightarrow \frac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta} = n$ --- (ii)

$\therefore n(m^2 - 1) = \frac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta}$

$[(\sin\theta + \cos\theta)^2 - 1]$

$= \frac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta}(\sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta - 1)$

$= \frac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta} \times 2\sin\theta . \cos\theta$

$[\because \sin^2\theta + \cos^2\theta = 1]$

$= 2(\sin\theta + \cos\theta) = 2m$

283. (3) $\frac{x - x\tan^2 30°}{1 + \tan^2 30°}$

$= \sin^2 30° + 4\cot^2 45° - \sec^2 60°$

$\Rightarrow \frac{x - x \times \left(\frac{1}{\sqrt{3}}\right)^2}{1 + \left(\frac{1}{\sqrt{3}}\right)^2}$

$= \left(\frac{1}{2}\right)^2 + 4 \times (1)^2 - (2)^2$

$\Rightarrow \frac{x - \frac{x}{3}}{1 + \frac{1}{3}} = \frac{1}{4} + 4 - 4$

$\Rightarrow \frac{3x - x}{3+1} = \frac{1}{4}$

$\Rightarrow 2x = \frac{1}{4} \times 4 = 1$

$\Rightarrow x = \frac{1}{2}$

284. (1) cosA + sinA

$= \sqrt{2}\cos A$ --- (i)

cosA – sinA = x (let) --- (ii)

On squaring both equation and adding

$\cos^2 A + \sin^2 A + 2\sin A . \cos A + \cos^2 A + \sin^2 A - 2\sin A\cos A = 2\cos^2 A + x^2$

$\Rightarrow 2(\cos^2 A + \sin^2 A)$

$= 2\cos^2 A + x^2$

$\Rightarrow x^2 + 2\cos^2 A = 2$

$\Rightarrow x^2 = 2 - 2\cos^2 A$

$= 2(1 - \cos^2 A) = 2\sin^2 A$

$\therefore x = \sqrt{2}\sin A$

285. (*) $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \frac{3}{1}$

By componendo and dividendo,

$\frac{\sin\theta + \cos\theta + \sin\theta - \cos\theta}{\sin\theta + \cos\theta - \sin\theta + \cos\theta}$

$= \frac{3+1}{3-1}$

$\Rightarrow \frac{2\sin\theta}{2\cos\theta} = \frac{4}{2}$

$\Rightarrow \tan\theta = 2$

$\therefore \cot\theta = \frac{1}{2}$

$\therefore \operatorname{cosec}\theta = \sqrt{1+\cot^2\theta}$

$= \sqrt{1 + \frac{1}{4}} = \sqrt{\frac{5}{4}} = \frac{\sqrt{5}}{2}$

$\therefore \sin\theta = \frac{2}{\sqrt{5}}$

$\sin^4\theta = \frac{16}{25}$

286. (2) $\sin 2\theta = \frac{\sqrt{3}}{2} = \sin 60°$

$\Rightarrow 2\theta = 60° \Rightarrow \theta = 30°$

$\therefore \sin 3\theta = \sin 90° = 1$

287. (3) Expression

$$= \frac{1+2\times\frac{\sqrt{3}}{2}\times\frac{1}{2}}{\frac{\sqrt{3}}{2}+\frac{1}{2}} + \frac{1-2\times\frac{\sqrt{3}}{2}\times\frac{1}{2}}{\frac{\sqrt{3}}{2}-\frac{1}{2}}$$

$$= \frac{1+\frac{\sqrt{3}}{2}}{\frac{\sqrt{3}+1}{2}} + \frac{1-\frac{\sqrt{3}}{2}}{\frac{\sqrt{3}-1}{2}}$$

$$= \frac{2+\sqrt{3}}{\sqrt{3}+1} + \frac{2-\sqrt{3}}{\sqrt{3}-1}$$

$$= \frac{(2+\sqrt{3})(\sqrt{3}-1)+(\sqrt{3}+1)(2-\sqrt{3})}{(\sqrt{3}+1)(\sqrt{3}-1)}$$

$$= \frac{2\sqrt{3}-2+3-\sqrt{3}+2\sqrt{3}-3+2-\sqrt{3}}{3-1}$$

$$= \frac{4\sqrt{3}-2\sqrt{3}}{2} = \frac{2\sqrt{3}}{2} = \sqrt{3}$$

288. (4) $\alpha + \beta = 90°$

$\Rightarrow \alpha = 90° - \beta$

$\Rightarrow \tan\alpha = \tan(90° - \beta) = \cot\beta.$

$\sin\alpha = \sin(90° - \beta) = \cos\beta$

$\therefore$ Expression

$$= \frac{\cot\beta}{\tan\beta} + \cos^2\beta + \sin^2\beta$$

$= \cot^2\beta + 1$

$= \text{cosec}^2\beta = \text{cosec}^2(90° - \alpha)$

$= \sec^2\alpha$

289. (4) $\tan^2\frac{\pi}{4} - \cos^2\frac{\pi}{3}$

$= x \sin\frac{\pi}{4} . \cos\frac{\pi}{4} . \tan\frac{\pi}{3}$

$\Rightarrow 1 - \left(\frac{1}{2}\right)^2 = x . \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} \times \sqrt{3}$

$\Rightarrow 1 - \frac{1}{4} = x \times \frac{\sqrt{3}}{2}$

$\Rightarrow \frac{4-1}{4} = x \times \frac{\sqrt{3}}{2}$

$\Rightarrow x = \frac{3}{4} \times \frac{2}{\sqrt{3}} = \frac{\sqrt{3}}{2}$

290. (3) $\sin A - \cos A = \frac{\sqrt{3}-1}{2}$

On squaring both sides,

$\sin^2 A + \cos^2 A - 2 \sin A . \cos A$

$= \frac{1}{4}\left[\left(\sqrt{3}\right)^2 + (1)^2 - 2\sqrt{3}\right]$

$\Rightarrow 1 - 2 \sin A \cos A$

$= \frac{1}{4}\left(4 - 2\sqrt{3}\right)$

$\Rightarrow 1 - 2 \sin A \cos A = \frac{2-\sqrt{3}}{2}$

$\Rightarrow 2 - 4 \sin A \cos A = 2 - \sqrt{3}$

$\Rightarrow 4 \sin A . \cos A = 2 - 2 + \sqrt{3} = \sqrt{3}$

$\Rightarrow \sin A . \cos A = \frac{\sqrt{3}}{4}$

291. (2) $\sin(90° - \theta) + \cos\theta$

$= \sqrt{2} \cos(90° - \theta)$

$\Rightarrow \cos\theta + \cos\theta = \sqrt{2} \sin\theta$

$\Rightarrow 2 \cos\theta = \sqrt{2} \sin\theta$

$\Rightarrow \frac{\cos\theta}{\sin\theta} = \frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$

$\Rightarrow \cot\theta = \frac{1}{\sqrt{2}}$

$\because \text{cosec}^2\theta = 1 + \cot^2\theta$

$= 1 + \left(\frac{1}{\sqrt{2}}\right)^2 = 1 + \frac{1}{2}$

$\Rightarrow \text{cosec}^2\theta = \frac{3}{2}$

$\Rightarrow \text{cosec}\,\theta = \sqrt{\frac{3}{2}}$

292. (2) $\tan\left(\frac{\pi}{2} - \frac{\alpha}{2}\right) = \sqrt{3}$

$\Rightarrow \cot\frac{\alpha}{2} = \sqrt{3} = \cot 30°$

$\Rightarrow \frac{\alpha}{2} = 30° \Rightarrow \alpha = 60°$

$\therefore \cos\alpha = \cos 60° = \frac{1}{2}$

293. (1) $\because \cos 90° = 0$

$\therefore \cos 1°.\cos 2°.... \cos 180° = 0$

294. (1) $\cos 20° = m$ and $\cos 70° = n$

$\therefore m^2 + n^2 = \cos^2 20° + \cos^2 70°$

$= \cos^2(90° - 70°) + \cos^2 70°$

$\Rightarrow \sin^2 70° + \cos^2 70° = 1$

295. (2) $\tan(90° - \theta) = \cot\theta$

$\therefore \tan(5x - 10°) = \cot(5y + 20°)$

$\Rightarrow \tan(5x - 10°)$

$= \tan\{90° - (5y + 20°)\}$

$\Rightarrow 5x - 10° = 90° - (5y + 20°)$

$\Rightarrow 5x - 10° = 90° - 5y - 20°$

$\Rightarrow 5x + 5y = 70° + 10°$

$\Rightarrow 5(x + y) = 80°$

$\Rightarrow x + y = \frac{80°}{5} = 16°$

296. (1) $\cos 27° = x$

$\Rightarrow \cos(90° - 63°) = x$

$\Rightarrow \sin 63° = x$

$\therefore \cos 63° = \sqrt{1 - \sin^2 63°}$

$= \sqrt{1 - x^2}$

$\therefore \tan 63° = \frac{\sin 63°}{\cos 63°}$

$= \frac{x}{\sqrt{1 - x^2}}$

297. (2) $\cos^2 x + \cos^4 x = 1$

$\Rightarrow \cos^4 x = 1 - \cos^2 x = \sin^2 x$

$\therefore \tan^2 x + \tan^4 x$

$= \frac{\sin^2 x}{\cos^2 x} + \frac{\sin^4 x}{\cos^4 x}$

$= \frac{\cos^4 x}{\cos^2 x} + \frac{\sin^4 x}{\sin^2 x}$

$= \cos^2 x + \sin^2 x = 1$

298. (4) $(1 + \sec 22° + \cot 68°)(1 - \text{cosec } 22° + \tan 68°)$

$= (1 + \sec 22° + \tan 22°)(1 - \text{cosec } 22° + \cot 22°)$

[$\because \tan(90° - \theta) = \cot\theta$; $\cot(90° - \theta) = \tan\theta$]

$$= \left(1 + \frac{1}{\cos 22°} + \frac{\sin 22°}{\cos 22°}\right)$$

$$\left(1 - \frac{1}{\sin 22°} + \frac{\cos 22°}{\sin 22°}\right)$$

$$= \left(\frac{\cos 22° + 1 + \sin 22°}{\cos 22°}\right)$$

$$\left(\frac{\sin 22° - 1 + \cos 22°}{\sin 22°}\right)$$

$$= \frac{(\cos 22° + \sin 22° + 1)(\sin 22° + \cos 22° - 1)}{\sin 22° . \cos 22°}$$

$$= \frac{(\sin 22° + \cos 22°)^2 - 1}{\sin 22° . \cos 22°}$$

$$= \frac{\sin^2 22° + \cos^2 22° + 2\sin 22° . \cos 22° - 1}{\sin 22° . \cos 22°}$$

$$= \frac{1 - 1 + 2\sin 22° . \cos 22°}{\sin 22° . \cos 22°} = 2$$

299. (1) $\because x \sin\theta - y \cos\theta = 0$

$\Rightarrow x \sin\theta = y \cos\theta$ ..... (i)

$\therefore x \sin^3\theta + y \cos^3\theta$

$= \sin\theta . \cos\theta$

$\Rightarrow y \cos\theta . \sin^2\theta + y \cos^3\theta$

$= \sin\theta . \cos\theta$

$\Rightarrow y \cos\theta (\sin^2\theta + \cos^2\theta)$

$= \sin\theta . \cos\theta$

$\Rightarrow y \cos\theta = \sin\theta . \cos\theta$

$\Rightarrow y = \sin\theta$

From equation (i),

$x \sin\theta = \sin\theta . \cos\theta$

$\Rightarrow x = \cos\theta$

$\therefore x^2 + y^2 = \cos^2\theta + \sin^2\theta = 1$

300. (2) $\sec\theta + \tan\theta = m$. (Given) ...(i)

$\because \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

$$\Rightarrow \sec\theta - \tan\theta = \frac{1}{m} \quad ....(ii)$$

By equations (i) + (ii),

$$2 \sec\theta = m + \frac{1}{m}$$

$$\Rightarrow \sec\theta = \frac{m^2 + 1}{2m}$$

By equation (i) – (ii),

$$2 \tan\theta = m - \frac{1}{m}$$

$$\Rightarrow \tan\theta = \frac{m^2 - 1}{2m}$$

$$\therefore \sin\theta = \frac{\tan\theta}{\sec\theta}$$

$$= \frac{m^2 - 1}{2m} \times \frac{2m}{m^2 + 1} = \frac{m^2 - 1}{m^2 + 1}$$

301. (2) $(a^2 - b^2) \sin\theta + 2ab \cos\theta = (a^2 + b^2)$

On dividing by $\cos\theta$,

$(a^2 - b^2) \tan\theta + 2ab = (a^2 + b^2) \sec\theta$

On squaring both sides,

$(a^2 - b^2)^2 \tan^2\theta + 4a^2b^2 + 4ab (a^2 - b^2) \tan\theta = (a^2 + b^2)^2 \sec^2\theta$

$\Rightarrow (a^2 - b^2)^2 \tan^2\theta + 4ab (a^2 - b^2) \tan\theta + 4a^2b^2 = (a^2 + b^2)^2 (1 + \tan^2\theta)$

$\Rightarrow (a^2 + b^2)^2 \tan^2\theta - (a^2 - b^2)^2 \tan^2\theta\ 4ab (a^2 - b^2)^2 \tan\theta + (a^2 + b^2) - 4a^2b^2 = 0$

$\Rightarrow \tan^2\theta \{(a^2 + b^2)^2 - (a^2 - b^2)^2\} - 4ab (a^2 - b^2) \tan\theta + (a^2 - b^2)^2 = 0$

$\Rightarrow 4a^2b^2 \tan^2\theta - 4ab (a^2 - b^2) \tan\theta + (a^2 - b^2)^2 = 0$

$\Rightarrow \{2ab \tan\theta - (a^2 - b^2)\}^2 = 0$

$\Rightarrow 2ab \tan\theta - (a^2 - b^2) = 0$

$$\Rightarrow \tan\theta = \frac{a^2 - b^2}{2ab}$$

302. (4) $2y \cos\theta = x \sin\theta$ ..(i)

$2x \sec\theta - y \text{ cosec}\theta = 3$

$$\Rightarrow 2.\frac{2y\cos\theta}{\sin\theta} . \sec\theta - y \text{ cosec}\theta = 3$$

$\Rightarrow 4y \text{ cosec}\theta - y \text{ cosec}\theta = 3$

$\Rightarrow 3y \text{ cosec}\theta = 3$

$$\Rightarrow y = \frac{3}{3\text{cosec } \theta} = \sin\theta$$

From equation (i),

$2 \sin\theta . \cos\theta = x \sin\theta$

$\Rightarrow x = 2\cos\theta$

$\therefore x^2 + 4y^2 = 4 \cos^2\theta + 4 \sin^2\theta = 4 (\cos^2\theta + \sin^2\theta) = 4$

303. (*) $\dfrac{\cot\theta + \text{cosec } \theta - 1}{\cot\theta - \text{cosec } \theta + 1}$

(we have taken $(\cot\theta - \text{cosec } \theta + 1)$ instead of $(\cot\theta + \text{cosec } \theta + 1)$ as denominator)

$$= \frac{\cot\theta + \text{cosec } \theta - (\text{cosec}^2\theta - \cot^2\theta)}{\cot\theta - \text{cosec } \theta + 1}$$

$$= \frac{(\cot\theta + \text{cosec } \theta) - (\text{cosec } \theta + \cot\theta)(\text{cosec } \theta - \cot\theta)}{\cot\theta - \text{cosec } \theta + 1}$$

$$= \frac{(\cot\theta + \text{cosec } \theta)(1 - \text{cosec } \theta + \cot\theta)}{\cot\theta - \text{cosec } \theta + 1}$$

$= \cot\theta + \text{cosec}\theta$

$$= \frac{\cos\theta}{\sin\theta} + \frac{1}{\sin\theta}$$

$$= \frac{\cos\theta + 1}{\sin\theta}$$

304. (2) $\sin\theta = \dfrac{5}{13}$

$$\cos\theta = \sqrt{1 - \sin^2\theta}$$

$$= \sqrt{1 - \left(\frac{5}{13}\right)^2}$$

$$= \sqrt{1 - \frac{25}{169}} = \sqrt{\frac{169 - 25}{169}}$$

$$= \sqrt{\frac{144}{169}} = \frac{12}{13}$$

$$\therefore \tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{5}{12}$$

$$\cot\theta = \frac{12}{5}$$

$$\therefore \sqrt{\tan\theta + \cot\theta} = \sqrt{\frac{5}{12} + \frac{12}{5}}$$

$$= \sqrt{\frac{25 + 144}{60}} = \sqrt{\frac{169}{60}}$$

$$= \frac{13}{2\sqrt{15}}$$

305. (3) Expression

$$= \frac{2\sin\theta}{\cos\theta(1 + \tan^2\theta)}$$

$= \dfrac{2\sin\theta}{\cos\theta.\sec^2\theta} = \dfrac{2\sin\theta}{\sec\theta}$

$[\because \cos\theta \,.\, \sec\theta = 1]$

$= 2\sin\theta \,.\, \cos\theta = \sin 2\theta$

306. (3) $\tan\theta_1 = 1 = \tan 45°$

$\Rightarrow \theta_1 = 45°$

Again, $\sin\theta_2 = \dfrac{1}{\sqrt{2}} = \sin 45°$

$\Rightarrow \theta_2 = 45°$

$\therefore \sin(\theta_1 + \theta_2) = \sin 90° = 1$

307. (2) $\tan\theta\,(1 + \sec 2\theta)\,(1 + \sec 4\theta)\,(1 + \sec 8\theta)$

$= \tan\theta \left(1+\dfrac{1}{\cos 2\theta}\right)\left(1+\dfrac{1}{\cos 4\theta}\right)\left(1+\dfrac{1}{\cos 8\theta}\right)$

$= \tan\theta \left(\dfrac{\cos 2\theta+1}{\cos 2\theta}\right)\left(\dfrac{\cos 4\theta+1}{\cos 4\theta}\right)\left(\dfrac{\cos 8\theta+1}{\cos 8\theta}\right)$

$= \tan\theta\ \dfrac{2\cos^2\theta}{\cos 2\theta} \cdot \dfrac{2\cos^2 2\theta}{\cos 4\theta} \cdot \dfrac{2\cos^2 4\theta}{\cos 8\theta}$

$[\because 1 + \cos 2\theta = 2\cos^2\theta]$

$= 8.\dfrac{\tan\theta.\cos^2\theta.\cos 2\theta.\cos 4\theta}{\cos 8\theta}$

$= 4.\dfrac{2\sin\theta\cos\theta.\cos 2\theta.\cos 4\theta}{\cos 8\theta}$

$[2\sin\theta.\cos\theta = \sin 2\theta]$

$= 4.\dfrac{\sin 2\theta.\cos 2\theta.\cos 4\theta}{\cos 8\theta}$

$= \dfrac{2\sin 4\theta.\cos 4\theta}{\cos 8\theta} = \dfrac{\sin 8\theta}{\cos 8\theta}$

$= \tan 8\theta.$

308. (4) $\dfrac{\sin x}{1+\cos x} + \dfrac{\sin x}{1-\cos x} = 4$

$\Rightarrow \dfrac{\sin x(1-\cos x) + \sin x(1+\cos x)}{(1+\cos x)(1-\cos x)} = 4$

$\Rightarrow \dfrac{\sin x - \sin x.\cos x + \sin x + \sin x.\cos x}{1-\cos^2 x} = 4$

$\Rightarrow \dfrac{2\sin x}{\sin^2 x} = 4$

$\Rightarrow 2\sin x = 1$

$\Rightarrow \sin x = \dfrac{1}{2} = \sin 30°$

$\Rightarrow x = 30°$

309. (2) $\dfrac{\sin 65°}{\cos 25°} = \dfrac{\sin(90°-25°)}{\cos 25°}$

$= \dfrac{\cos 25°}{\cos 25°} = 1$

310. (2) $\sin\theta + \operatorname{cosec}\theta = 2$

$\Rightarrow \sin\theta + \dfrac{1}{\sin\theta} = 2$

$\Rightarrow \sin^2\theta + 1 = 2\sin\theta$

$\Rightarrow \sin^2\theta - 2\sin\theta + 1 = 0$

$\Rightarrow (\sin\theta - 1)^2 = 0$

$\Rightarrow \sin\theta = 1$

$\therefore \operatorname{cosec}\theta = \dfrac{1}{\sin\theta} = 1$

$\therefore \sin^{100}\theta + \operatorname{cosec}^{100}\theta = 1 + 1 = 2$

311. (1) $\sin 31° = \dfrac{x}{y}$

$\therefore \cos 31° = \sqrt{1-\sin^2 31°}$

$= \sqrt{1-\dfrac{x^2}{y^2}} = \sqrt{\dfrac{y^2-x^2}{y^2}}$

$= \dfrac{\sqrt{y^2-x^2}}{y}$

$\therefore \sec 31° = \dfrac{y}{\sqrt{y^2-x^2}}$

$\therefore \sec 31° - \sin 59°$

$= \sec 31° - \sin(90° - 31°)$

$= \sec 31° - \cos 31°$

$= \dfrac{y}{\sqrt{y^2-x^2}} - \dfrac{\sqrt{y^2-x^2}}{y}$

$= \dfrac{y^2-(y^2-x^2)}{y\sqrt{(y^2-x^2)}}$

$= \dfrac{y^2-y^2+x^2}{y\sqrt{y^2-x^2}} = \dfrac{x^2}{y\sqrt{y^2-x^2}}$

312. (3) $\sec^2 45° - \cot^2 45° - \sin^2 30° - \sin^2 60°$

$= \left(\sqrt{2}\right)^2 - 1 - \left(\dfrac{1}{2}\right)^2 - \left(\dfrac{\sqrt{3}}{2}\right)^2$

$= 2 - 1 - \dfrac{1}{4} - \dfrac{3}{4}$

$= 1 - \dfrac{1}{4} - \dfrac{3}{4} = \dfrac{3}{4} - \dfrac{3}{4} = 0$

313. (1) Expression

$= \dfrac{(\sin\theta.\operatorname{cosec}\theta)(\tan\theta.\cot\theta)}{\sin^2\theta + \cos^2\theta}$

$= \dfrac{1\times 1}{1} = 1$

314. (3) $a^3 + b^3 = (a+b)^3 - 3ab(a+b)$.

$\therefore \cos^3\theta + \sec^3\theta = (\cos\theta + \sec\theta)^3 - 3\cos\theta.\sec\theta(\cos\theta + \sec\theta)$

$= \left(\sqrt{3}\right)^3 - 3\times\sqrt{3}$

$[\because \cos\theta + \sec\theta = \sqrt{3}$

$= 3\sqrt{3} - 3\sqrt{3} = 0$

315. (2) $\tan\theta = \sqrt{3} = \tan\dfrac{\pi}{3}$

$\Rightarrow \theta = \dfrac{\pi}{3}$

$\therefore \alpha + \theta = \dfrac{7\pi}{12} \Rightarrow \alpha = \dfrac{7\pi}{12} - \dfrac{\pi}{3}$

$= \dfrac{7\pi - 4\pi}{12} = \dfrac{\pi}{4}$

$\therefore \tan\alpha = \tan\dfrac{\pi}{4} = 1$

316. (4)

$XY = 2\sqrt{6}$ cm

$XY - YZ = 2$ cm. ...(i)

$\therefore XZ^2 = XY^2 + YZ^2$

$\Rightarrow XZ^2 - YZ^2 = \left(2\sqrt{6}\right)^2$

$\Rightarrow XZ^2 - YZ^2 = 24$

$\therefore \dfrac{XZ^2 - YZ^2}{XZ - YZ} = \dfrac{24}{2}$

$\Rightarrow XZ + YZ = 12$ ....(ii)

$\Rightarrow \sec X + \tan X = \dfrac{XZ}{XY} + \dfrac{YZ}{XY}$

$= \dfrac{XZ + YZ}{XY} = \dfrac{12}{2\sqrt{6}} = \sqrt{6}$

317. (4) $\sec\theta + \tan\theta = 2$

$\therefore \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

$\Rightarrow \sec\theta - \tan\theta = \dfrac{1}{2}$

$\therefore \sec\theta + \tan\theta + \sec\theta - \tan\theta$

$= 2 + \dfrac{1}{2}$

$\Rightarrow 2\sec\theta = \dfrac{5}{2} \Rightarrow \sec\theta = \dfrac{5}{4}$

Again, $(\sec\theta + \tan\theta) - (\sec\theta - \tan\theta)$

$= 2 - \dfrac{1}{2}$

$\Rightarrow 2\tan\theta = \dfrac{3}{2} \Rightarrow \tan\theta = \dfrac{3}{4}$

$\Rightarrow \sin\theta = \dfrac{\tan\theta}{\sec\theta} = \dfrac{3}{4} \div \dfrac{5}{4} = \dfrac{3}{5}$

318. (3) Expression

$= 8 \cos 10^\circ . \cos 20^\circ . \cos 40^\circ$

$= 4\left(\dfrac{2\sin 10^\circ . \cos 10^\circ . \cos 20^\circ . \cos 40^\circ}{\sin 10^\circ}\right)$

$= 2\left(\dfrac{2\sin 20^\circ . \cos 20^\circ . \cos 40^\circ}{\sin 10^\circ}\right)$

$[\because 2\sin\theta . \cos\theta = \sin 2\theta]$

$= \left(\dfrac{2\sin 40^\circ . \cos 40^\circ}{\sin 10^\circ}\right)$

$= \dfrac{\sin 80^\circ}{\sin 10^\circ} = \dfrac{\sin 80^\circ}{\cos(90^\circ - 10^\circ)}$

$= \dfrac{\sin 80^\circ}{\cos 80^\circ}$ or, $\dfrac{\cos 10^\circ}{\sin 10^\circ}$

$\left[\begin{array}{l}\because \sin(90^\circ - \theta) = \cos\theta; \\ \cos(90^\circ - \theta) = \sin\theta\end{array}\right]$

$= \tan 80^\circ$ or $\cot 10^\circ$

319. (1) $\dfrac{\cot\theta + \operatorname{cosec}\theta - 1}{\cot\theta - \operatorname{cosec}\theta + 1}$

$= \dfrac{\cot\theta + \operatorname{cosec}\theta - \left(\operatorname{cosec}^2\theta - \cot^2\theta\right)}{\cot\theta - \operatorname{cosec}\theta + 1}$

$= \dfrac{(\cot\theta + \operatorname{cosec}\theta) - (\operatorname{cosec}\theta - \cot\theta)(\operatorname{cosec}\theta + \cot\theta)}{\cot\theta - \operatorname{cosec}\theta + 1}$

$= \dfrac{(\cot\theta + \operatorname{cosec}\theta)(1 - \operatorname{cosec}\theta + \cot\theta)}{\cot\theta - \operatorname{cosec}\theta + 1}$

$= \cot\theta + \operatorname{cosec}\theta$

320. (3)

PA = PR

$\angle APB = \angle ARB = 45^\circ$

If PR = $\sqrt{2}x$:

PB = $\dfrac{x}{\sqrt{2}}$

From Δ APB

$\tan 45^\circ = \dfrac{AB}{PB} \Rightarrow AB = PB = \dfrac{x}{\sqrt{2}}$

$\therefore PA = \sqrt{\dfrac{x^2}{2} + \dfrac{x^2}{2}} = \sqrt{x^2} = x$

$\therefore QA = PQ = PA = x$

$\therefore \angle PAQ = 60^\circ$

321. (1) $0 \le \phi \le 90^\circ$

$\therefore 0 \le \sin\phi \le 1$

$\because \sin\phi = \dfrac{3x - 2}{4}$

when, $x = 1$, $\sin\phi = \dfrac{1}{4}$

$x = 2 = \sin\phi = \dfrac{4}{4} = 1$

322. (1) $\cot\dfrac{\pi}{32} - \tan\dfrac{\pi}{32} - 2\tan\dfrac{\pi}{16}$

$= \dfrac{\cos\frac{\pi}{32}}{\sin\frac{\pi}{32}} - \dfrac{\sin\frac{\pi}{32}}{\cos\frac{\pi}{32}} - 2\tan\dfrac{\pi}{16}$

$= \dfrac{\cos^2\frac{\pi}{32} - \sin^2\frac{\pi}{32}}{\sin\frac{\pi}{32} \times \cos\frac{\pi}{32}} - 2\tan\dfrac{\pi}{16}$

$= \dfrac{2\cos\frac{\pi}{16}}{2\sin\frac{\pi}{32} . \cos\frac{\pi}{32}} - 2\tan\dfrac{\pi}{16}$

$[\cos^2\theta - \sin^2\theta = \cos 2\theta]$

$= \dfrac{2\cos\frac{\pi}{16}}{\sin\frac{\pi}{16}} - 2\tan\dfrac{\pi}{16}$

$[\because \sin 2\theta = 2\sin\theta . \cos\theta]$

$= 2\left(\dfrac{\cos\frac{\pi}{16}}{\sin\frac{\pi}{16}} - \dfrac{\sin\frac{\pi}{16}}{\cos\frac{\pi}{16}}\right)$

$= 2\left(\dfrac{\cos^2\frac{\pi}{16} - \sin^2\frac{\pi}{16}}{\sin\frac{\pi}{16} . \cos\frac{\pi}{16}}\right)$

$= \dfrac{4\cos\frac{\pi}{8}}{\sin\frac{\pi}{8}} = 4\cot\dfrac{\pi}{8}$

323. (4)

$$\left(a^2-1\right)\cot^2\phi+\left(1-b^2\right)\cot^2\theta$$

$$=\left(a^2-1\right)\frac{\cos^2\phi}{\sin^2\phi}+\left(1-b^2\right)\frac{\cos^2\theta}{\sin^2\theta}$$

$$=\frac{(a^2-1)\cos^2\phi.\sin^2\theta+(1-b^2)\cos^2\theta.\sin^2\phi}{\sin^2\phi.\sin^2\theta}$$

$$=\frac{a^2\cos^2\phi.\sin^2\theta-\cos^2\phi.\sin^2\theta+\cos^2\theta.\sin^2\phi-b^2\cos^2\theta.\sin^2\phi}{\sin^2\phi.\sin^2\theta}$$

$$=\frac{\sin^2\theta.\sin^2\theta-\cos^2\phi.\sin^2\theta+\cos^2\theta.\sin^2\phi-\cos^2\theta.\cos^2\phi}{\sin^2\phi.\sin^2\theta}$$

$[\because \sin\theta=b\cos\phi;\cos\theta=b\sin\phi]$

$$=\frac{\sin^4\theta-\cos^4\theta-\cos^2\phi.\sin^2\theta+\cos^2\theta.\sin^2\phi}{\sin^2\phi.\sin^2\theta}$$

$$=\frac{(\sin^2\theta-\cos^2\theta)(\sin^2\theta+\cos^2\theta)-\cos^2\phi.\sin^2\theta+\cos^2\theta.\sin^2\phi}{\sin^2\phi.\sin^2\theta}$$

$$=\frac{\sin^2\theta-\cos^2\phi.\sin^2\theta-\cos^2\theta+\cos^2\theta.\sin^2\phi}{\sin^2\phi.\sin^2\theta}$$

$$=\frac{\sin^2\theta(1-\cos^2\phi)-\cos^2\theta(1-\sin^2\phi)}{\sin^2\phi.\sin^2\theta}$$

$$=\frac{\sin^2\theta.\sin^2\phi-\cos^2\theta.\cos^2\phi}{\sin^2\phi.\sin^2\theta}$$

$$=1-\frac{\cos^2\theta}{\sin^2\phi}.\frac{\cos^2\phi}{\sin^2\theta}=1-\frac{b^2}{a^2}=\frac{a^2-b^2}{a^2}$$

324. (3) $\sec^2\theta+\tan^2\theta=\sqrt{3}$
and $\sec^2\theta-\tan^2\theta=1$
$\therefore \sec^4\theta-\tan^4\theta$
$=(\sec^2\theta+\tan^2\theta)(\sec^2\theta-\tan^2\theta)$
$=\sqrt{3}\times 1=\sqrt{3}$

325. (3) $\pi\sin\theta=1$ and
$\pi\cos\theta=1$
$\therefore \dfrac{\pi\sin\theta}{\pi\cos\theta}=1$
$\therefore \tan\theta=1=\tan 45°$
$\Rightarrow \theta=45°$
$\therefore \sqrt{3}\tan\left(\dfrac{2\theta}{3}\right)+1$
$=\sqrt{3}\tan\left(\dfrac{2\times 45°}{3}\right)+1$
$=\sqrt{3}\tan 30°+1$
$=\sqrt{3}\times\dfrac{1}{\sqrt{3}}+1=1+1=2$

326. (2) Expression,
$=\dfrac{1}{1+\tan^2\theta}+\dfrac{1}{1+\cot^2\theta}$
$=\dfrac{1}{\sec^2\theta}+\dfrac{1}{\operatorname{cosec}^2\theta}$
$[\because \sec^2\theta-\tan^2\theta=1;\ \operatorname{cosec}^2\theta-\cot^2\theta=1]$
$=\cos^2\theta+\sin^2\theta=1$
$[\because \cos\theta.\sec\theta=1;\ \sin\theta.\operatorname{cosec}\theta=1]$

327. (3) $\tan\theta+\dfrac{1}{\tan\theta}=2$
$\Rightarrow \tan^2\theta+1=2\tan\theta$
$\Rightarrow \tan^2\theta-2\tan\theta+1=0$
$\Rightarrow (\tan\theta-1)^2\Rightarrow \tan\theta-1=0$
$\Rightarrow \tan\theta=1$
$\therefore \tan^2\theta+\dfrac{1}{\tan^2\theta}=1+1=2$

328. (2) $\sin A=\cos B$
$\Rightarrow \sin A=\sin(90°-B)$
$\Rightarrow A=90°-B$
$\Rightarrow A+B=90°$
$\therefore \angle C=90°$
$\therefore \cos C=\cos 90°=0$

329. (1) $\sin\theta.\cos\theta=\dfrac{1}{2}$
$\Rightarrow 2\sin\theta.\cos\theta=1$
$\Rightarrow \sin 2\theta=1=\sin 90°$
$\Rightarrow 2\theta=90°$
$\Rightarrow \theta=45°$
$\therefore \sin\theta-\cos\theta$
$=\sin 45°-\cos 45°$
$=\dfrac{1}{\sqrt{2}}-\dfrac{1}{\sqrt{2}}=0$

330. (1) $\dfrac{\cos\theta}{1-\sin\theta}+\dfrac{\cos\theta}{1+\sin\theta}=4$
$\Rightarrow \dfrac{\cos\theta(1+\sin\theta)+\cos\theta(1-\sin\theta)}{(1-\sin\theta)(1+\sin\theta)}=4$
$\Rightarrow \dfrac{\cos\theta+\cos\theta.\sin\theta+\cos\theta-\cos\theta.\sin\theta}{1-\sin^2\theta}$
$=4$
$\Rightarrow \dfrac{2\cos\theta}{\cos^2\theta}=4$
$\Rightarrow \dfrac{1}{\cos\theta}=2\Rightarrow \cos\theta=\dfrac{1}{2}$
$=\cos 60°$
$\Rightarrow \theta=60°$

331. (4) $x^2=\sin^2 30°+4\cot^2 45°-\sec^2 60°$
$=\left(\dfrac{1}{2}\right)^2+4(1)^2-(2)^2$
$=\dfrac{1}{4}+4-4=\dfrac{1}{4}$
$\therefore x=\dfrac{1}{2}$

332. (2) $7\sin^2\theta+3\cos^2\theta=4$
$\Rightarrow 4\sin^2\theta+3\sin^2\theta+3\cos^2\theta$
$=4$
$\Rightarrow 4\sin^2\theta+3(\sin^2\theta+\cos^2\theta)=4$
$\Rightarrow 4\sin^2\theta=4-3$
$[\because \sin^2\theta+\cos^2\theta=1]$
$\Rightarrow 4\sin^2\theta=1$
$\Rightarrow \sin^2\theta=\dfrac{1}{4}$

$\Rightarrow \sin\theta = \frac{1}{2} = \sin 30°$

$\Rightarrow \theta = 30°$

$\therefore \sec\theta + \operatorname{cosec}\theta$

$= \sec 30° + \operatorname{cosec} 30°$

$= \frac{2}{\sqrt{3}} + 2$

333. (3) $\tan\theta + \cot\theta = 5$

On squaring both sides,

$(\tan\theta + \cot\theta)^2 = 25$

$\Rightarrow \tan^2\theta + \cot^2\theta + 2\tan\theta . \cot\theta = 25$

$\Rightarrow \tan^2\theta + \cot^2\theta + 2 = 25$

$\Rightarrow \tan^2\theta + \cot^2\theta = 25 - 2 = 23$

334. (2) $5 \cos\theta + 12 \sin\theta = 13$

$\Rightarrow 5 \cos\theta - 13 = 12 \sin\theta$

On squaring both sides,

$25 \cos^2\theta + 169 - 130 \cos\theta$

$= 144 (1 - \cos^2\theta)$

$\Rightarrow 25 \cos^2\theta - 130 \cos\theta + 169$

$= 144 - 144 \cos^2\theta$

$\Rightarrow 144 \cos^2\theta + 25 \cos^2\theta - 130 \cos\theta + 169 - 144 = 0$

$\Rightarrow 169 \cos^2\theta - 130 \cos\theta + 25 = 0$

$\Rightarrow (13 \cos\theta - 5)^2 = 0$

$\Rightarrow 13 \cos\theta - 5 = 0$

$\Rightarrow 13 \cos\theta = 5$

$\Rightarrow \cos\theta = \frac{5}{13}$

OR

$5 \cos\theta + 12 \sin\theta = 13$

$\Rightarrow \frac{5}{13} \cos\theta + \frac{12}{13} \sin\theta = 1$

$\because \cos^2\theta + \sin^2\theta = 1$

$\therefore \cos\theta = \frac{5}{13}$

335. (3) $\tan 45° = \cot\theta$

$\Rightarrow \tan 45° = \tan (90° - \theta)$

$\Rightarrow 45° = 90° - \theta$

$\Rightarrow \theta = 90° - 45° = 45°$

$\because 180° = \pi$ radian

$\therefore 45° = \frac{\pi}{180} \times 45°$

$= \frac{\pi}{4}$ radian

336. (3) $\sin \frac{A+B}{2} = \frac{\sqrt{3}}{2} = \sin 60°$

$\Rightarrow \frac{A+B}{2} = 60°$

$\Rightarrow A + B = 2 \times 60° = 120°$

$\therefore C = 180° - 120° = 60°$

$\therefore \sin \frac{C}{2} = \sin 30° = \frac{1}{2}$

337. (1) $\cos^2\theta + \sin^2\theta = 1$ ..... (i)

$\therefore \cos^4\theta - \sin^4\theta = \frac{1}{3}$

$\Rightarrow (\cos^2\theta + \sin^2\theta) (\cos^2\theta - \sin^2\theta) = \frac{1}{3}$

$\Rightarrow \cos^2\theta - \sin^2\theta = \frac{1}{3}$ ..... (ii)

By equations (i) + (ii),

$2 \cos^2\theta = 1 + \frac{1}{3} = \frac{4}{3}$

$\Rightarrow \cos^2\theta = \frac{2}{3}$

From equation (i),

$\frac{2}{3} + \sin^2\theta = 1$

$\Rightarrow \sin^2\theta = 1 - \frac{2}{3} = \frac{1}{3}$

$\therefore \tan^2\theta = \frac{\frac{1}{3}}{\frac{2}{3}} = \frac{1}{2}$

338. (3) $\tan 80° . \tan 10° + \sin^2 70° + \sin^2 20°$

$= \tan (90° - 10°) . \tan 10° + \sin^2 (90° - 20°) + \sin^2 20°$

$= \cot 10° . \tan 10° + \cos^2 20° + \sin^2 20°$

$= 1 + 1 = 2$

[$\because \sin (90° - \theta) = \cos\theta$; $\tan (90° - \theta) = \cot\theta$; $\tan\theta . \cot\theta = 1$]

339. (2) $\sin 27° = \sin (90° - 63°)$

$= \cos 63°$

[$\because \sin (90° - \theta) = \cos \theta$]

$\therefore \left(\frac{\sin 27°}{\cos 63°}\right)^2 + \left(\frac{\cos 63°}{\sin 27°}\right)^2$

$= \left(\frac{\sin 27°}{\sin 27°}\right)^2 + \left(\frac{\sin 27°}{\sin 27°}\right)^2$

$= 1 + 1 = 2$

340. (2) $\sqrt{2} \tan 2\theta = \sqrt{6}$

$\Rightarrow \tan 2\theta = \frac{\sqrt{6}}{\sqrt{2}} = \sqrt{3}$

$\Rightarrow \tan 2\theta = \tan 60°$

$\Rightarrow 2\theta = 60° \Rightarrow \theta = 30°$

$\therefore \sin\theta + \sqrt{3} \cos\theta - 2 \tan 2\theta$

$= \sin 30° + \sqrt{3} \cos 30° - 2 \tan^2 30°$

$= \frac{1}{2} + \sqrt{3} \times \frac{\sqrt{3}}{2} - 2 \left(\frac{1}{\sqrt{3}}\right)^2$

$= \frac{1}{2} + \frac{3}{2} - \frac{2}{3}$

$= \frac{3+9-4}{6} = \frac{8}{6} = \frac{4}{3}$

341. (3) $\tan\alpha = 2$

$\therefore \sec^2\alpha = 1 + \tan^2\alpha = 1 + 2^2$

$= 1 + 4 = 5$

Expression $= \frac{\sin\alpha}{\sin^3\alpha + \cos^3\alpha}$

$= \frac{\sin\alpha}{\cos^3\alpha \left(\frac{\sin^3\alpha}{\cos^3\alpha} + \frac{\cos^3\alpha}{\cos^3\alpha}\right)}$

$= \frac{\sin\alpha}{\cos\alpha} \cdot \frac{1}{\cos^2\alpha} \cdot \frac{1}{(\tan^3\alpha + 1)}$

$= \tan\alpha . \sec^2\alpha . \frac{1}{(\tan^3\alpha + 1)}$

$= 2 \times 5 \times \frac{1}{(2^3 + 1)} = \frac{10}{9}$

342. (1) $\sin\theta + \cos\theta = 1$

On squaring,

$(\sin\theta + \cos\theta)^2 = 1$

$\Rightarrow \sin^2\theta + \cos^2\theta + 2 \sin\theta . \cos\theta = 1$

$\Rightarrow 1 + 2 \sin\theta . \cos\theta = 1$

$\Rightarrow 2 \sin\theta . \cos\theta = 1 - 1 = 0$

$\Rightarrow \sin\theta . \cos\theta = 0$

343. (4) $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 3$

$\Rightarrow 3 \sin\theta - 3 \cos\theta = \sin\theta + \cos\theta$

$\Rightarrow 3 \sin\theta - \sin\theta = 3 \cos\theta + \cos\theta$

$\Rightarrow 2 \sin\theta = 4 \cos\theta$

$\Rightarrow \sin\theta = 2 \cos\theta$

$\Rightarrow \tan\theta = 2$

$\therefore \sec^2\theta = 1 + \tan^2\theta$

$= 1 + 4 = 5$

$\therefore \cos^2\theta = \frac{1}{5}$

$\therefore \sin^2\theta = 1 - \cos^2\theta$

$= 1 - \frac{1}{5} = \frac{4}{5}$

$\therefore \sin^4\theta - \cos^4\theta$

$= (\sin^2\theta + \cos^2\theta)(\sin^2\theta - \cos^2\theta)$

$= \sin^2\theta - \cos^2\theta$

$= \frac{4}{5} - \frac{1}{5} = \frac{3}{5}$

344. (3) $\sin C - \sin D = 2 \cos \frac{C+D}{2} . \sin \frac{C-D}{2} = x$

Illustration

$\sin(A + B)$
$= \sin A \cdot \cos B + \cos A \cdot \sin B$
$\sin(A - B)$
$= \sin A \cdot \cos B - \cos A \cdot \sin B$
$\therefore \sin(A + B) - \sin(A - B)$
$= 2 \cos A \cdot \sin B$
Let, $A + B = C$; $A - B = D$
$\therefore$ On adding,

$$A = \frac{C + D}{2}$$

On subtracting,

$$B = \frac{C - D}{2}$$

$$\therefore \sin C - \sin D = 2 \cos \frac{C + D}{2} \cdot \sin \frac{C - D}{2}$$

345. (1) $\sin A + \sin^2 A = 1$
$\Rightarrow \sin A = 1 - \sin^2 A = \cos^2 A$
$\therefore \cos^2 A + \cos^4 A$
$= \cos^2 A + (\cos^2 A)^2$
$= \cos^2 A + \sin^2 A = 1$

346. (1) For $0° < \theta < 90°$
$\cos\theta > \cos^2\theta$ because $\cos\theta° = 1$ and $\cos 90° = 0$

347. (1) $5 \sin^2\theta + 4 \cos^2\theta = \frac{9}{2}$
$\Rightarrow 10 \sin^2\theta + 8 \cos^2\theta = 9$
On dividing by $\cos^2\theta$,

$$\frac{10\sin^2\theta}{\cos^2\theta} + \frac{8\cos^2\theta}{\cos^2\theta} = \frac{9}{\cos^2\theta}$$

$= 9 \sec^2\theta$
$\Rightarrow 10 \tan^2\theta + 8 = 9 (1 + \tan^2\theta)$
$\Rightarrow 10 \tan^2\theta + 8 = 9 + 9 \tan^2\theta$
$\Rightarrow 10 \tan^2\theta - 9 \tan^2\theta = 9 - 8$
$\Rightarrow \tan^2\theta = 1 \Rightarrow \tan\theta = \pm 1$

$\because 0 < \theta < \frac{\pi}{2}$, $\therefore \tan\theta = 1$

348. (2) $\sec^2 17° - \frac{1}{\tan^2 73°} - \sin 17° . \sec 73°$
$= \sec^2 17° - \cot^2 73° - \sin 17° . \sec 73°$
$= \sec^2 17° - \cot^2 (90° - 17°) - \sin 17° . \sec (90° - 17°)$
$= \sec^2 17^2 - \tan^2 17° - \sin 17° . \operatorname{cosec} 17°$
$= 1 - 1 = 0$
[$\because \cot(90° - \theta) = \tan\theta$; $\sec(90° - \theta) = \operatorname{cosec}\theta$; $\sec^2\theta - \tan^2\theta = 1$; $\sin\theta . \operatorname{cosec}\theta = 1$]

349. (4) $x = a \cos\theta . \cos\phi$
$y = a \cos\theta . \sin\phi$
$z = a \sin\theta$
$\therefore x^2 + y^2 + z^2$
$= a^2 \cos^2\phi . \cos^2\theta + a^2 \cos^2\theta . \sin^2\phi + a^2 \sin^2\theta$
$= a^2 \cos^2\theta (\cos^2\phi + \sin^2\phi) + a^2 \sin^2\theta$
$= a^2 \cos^2\theta + a^2 \sin^2\theta$
$= a^2 (\cos^2\theta + \sin^2\theta) = a^2$

350. (4) $\sec 15\theta = \operatorname{cosec} 15\theta$
$\Rightarrow \sec 15\theta = \sec(90° - 15\theta)$
$\Rightarrow 15\theta = 90° - 15\theta$
$\Rightarrow 15\theta = 90° - 15\theta$
$\Rightarrow 15\theta + 15\theta = 90°$
$\Rightarrow 30\theta = 90°$
$\Rightarrow \theta = \frac{90°}{30} = 3°$

351. (3) $\tan\theta = \tan 30° . \tan 60°$
$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}} \times \sqrt{3} = 1$
$\Rightarrow \tan\theta = \tan 45°$
$\Rightarrow \theta = 45°$
$\therefore 2\theta = 2 \times 45° = 90°$

352. (2) Expression
$= (1 + \tan^2\theta) . (1 - \sin^2\theta)$
$= \sec^2\theta . \cos^2\theta = 1$
[$\because \sec^2\theta - \tan^2\theta = 1 = \sin^2\theta + \cos^2\theta$; $\sec\theta . \cos\theta = 1$]

353. (3) $r \sin\theta = 1$ ..... (i)
$r \cos\theta = \sqrt{3}$ ..... (ii)
On squaring and adding both equations,
$r^2 \sin^2\theta + r^2\cos^2\theta = 1 + 3$
$\Rightarrow r^2 (\sin^2\theta + \cos^2\theta) = 4$
$\Rightarrow r^2 = 4$
Again, $\frac{r \sin\theta}{r \cos\theta} = \frac{1}{\sqrt{3}}$
$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}}$
$\therefore r^2 \tan\theta = \frac{4}{\sqrt{3}}$

354. (1) $\sin\theta = \frac{\sqrt{3}}{2} = \sin 60°$
$\Rightarrow \theta = 60°$
$\therefore \tan(\theta - 15°)$
$= \tan(60° - 15°) = \tan 45° = 1$

355. (1) $\frac{\operatorname{cosec}\theta + \sin\theta}{\operatorname{cosec}\theta - \sin\theta} = \frac{5}{3}$
$\Rightarrow 5 \operatorname{cosec}\theta - 5 \sin\theta$
$= 3 \operatorname{cosec}\theta + 3 \sin\theta$
$\Rightarrow 5 \operatorname{cosec}\theta - 3 \operatorname{cosec}\theta$
$= 5 \sin\theta + 3 \sin\theta$
$\Rightarrow 2 \operatorname{cosec}\theta = 8 \sin\theta$
$\Rightarrow \frac{1}{\sin\theta} = 4 \sin\theta$
$\Rightarrow 4 \sin^2\theta = 1 \Rightarrow 2\sin\theta = 1$
$\Rightarrow \sin\theta = \frac{1}{2}$

356. (2) $y = 2\sec\theta \Rightarrow \sec\theta = \frac{y}{2}$
and $x = 3 \tan\theta \Rightarrow \tan\theta = \frac{x}{3}$
$\because \sec^2\theta - \tan^2\theta = 1$
$\Rightarrow \frac{y^2}{4} - \frac{x^2}{9} = 1$
$\Rightarrow \frac{x^2}{9} - \frac{y^2}{4} = -1$

357. (4) $r \sin\theta = \sqrt{3}$
$r \cos\theta = 1$
On squaring and adding,
$r^2\sin^2\theta + r^2\cos^2\theta = 3 + 1$
$\Rightarrow r^2 (\sin^2\theta + \cos^2\theta) = 4$
$\Rightarrow r^2 = 4 \Rightarrow r = \sqrt{4} = 2$
Again, $\frac{r \sin\theta}{r \cos\theta} = \sqrt{3}$
$\Rightarrow \tan\theta = \sqrt{3} = \tan 60°$
$\Rightarrow \theta = 60°$

358. (2) $x \tan 60° + \cos 45°$
$= \sec 45°$
$\Rightarrow \sqrt{3}x + \frac{1}{\sqrt{2}} = \sqrt{2}$
$\Rightarrow \sqrt{3}x = \sqrt{2} - \frac{1}{\sqrt{2}}$
$\Rightarrow \sqrt{3}x = \frac{2-1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$
$\Rightarrow x = \frac{1}{\sqrt{6}}$
$\therefore x^2 + 1 = \left(\frac{1}{\sqrt{6}}\right)^2 + 1$
$= \frac{1}{6} + 1 = \frac{7}{6}$

359. (3) $\sin(2x - 20°) = \cos(2y + 20°)$
$\Rightarrow \sin(2x - 20°)$
$= \sin\{90° - (2y + 20°)\}$
$\Rightarrow 2x - 20° = 90° - 2y - 20°$
$\Rightarrow 2x + 2y = 90°$
$\Rightarrow 2(x + y) = 90° \Rightarrow x + y = 45°$
$\therefore \tan(x + y) = \tan 45° = 1$

360. (2) $a^2 \sec^2 x - b^2 \tan^2 x = c^2$
$\Rightarrow a^2 (1 + \tan^2 x) - b^2 \tan^2 x = c^2$
$\Rightarrow a^2 + a^2 \tan^2 x - b^2 \tan^2 x = c^2$
$\Rightarrow a^2 \tan^2 x - b^2 \tan^2 x = c^2 - a^2$
$\Rightarrow \tan^2 x (a^2 - b^2) = c^2 - a^2$
$\Rightarrow \tan^2 x = \frac{c^2 - a^2}{a^2 - b^2}$

$\therefore\ \sec^2 x + \tan^2 x$
$= 1 + \tan^2 x + \tan^2 x$
$= 1 + 2\tan^2 x$

$$= 1 + \frac{2(c^2 - a^2)}{a^2 - b^2}$$

$$= \frac{a^2 - b^2 + 2c^2 - 2a^2}{a^2 - b^2}$$

$$= \frac{-b^2 + 2c^2 - a^2}{a^2 - b^2}$$

$$= \frac{b^2 + a^2 - 2c^2}{b^2 - a^2}$$

361. (3) (1 + sec 20° + cot 70°) (1 – cosec 20° + tan 70°)
= (1 + sec 20° + tan 20°) (1 – cosec 20° + cot 20°)
[$\because$ tan (90° – θ) = cotθ; cot (90° – θ) = tanθ]

$$= \left(1 + \frac{1}{\cos 20^\circ} + \frac{\sin 20^\circ}{\cos 20^\circ}\right)$$

$$\left(1 - \frac{1}{\sin 20^\circ} + \frac{\cos 20^\circ}{\sin 20^\circ}\right)$$

$$= \left(\frac{\cos 20^\circ + 1 + \sin 20^\circ}{\cos 20^\circ}\right)$$

$$\left(\frac{\sin 20^\circ - 1 + \cos 20^\circ}{\sin 20^\circ}\right)$$

$$= \frac{(\sin 20^\circ + \cos 20^\circ + 1)(\sin 20^\circ + \cos 20^\circ - 1)}{\sin 20^\circ . \cos 20^\circ}$$

$$= \frac{(\sin 20^\circ + \cos 20^\circ)^2 - 1}{\sin 20^\circ . \cos 20^\circ}$$

$$= \frac{\sin^2 20^\circ + \cos^2 20^\circ + 2\sin 20^\circ . \cos 20^\circ - 1}{\sin 20^\circ . \cos 20^\circ}$$

$$= \frac{1 + 2\sin 20^\circ . \cos 20^\circ - 1}{\sin 20^\circ . \cos 20^\circ} = 2$$

362. (3) $\tan^4\theta + \tan^2\theta = 1$
$\Rightarrow \tan^2\theta\,(\tan^2\theta + 1) = 1$
$\Rightarrow \tan^2\theta\ .\ \sec^2\theta = 1$

$$\Rightarrow \tan^2\theta = \frac{1}{\sec^2\theta} = \cos^2\theta.$$

$\therefore\ \cos^4\theta + \cos^2\theta = \tan^4\theta + \tan^2\theta$
$= 1$

363. (3) $8(\sin^6\theta + \cos^6\theta) - 12(\sin^4\theta + \cos^4\theta)$
$= 8\{(\sin^2\theta + \cos^2\theta)^3 - 3\sin^2\theta\ .\ \cos^2\theta\,(\sin^2\theta + \cos^2\theta)\} - 12\{(\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta\cos^2\theta)\}$
$= 8(1 - 3\sin^2\theta\ .\ \cos^2\theta) - 12(1 - 2\sin^2\theta\ .\ \cos^2\theta)$
$= 8 - 24\sin^2\theta\ .\ \cos^2\theta - 12 + 24\sin^2\theta.\cos^2\theta = -4$

364. (3) $\tan 3\theta.\ \tan 7\theta = 1$

$$\Rightarrow \tan 3\theta = \frac{1}{\tan 7\theta} = \cot 7\theta$$

$\Rightarrow \tan 3\theta = \tan(90^\circ - 7\theta)$
$\Rightarrow 3\theta = 90^\circ - 7\theta$
$\Rightarrow 3\theta + 7\theta = 90^\circ$
$\Rightarrow 10\theta = 90^\circ \Rightarrow \theta = 9^\circ$
$\therefore\ \tan(\theta + 36^\circ) = \tan(9^\circ + 36^\circ)$
$= \tan 45^\circ = 1$

365. (4) Expression

$$= \frac{\sin\theta}{1 + \cos\theta} + \frac{\sin\theta}{1 - \cos\theta}$$

$$= \frac{\sin\theta(1 - \cos\theta) + \sin\theta(1 + \cos\theta)}{(1 + \cos\theta)(1 - \cos\theta)}$$

$$= \frac{\sin\theta - \sin\theta.\cos\theta + \sin\theta + \sin\theta.\cos\theta}{1 - \cos^2\theta}$$

$$= \frac{2\sin\theta}{\sin^2\theta} = \frac{2}{\sin\theta} = 2\operatorname{cosec}\theta$$

366. (3) $\tan\theta = \dfrac{8}{15}$

$\therefore\ \sec^2\theta - \tan^2\theta = 1$
$\Rightarrow \sec^2\theta = 1 + \tan^2\theta$

$$= 1 + \left(\frac{8}{15}\right)^2$$

$$= 1 + \frac{64}{225} = \frac{225 + 64}{225} = \frac{289}{225}$$

$$\Rightarrow \sec\theta = \sqrt{\frac{289}{225}} = \frac{17}{15}$$

$\therefore$ Expression

$$= \sqrt{\frac{1 - \sin\theta}{1 + \sin\theta}}$$

$$= \sqrt{\frac{(1 - \sin\theta)(1 - \sin\theta)}{(1 + \sin\theta)(1 - \sin\theta)}}$$

$$= \sqrt{\frac{(1 - \sin\theta)^2}{1 - \sin^2\theta}}$$

$$= \sqrt{\frac{(1 - \sin\theta)^2}{\cos^2\theta}} = \frac{1 - \sin\theta}{\cos\theta}$$

$$= \frac{1}{\cos\theta} - \frac{\sin\theta}{\cos\theta} = \sec\theta - \tan\theta$$

$$= \frac{17}{15} - \frac{8}{15}$$

$$= \frac{17 - 8}{15} = \frac{9}{15} = \frac{3}{5}$$

367. (4) Expression

$$= \frac{\sin\theta + \sin\phi}{\cos\theta + \cos\phi} + \frac{\cos\theta - \cos\phi}{\sin\theta - \sin\phi}$$

$$= \frac{(\sin\theta + \sin\phi)(\sin\theta - \sin\phi) + (\cos\theta - \cos\phi)(\cos\theta + \cos\phi)}{(\cos\theta + \cos\phi)(\sin\theta - \sin\phi)}$$

$$= \frac{\sin^2\theta - \sin^2\phi + \cos^2\theta - \cos^2\phi}{(\cos\theta + \cos\phi)(\sin\theta - \sin\phi)}$$

$$= \frac{(\sin^2\theta + \cos^2\theta) - (\sin^2\phi + \cos^2\phi)}{(\cos\theta + \cos\phi)(\sin\theta - \sin\phi)}$$

$$= \frac{1 - 1}{(\cos\theta + \cos\phi)(\sin\theta - \sin\phi)} = 0$$

368. (*) $\cot\theta = 4$ (Given)

$$\text{Expression} = \frac{5\sin\theta + 3\cos\theta}{5\sin\theta - 3\cos\theta}$$

$$= \frac{5\dfrac{\sin\theta}{\sin\theta} + \dfrac{3\cos\theta}{\sin\theta}}{5\dfrac{\sin\theta}{\sin\theta} - \dfrac{3\cos\theta}{\sin\theta}}$$

[On dividing numerator and denominator by sinθ]

$$= \frac{5 + 3\cot\theta}{5 - 3\cot\theta}$$

$$= \frac{5 + 3 \times 4}{5 - 3 \times 4} = \frac{5 + 12}{5 - 12} = \frac{-17}{7}$$

369. (4) $\cos^2 20^\circ + \cos^2 70^\circ$
$= \cos^2(90^\circ - 70^\circ) + \cos^2 70^\circ$
$= \sin^2 70^\circ + \cos^2 70^\circ = 1$
[$\cos(90^\circ - \theta) = \sin\theta$]

370. (4) $\cos A + \cos^2 A = 1$
$\Rightarrow \cos A = 1 - \cos^2 A = \sin^2 A$
$\therefore\ \sin^2 A + \sin^4 A$
$= \sin^2 A + (\sin^2 A)^2$
$= \sin^2 A + \cos^2 A = 1$

371. (3) $\sin\theta + \operatorname{cosec}\theta = 2$

$$\Rightarrow \sin\theta + \frac{1}{\sin\theta} = 2$$

$\Rightarrow \sin^2\theta + 1 = 2\sin\theta$
$\Rightarrow \sin^2\theta - 2\sin\theta + 1 = 0$
$\Rightarrow (\sin\theta - 1)^2 = 0$
$\Rightarrow \sin\theta - 1 = 0$
$\Rightarrow \sin\theta = 1$
$\therefore\ \operatorname{cosec}\theta = 1$
$\therefore\ \sin^{-7}\theta + \operatorname{cosec}^7\theta$
$= (1)^{-7} + (1)^7 = 2$

372. (1) $2y\cos\theta = x\sin\theta$

$$\Rightarrow x = \frac{2y\cos\theta}{\sin\theta} \quad \text{....(i)}$$

$\therefore\ 2x\sec\theta - y\operatorname{cosec}\theta = 3$

$$\Rightarrow \frac{2 \times 2 \times y\cos\theta.\sec\theta}{\sin\theta} - y\operatorname{cosec}\theta = 3$$

$\Rightarrow 4y\operatorname{cosec}\theta - y\operatorname{cosec}\theta = 3$
$\Rightarrow 3y\operatorname{cosec}\theta = 3$

$\Rightarrow y = \dfrac{1}{\text{cosec}\theta} = \sin\theta$

From equation (i),

$x = \dfrac{2 \times \sin\theta.\cos\theta}{\sin\theta} = 2\cos\theta$

$\therefore x^2 + 4y^2 = (2\cos\theta)^2 + 4\sin^2\theta$
$= 4(\cos^2\theta + \sin^2\theta) = 4$

373. (2) $\sin^2\theta - \cos^2\theta = \dfrac{1}{4}$

$\therefore \sin^4\theta - \cos^4\theta = (\sin^2\theta + \cos^2\theta)$
$(\sin^2\theta - \cos^2\theta) = \dfrac{1}{4}$

374. (2) $\dfrac{\sin^2 63° + \sin^2 27°}{\cos^2 17° + \cos^2 73°}$

$= \dfrac{\sin^2 63° + \sin^2(90° - 63°)}{\cos^2 17° + \cos^2(90° - 17°)}$

$= \dfrac{\sin^2 63° + \cos^2 63°}{\cos^2 17° + \sin^2 17°}$
$= 1$

$\left[\because \sin(90° - \theta) = \cos\theta; \cos(90° - \theta) = \sin\theta; \sin^2\theta + \cos^2\theta = 1\right]$

375. (2) $\cos^2 20° + \cos^2 70°$
$= \cos^2 20° + \cos^2(90° - 20°)$
$= \cos^2 20° + \sin^2 20° = 1$
$[\because \cos(90° - \theta) = \sin\theta]$

376. (1) $a \sin 45° . \cos 45° . \tan 60°$
$= \tan^2 45° - \cos 60°$

$\Rightarrow a \times \dfrac{1}{\sqrt{2}} \times \dfrac{1}{\sqrt{2}} \times \sqrt{3} = 1 - \dfrac{1}{2}$

$\Rightarrow \dfrac{\sqrt{3}a}{2} = \dfrac{1}{2}$

$\Rightarrow \sqrt{3}a = 1 \quad \Rightarrow a = \dfrac{1}{\sqrt{3}}$

377. (3) $3\sin\theta + 4\cos\theta = 5$

$\Rightarrow \dfrac{3}{5}\sin\theta + \dfrac{4}{5}\cos\theta = 1$

$\because \sin^2\theta + \cos^2\theta = 1$

$\therefore \sin\theta = \dfrac{3}{5}, \cos\theta = \dfrac{4}{5}$

378. (2) $\sin x - \cos x = 1$ ..... (i)
$\sin x + \cos x = y$ ..... (ii)
On squaring and adding both equations,
$\sin^2 x + \cos^2 x - 2\sin x.\cos x + \sin^2 x + \cos^2 x + 2\sin x . \cos x$
$= 1 + y^2$
$\Rightarrow 1 + 1 = 1 + y^2$
$\Rightarrow y^2 = 1 \Rightarrow y = 1$

379. (4) $\sin(3x - 20°) = \cos(3y + 20°)$
$\Rightarrow \sin(3x - 20°)$
$= \sin\{90° - (3y + 20°)\}$
$[\because \sin(90° - \theta) = \cos\theta]$
$\Rightarrow 3x - 20° = 90° - 3y - 20°$
$= 70° - 3y$
$\Rightarrow 3x + 3y = 70° + 20° = 90°$
$\Rightarrow 3(x + y) = 90°$

$\Rightarrow x + y = \dfrac{90°}{3} = 30°$

380. (1) $m = \dfrac{\cos\alpha}{\cos\beta}; n = \dfrac{\cos\alpha}{\sin\beta}$

$\therefore (m^2 + n^2)\cos^2\beta$

$= \left(\dfrac{\cos^2\alpha}{\cos^2\beta} + \dfrac{\cos^2\alpha}{\sin^2\beta}\right)\cos^2\beta$

$= \cos^2\alpha\left(\dfrac{1}{\cos^2\beta} + \dfrac{1}{\sin^2\beta}\right)\cos^2\beta$

$= \cos^2\alpha . \cos^2\beta\left(\dfrac{\sin^2\beta + \cos^2\beta}{\sin^2\beta.\cos^2\beta}\right)$

$= \dfrac{\cos^2\alpha}{\sin^2\beta} = n^2$

381. (2) $\tan 315° . \cot(-405°)$
$= -\tan 315° . \cot 405°$
$[\cot(-\theta) = -\cot\theta]$
$= -\tan(360° - 45°) . \cot(360° + 45°)$
$= -(-\tan 45°) . \cot 45°$
$= \tan 45° . \cot 45° = 1$

382. (4) $\tan(\alpha - \beta) = 1 = \tan 45°$
$\Rightarrow \alpha - \beta = 45°$ ..... (i)

$\sec(\alpha + \beta) = \dfrac{2}{\sqrt{3}} = \sec 30°$

$\Rightarrow \alpha + \beta = 30°$ ..... (ii)
On adding (i) and (ii),

$2\alpha = 45° + 30° = 75° \Rightarrow \alpha = \dfrac{75}{2}$

$= 37\dfrac{1°}{2}$

383. (4) $\tan\theta + \cot\theta = 2$

$\Rightarrow \tan\theta + \dfrac{1}{\tan\theta} = 2$

$\Rightarrow \dfrac{\tan^2\theta + 1}{\tan\theta} = 2$

$\Rightarrow \tan^2\theta + 1 = 2\tan\theta$
$\Rightarrow \tan^2\theta - 2\tan\theta + 1 = 0$
$\Rightarrow (\tan\theta - 1)^2 = 0$
$\Rightarrow \tan\theta - 1 = 0$
$\Rightarrow \tan\theta = 1$
$\therefore \cot\theta = 1$
$\therefore \tan^n\theta + \cot^n\theta = 1 + 1 = 2$

384. (3) $\cos x = \sin y$
$\Rightarrow \cos x = \cos(90° - y)$
$\Rightarrow x = 90° - y$
$[\because \cos(90° - \theta = \sin\theta)]$
$\Rightarrow x + y = 90°$ .... (i)

Again,
$\cot(x - 40°) = \tan(50° - y)$
$\Rightarrow (\cot(x - 40°)$
$= \cot\{90° - (50° - y)\}$
$[\because \cot(90° - \theta) = \tan\theta]$
$\Rightarrow x - 40° = 90° - 50° + y$
$\Rightarrow x - 40 = 40 + y$ (i)
$\Rightarrow x - y = 40 + 40 = 80°$ (ii)
On adding equations (i) and (ii),
$x + y + x - y = 90° + 80°$
$\Rightarrow 2x = 170°$

$\Rightarrow x = \dfrac{170°}{2} = 85°$

From equation (i),
$\Rightarrow 85° + y = 90°$
$\Rightarrow y = 90° - 85° = 5°$

385. (3) $\text{cosec}^2 60° + \sec^2 60° - \cot^2 60° + \tan^2 30°$

$= \left(\dfrac{2}{\sqrt{3}}\right)^2 + (2)^2 - \left(\dfrac{1}{\sqrt{3}}\right)^2 + \left(\dfrac{1}{\sqrt{3}}\right)^2$

$= \dfrac{4}{3} + 4 = \dfrac{4 + 12}{3} = \dfrac{16}{3} = 5\dfrac{1}{3}$

386. (3) $\sin\theta + \text{cosec}\theta = 2$

$\Rightarrow \sin\theta + \dfrac{1}{\sin\theta} = 2$

$\Rightarrow \dfrac{\sin^2\theta + 1}{\sin\theta} = 2$

$\Rightarrow \sin^2\theta + 1 = 2\sin\theta$
$\Rightarrow \sin^2\theta - 2\sin\theta + 1 = 0$
$\Rightarrow (\sin\theta - 1)^2 = 0$
$\Rightarrow \sin\theta - 1$
$= 0 \Rightarrow \sin\theta - 1$
$\therefore \text{cosec}\theta = 1$
$\therefore \sin^n\theta + \text{cosec}^n\theta = 1 + 1 = 2$

387. (2) $\sin A + \sin^2 A = 1$
$\Rightarrow \sin A = 1 - \sin^2 A = \cos^2 A$
$\therefore \cos^4 A = \sin^2 A$
$\therefore \cos^2 A + \cos^4 A$
$= \cos^2 A + \sin^2 A = 1$

388. (2)

$\angle CAB = 90°$
$\therefore \cos A = \cos 90° = 0$

$\cos B = \dfrac{AB}{BC}, \cos C = \dfrac{AC}{BC}$

$\therefore \cos^2 A + \cos^2 B + \cos^2 C$

$= 0 + \dfrac{AB^2}{BC^2} + \dfrac{AC^2}{BC^2}$

$= \frac{AB^2 + AC^2}{BC^2} = \frac{BC^2}{BC^2} = 1$

389. (1) $r \sin\theta = \frac{7}{2}$

$r \cos\theta = \frac{7\sqrt{3}}{2}$

$\Rightarrow \frac{r\sin\theta}{r\cos\theta} = \frac{\frac{7}{2}}{\frac{7\sqrt{3}}{2}}$

$\Rightarrow \tan\theta = \frac{7}{2} \times \frac{2}{7\sqrt{3}} = \frac{1}{\sqrt{3}}$

$\Rightarrow \tan\theta = \tan 30°$

$\Rightarrow \theta = 30°$

290. (3) Expression

$= \frac{8\sin\theta + 5\cos\theta}{\sin^3\theta - 2\cos^3\theta + 7\cos\theta}$

Dividing numerator and denominator by $\cos^3\theta$

$= \frac{\frac{8\sin\theta}{\cos^3\theta} + \frac{5\cos\theta}{\cos^3\theta}}{\frac{\sin^3\theta}{\cos^3\theta} - \frac{2\cos^3\theta}{\cos^3\theta} + \frac{7\cos\theta}{\cos^3\theta}}$

$= \frac{8\tan\theta.\sec^2\theta + 5\sec^2\theta}{\tan^3\theta - 2 + 7\sec^2\theta}$

$= \frac{8\tan\theta(1+\tan^2\theta) + 5(1+\tan^2\theta)}{\tan^3\theta - 2 + 7(1+\tan^2\theta)}$

$= \frac{8(1+1) + 5 \times 2}{1 - 2 + 7(1+1)} = \frac{16+10}{1-2+14}$

$= \frac{26}{13} = 2$

391. (2) $4 \sin^2\theta = 3$

$\Rightarrow \sin^2\theta = \frac{3}{4}$

$\Rightarrow \sin\theta = \frac{\sqrt{3}}{2} = \sin 60°$

$\Rightarrow \theta = 60°$

$\therefore \tan\theta - \cot\frac{\theta}{2}$

$= \tan 60° - \cot 30°$

$= \sqrt{3} - \sqrt{3} = 0$

392. (4) $\frac{\cos^2\theta - 3\cos\theta + 2}{\sin^2\theta} = 1$

$\Rightarrow \cos^2\theta - 3\cos\theta + 2$

$= \sin^2\theta = 1 - \cos^2\theta$

$\Rightarrow 2\cos^2\theta - 3\cos\theta + 1 = 0$

$\Rightarrow 2\cos^2\theta - 2\cos\theta - \cos\theta + 1 = 0$

$\Rightarrow 2\cos\theta(\cos\theta - 1) - 1(\cos\theta - 1) = 0$

$\Rightarrow (2\cos\theta - 1)(\cos\theta - 1) = 0$

$\Rightarrow \cos\theta = \frac{1}{2}$

as $\cos\theta \neq 1$ as $\theta > 0$

$\therefore \cos\theta = \cos 60°$

$\Rightarrow \theta = 60°$

393. (2) $\cot 17° . \cot 73° . \cos^2 22° + \frac{\cot 17°}{\cot 17°.\sec^2 68°}$

$= \cot 17° . \cot(90° - 17°) . \cos^2 22° + \cos^2 68°$

$= \cot 17° . \tan 17° . \cos^2 22° + \cos^2(90° - 22°)$

$= \cos^2 22° + \sin^2 22° = 1$

[$\because \cot(90° - \theta) = \tan\theta$; $\cos(90° - \theta) = \sin\theta$]

294. (3) $\sin\theta - \cos\theta = 0$

$\Rightarrow \sin\theta = \cos\theta$

$\Rightarrow \tan\theta = 1 = \tan 45°$

$\Rightarrow \theta = 45°$

$\therefore \sec\theta + \operatorname{cosec}\theta$

$= \sec 45° + \operatorname{cosec} 45°$

$= \sqrt{2} + \sqrt{2} = 2\sqrt{2}$

395. (3) $\frac{2\tan 53°}{\cot 37°} - \frac{\cot 80°}{\tan 10°}$

$= \frac{2\tan(90°-37°)}{\cot 37°} - \frac{\cot(90°-10°)}{\tan 10°}$

$= \frac{2\cot 37°}{\cot 37°} - \frac{\tan 10°}{\tan 10°}$

$= 2 - 1 = 1$

396. (2) The minimum value of $a\tan^2 x + b\cot^2 x = 2\sqrt{ab}$

$\therefore$ The minimum value of $\tan^2 x + \cot^2 x = 2$

397. (1) $\cos 21° = \frac{x}{y}$

$\therefore \cos 69° = \cos(90° - 21°)$

$= \sin 21°$

$= \sqrt{1 - \cos^2 21°} = \sqrt{1 - \frac{x^2}{y^2}}$

$= \frac{\sqrt{y^2 - x^2}}{y}$

$\therefore \operatorname{cosec} 21° = \frac{y}{\sqrt{y^2 - x^2}}$

$\therefore \operatorname{cosec} 21° - \cos 69°$

$= \frac{y}{\sqrt{y^2 - x^2}} - \frac{\sqrt{y^2 - x^2}}{y}$

$= \frac{y^2 - (y^2 - x^2)}{y\sqrt{y^2 - x^2}} = \frac{x^2}{y\sqrt{y^2 - x^2}}$

398. (1) $\alpha : \beta = 2 : 1$

Sum of the terms of ratio

$= 2 + 1 = 3$

$\alpha + \beta = 90°$

$\therefore \alpha = \frac{2}{3} \times 90° = 60°$

$\beta = 30°$

$\therefore \frac{\cos\alpha}{\cos\beta} = \frac{\cos 60°}{\cos 30°} = \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}}$

$= 1 : \sqrt{3}$

399. (1) $7\cos^2\theta + 3\sin^2\theta = 4$

$\Rightarrow 7(1 - \sin^2\theta) + 3\sin^2\theta = 4$

$\Rightarrow 7 - 7\sin^2\theta + 3\sin^2\theta = 4$

$\Rightarrow 7 - 4\sin^2\theta = 4$

$\Rightarrow 4\sin^2\theta = 7 - 4 = 3$

$\Rightarrow \sin^2\theta = \frac{3}{4}$

$\Rightarrow \sin\theta = \frac{\sqrt{3}}{2}$

$\because 0 < \theta < 90°$

$\Rightarrow \theta = 60°$

400. (3) $\tan\theta = \frac{4}{3}$

Expression $= \frac{3\sin\theta + 2\cos\theta}{3\sin\theta - 2\cos\theta}$

On dividing numerator and denominator by $\cos\theta$,

$= \frac{\frac{3\sin\theta}{\cos\theta} + \frac{2\cos\theta}{\cos\theta}}{\frac{3\sin\theta}{\cos\theta} - \frac{2\cos\theta}{\cos\theta}}$

$= \frac{3\tan\theta + 2}{3\tan\theta - 2}$

$= \frac{3 \times \frac{4}{3} + 2}{3 \times \frac{4}{3} - 2} = \frac{4+2}{4-2} = \frac{6}{2} = 3$

401. (3) $\sec(4x - 50°) = \sec(50° - x)$

$\Rightarrow \sec(4x - 50°) = \sec(90° - (50° - x)) = \sec(40° + x)$

$\Rightarrow 4x - 50° = 40° + x$

$\Rightarrow 4x - x = 50° + 40°$

$\Rightarrow 3x = 90° \Rightarrow x = \frac{90°}{3} = 30°$

402. (1) $\cos 53° - \sin 37°$

$= \cos(90° - 37°) - \sin 37°$

$= \sin 37° - \sin 37° = 0$

403. (2) $\text{cosec}\theta + \sin\theta = \frac{5}{2}$

$\Rightarrow \frac{1}{\sin\theta} + \sin\theta = \frac{5}{2}$

$\Rightarrow \frac{1+\sin^2\theta}{\sin\theta} = \frac{5}{2}$

$\Rightarrow 2\sin^2\theta + 2 = 5\sin\theta$
$\Rightarrow 2\sin^2\theta - 5\sin\theta + 2 = 0$
$\Rightarrow 2\sin^2\theta - 4\sin\theta - \sin\theta + 2 = 0$
$\Rightarrow 2\sin\theta(\sin\theta - 2) - 1(\sin\theta - 2) = 0$
$\Rightarrow (2\sin\theta - 1)(\sin\theta - 2) = 0$
$\Rightarrow 2\sin\theta - 1 = 0$
$\Rightarrow 2\sin\theta = 1$

$\Rightarrow \sin\theta = \frac{1}{2}$ because $\sin\theta \neq 2$

$\Rightarrow \text{cosec}\theta = 2$

$\therefore \text{cosec}\theta - \sin\theta = 2 - \frac{1}{2} = \frac{3}{2}$

404. (2) $\sin(2a + 45°) = \cos(30° - a)$
$\Rightarrow \sin(2a + 45°)$
$= \sin\{90° - (30° - a)\}$
$\Rightarrow \sin(2a + 45°) = \sin(60° + a)$
$[\because \sin(90° - \theta) = \cos\theta]$
$\Rightarrow 2a + 45° = 60° + a$
$\Rightarrow 2a - a = 60° - 45°$
$\Rightarrow a = 15°$

405. (4) Expression
$= \cot10°.\cot20°.\cot60°.\cot70°.\cot80°$
$= (\cot10°.\cot80°)(\cot20°.\cot70°).\cot60°$
$= \{\cot10°.\cot(90° - 10°)\}$
$\{\cot20°.\cot(90° - 20°)\}.\frac{1}{\sqrt{3}}$
$= (\cot10°.\tan10°)$
$(\cot20°.\tan20°).\frac{1}{\sqrt{3}}$
$= 1.1.\frac{1}{\sqrt{3}} = \frac{1}{\sqrt{3}}$
$[\because \cot(90° - \theta) = \tan\theta; \tan\theta.\cot\theta = 1]$

406. (2)
$7\sin^2\theta + 3\cos^2\theta = 4$
On dividing by $\cos^2\theta$,
$\frac{7\sin^2\theta}{\cos^2\theta} + \frac{3\cos^2\theta}{\cos^2\theta} = \frac{4}{\cos^2\theta}$
$\Rightarrow 7\tan^2\theta + 3 = 4\sec^2\theta = 4(1 + \tan^2\theta)$
$\Rightarrow 7\tan^2\theta + 3 = 4 + 4\tan^2\theta$
$\Rightarrow 7\tan^2\theta - 4\tan^2\theta = 4 - 3$
$\Rightarrow 3\tan^2\theta = 1$

$\Rightarrow \tan^2\theta = \frac{1}{3}$

$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}}$

407. (2) Expression
$= \frac{(1+\tan^2 A)\cot A}{\text{cosec}^2 A}$
$= \sec^2 A . \cot A . \sin^2 A$
$(\sin A . \text{cosec} A = 1)$
$= \frac{1}{\cos^2 A} . \frac{\cos A}{\sin A} . \sin^2 A$
$= \frac{\sin A}{\cos A} = \tan A$

408. (4) $\sin(A - B) = \sin A . \cos B - \cos A . \sin B$
$\cos(A - B) = \cos A . \cos B + \sin A . \sin B$

$\therefore \frac{\sin(A-B)}{\cos(A-B)}$

$= \frac{\sin A.\cos B - \cos A.\sin B}{\cos A.\cos B + \sin A.\sin B}$
$\Rightarrow \tan(A - B)$
$= \frac{\frac{\sin A.\cos A}{\cos A.\cos B} - \frac{\cos A.\sin B}{\cos A.\cos B}}{\frac{\cos A.\cos B}{\cos A.\cos B} + \frac{\sin A.\sin B}{\cos A.\cos B}}$
(Dividing numerator and denominator by cosA cosB)
$= \frac{\tan A - \tan B}{1 + \tan A.\tan B}$

409. (4) $\sec 330° = \sec(360° - 30°)$
$= \sec 30° = \frac{2}{\sqrt{3}}$
$[\because \sec(360° - \theta) = \sec\theta]$

410. (1) $\frac{1}{\tan A + \cot A} = x$

$\Rightarrow \frac{1}{\frac{\sin A}{\cos A} + \frac{\cos A}{\sin A}} = x$

$\Rightarrow \frac{1}{\frac{\sin^2 A + \cos^2 A}{\sin A.\cos A}} = x$

$\Rightarrow x = \frac{1}{\frac{1}{\sin A.\cos A}} = \sin A.\cos A$

411. (3) $\sin\frac{11\pi}{6}$

$= \sin\left(2\pi - \frac{\pi}{6}\right)$
$[\because \sin(360° - \theta)$
$= \sin(2\pi - \theta) = -\sin\theta]$
$= -\sin\frac{\pi}{6} = -\frac{1}{2}$

412. (2) $\sec A + \tan A = a$ ..... (i)
$\because \sec^2 A - \tan^2 A = 1$
$\Rightarrow (\sec A + \tan A)(\sec A - \tan A) = 1$
$\Rightarrow \sec A - \tan A = \frac{1}{a}$ ... (ii)
On adding equations (i) and (ii),
$2\sec A = a + \frac{1}{a} = \frac{a^2+1}{a}$
$\Rightarrow \sec A = \frac{a^2+1}{2a}$
$\Rightarrow \cos A = \frac{2a}{a^2+1}$

413. (2) $\sin P + \text{cosec}\, P = 2$
$\Rightarrow \sin P + \frac{1}{\sin P} = 2$
$\Rightarrow \frac{\sin^2 P + 1}{\sin P} = 2$
$\Rightarrow \sin^2 P + 1 = 2\sin P$
$\Rightarrow \sin^2 P - 2\sin P + 1 = 0$
$\Rightarrow (\sin P - 1)^2 = 0$
$\Rightarrow \sin P - 1 = 0 \Rightarrow \sin P = 1$
$\therefore \text{cosec}\, P = 1$
$\therefore \sin^7 P + \text{cosec}^7 P = 1 + 1 = 2$

414. (3) $\cos x . \cos y + \sin x . \sin y = -1$
$\Rightarrow \cos x . \cos y + 1$
$= -\sin x . \sin y$
On squaring both sides,
$(\cos x . \cos y + 1)^2 = \sin^2 x \sin^2 y$
$\Rightarrow \cos^2 x . \cos^2 y + 2\cos x . \cos y + 1 = (1 - \cos^2 x)(1 - \cos^2 y)$
$\Rightarrow \cos^2 x . \cos^2 y + 2\cos x . \cos y + 1 = 1 - \cos^2 x - \cos^2 y + \cos^2 x . \cos^2 y$
$\Rightarrow \cos^2 x + \cos^2 y + 2\cos x . \cos y = 0$
$\Rightarrow (\cos x + \cos y)^2 = 0$
$\Rightarrow \cos x + \cos y = 0$

415. (2) $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) + 1$
$= 2\{(\sin^2\theta + \cos^2\theta)^3 - 3\sin^2\theta\cos^2\theta(\sin^2\theta + \cos^2\theta)\} - 3\{(\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta . \cos^2\theta\} + 1$
$= 2(1 - 3\sin^2\theta . \cos^2\theta) - 3(1 - 2\sin^2\theta . \cos^2\theta) + 1$
$= 2 - 6\sin^2\theta . \cos^2\theta - 3 + 6\sin^2\theta . \cos^2\theta + 1$
$= 3 - 3 = 0$

416. (4) $\cos\theta = \frac{x^2 - y^2}{x^2 + y^2}$

$\therefore \sin\theta = \sqrt{1 - \cos^2\theta}$

$= \sqrt{1 - \frac{(x^2 - y^2)^2}{(x^2 + y^2)^2}}$

$= \sqrt{\frac{(x^2 + y^2)^2 - (x^2 - y^2)^2}{(x^2 + y^2)^2}}$

$= \sqrt{\frac{4x^2y^2}{(x^2 + y^2)^2}} = \frac{2xy}{x^2 + y^2}$

$\therefore \cot\theta = \frac{\cos\theta}{\sin\theta}$

TYPE-III

1. (4)

Let AB be a pillar of height h meter
If BD = length of shadow = x
and DC = 20 m
then, BC = BD + DC
$\Rightarrow$ BC = $(x + 20)$ metre
From Δ ABD,

$$\tan 45° = \frac{h}{x} \Rightarrow h = x \quad \text{...(i)}$$

From Δ ABC,

$$\tan 30° = \frac{AB}{BC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+20}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{h+20} \Rightarrow \sqrt{3}h = h + 20$$

[From (i)]

$$\Rightarrow (\sqrt{3}-1)h = 20 \Rightarrow h = \frac{20}{\sqrt{3}-1}$$

$$= \frac{20}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$= \frac{20(\sqrt{3}+1)}{2} = 10(\sqrt{3}+1) \text{ metre}$$

2. (2) AB = Length of the thread = 150 metre
$\angle$BAC = 60°

In ΔABC,

$$\sin 60° = \frac{BC}{AB} \Rightarrow \frac{\sqrt{3}}{2} = \frac{BC}{150}$$

$$\Rightarrow BC = 150 \times \frac{\sqrt{3}}{2} = 75\sqrt{3} \text{ metre}$$

3. (2)

Tower = PQ = h metre
QB = x metre
From ΔAPQ,

$$\tan 15° = \frac{h}{x+48}$$

$$2 - \sqrt{3} = \frac{h}{x+48} \quad \text{...(i)}$$

[$\because$ tan 15° = tan (45° – 30°)

$$= \frac{\tan 45° - \tan 30°}{1 + \tan 45° \tan 30°} = \frac{1 - \frac{1}{\sqrt{3}}}{1 + \frac{1}{\sqrt{3}}}$$

$$\text{or } \frac{\sqrt{3}-1}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1}$$

$$= \frac{4 - 2\sqrt{3}}{2} = 2 - \sqrt{3}]$$

From ΔPQB,

$$\tan 30° = \frac{h}{x}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x}$$

$$\Rightarrow \sqrt{3}h = x \quad \text{...(ii)}$$

$$\Rightarrow 2 - \sqrt{3} = \frac{h}{\sqrt{3}h + 48}$$

$$\Rightarrow 2\sqrt{3}h - 3h + (2 - \sqrt{3})48 = h$$

$$\Rightarrow h + 3h - 2\sqrt{3}\,h$$

$$= (2 - \sqrt{3}) \times 48$$

$$\Rightarrow 2h(2 - \sqrt{3}) = 48 \times (2 - \sqrt{3})$$

$$\Rightarrow h = \frac{48}{2} = 24 \text{ metre}$$

4. (3)

AB = monument = h metre
DC = 138 metre
BD = x metre

$$\tan \alpha = \frac{1}{5}$$

$$\sec \beta = \frac{\sqrt{193}}{12}$$

$$\therefore \tan \beta = \sqrt{\sec^2 \beta - 1}$$

$$= \sqrt{\frac{193}{144} - 1} = \sqrt{\frac{193 - 144}{144}}$$

$$= \sqrt{\frac{49}{144}} = \frac{7}{12}$$

$\therefore$ From ΔABC,

$$\tan\alpha = \frac{AB}{BC}$$

$$\Rightarrow \frac{1}{5} = \frac{h}{x+138}$$

$$\Rightarrow h = \frac{x+138}{5}$$

$$\Rightarrow 5h = x + 138 \quad \text{... (i)}$$

From ΔABD,

$$\tan \beta = \frac{h}{x} \Rightarrow \frac{7}{12} = \frac{h}{x}$$

$$\Rightarrow x = \frac{12h}{7} \quad \text{... (ii)}$$

$$\therefore 5h = \frac{12h}{7} + 138 \text{ (By (i) \& (ii))}$$

$$\Rightarrow 35h - 12h = 138 \times 7$$

$$\Rightarrow 23\,h = 138 \times 7$$

$$\Rightarrow h = \frac{138 \times 7}{23} = 42 \text{ metre}$$

5. (3)

From ΔABC,

$$\tan(90° - \theta) = \frac{16}{x}$$

$$\Rightarrow \cot\theta = \frac{16}{x} \quad .....(i)$$

From ΔBCD,

$$\tan\theta = \frac{9}{x} \quad .....(ii)$$

$$\therefore \tan\theta \,.\, \cot\theta = \frac{9}{x} \times \frac{16}{x}$$

$\Rightarrow x^2 = 16 \times 9$ [$\because \tan\theta \cot\theta = 1$]

$\Rightarrow x = 4 \times 3 = 12$ metre

6. (3)

CD = tree = h metre

Let AB = building = a metre

& BC = ED = b metre

$\therefore$ From Δ AED,

$$\tan x = \frac{AE}{ED}$$

$$\Rightarrow \tan x = \frac{a-h}{b}$$

$\Rightarrow b = (a - h) \cot x$ ...(i)

From Δ ABC,

$$\tan y = \frac{AB}{BC}$$

$$\Rightarrow \tan y = \frac{a}{b}$$

$\Rightarrow b = a \cot y$ ...(ii)

From equations (i) and (ii),

$(a - h) \cot x = a \cot y$

$\Rightarrow a \cot x - h \cot x = a \cot y$

$\Rightarrow h \cot x = a (\cot x - \cot y)$

$$\Rightarrow a = \frac{h \cot x}{\cot x - \cot y}$$

7. (3)

Let PQ = h metre and BQ = x metre.

From Δ APQ,

$$\tan 30° = \frac{h}{x+20}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+20}$$

$\Rightarrow \sqrt{3}h = x + 20$ .....(i)

From Δ PQB,

$$\tan 60° = \frac{PQ}{BQ} = \frac{h}{x}$$

$$\Rightarrow \sqrt{3} = \frac{h}{x} \Rightarrow h = \sqrt{3}x$$

$$\Rightarrow x = \frac{1}{\sqrt{3}}h \quad .....(ii)$$

$$\therefore \sqrt{3}h = \frac{1}{\sqrt{3}}h + 20$$

[From equation (i) and (ii)]

$\Rightarrow 3h - h = 20\sqrt{3}$

$\Rightarrow 2h = 20\sqrt{3}$

$\therefore h = 10\sqrt{3}$ metre

8. (1)

AB = CD = h metre (Height of pole)

From ΔABE,

$$\tan 30° = \frac{h}{x}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x} \Rightarrow \sqrt{3}h = x \quad ...(i)$$

From ΔDEC,

$$\tan 60° = \frac{h}{100-x}$$

$$\Rightarrow \sqrt{3} = \frac{h}{100-x}$$

$\Rightarrow \sqrt{3}(100 - x) = h$

$\Rightarrow \sqrt{3}(100 - \sqrt{3}h) = h$

[From equation (i)]

$\Rightarrow 100\sqrt{3} - 3h = h \Rightarrow 4h = 100\sqrt{3}$

$\Rightarrow h = 25\sqrt{3}$ metre

9. (3)

AB = Telegraph post = h metre

Telegraph post bends at point D.

DB = x metre

$\therefore$ AD = CD = $(h - x)$ metre

BC = $8\sqrt{3}$ metre

From, Δ DBC,

$$\sin 30° = \frac{DB}{DC}$$

$$\Rightarrow \frac{1}{2} = \frac{x}{h-x} \Rightarrow 2x = h - x$$

$\Rightarrow 3x = h$ ..... (i)

Again,

$$\tan 30° = \frac{DB}{BC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{x}{8\sqrt{3}}$$

$\Rightarrow x = 8$ metre

$\therefore h = 3 \times 8 = 24$ metre

10. (2)

AB = Buidling

= h metre

AD = Chimney = y metre

From ΔBCD,

$$\tan 45° = \frac{BD}{BC} \Rightarrow 1 = \frac{h+y}{BC}$$

$\Rightarrow BC = h + y$ ... (i)

From ΔABC,

$$\tan x = \frac{AB}{BC} \Rightarrow \tan x = \frac{h}{BC}$$

$\Rightarrow BC = h \cot x$ ...(ii)

From equations (i) and (ii),

$h + y = h \cot x$

$\Rightarrow y = (h \cot x - h)$ metre

11. (1) CD = h metre, AB = 2h metre

OB = OD = $\frac{x}{2}$ metre

From ΔOCD,

$$\tan\theta = \frac{h}{\frac{x}{2}} = \frac{2h}{x} \quad ...(i)$$

From ΔOAB,

$$\tan(90° - \theta) = \frac{AB}{BO}$$

$$\Rightarrow \cot\theta = \frac{2h}{\frac{x}{2}} = \frac{4h}{x} \quad ...(ii)$$

Multiplying both equations,

$$\tan\theta.\cot\theta = \frac{2h}{x} \times \frac{4h}{x}$$

$\Rightarrow x^2 = 8h^2$ [$\because \tan\theta\cot\theta = 1$]

$$\Rightarrow h^2 = \frac{x^2}{8}$$

$$\Rightarrow h = \frac{x}{2\sqrt{2}} \text{ metre}$$

12. (3)

∠ACB = 60°
∠DCB = 45°
AB = 5000 metre
AD = x metre
∴ From ΔABC,

$$\tan 60° = \frac{AB}{BC}$$

$$\Rightarrow \sqrt{3} = \frac{5000}{BC}$$

$$\Rightarrow BC = \frac{5000}{\sqrt{3}} \text{ metre}$$

From ΔDBC,

$$\tan 45° = \frac{DB}{BC}$$

$$\Rightarrow DB = BC = \frac{5000}{\sqrt{3}}$$

∴ AD = AB – BD

$$= 5000 - \frac{5000}{\sqrt{3}}$$

$$= 5000\left(1 - \frac{1}{\sqrt{3}}\right) \text{m}$$

13. (4)

AB = Tower = 30 metre
CD = x metre
∠ACB = 30°
∠ADB = 60°
From Δ ABD,

$$\tan 60° = \frac{AB}{BD}$$

$$\Rightarrow \sqrt{3} = \frac{30}{BD}$$

$$\Rightarrow BD = \frac{30}{\sqrt{3}} = 10\sqrt{3} \text{ metre}$$

From Δ ABC,

$$\tan 30° = \frac{AB}{BC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{30}{10\sqrt{3} + x}$$

$$\Rightarrow 10\sqrt{3} + x = 30\sqrt{3}$$

$$\Rightarrow x = 30\sqrt{3} - 10\sqrt{3}$$

$$= 20\sqrt{3} \text{ metre}$$

14. (4)

BE = DE = 30 metre
∠AEB = θ ∴ ∠CED = 90° – θ
From Δ ABE,

$$\tan\theta = \frac{AB}{BE}$$

$$\Rightarrow \tan\theta = \frac{h}{30}$$

$\Rightarrow h = 30 \tan\theta$ ...(i)

From Δ CDE,

$$\tan(90° - \theta) = \frac{2h}{30}$$

$$\Rightarrow \cot\theta = \frac{h}{15} \Rightarrow h = 15\cot\theta \quad ...(ii)$$

By multiplying both equations,
$h^2 = 30 \times 15 \times \tan\theta.\cot\theta$
$\Rightarrow h^2 = 30 \times 15$
[$\because \tan\theta . \cot\theta = 1$]

$\Rightarrow h = 15\sqrt{2}$ metre = AB

$\Rightarrow 2h = 30\sqrt{2}$ metre = CD

15. (4)

A and C ⇒ position of planes
BC = 3125m
Let AC = x metre
In ΔABD,

$$\tan 60° = \frac{AB}{BD}$$

$$\Rightarrow \sqrt{3} = \frac{3125 + x}{BD}$$

$\Rightarrow$ BD = $\dfrac{3125+x}{\sqrt{3}}$

In ΔBCD,

$\tan 30° = \dfrac{BC}{BD}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{3125}{\dfrac{3125+x}{\sqrt{3}}}$

$\Rightarrow 3\,(3125) = 3125 + x$
$\Rightarrow 9375 = 3125 + x$
$\Rightarrow x = 9375 - 3125$
$x = 6250$ metre

16. (3)

AB = Tower = h metre
$\angle$ADB = 30°
$\angle$ACB = 45°
CD = 60 metre
BC = x metre
From ΔABC,

$\tan 45° = \dfrac{AB}{BC}$

$\Rightarrow 1 = \dfrac{h}{x} \Rightarrow h = x$

From ΔABD,

$\tan 30° = \dfrac{AB}{BD}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{h}{x+60}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{h}{h+60}$

$\Rightarrow \sqrt{3}\,h = h + 60$

$\Rightarrow \sqrt{3}\,h - h = 60$

$\Rightarrow h\left(\sqrt{3}-1\right) = 60$

$\Rightarrow h = \dfrac{60}{\sqrt{3}-1} = \dfrac{60\left(\sqrt{3}+1\right)}{\left(\sqrt{3}-1\right)\left(\sqrt{3}+1\right)}$

$= 30\left(\sqrt{3}+1\right)$ metre

17. (2)

AB = Post = 15 feet
The post breaks at point C.
BC = x feet
$\Rightarrow$ AC = CD = (15 – x) feet
$\angle$CDB = 30°
From Δ BCD,

$\sin 30° = \dfrac{BC}{CD}$

$\Rightarrow \dfrac{1}{2} = \dfrac{x}{15-x}$

$\Rightarrow 2x = 15 - x$
$\Rightarrow 3x = 15 \Rightarrow x = 5$ feet

18. (2)

AB = Tower = x units

BC = Shadow = $\sqrt{3}\,x$ units

$\tan(ACB) = \dfrac{AB}{BC}$

$= \dfrac{x}{\sqrt{3}x} = \dfrac{1}{\sqrt{3}} = \tan 30°$

$\therefore \angle ACB = 30°$

19. (2) $\dfrac{6}{4} = \dfrac{h}{50}$ (Assuming 'h' be the height of flag pole)

$\Rightarrow h = \dfrac{50 \times 6}{4} = 75$ feet

20. (2)

P & Q are the positions of the plane.

$\angle$PAB = 60° ; $\angle$QAB = 30°

PB = $1500\sqrt{3}$ metre

In Δ ABP,

$\tan 60° = \dfrac{BP}{AB}$

$\Rightarrow \sqrt{3} = \dfrac{1500\sqrt{3}}{AB}$

$\Rightarrow$ AB = 1500 metre

In Δ ACQ,

$\tan 30° = \dfrac{CQ}{AC}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{1500\sqrt{3}}{AC}$

= AC = 1500 × 3 = 4500 metre
PQ = BC = AC – AB
= 4500 – 1500 = 3000 metre
$\Rightarrow$ 3000 m travelled in 15 sec.

$\therefore$ Speed of plane = $\dfrac{3000}{15}$

= 200 metre/second

21. (1)

AB = Tower = h units
Let, $\angle$AQB = θ $\therefore$ $\angle$APB = 90° – θ
PB = a; BQ = b
From Δ AQB,

$\tan\theta = \dfrac{AB}{BQ}$

$\Rightarrow \tan\theta = \dfrac{h}{b}$ ...(i)

From Δ APB

$\tan(90°-\theta) = \dfrac{h}{PB}$

$\Rightarrow \cot\theta = \dfrac{h}{a}$ ...(ii)

By multiplying (i) & (ii)

$\tan\theta.\cot\theta = \dfrac{h}{b} \times \dfrac{h}{a}$

$\Rightarrow h^2 = ab$

$\Rightarrow h = \sqrt{ab}$

22. (1)

AB = Tower = h metre

$\angle ACB = 30°$;

BC = 100 metre

$\therefore \tan 30° = \frac{AB}{BC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{100}$

$\Rightarrow h = \frac{100}{\sqrt{3}}$ metre

23. (4)

AB = Height of kite

= 50 metre

OB = length of thread

= 100 metre

$\therefore \sin BOA = \frac{AB}{OB} = \frac{50}{100} = \frac{1}{2}$

$= \sin 30°$

$\therefore \angle BOA = 30°$

24. (1)

AB = Height of balloon = h km

BD = x km, CD = 1 km

From Δ ABD,

$\tan 60° = \frac{AB}{BD}$

$\Rightarrow \sqrt{3} = \frac{h}{x}$

$\Rightarrow x = \frac{h}{\sqrt{3}}$ km .....(i)

From Δ ABC,

$\tan 30° = \frac{AB}{BC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{\frac{h}{\sqrt{3}} + 1}$ [By (i)]

$\Rightarrow \sqrt{3}\, h = \frac{h}{\sqrt{3}} + 1$

$\Rightarrow \sqrt{3}\, h - \frac{h}{\sqrt{3}} = 1$

$\Rightarrow \frac{3h - h}{\sqrt{3}} = 1$

$\Rightarrow 2h = \sqrt{3}$

$\Rightarrow h = \frac{\sqrt{3}}{2}$ km

25. (2) $\frac{\text{Height of tower}}{\text{Length of stick}}$

$= \frac{\text{Length of shadow of tower}}{\text{Length of shadow of stick}}$

$\Rightarrow \frac{h}{12} = \frac{40}{8}$

$\Rightarrow h = \frac{40 \times 12}{8} = 60$ metre

26. (1)

AB = Tower = h metre

CD = 100 metre; BC = 160 metre

$\angle ACB =$ $\therefore \angle ADB = 2\theta$

In Δ ABC,

$\tan\theta = \frac{AB}{BC} \Rightarrow \tan\theta = \frac{h}{160}$ ....(i)

In Δ ABD,

$\tan 2\theta = \frac{AB}{BD} = \frac{h}{60}$

$\Rightarrow \frac{2\tan\theta}{1 - \tan^2\theta} = \frac{h}{60}$

$\Rightarrow \frac{2 \times \frac{h}{160}}{1 - \frac{h^2}{160 \times 160}} = \frac{h}{60}$

$\Rightarrow \frac{1}{80\left(1 - \frac{h^2}{160 \times 160}\right)} = \frac{1}{60}$

$\Rightarrow 4\left(1 - \frac{h^2}{160 \times 160}\right) = 3$

$\Rightarrow \frac{h^2}{160 \times 160} = 1 - \frac{3}{4} = \frac{1}{4}$

$\Rightarrow h^2 = 6400$

$\Rightarrow h = \sqrt{6400} = 80$ metre

27. (2)

AB = Tower = h metre

BC = 50 metre

$\angle ACB = 30°$

$\therefore \tan 30° = \frac{AB}{BC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AB}{50}$

$\Rightarrow AB = \frac{50}{\sqrt{3}}$ metre

28. (3)

AB = Tower = h metre

$\angle BDA = 30°$

$\angle ACB = 45°$

CD = 10 metre

From ΔABC,

$\tan 45° = \frac{AB}{BC} \Rightarrow 1 = \frac{h}{x} \Rightarrow h = x$

From ΔABD,

$\tan 30° = \frac{AB}{BD} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+10}$

$\Rightarrow \sqrt{3}h = h + 10$ $[\because h = x]$

$\Rightarrow \sqrt{3}h - h = 10$

$\Rightarrow h(\sqrt{3} - 1) = 10$

$\Rightarrow h = \frac{10}{\sqrt{3}-1} = \frac{10}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$

$= \frac{10(\sqrt{3}+1)}{2} = 5(\sqrt{3}+1)$ metre

29. (3)

AB = tower = h metre

∠ACB = 45°, ∠ADB = 60°

CD = 60 metre, BD = x metre

From ΔABC,

$\tan 45° = \frac{AB}{BC}$

$\Rightarrow 1 = \frac{h}{x+60}$

$\Rightarrow h = x + 60$ .....(i)

From ΔABD,

$\tan 60° = \frac{AB}{BD}$

$\Rightarrow \sqrt{3} = \frac{h}{x} \Rightarrow h = \sqrt{3}x$

$\Rightarrow h = \sqrt{3}.(h - 60)$

$\Rightarrow \sqrt{3}h - h = 60\sqrt{3}$

$\Rightarrow h(\sqrt{3} - 1) = 60\sqrt{3}$

$\Rightarrow h = \frac{60\sqrt{3}}{\sqrt{3}-1} = \frac{60\sqrt{3}(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$

$= 30\sqrt{3}(\sqrt{3}+1)$

$= 30(3 + \sqrt{3})$ metre

30. (4)

AB = Pole = h metre

BC = 9 metre BD = 16 metre

∠ADB = θ;

∴ ∠ACB = 90° – θ

From ΔABC,

$\tan(90° - \theta) = \frac{AB}{BC}$

$\Rightarrow \cot\theta = \frac{h}{9}$ ...(i)

ΔABD from,

$\Rightarrow \tan\theta = \frac{h}{16}$ ...(ii)

By multiplying (i) & (ii)

$\tan\theta \,.\, \cot\theta = \frac{h}{9} \times \frac{h}{16}$

$\Rightarrow \frac{h^2}{144} = 1$

$\Rightarrow h^2 = 144$

$\Rightarrow h = \sqrt{144} = 12$ metre

31. (4)

AC = Flag

AB = building = 10 metre

∠ APB = 30°; ∠ CPB = 45°

In Δ APB,

$\tan 30° = \frac{AB}{PB}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{10}{PB}$

$\Rightarrow$ PB = 10 $\sqrt{3}$ metre

In Δ PBC,

$\tan 45° = \frac{BC}{PB}$

$\Rightarrow 1 = \frac{AB + AC}{PB}$

$\Rightarrow$ PB = AB + AC

$\Rightarrow 10\sqrt{3} = 10 + AC$

$\Rightarrow AC = 10\sqrt{3} - 10$

$= 10(\sqrt{3} - 1)$ metre

= 10 (1.732 – 1) metre

= 10 × 0. 732 = 7.32 metre

32. (2)

AB = Tower = h metre

PQ = 10 metre

∠ APB = 60°,

∠ CQB = ∠ QBP = 30°

In Δ PBQ,

$\tan 30° = \frac{PQ}{PB} \Rightarrow \frac{1}{\sqrt{3}} = \frac{10}{PB}$

$\Rightarrow$ PB = 10 $\sqrt{3}$ metre

In Δ APB,

$\tan 60° = \frac{AB}{PB}$

$\Rightarrow \sqrt{3} = \frac{h}{10\sqrt{3}}$

$\Rightarrow h = \sqrt{3} \times 10\sqrt{3} = 30$ metre

33. (4)

AB = Tower, BC = 20 metre
In Δ ABC,

$$\tan 30° = \frac{AB}{BC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AB}{20}$$

$$\Rightarrow AB = \frac{20}{\sqrt{3}} \text{ metre}$$

34. (2)

AB = house, AC = ladder
In ΔABC,

$$\cos 60° = \frac{BC}{AC} \Rightarrow \frac{1}{2} = \frac{6.5}{AC}$$

$\Rightarrow$ AC = 2 × 6.5
= 13 metre

35. (4)

$\angle$ACB = 30°
$\angle$ADB = 45°
CD = 4 metre
AB = pole = h metre
BD = x metre
From ΔABD,

$$\tan 45° = \frac{AB}{BD}$$

$$\Rightarrow 1 = \frac{h}{x} \Rightarrow h = x \qquad \text{...(i)}$$

From ΔABC,

$$\tan 30° = \frac{AB}{BC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+4}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{h+4} \Rightarrow h + 4$$

$$= \sqrt{3}h$$

$$\Rightarrow \sqrt{3}h - h = 4$$

$$\Rightarrow h(\sqrt{3} - 1) = 4$$

$$\Rightarrow h = \frac{4}{\sqrt{3}-1} = \frac{4(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$$

$$= \frac{4(\sqrt{3}+1)}{3-1} = 2\left(\sqrt{3}+1\right)$$

= 2 (1.732 + 1)
= 2 × 2.732
= 5.464 metre

36. (3)

AB = Pole = 10 metre
CD = Tower = h metre (let)
$\angle$ DAE = 60°
$\angle$ EAC = $\angle$ ACB = 30°
From Δ ABC,

$$\tan 30° = \frac{AB}{BC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{10}{BC}$$

$$\Rightarrow BC = 10\sqrt{3} \text{ metre}$$

$$\therefore AE = 10\sqrt{3} \text{ metre}$$

From Δ ADE,

$$\tan 60° = \frac{DE}{AE} \Rightarrow \sqrt{3} = \frac{DE}{10\sqrt{3}}$$

$$\Rightarrow DE = 10\sqrt{3} \times \sqrt{3}$$

= 30 metre
$\therefore$ CD = Heigth of tower
= CE + ED = 10 + 30
= 40 metre

37. (1)

AB = Tower = h metre
BD = Shadow = x metre
$\angle$ ADB = 45°
$\angle$ ACB = 30°
In Δ ABD,

$$\tan 45° = \frac{AB}{BD} \Rightarrow 1 = \frac{AB}{BD} = \frac{h}{x}$$

$\Rightarrow h = x$ ..... (i)

In Δ ABC,

$$\tan 30° = \frac{AB}{BC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+10}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{h+10}$$

$$\Rightarrow \sqrt{3}h = h + 10$$

$$\Rightarrow \sqrt{3}h - h = 10$$

$$\Rightarrow h(\sqrt{3} - 1) = 10$$

$$\Rightarrow h = \frac{10}{\sqrt{3}-1}$$

$$= \frac{10}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$= \frac{10(\sqrt{3}+1)}{3-1}$$

= 5 ($\sqrt{3}$ +1) metre

38. (2)

AB = pole = 12 metre
Shadow = BC = $4\sqrt{3}$ metre

From ΔABC,

$$\tan\theta = \frac{AB}{BC} = \frac{12}{4\sqrt{3}} = \sqrt{3}$$

$\Rightarrow \tan\theta = \tan 60°$

$\Rightarrow \theta = 60°$

39. (4)

AB = Height of tower
= h metre (let)
CD = 70 metre
BD = x metre (let)
In ΔABC,

$$\tan 30° = \frac{AB}{BC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+70}$$

$\Rightarrow \sqrt{3}h = x + 70$

$\Rightarrow x = \sqrt{3}h - 70$ ...(i)

In ΔABD,

$$\tan 60° = \frac{h}{x}$$

$$\Rightarrow \sqrt{3} = \frac{h}{x}$$

$$\Rightarrow x = \frac{h}{\sqrt{3}} \quad ...(ii)$$

From equations (i) and (ii),

$$\sqrt{3}h - 70 = \frac{h}{\sqrt{3}}$$

$$\Rightarrow \sqrt{3}h - \frac{h}{\sqrt{3}} = 70$$

$$\Rightarrow \frac{3h - h}{\sqrt{3}} = 70$$

$\Rightarrow 2h = 70\sqrt{3}$

$$\Rightarrow h = \frac{70\sqrt{3}}{2} = 35\sqrt{3} \text{ metre}$$

40. (1)

AB = Tower = h metre (let)

CD = 30 metre

BC = x metre (let)

From ΔABC,

$$\tan 60° = \frac{AB}{BC} \Rightarrow \sqrt{3} = \frac{h}{x}$$

$\Rightarrow h = \sqrt{3}x$ metre ...(i)

From ΔABD,

$$\tan 45° = \frac{AB}{BD} \Rightarrow 1 = \frac{h}{x+30}$$

$\Rightarrow h = x + 30$

$$\Rightarrow h = \frac{h}{\sqrt{3}} + 30$$

$\Rightarrow \sqrt{3}h = h + 30\sqrt{3}$

$\Rightarrow \sqrt{3}h - h = 30\sqrt{3}$

$\Rightarrow h\left(\sqrt{3} - 1\right) = 30\sqrt{3}$

$$\Rightarrow h = \frac{30\sqrt{3}}{\sqrt{3}-1} = \frac{30\sqrt{3}\left(\sqrt{3}+1\right)}{\left(\sqrt{3}-1\right)\left(\sqrt{3}+1\right)}$$

$$= \frac{30\sqrt{3}\left(\sqrt{3}+1\right)}{3-1}$$

$= 15\sqrt{3}\ (\sqrt{3}+1)$

$= 15(3+\sqrt{3})$ metre

41. (2)

AB = Tower = $100\sqrt{3}$ metre

BC = 100 metre

From Δ ABC,

$$\tan\theta = \frac{AB}{BC}$$

$$\Rightarrow \tan\theta = \frac{100\sqrt{3}}{100} = \sqrt{3}$$

$\Rightarrow \tan\theta = \tan 60° \Rightarrow \theta = 60°$

42. (3)

$\angle ACB = 60°$; BC = x metre
CD = 40 metre, AB = Tower = h metre
From ΔABC,

$$\tan 60° = \frac{AB}{BC} \Rightarrow \sqrt{3} = \frac{h}{x}$$

$\Rightarrow h = \sqrt{3}\,x$ ...(i)

From ΔABD,

$$\tan 45° = \frac{AB}{BD}$$

$$\Rightarrow 1 = \frac{h}{x+40}$$

$$\Rightarrow h = x + 40 = \frac{h}{\sqrt{3}} + 40$$

$$\Rightarrow h - \frac{h}{\sqrt{3}} = 40$$

$$\Rightarrow \frac{\sqrt{3}h - h}{\sqrt{3}} = 40$$

$\Rightarrow (\sqrt{3} - 1)h = 40\sqrt{3}$

$$\Rightarrow h = \frac{40\sqrt{3}}{\sqrt{3}-1}$$

$$= \frac{40\sqrt{3}(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$$

$$= \frac{40\sqrt{3}(\sqrt{3}+1)}{3-1}$$

$= 20\ (3 + \sqrt{3})$ metre

43. (2)

Let, $\angle ACB = \theta$

$\therefore \angle ADB = 90° - \theta$

BC = 12 metre,

BD = 27 metre

AB = Pillar = h metre

From ΔABC,

$$\tan\theta = \frac{AB}{BC} = \frac{h}{12} \quad ....(i)$$

From ΔABD

$$\tan(90° - \theta) = \frac{AB}{BD}$$

$$\Rightarrow \cot\theta = \frac{h}{27} \quad ....(ii)$$

$$\therefore \tan\theta . \cot\theta = \frac{h}{12} \times \frac{h}{27}$$

$$\Rightarrow h^2 = 12 \times 27$$

$$\Rightarrow h = \sqrt{12 \times 27}$$

$$= \sqrt{2 \times 2 \times 3 \times 3 \times 3 \times 3}$$

$= 2 \times 3 \times 3 = 18$ metre

44. (4)

$$\tan\theta = \frac{AB}{BC} = \frac{2\sqrt{3}}{2} = \sqrt{3}$$

$\Rightarrow \tan\theta = \tan 60° \Rightarrow \theta = 60°$

45. (4)

AC = ladder = 10 metre

BC = ?

$\angle ABC = \theta = 30°$

From ΔABC,

$$\cos\theta = \frac{BC}{AC}$$

$$\Rightarrow \cos 30° = \frac{BC}{10}$$

$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{BC}{10}$$

$$\Rightarrow BC = \frac{10\sqrt{3}}{2} = 5\sqrt{3}$$

$= 5 \times 1.732$

$= 8.660$ metre

46. (4)

AB = Tower = h metre

From ΔABC,

$$\tan 30° = \frac{AB}{BC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{100}$$

$$\Rightarrow h = \frac{100}{\sqrt{3}} \text{ metre}$$

47. (1)

A = Position of kite

AC = length of string

AB = 75 metre

$$\cot\theta = \frac{8}{15}$$

$$\therefore \operatorname{cosec}\theta = \sqrt{1 + \cot^2\theta}$$

$$= \sqrt{1 + \left(\frac{8}{15}\right)^2} = \sqrt{1 + \frac{64}{225}}$$

$$= \sqrt{\frac{225 + 64}{225}} = \sqrt{\frac{289}{225}} = \frac{17}{15}$$

$$\therefore \sin\theta = \frac{15}{17}$$

From ΔABC

$$\sin\theta = \frac{AB}{AC}$$

$$\Rightarrow \frac{15}{17} = \frac{75}{AC}$$

$\Rightarrow AC \times 15 = 17 \times 15$

$$\Rightarrow AC = \frac{17 \times 75}{15} = 85 \text{ metre}$$

48. (2)

PQ = Tower A = 45 metre

RS = Tower B = 15 metre,

QS = x metre (let)

$\angle PSQ = 60°$; $\angle RQS = \theta$

From ΔPQS,

$$\tan\theta\ 60° = \frac{PQ}{QS}$$

$$\Rightarrow \sqrt{3} = \frac{45}{x} \Rightarrow \sqrt{3}\ x = 45$$

$$\Rightarrow x = \frac{45}{\sqrt{3}} = 15\sqrt{3} \text{ metre}$$

From ΔRSQ,

$$\tan\theta = \frac{RS}{QS} = \frac{15}{15\sqrt{3}}$$

$$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}}$$

$\Rightarrow \tan\theta = \tan 30°$

$\Rightarrow \theta = 30°$

$$\therefore \sin\theta = \sin 30° = \frac{1}{2}$$

49. (4)

AB = Building = 48 metre

BC = Shadow = $48\sqrt{3}$ metre

$\angle ACB = \theta = ?$

$\therefore \tan\theta = \frac{AB}{BC} = \frac{48}{48\sqrt{3}}$

$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}} = \tan 30°$

$\Rightarrow \theta = 30°$

50. (1)

AB = Telegraph post
AC = CD = bent part

BD = $10\sqrt{3}$ metre

In Δ BCD,

$\tan 30° = \frac{BC}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{BC}{10\sqrt{3}}$

$\Rightarrow BC = \frac{1}{\sqrt{3}} \times 10\sqrt{3}$

= 10 metre

Again,

$\sin 30° = \frac{BC}{CD}$

$\Rightarrow \frac{1}{2} = \frac{10}{CD}$

$\Rightarrow$ CD = 20 metre

$\therefore$ AB = BC + CD

= (10 + 20) metre

= 30 metre

51. (4)

TF = Tower = h metre

$\angle TAF = x°$; $\angle TBF = y°$,

BF = 80 metre

In ΔAFT,

$\tan x° = \frac{TF}{AF}$

$\Rightarrow \frac{2}{5} = \frac{h}{200}$

$\Rightarrow h = \frac{2}{5} \times 200$

= 80 metre

In ΔBFT,

$\tan y° = \frac{TF}{FB}$

$\Rightarrow \tan y° = \frac{80}{80} = 1$

$\Rightarrow \tan y° = \tan 45°$

$\Rightarrow y = 45°$

52. (4)

AB = Height of pillar

= h metre (let)

CD = 10 metre

$\angle ACB = 45°$

$\angle ADB = 60°$

BD = x metre (let)

From ΔABC,

$\tan 45° = \frac{AB}{BC}$

$\Rightarrow 1 = \frac{h}{x+10}$

$\Rightarrow h = (x + 10)$ metre (i)

From ΔABD,

$\tan 60° = \frac{AB}{BD}$

$\Rightarrow \sqrt{3} = \frac{h}{x}$

$\Rightarrow x = \frac{h}{\sqrt{3}}$ metre (ii)

From equation (i),

$h = \frac{h}{\sqrt{3}} + 10$

$\Rightarrow h - \frac{h}{\sqrt{3}} = 10$

$\Rightarrow \frac{\sqrt{3}h - h}{\sqrt{3}} = 10$

$\Rightarrow h\left(\sqrt{3} - 1\right) = 10\sqrt{3}$

$\Rightarrow h = \frac{10\sqrt{3}}{\sqrt{3} - 1}$

$= \frac{10\sqrt{3}\left(\sqrt{3}+1\right)}{\left(\sqrt{3}-1\right)\left(\sqrt{3}+1\right)}$

$= \frac{10\sqrt{3}(\sqrt{3}+1)}{3-1}$

$= 5\sqrt{3}\left(\sqrt{3}+1\right)$

$= 5\left(3+\sqrt{3}\right)$ metre

53. (2)

$\frac{AB}{BC} = \frac{1}{\sqrt{3}}$

$\tan\theta = \frac{AB}{BC} = \frac{1}{\sqrt{3}}$

$\Rightarrow \tan\theta = \tan 30°$

$\Rightarrow \theta = 30°$

54. (2)

AB = Height of tower

= 50 metre

$\angle ACB = 30°$; $\angle ADB = 45°$

CD = x metre (let)

In Δ ABD,

$\tan 45° = \frac{50}{BD}$

$\Rightarrow 1 = \frac{50}{BD} \Rightarrow$ BD = 50 metre

In Δ ABC,

$\tan 30° = \frac{AB}{BC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{50}{50+x}$

$\Rightarrow 50 + x = 50\sqrt{3}$

$\Rightarrow x = 50\sqrt{3} - 50$

$= 50(\sqrt{3} - 1)$ metre

55. (4)

Let A and C be the positions of plane.
AB = CD = 2500 metre
BD = AC = x metre (let)
$\angle AOB = 60°$; $\angle COD = 30°$
In ΔOAB,

$$\tan 45° = \frac{AB}{OB} \Rightarrow 1 = \frac{2500}{OB}$$

$\Rightarrow$ OB = 2500 metre
In ΔOCD,

$$\tan 30° = \frac{CD}{OD}$$

$$\Rightarrow \frac{1}{\sqrt{3}}$$

$$= \frac{2500}{2500 + x}$$

$\Rightarrow 2500 + x = 2500\sqrt{3}$
$\Rightarrow x$
$= 2500\sqrt{3} - 2500$
$= 2500\ (\sqrt{3} - 1)$ metre
Time = 15 seconds

$$= \frac{15}{60 \times 60} \text{ hour} = \frac{1}{240} \text{ hour}$$

$\therefore$ Speed of plane

$$= \frac{2500(\sqrt{3} - 1)}{1000} \times 240 \text{ kmph}$$

$= 600\ (\sqrt{3} - 1)$ kmph.

56. (2)

Let height of tower = BC
= y metre
AB = height of flag-staff
= h metre
$\angle BDC = \alpha$; $\angle ADC = \beta$
Let, CD = x metre
In ΔBCD,

$$\tan\alpha = \frac{BC}{CD}$$

$$\Rightarrow \tan\alpha = \frac{y}{x}$$

$$\Rightarrow x = \frac{y}{\tan\alpha} \quad \text{..... (i)}$$

In ΔACD,

$$\tan\beta = \frac{AC}{CD}$$

$$\Rightarrow \tan\beta = \frac{h + y}{x}$$

$$\Rightarrow x = \frac{h + y}{\tan\beta} \quad \text{..... (ii)}$$

$$\therefore \frac{y}{\tan\alpha} = \frac{h + y}{\tan\beta}$$

$\Rightarrow y \tan\beta = h \tan\alpha + y \tan\alpha$
$\Rightarrow y \tan\beta - y \tan\alpha = h \tan\alpha$
$\Rightarrow y (\tan\beta - \tan\alpha) = h \tan\alpha$

$$\Rightarrow y = \frac{h \tan\alpha}{\tan\beta - \tan\alpha}$$

57. (1)

AB = pole = 5 metre
$\angle ACB = 30°$, BC = ?
In ΔABC,

$$\tan 30° = \frac{AB}{BC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{5}{BC}$$

$\Rightarrow$ BC = $5\sqrt{3}$ metre

58. (3)

AB = Height of the wall
AC = Length of ladder
= h metre
BC = b = 4.6 metre
$\angle ACB = 60°$

$$\therefore \cos 60° = \frac{BC}{AC}$$

$$\Rightarrow \frac{1}{2} = \frac{4.6}{h}$$

$\Rightarrow h = (2 \times 4.6)$ metre
= 9.2 metre

59. (3)

In ΔABC,
AB = Wall
BC = 10 feet
$\angle ACB = 60°$

$$\therefore \tan 60° = \frac{AB}{BC}$$

$$\Rightarrow \sqrt{3} = \frac{AB}{10}$$

$\Rightarrow$ AB = $10\sqrt{3}$ feet

$$\therefore AC = \sqrt{AB^2 + BC^2}$$

$$= \sqrt{\left(10\sqrt{3}\right)^2 + 10^2}$$

$$= \sqrt{300 + 100}$$

$= \sqrt{400}$ = 20 feet
Case II,
$\angle BDE = 30°$

$$\therefore \sin 30° = \frac{BE}{DE}$$

$$\Rightarrow \frac{1}{2} = \frac{BE}{20}$$

$\Rightarrow$ BE = 10 feet

$\therefore$ AE = $10\sqrt{3} - 10$

$= 10\left(\sqrt{3} - 1\right)$ feet
= 10 (1.732 – 1)
= 10 × 0.732 = 7.32 feet

60. (2)

AB = BC

$$\tan\theta = \frac{AB}{BC}$$

$\Rightarrow \tan\theta = 1 = \tan 45°$
$\Rightarrow \theta = 45°$

61. (4)

AD = flag = x metre
AB = flagpost = h metre
BC = 30 metre
$\angle ACB = 45°$; $\angle DCB = 30°$
From Δ ABC,

$$\tan 45° = \frac{AB}{BC}$$

$$\Rightarrow 1 = \frac{h}{30} \Rightarrow h = 30 \text{ metre}$$

From Δ BCD,

$$\tan 30° = \frac{BD}{BC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h-x}{30}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{30-x}{30}$$

$$\Rightarrow 30 - x = \frac{30}{\sqrt{3}} = 10\sqrt{3}$$

$\Rightarrow x = 30 - 10\sqrt{3}$
$= 30 - 10 \times 1.732$
$= 30 - 17.32$
$= 12.68$ metre

62. (1)

AB = Tower = h metre
BC = 40 metre

$$\therefore \tan\theta = \frac{AB}{BC}$$

$$\Rightarrow \tan 60° = \frac{h}{40}$$

$$\Rightarrow \sqrt{3} = \frac{h}{40}$$

$$\Rightarrow h = 40\sqrt{3} = \frac{40\sqrt{3} \times \sqrt{3}}{\sqrt{3}}$$

$$= \frac{120}{\sqrt{3}} \text{ metre}$$

63. (2)

AB = tree = h metre
BC = width of river = x metre
CD = 36 metre
From Δ ABC,

$$\tan 60° = \frac{AB}{BC}$$

$$\Rightarrow \sqrt{3} = \frac{h}{x}$$

$\Rightarrow h = \sqrt{3}\,x$ metre .... (i)
From Δ ABD,

$$\tan 30° = \frac{AB}{BD}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+36}$$

$\Rightarrow \sqrt{3}\,h = x + 36$
$\Rightarrow \sqrt{3} \times \sqrt{3}\,x = x + 36$
$\Rightarrow 3x - x = 36$
$\Rightarrow 2x = 36 \Rightarrow x = 18$ metre

64. (3)

AB = Light house = 100 metre
C and D are positions of ships.
Let,
BC = x metre and BD = y metre
$\angle ACB = 45°$ and $\angle ADB = 30°$
From Δ ABC,

$$\tan 45° = \frac{AB}{BC}$$

$$\Rightarrow 1 = \frac{100}{x} \Rightarrow x = 100 \text{ metre}$$

From Δ ABD,

$$\tan 30° = \frac{AB}{BD}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{100}{y}$$

$\Rightarrow y = 100\sqrt{3}$ metre
$= (100 \times 1.73)$ metre
$= 173$ metre
$\therefore$ Required distance $= x + y$
$= 100 + 173 = 273$ metre

65. (3)

AB = Height of mountain
= 500 metre
$\angle ACB = 30°$; $\angle ADB = 45°$
C and D $\Rightarrow$ Positions of boats
Let CD = x metre
From Δ ABD,

$$\tan 45° = \frac{AB}{BD}$$

$\Rightarrow AB = BD$
$= 500$ metre
From Δ ABC,

$$\tan 30° = \frac{AB}{BC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{500}{500+x}$$

$\Rightarrow 500 + x = 500\sqrt{3}$

$\Rightarrow x = 500\sqrt{3} - 500$

$= 500\,(\sqrt{3} - 1)$ metre
$= 500\,(1.732 - 1)$ metre
$= (500 \times 0.732)$ metre
$= 366$ metre

66. (4)

Let, AB = height of pole
= h metre
CD = height of building
= 20 metre = BE
$\angle ADB = 60°$; $\angle ACE = 30°$
Let, AE = x metre ; BD = EC
= y metre
In Δ ABD,

$$\tan 60° = \frac{AB}{BD} \Rightarrow \sqrt{3} = \frac{x+20}{y}$$

$\Rightarrow x + 20 = \sqrt{3}\ y$ .... (i)
In Δ AEC,

$$\tan 30° = \frac{AE}{EC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{x}{y} \Rightarrow y = \sqrt{3}\ x \text{ .... (ii)}$$

From equation (i),
$x + 20 = \sqrt{3} \times \sqrt{3}x$
$\Rightarrow 3x - x = 20$
$\Rightarrow 2x = 20$

$$\Rightarrow x = \frac{20}{2} = 10 \text{ metre}$$

$\therefore$ Height of pole
= (20 + 10) metre
= 30 metre

67. (4)

AB = Height of building
= 30 metre
CD = Height of temple
= h metre
AB = CE = 30 metre
$\therefore$ DE = (h – 30) metre;
BC = AE = x metre
$\angle DAE = 30°$; $\angle DBC = 60°$
In ΔBCD,

$$\tan 60° = \frac{CD}{BC} \Rightarrow \sqrt{3} = \frac{h}{x}$$

$\Rightarrow h = \sqrt{3}\,x$ metre ..... (i)
In ΔADE,

$$\tan 30° = \frac{DE}{AE}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h-30}{x}$$

$\Rightarrow x = \sqrt{3}\,h - 30\sqrt{3}$ ..... (ii)
$\therefore h = \sqrt{3}\,x$
$= 3h - 30 \times 3$
$\Rightarrow 3h - h = 90 \Rightarrow 2h = 90$

$$\Rightarrow h = \frac{90}{2} = 45 \text{ metre}$$

68. (3)

AB = Height of tower
$= 50\sqrt{3}$ metre
BC = 50 metre

$$\therefore \tan\theta = \frac{AB}{BC} = \frac{50\sqrt{3}}{50}$$

$\Rightarrow \tan\theta = \sqrt{3} = \tan 60°$
$\Rightarrow \theta = 60°$

69. (2)

AB = Tower
BC = distance of point C

$$\tan\theta = \frac{AB}{BC} = \frac{5\sqrt{3}}{5} = \sqrt{3}$$

$\therefore \tan\theta = \tan 60° \Rightarrow \theta = 60°$

70. (4)

AB = Length of thread
= h metre
= 80 metre
$\angle BAC = 60°$
BC = Vertical height of kite
In ΔABC,

$$\sin 60° = \frac{BC}{AB}$$

$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{h}{80}$$

$$\Rightarrow h = 80 \times \frac{\sqrt{3}}{2} = 40\sqrt{3} \text{ metre}$$

71. (3)

Let, AB = height of tower
= h metre
$\angle ACB = 30°$,
$\angle ADB = 60°$
CD = 20 metre ; BC = x metre
In Δ ABC,

$$\tan 30° = \frac{AB}{BC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x}$$

$\Rightarrow x = \sqrt{3}\ h$ .... (i)
In Δ ABD,

$$\tan 60° = \frac{AB}{BD}$$

$$\Rightarrow \sqrt{3} = \frac{h}{x-20}$$

$\Rightarrow h = \sqrt{3}\,x - 20\sqrt{3}$
$= \sqrt{3} \times \sqrt{3}\ h - 20\sqrt{3}$
$\Rightarrow h = 3h - 20\sqrt{3}$
$\Rightarrow 3h - h = 20\sqrt{3}$
$\Rightarrow 2h = 20\sqrt{3}$

$$\Rightarrow h = \frac{20\sqrt{3}}{2} = 10\sqrt{3} \text{ metre}$$

72. (3)

AB = Height of observer = 1.6 metre
CD = Height of tower
= h metre
$\therefore$ DE = $(h - 1.6)$ metre ; BC = AE = 45 metre
$\angle$ DAE = 30°

$\therefore \tan 30° = \frac{DE}{AE}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h - 1.6}{45}$

$\Rightarrow h - 1.6 = \frac{45}{\sqrt{3}} = 15\sqrt{3}$

$\Rightarrow h - 1.6 = 15 \times 1.732 = 25.98$
$\Rightarrow h = (25.98 + 1.6)$ metre
= 27.58 metre

73. (1)

AB = Height of tree
BD = 10 metre
AC = CD = broken part of tree
$\angle$CDB = 30°
In ΔBCD,

$\tan 30° = \frac{BC}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{BC}{10}$

$\Rightarrow BC = \frac{10}{\sqrt{3}}$ metre

Again, $\sin 30° = \frac{BC}{CD}$

$\Rightarrow \frac{1}{2} = \frac{10}{\sqrt{3} \times CD}$

$\Rightarrow CD = \frac{10 \times 2}{\sqrt{3}} = \frac{20}{\sqrt{3}}$ metre

$\therefore$ AB = BC + CD

$= \frac{10}{\sqrt{3}} + \frac{20}{\sqrt{3}} = \frac{30}{\sqrt{3}}$

$= 10\sqrt{3}$ metre

74. (3)

Let AB = height of tree
= h metre
AC = 8 metre,
BC = CD = Broken part of tree
AD = 15 metre
In ΔACD,
$CD^2 = AC^2 + AD^2 = 8^2 + 15^2$
$= 64 + 225 = 289$

$\therefore CD = \sqrt{289} = 17$ metre

$\therefore$ Original height of tree
= 17 + 8 = 25 metre

75. (3)

Let AB = height of pole
= h metre
$\angle ACB = \theta$, $\angle ADB = \phi$
In ΔABD,

$\tan\phi = \frac{AB}{BD}$

$\Rightarrow BD = \frac{h}{\tan\phi} = h \cot\phi$

In ΔABC,

$\tan\theta = \frac{AB}{BC}$

$\Rightarrow BC = \frac{h}{\tan\theta} = h \cot\theta$

$\therefore$ Required distance
$= CD = h \cot\theta - h \cot\phi$
$= h(\cot\theta - \cot\phi)$ metre

76. (4)

Let AB = Height of tower
= h metre
BC = 25 metre
BD = 64 metre
$\angle ACB = x°$ and $\angle ADB$
$= (90 - x)$
In ΔABC,

$\tan x = \frac{AB}{BC}$

$\Rightarrow \tan x = \frac{h}{25}$

In ΔABD,

$\tan(90° - x) = \frac{AB}{BD}$

$\Rightarrow \cot x = \frac{h}{64}$

$\therefore \tan x \,.\, \cot x = \frac{h}{25} \times \frac{h}{64}$

$\Rightarrow h^2 = 25 \times 64$

$\therefore h = \sqrt{25 \times 64} = 5 \times 8$
= 40 metre

77. (3)

AB = Height of pole = x units
BC = Length of shadow
$= \sqrt{3}\,x$ units
$\angle ACB = \theta$

$\therefore \tan\theta = \frac{AB}{BC}$

$\Rightarrow \tan\theta = \frac{x}{\sqrt{3}x} = \frac{1}{\sqrt{3}} = \tan 30°$

$\Rightarrow \theta = 30°$

78. (2)

AB = CD = 3000 metre
A and C = Positions of aeroplane

$\angle AOB = 60°$; $\angle COD = 30°$

In ΔOAB,

$\tan 60° = \frac{AB}{OB}$

$\Rightarrow \sqrt{3} = \frac{3000}{OB}$

$\Rightarrow OB = \frac{3000}{\sqrt{3}}$

$= 1000\sqrt{3}$ metre

In ΔOCD,

$\tan 30° = \frac{CD}{OD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{3000}{OD}$

$\Rightarrow OD = 3000\sqrt{3}$ metre

$\therefore BD = (3000\sqrt{3} - 1000\sqrt{3})$ metre

$= 2000\sqrt{3}$ metre

$\therefore$ Speed of aeroplane

$= \frac{2000\sqrt{3}}{15}$ m./sec.

$= \left(\frac{2000 \times 1.732}{15}\right)$ m./sec.

$= 230.93$ m./sec.

79. (3)

AB = Height of pole = h metre

CD = 60 metre

In ΔABC,

$\tan 45° = \frac{AB}{BC} \Rightarrow 1 = \frac{h}{BC}$

$\Rightarrow BC = h$ metre

In ΔABD,

$\tan 30° = \frac{AB}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{h+60}$

$\Rightarrow \sqrt{3}h = h + 60$

$\Rightarrow \sqrt{3}h - h = 60$

$\Rightarrow h\left(\sqrt{3}-1\right) = 60$

$\Rightarrow h = \frac{60}{\sqrt{3}-1}$

$= \frac{60\left(\sqrt{3}+1\right)}{\left(\sqrt{3}-1\right)\left(\sqrt{3}+1\right)} = \frac{60\left(\sqrt{3}+1\right)}{2}$

$= 30\left(\sqrt{3}+1\right)$ metre

80. (4)

Let AB = height of tower

$= h$ metre

$\angle ACB = \alpha$; $\angle ADB = \beta$

In ΔABC,

$\tan\alpha = \frac{AB}{BC}$

$\Rightarrow \tan\alpha = \frac{h}{BC} \Rightarrow BC = \frac{h}{\tan\alpha}$

$= h \cot\alpha$

In ΔABD,

$\tan\beta = \frac{AB}{BD} \Rightarrow \tan\beta = \frac{h}{BD}$

$\Rightarrow BD = \frac{h}{\tan\beta} = h \cot\beta$

$\therefore BC = BC + BD$

$= h \cot\alpha + h \cot\beta$

$= h(\cot\alpha + \cot\beta)$

81. (1)

AB = incomplete pole

BC = 150 metre

$\angle ACB = 30°$

In ΔABC,

$\tan 30° = \frac{AB}{BC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AB}{150}$

$\Rightarrow AB = \frac{150}{\sqrt{3}} = 50\sqrt{3}$ metre

In ΔBCD,

$\tan 45° = \frac{BD}{BC}$

$\Rightarrow 1 = \frac{BD}{150}$

$\Rightarrow BD = 150$ metre

$\therefore AD = BD - AB$

$= (150 - 50\sqrt{3})$ metre

$= 50\left(3 - \sqrt{3}\right)$ metre

$= 50(3 - 1.732)$ metre

$= (50 \times 1.268)$ metre

$= 63.4$ metre

82. (4)

AB is the surface of lake. C' is the reflection of cloud 'C'.

$\angle CPM = 30°$ and $\angle C'PM = 60°$

Let, C M = h metre

CB = $(h + 200)$ metre

C'B = $(h + 200)$ metre

In ΔCMP,

$\tan 30° = \frac{CM}{PM}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{PM}$

$\Rightarrow PM = \sqrt{3}h$ ....(i)

In $\Delta PMC'$,

$\tan 60° = \frac{C'M}{PM}$

$\Rightarrow \tan 60° = \frac{C'B + BM}{PM}$

$\Rightarrow \sqrt{3} = \frac{h + 200 + 200}{PM}$

$\Rightarrow PM = \frac{h + 400}{\sqrt{3}}$ .... (ii)

From equations (i) and (ii),

$\sqrt{3}\,h = \dfrac{h+400}{\sqrt{3}}$

$\Rightarrow 3h = h + 400$

$\Rightarrow 2h = 400 \Rightarrow h = 200$

$\therefore$ CB = h + 200 = 400 metre

Note : If the angle of elevation of a cloud from a point h metre above a lake is α and the angle of depression of its reflection in the lake is β, then the height of the cloud

$= \dfrac{h(\tan\beta + \tan\alpha)}{(\tan\beta - \tan\alpha)}$

83. (3)

AB = Height of cliff = h metre

BC = 129 metre

In ΔABC,

$\tan\theta = \dfrac{AB}{BC}$

$\Rightarrow \tan 30° = \dfrac{h}{129}$

$\Rightarrow \dfrac{1}{\sqrt{3}} - \dfrac{h}{129}$

$\Rightarrow h = \dfrac{129}{\sqrt{3}} = 43\sqrt{3}$ metre

84. (2)

A' $\Rightarrow$ Position of sun

AB = Height of pole = 15 metre

BC = Length of shadow

$= \dfrac{15}{\sqrt{3}}$ metre

$\therefore \tan\theta = \dfrac{AB}{BC} = \dfrac{15}{\frac{15}{\sqrt{3}}} = \sqrt{3}$

$\Rightarrow \tan\theta = \tan 60°$

$\Rightarrow \theta = 60°$

85. (3)

AB = Height of pole

$= 50\sqrt{3}$ metre

BC = Length of shadow

= x metre

When,

$\angle ACB = 30°$

BD = Length of shadow

= y metre

when,

$\angle ADB = 60°$

In ΔABC,

$\tan 30° = \dfrac{AB}{BC}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{50\sqrt{3}}{x}$

$\Rightarrow x = 50\sqrt{3} \times \sqrt{3} = 150$ metre

In ΔABD,

$\tan 60° = \dfrac{AB}{BD}$

$\Rightarrow \sqrt{3} = \dfrac{50\sqrt{3}}{y}$

$\Rightarrow \sqrt{3}y = 50\sqrt{3}$

$\Rightarrow y = \dfrac{50\sqrt{3}}{\sqrt{3}} = 50$ metre

$\therefore$ CD = $x - y$ = 150 – 50

= 100 metre

86. (3)

Let, AB = Height of tower

= 100 metre

$\angle ACB = 30°$

In ΔABC,

$\tan 30° = \dfrac{AB}{BC}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{100}{BC}$

$\Rightarrow$ BC = $100\sqrt{3}$ metre

= (100 × 1.73) metre

= 173 metre

87. (3)

AB = Height of pole

= 75 metre

C and D $\Rightarrow$ positions of persons

Let, BC = x metre,

BD = y metre

$\angle ACB = 60°$; $\angle ADB = 30°$

In ΔABC,

$\tan 60° = \dfrac{AB}{BC}$

$\Rightarrow \sqrt{3} = \dfrac{75}{x}$

$\Rightarrow x = \dfrac{75}{\sqrt{3}} = 25\sqrt{3}$ metre

In ΔABD,

$\tan 30° = \dfrac{AB}{BD}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{75}{y}$

$\Rightarrow y = 75\sqrt{3}$ metre

$\therefore$ CD = $y - x$

$= \left(75\sqrt{3} - 25\sqrt{3}\right)$ metre

$= 50\sqrt{3}$ metre

88. (4)

Two consecutive kilometre stones $\Rightarrow$ C and D

$\angle ADB = 45°$; $\angle ACB = 60°$

CD = 1 km.

AB = height of plane = h metre

BC = x metre (let)

In ΔABC,

$\tan 60° = \dfrac{AB}{BC}$

$\Rightarrow \sqrt{3} = \dfrac{h}{x}$

$\Rightarrow h = \sqrt{3}\,x$ metre ..... (i)

In ΔABD,

$\tan 45° = \frac{AB}{BD}$

$\Rightarrow 1 = \frac{h}{x+1}$

$\Rightarrow h = x + 1$

$\Rightarrow h = \frac{h}{\sqrt{3}} + 1$

[From equation (i)]

$\Rightarrow h - \frac{h}{\sqrt{3}} = 1$

$\Rightarrow \frac{\sqrt{3}h - h}{\sqrt{3}} = 1$

$\Rightarrow \left(\sqrt{3}-1\right) h = \sqrt{3}$

$\Rightarrow h = \frac{\sqrt{3}}{\sqrt{3}-1}$

$= \frac{\sqrt{3}\left(\sqrt{3}+1\right)}{\left(\sqrt{3}-1\right)\left(\sqrt{3}+1\right)} = \frac{\sqrt{3}}{2}\left(\sqrt{3}+1\right)$

$= \frac{1}{2}\left(3+\sqrt{3}\right)$ metre

89. (2)

AB = Height of tower
= h metre
AD = Height of flagstaff
= x metre
$\angle BCD = 60°$; $\angle BCA = 30°$
BC = 9 metre
In ΔABC,

$\tan 30° = \frac{AB}{BC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{9}$

$\Rightarrow h = \frac{9}{\sqrt{3}} = 3\sqrt{3}$ metre

In ΔBCD,

$\tan 60° = \frac{BD}{BC}$

$\Rightarrow \sqrt{3} = \frac{h+x}{9}$

$\Rightarrow h + x = 9\sqrt{3}$

$\Rightarrow 3\sqrt{3} + x = 9\sqrt{3}$

$\Rightarrow x = 9\sqrt{3} - 3\sqrt{3}$

$= 6\sqrt{3}$ metre

90. (3)

AB = Height of pole
= 15 metre
$\angle ACB = 60°$; $\angle ADB = 30°$
In ΔABC,

$\tan 60° = \frac{AB}{BC} \Rightarrow \sqrt{3} = \frac{15}{BC}$

$\Rightarrow BC = \frac{15}{\sqrt{3}} = 5\sqrt{3}$ metre

In ΔABD,

$\tan 30° = \frac{AB}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{15}{BD}$

$\Rightarrow BD = 15\sqrt{3}$ metre

$\therefore$ Required difference
= BD – BC

$= \left(15\sqrt{3} - 5\sqrt{3}\right)$ metre

$= 10\sqrt{3}$ metre

91. (1)

AD = Height of temple
= 75 metre
B and C $\Rightarrow$ Positions of men
$\angle ABD = 30°$; $\angle ACD = 60°$
In ΔABD,

$\tan 30° = \frac{AD}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{75}{BD}$

$\Rightarrow BD = 75\sqrt{3}$ metre

In ΔACD,

$\tan 60° = \frac{AD}{DC}$

$\Rightarrow \sqrt{3} = \frac{75}{DC}$

$\Rightarrow DC = \frac{75}{\sqrt{3}} = 25\sqrt{3}$ metre

$\therefore$ BC = BD + DC

$= 75\sqrt{3} + 25\sqrt{3}$

$= 100\sqrt{3}$ metre

= (100 × 1.732) metre

= 173.2 metre

92. (3)

AB = Height of building
= 20 metre
CD = Height of tower
= h metre (let)
$\angle ACB = \angle EAC = 45°$
$\angle DAE = 60°$
BC = AE = x metre
In ΔABC,

$\tan 45° = \frac{AB}{BC}$

$\Rightarrow 1 = \frac{20}{x}$

$\Rightarrow x = 20$ metre

In ΔADE,

$\tan 60° = \frac{DE}{AE} \Rightarrow \sqrt{3} = \frac{h-20}{20}$

$\Rightarrow h - 20 = 20\sqrt{3}$

$\Rightarrow h = 20\sqrt{3} + 20$

$= 20\left(\sqrt{3}+1\right)$ metre

= 20 (1.732 + 1) metre

= (20 × 2.732) metre

= 54.64 metre

93. (2)

Let the height of tower be x units.

$\therefore$ Length of shadow = $\sqrt{3}x$ units

In ΔABC,

$\therefore \tan\theta = \frac{AB}{BC} = \frac{x}{\sqrt{3}x} = \frac{1}{\sqrt{3}}$

$\Rightarrow \tan\theta = \tan 30°$

$\Rightarrow \theta = 30°$

94. (3)

AB = Height of tree
Let the tree break at point C.

BC = x metre
$\therefore$ AC = CD
$\angle$CDB = 60°; BD = 10 metre
In ΔBCD,

$\tan 60° = \frac{BC}{BD} \Rightarrow \sqrt{3} = \frac{x}{10}$

$\Rightarrow x = 10\sqrt{3}$ metre

Again, $\sin 60° = \frac{BC}{CD}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{10\sqrt{3}}{CD}$

$\Rightarrow CD = \frac{2 \times 10\sqrt{3}}{\sqrt{3}} = 20$ metre

$\therefore$ Height of tree = AB

$= \left(20 + 10\sqrt{3}\right)$ metre

$= 10\left(2 + \sqrt{3}\right)$ metre

95. (4)

Let telegraph pole bend at point A.
BC = $8\sqrt{3}$ metre
In ΔABC,

$\tan 30° = \frac{AB}{BC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AB}{8\sqrt{3}}$

$\Rightarrow AB = \frac{8\sqrt{3}}{\sqrt{3}} = 8$ metre

Again, $\sin 30° = \frac{AB}{AC}$

$\Rightarrow \frac{1}{2} = \frac{8}{AC}$

$\Rightarrow$ AC = 2 × 8 = 16 metre
$\therefore$ Height of telegraph–pole
= AB + AC
= 8 + 16 = 24 metre

96. (4)

Let, AB = Height of tower = h metre
BC = 4 metre, BD = 9 metre
$\angle$ACB = 90° – θ; $\angle$ADB = θ
In ΔABC,

$\tan(90° - \theta) = \frac{AB}{BC}$

$\Rightarrow \cot\theta = \frac{h}{4}$ ..... (i)

In ΔABD,

$\tan\theta = \frac{h}{9}$ ..... (ii)

On multiplying both equations,

$\tan\theta \,.\, \cot\theta = \frac{h}{4} \times \frac{h}{9}$

$\Rightarrow \frac{h^2}{36} = 1 \Rightarrow h^2 = 36$

$\Rightarrow h = \sqrt{36} = 6$ metre

97. (2)

AB = Height of tower
= h metre
BC = Length of shadow when
$\angle$BCA = 60° = x metre
BD = Length of shadow when
$\angle$ADB = 45° = (x + 10) metre
In ΔABC,

$\tan 60° = \frac{AB}{BC}$

$\Rightarrow \sqrt{3} = \frac{h}{x}$

$\Rightarrow h = \sqrt{3}\,x$ metre ..... (i)

In ΔABD,

$\tan 45° = \frac{AB}{BD} \Rightarrow 1 = \frac{h}{x+10}$

$\Rightarrow h = x + 10 \Rightarrow h = \frac{h}{\sqrt{3}} + 10$

$\Rightarrow h - \frac{h}{\sqrt{3}} = 10$

$\Rightarrow \frac{\sqrt{3}h - h}{\sqrt{3}} = 10$

$\Rightarrow h\left(\sqrt{3} - 1\right) = 10\sqrt{3}$

$\Rightarrow h = \frac{10\sqrt{3}}{\sqrt{3}-1} = \frac{10\sqrt{3}\left(\sqrt{3}+1\right)}{\left(\sqrt{3}-1\right)\left(\sqrt{3}+1\right)}$

$= \frac{10\sqrt{3}\left(\sqrt{3}+1\right)}{2}$

$= 5\left(3 + \sqrt{3}\right)$ metre

98. (1)

AB = Height of tower
C and D ⇒ Positions of men
BC = x metre (let)
BD = y metre
$\angle$ACB = 45° ; $\angle$ADB = 30°
In ΔABC,

$\tan 45° = \frac{AB}{BC}$

$\Rightarrow 1 = \frac{50}{x}$

$\Rightarrow x = 50$ metre
In ΔABD,

$\tan 30° = \frac{AB}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{50}{y}$

$\Rightarrow y = 50\sqrt{3}$
= (50 × 1.73) metre
= 86.5 metre
$\therefore$ CD = (50 + 86.5) metre
= 136.5 metre

99. (1)

Suppose, AB = Height of tower = h metre
When $\angle$ACB = 45°, length of shadow = BC = x metre
When $\angle$ADB = 30°, length of shadow = BD = (x + 10) metre
In ΔABC,

$\tan 45° = \frac{AB}{BC}$

$\Rightarrow 1 = \frac{h}{x}$

$\Rightarrow h = x$ metre ...(i)

In ΔABD,

$\tan 30° = \frac{AB}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+10}$

$\Rightarrow \sqrt{3}h = x + 10$

$\Rightarrow \sqrt{3}h = h + 10$

$\Rightarrow \sqrt{3}h - h = 10$

$\Rightarrow h\left(\sqrt{3} - 1\right) = 10$

$\Rightarrow h = \dfrac{10}{\sqrt{3} - 1}$

$= \dfrac{10\left(\sqrt{3} + 1\right)}{\left(\sqrt{3} - 1\right)\left(\sqrt{3} - 1\right)}$

$= \dfrac{10\left(\sqrt{3} + 1\right)}{2}$

$= 5\left(\sqrt{3} + 1\right)$ metre

100. (3)

Suppose, height of tree
= AB = h foot
BC = width of river = x foot
CD = $20\sqrt{3}$ foot
$\angle ACB = 60°$ and $\angle ADB = 30°$
In ΔABC,

$\tan 60° = \dfrac{AB}{BC}$

$\Rightarrow \sqrt{3} = \dfrac{h}{x}$

$\Rightarrow h = \sqrt{3}x$ foot ...(i)

In ΔABD,

$\tan 30° = \dfrac{AB}{BD}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{h}{x + 20\sqrt{3}}$

$\Rightarrow \sqrt{3}h = x + 20\sqrt{3}$

$\Rightarrow \sqrt{3}h = \dfrac{h}{\sqrt{3}} + 20\sqrt{3}$

$\Rightarrow 3h = h + 20\sqrt{3} \times \sqrt{3}$

$\Rightarrow 2h = 60$

$\Rightarrow h = \dfrac{60}{2} = 30$ feet

101. (4)

Let, AB = $3h$ metre
CD = h metre
BE = ED = 60° metre
$\angle AEB = 90° - \theta$; $\angle CED = \theta$
In ΔABE,

$\tan(90° - \theta) = \dfrac{AB}{BE}$

$\Rightarrow \cot\theta = \dfrac{3h}{60}$ ..... (i)

In ΔCED,

$\tan\theta = \dfrac{h}{60}$ ..... (ii)

$\therefore \tan\theta \,.\, \cot\theta = \dfrac{3h}{60} \times \dfrac{h}{60}$

$\Rightarrow 3h^2 = 60 \times 60$

$\Rightarrow h^2 = \dfrac{60 \times 60}{3} = 1200$

$\Rightarrow h = \sqrt{1200}$

$= 20\sqrt{3}$ metre

$\therefore$ Height of larger pole

$= 3 \times 20\sqrt{3} = 60\sqrt{3}$ metre

= (60 × 1.732) metre

= 103.92 metre

102. (4)

If height of balloown = $3800\sqrt{3}$ m, then,

$\tan 60° = \dfrac{BP}{AB}$

$\Rightarrow \sqrt{3} = \dfrac{3800\sqrt{3}}{AB}$

$\Rightarrow$ AB = 3800 m

$\tan 45° = \dfrac{CQ}{AC}$

$\Rightarrow 1 = \dfrac{3800\sqrt{3}}{AC}$

$\Rightarrow$ AC = $3800\sqrt{3}$ m

$\therefore$ PQ = AC – AB

= $(3800\sqrt{3} - 3800)$

= 3800 × 0.732 = 3800 $(\sqrt{3} - 1)$

= 2782 m

$\therefore$ Required speed

$= \left(\dfrac{2782}{\dfrac{5}{60} \times 1000}\right)$ km/hr.

= 33.3 km/hr. (Approximately)

TYPE-IV

1. (2)

[Note : Interior alternate angles are equal **]**
AB = 108 m
CD = x metre
From Δ ABC,

$\tan 60° = \dfrac{AB}{BC}$

$\Rightarrow \sqrt{3} = \dfrac{108}{BC}$

$\Rightarrow BC = \dfrac{108}{\sqrt{3}} = 36\sqrt{3}\,m$

From Δ AED,

$\tan 30° = \dfrac{AE}{ED}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{108 - x}{36\sqrt{3}}$

$\Rightarrow 108 - x = 36$

$\Rightarrow x = 108 - 36 = 72$ m

2. (2)

AB = temple = 54 metre
CD = temple = h metre
BC = width of river
= x metre

From ΔABC,

$\tan 60° = \frac{AB}{BC}$

$\Rightarrow \sqrt{3} = \frac{54}{x} \Rightarrow x = \frac{54}{\sqrt{3}}$

$= 18\sqrt{3}$ metre

From ΔADE,

$\tan 30° = \frac{AE}{DE}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{54 - h}{18\sqrt{3}}$

$\Rightarrow 54 - h = 18$

$\Rightarrow h = 54 - 18 = 36$ metre

3. (2)

DE = 36 – 24 = 12 metre

From Δ ADE,

$\sin 60° = \frac{DE}{AD}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{12}{AD}$.

$\Rightarrow AD = \frac{12 \times 2}{\sqrt{3}} = 8\sqrt{3}$ metre

4. (3)

AB = Hill = 200 metre

∠ADE = 30°

∠ACB = 60°

DE = BC = x metre

From ΔABC,

$\tan 60° = \frac{AB}{BC}$

$\Rightarrow \sqrt{3} = \frac{200}{x}$

$\Rightarrow x = \frac{200}{\sqrt{3}}$ metre

From ΔAED,

$\tan 30° = \frac{AE}{DE}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AE}{\frac{200}{\sqrt{3}}}$

$\Rightarrow AE = \frac{200}{3}$ metre

$\therefore CD = 200 - \frac{200}{3} = \frac{400}{3}$

$= 133\frac{1}{3}$ metre

5. (2)

AB = Tower = 125 metre

BC = x metre, BD = y metre

From ΔABC,

$\tan 45° = \frac{AB}{BC}$

$\Rightarrow 1 = \frac{125}{x} \Rightarrow x = 125$ metre

From Δ ABD,

$\tan 30° = \frac{AB}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{125}{y}$

$\Rightarrow y = 125\sqrt{3}$ metre

$\therefore CD = y - x = 125\sqrt{3} - 125$

$= 125(\sqrt{3} - 1)$ metre

6. (4)

AD is tower and B and C are two objects,

∠ABD = 30° and ∠ACD = 45°

AD = 180 metre

From ΔABD,

$\tan 30° = \frac{AD}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{180}{BD}$

$\Rightarrow BD = 180\sqrt{3}$ metre

From ΔADC,

$\tan 45° = \frac{AD}{DC}$

$\Rightarrow 1 = \frac{180}{DC} \Rightarrow DC = 180$ metre

$\therefore BC = BD + DC$

$= 180\sqrt{3} + 180$

$= 180(\sqrt{3} + 1)$ metre

7. (1)

AB = hill = 300 metre

CD = bridge = x metre

In ΔABC,

$\tan 45° = \frac{AB}{BC}$

$\Rightarrow 1 = \frac{300}{BC}$

$\Rightarrow$ BC = 300 metre

In ΔABD,

$\tan 30° = \frac{AB}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{300}{300 + x}$

$\Rightarrow 300 + x = 300\sqrt{3}$

$\Rightarrow x = 300\sqrt{3} - 300$

$= 300 (\sqrt{3} - 1)$ metre

8. (1)

BC = River = 400 metre

AD = Height of plane = h metre

BD = x metre (let)

$\therefore$ CD = $(400 - x)$ metre

From ΔABD,

$\tan 60° = \frac{AD}{BD}$

$\Rightarrow \sqrt{3} = \frac{h}{x}$

$\Rightarrow h = \sqrt{3}\, x$ metre

$\Rightarrow x = \frac{h}{\sqrt{3}}$ metre ...(i)

From ΔACD,

$\tan 30° = \frac{AD}{CD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{400 - x}$

$\Rightarrow \sqrt{3}h = 400 - x$

$\Rightarrow \sqrt{3}h = 400 - \frac{h}{\sqrt{3}}$

[From equation (i)]

$\Rightarrow \sqrt{3}h + \frac{h}{\sqrt{3}} = 400$

$\Rightarrow \frac{3h + h}{\sqrt{3}} = 400$

$\Rightarrow 4h = 400\sqrt{3}$

$\Rightarrow h = \frac{400\sqrt{3}}{4}$

$= 100\sqrt{3}$ metre

$= 100 \times 1.732 = 173.2$ metre

9. (2)

AB = Height of light house

= 20 metre

= 20 metre

$\angle$DAC = $\angle$ACB = 30°

In Δ ABC

$\tan 30° = \frac{AB}{BC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{20}{BC}$

$\Rightarrow$ BC = $20\sqrt{3}$ metre

10. (3)

A = Position of aeroplane

B and C are km stones,

$\angle$ABD = 60°, $\angle$ACD = 30°

BD = x km.

$\therefore$ CD = $(1 - x)$ km.

In ΔABD,

$\tan 60° = \frac{AD}{BD}$

$\Rightarrow \sqrt{3} = \frac{AD}{x}$

$\Rightarrow$ AD = $\sqrt{3}\, x$ km. ...(i)

In ΔACD,

$\tan 30° = \frac{AD}{CD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AD}{1 - x}$

$\Rightarrow$ AD = $\frac{1 - x}{\sqrt{3}}$ km. ...(ii)

$\therefore$ From equations (i) and (ii),

$\sqrt{3}\, x = \frac{1 - x}{\sqrt{3}}$

$\Rightarrow 3x = 1 - x$

$\Rightarrow 4x = 1 \Rightarrow x = \frac{1}{4}$ km.

$\therefore$ AD = $\sqrt{3}\, x = \frac{\sqrt{3}}{4}$ km.

11. (4)

OC = Height of plane = h km (let)

$\angle$DOA = $\angle$OAC = 60° ;

$\angle$BOE = $\angle$OBC = 30°

AB = 2 km.

AC = x km (let)

$\therefore$ BC = $(2 - x)$ km.

From, ΔOAC

$\tan 60° = \frac{OC}{AC}$

$\Rightarrow \sqrt{3} = \frac{h}{x}$

$\Rightarrow x = \frac{h}{\sqrt{3}}$ km. ....(i)

From ΔOBC,

$\tan 30° = \frac{OC}{CB}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{2 - x}$

$\Rightarrow \sqrt{3}\, h = 2 - \frac{h}{\sqrt{3}}$

[From equation(i)]

$\Rightarrow \sqrt{3}\, h + \frac{h}{\sqrt{3}} = 2$

$\Rightarrow \frac{3h + h}{\sqrt{3}} = 2$

$\Rightarrow 4h = 2\sqrt{3}$

$\Rightarrow h = \dfrac{2\sqrt{3}}{4} = \dfrac{\sqrt{3}}{2}$ km.

$= \dfrac{1.732}{2} = 0.866$ km.

12. (2)

AB = Tower = h metre (let)
$\angle DAC = \angle ACB = 60°$
BC = 70 metre
In ΔABC,

$\tan 60° = \dfrac{AB}{BC}$

$\Rightarrow \sqrt{3} = \dfrac{h}{70}$

$\Rightarrow h = 70\sqrt{3}$ metre

13. (1)

P = Position of pilot ;
PC = 200 metre
AB = width of river
AC = x metre (let)
CB = y metre (let)
$\angle PAC = 45°$; $\angle PBC = 60°$
In Δ APC,

$\tan 45° = \dfrac{PC}{AC}$

$\Rightarrow 1 = \dfrac{200}{x}$

$\Rightarrow x = 200$ metre
In Δ PCB,

$\tan 60° = \dfrac{PC}{CB}$

$\Rightarrow \sqrt{3} = \dfrac{200}{y}$

$\Rightarrow y = \dfrac{200}{\sqrt{3}}$ metre

$\therefore$ Width of river = $x + y$

$= \left(200 + \dfrac{200}{\sqrt{3}}\right)$ metre

14. (3)

AB = height of hill = h metre
Let speed of vehicle be v metre/minute.
Time taken to reach B from D = t minutes
CD = $10v$ metre
BD = vt metre
In ΔABC,

$\tan 45° = \dfrac{AB}{BC}$

$\Rightarrow 1 = \dfrac{h}{BC}$

$\Rightarrow BC = h$
$= (10v + vt)$ metre ....(i)
In ΔABD,

$\tan 60° = \dfrac{AB}{BD}$

$\Rightarrow \sqrt{3} = \dfrac{h}{vt}$

$\Rightarrow h = \sqrt{3}\,vt$

$\Rightarrow 10v + vt = \sqrt{3}\,vt$

$\Rightarrow 10 = \sqrt{3}\,t - t$

$\Rightarrow 10 = t\left(\sqrt{3} - 1\right)$

$\Rightarrow t = \dfrac{10}{\sqrt{3} - 1}$

$= \dfrac{10\left(\sqrt{3}+1\right)}{\left(\sqrt{3}-1\right)\left(\sqrt{3}+1\right)} = \dfrac{10\left(\sqrt{3}+1\right)}{2}$

$= 5\,(1.732 + 1) = 5 \times 2.732$
$= 13.66$ minutes
= 13 minutes 40 seconds

15. (1)

AB = Height of cliff = 100 metre.
CD = Height of tower = h metre.
$\angle ADE = 45°$, $\angle ACB = 60°$
In ΔABC,

$\tan 60° = \dfrac{AB}{BC}$

$\Rightarrow \sqrt{3} = \dfrac{100}{BC}$

$\Rightarrow BC = \dfrac{100}{\sqrt{3}}$ metre .... (i)

In ΔADE,

$\tan 45° = \dfrac{AE}{DE}$

$\Rightarrow 1 = \dfrac{AE}{BC} = \dfrac{100 - h}{BC}$

$\Rightarrow BC = 100 - h$

$\therefore \dfrac{100}{\sqrt{3}} = 100 - h$

$\Rightarrow h = 100 - \dfrac{100}{\sqrt{3}}$

$= \dfrac{100\sqrt{3} - 100}{\sqrt{3}}$

$= \dfrac{100\left(\sqrt{3}-1\right)}{\sqrt{3}} = \dfrac{100\sqrt{3}\left(\sqrt{3}-1\right)}{3}$

$= \dfrac{100\left(3-\sqrt{3}\right)}{3}$ metre

16. (1)

Let speed of boat
= v metre/minute
Time taken to reach B from D = t minutes
$\angle ACB = 30°$; $\angle ADB = 60°$
AB = Tower
In ΔABC,

$\tan 30° = \dfrac{AB}{BC}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{AB}{vt + 10v}$

$\Rightarrow$ AB = $\dfrac{vt+10v}{\sqrt{3}}$

In ΔABD,

$\tan 60° = \dfrac{AB}{BD}$

$\Rightarrow \sqrt{3} = \dfrac{AB}{vt}$

$\Rightarrow \sqrt{3}\,vt = AB$

$\Rightarrow \sqrt{3}\,vt = \dfrac{10v+vt}{\sqrt{3}}$

$\Rightarrow 3t = 10 + t$

$\Rightarrow 2t = 10$

$\Rightarrow t = 5$ minutes

17. (2)

CD = 2 metre

BD = x metre

AB = Tree = h metre

From Δ ABC,

$\tan 45° = \dfrac{AB}{BC}$

$\Rightarrow 1 = \dfrac{h}{x+2}$

$\Rightarrow h = (x + 2)$ metre .....(i)

From Δ ABD,

$\tan 60° = \dfrac{AB}{BD}$

$\Rightarrow \sqrt{3} = \dfrac{h}{x}$

$\Rightarrow x = \dfrac{h}{\sqrt{3}}$ .... (ii)

From equations (i) and (ii),

$h = \dfrac{h}{\sqrt{3}} + 2$

$\Rightarrow h - \dfrac{h}{\sqrt{3}} = 2$

$\Rightarrow \dfrac{\sqrt{3}h - h}{\sqrt{3}} = 2$

$\Rightarrow h\left(\sqrt{3}-1\right) = 2\sqrt{3}$

$\Rightarrow h = \dfrac{2\sqrt{3}}{\sqrt{3}-1}$

$= \dfrac{2\sqrt{3}\left(\sqrt{3}+1\right)}{\left(\sqrt{3}-1\right)\left(\sqrt{3}+1\right)}$

$= \dfrac{2\sqrt{3}\left(\sqrt{3}+1\right)}{3-1} = \sqrt{3}\left(\sqrt{3}+1\right)$

$= \left(3+\sqrt{3}\right)$ metre

18. (3)

AD = Cliff = 180 metre

$\angle$ABD = 60°, $\angle$ACD = 30°

From ΔABD,

$\tan 60° = \dfrac{AD}{BD}$

$\Rightarrow \sqrt{3} = \dfrac{180}{BD}$

$\Rightarrow$ BD = $\dfrac{180}{\sqrt{3}} = 60\sqrt{3}$ metre

From ΔACD,

$\tan 30° = \dfrac{AD}{CD}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{180}{CD}$

$\Rightarrow$ CD = $100\sqrt{3}$ metre

$\therefore$ BC = BD + DC

$= 60\sqrt{3} + 180\sqrt{3}$

$= 240\sqrt{3}$ metre

= (240 × 1.732) metre

= 415.68 metre

19. (3)

AB = height of tower

= 60 metre

BE = CD = height of pole

= h metre

BC = ED = x metre

In Δ AED,

$\tan 45° = \dfrac{AE}{ED}$

$\Rightarrow 1 = \dfrac{60-h}{x}$

$\Rightarrow x$

$= 60 - h$ ... (i)

In Δ ABC,

$\tan 60° = \dfrac{AB}{BC}$

$\Rightarrow \sqrt{3} = \dfrac{60}{x}$

$\Rightarrow \sqrt{3}\,x = 60$

$\Rightarrow x = \dfrac{60}{\sqrt{3}} = 20\sqrt{3}$ metre

From equation (i),

$20\sqrt{3} = 60 - h$

$\Rightarrow h = 60 - 20\sqrt{3}$

$= 20\left(3-\sqrt{3}\right)$ metre

20. (1)

AD = Height of helicopter

= 1500 metre

C and D $\Rightarrow$ positions of ships

$\angle$ADB = 30°; $\angle$ACB = 60°

Let, BC = x metre and BD = y metre

In ΔABD,

$\tan 30° = \dfrac{AB}{BD}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{1500}{y}$

$\Rightarrow y = 1500\sqrt{3}$ metre ...(i)

In ΔABC,

$\tan 60° = \dfrac{AB}{BC}$

$\Rightarrow \sqrt{3} = \dfrac{1500}{x}$

$\Rightarrow x = \dfrac{1500}{\sqrt{3}}$

$= 500\sqrt{3}$ metre ...(ii)

$\therefore$ Distance between ships

$= (y - x)$ metre

$= \left(1500\sqrt{3} - 500\sqrt{3}\right)$ metre

$= 1000\sqrt{3}$ metre

21. (1)

AB = Height of light-post
$= h$ metre
CD = 200 metre;
C and D ⇒ positions of ships
∠ACB = 45°; ∠ADB = 30°
In ΔABC,

$\tan 45° = \frac{AB}{BC}$

$\Rightarrow 1 = \frac{AB}{BC} \Rightarrow AB = BC = h$ metre

In ΔABD,

$\tan 30° = \frac{AB}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{h+200}$

$\Rightarrow \sqrt{3}h = h + 200$

$\Rightarrow \sqrt{3}h - h = 200$

$\Rightarrow h(\sqrt{3} - 1) = 200$

$\Rightarrow h = \frac{200}{\sqrt{3} - 1}$

$= \frac{200\left(\sqrt{3}+1\right)}{\left(\sqrt{3}-1\right)\left(\sqrt{3}+1\right)}$

$= \frac{200\left(\sqrt{3}+1\right)}{2}$

= 100 (1.73 + 1) metre
= 273 metre

22. (1)

AB = Height of building = 60 metre
CD = Height of tower = h metre
∠FAD = ∠ADE = 30°
∠FAC = ∠ACB = 60°
From ΔABC,

$\tan 60° = \frac{AB}{BC}$

$\Rightarrow \sqrt{3} = \frac{60}{BC}$

$\Rightarrow BC = \frac{60}{\sqrt{3}} = 20\sqrt{3}$ metre = DE

From ΔADE,

$\tan 30° = \frac{AE}{ED}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{60 - h}{20\sqrt{3}}$

$\Rightarrow 60 - h = \frac{20\sqrt{3}}{\sqrt{3}} = 20$

$\Rightarrow h = 60 - 20 = 40$ metre

23. (2)

AD = Height of bridge
= 2.5 metre
∠EAB = ∠ABD = 45°; ∠FAC
= ∠ACD = 30°
In ΔABD,

$\tan 45° = \frac{AD}{BD} \Rightarrow 1 = \frac{2.5}{BD}$

⇒ BD = 2.5 metre
In ΔACD,

$\tan 30° = \frac{AD}{CD} \Rightarrow \frac{1}{\sqrt{3}} = \frac{2.5}{CD}$

$\Rightarrow CD = 2.5\sqrt{3}$ metre
CD = (2.5 × 1.732) metre
= 4.33 metre
∴ BC = (2.5 + 4.33) metre
= 6.83 metre

24. (3)

AB = Height of observation tower = h metre
C and D = Positions of boat
BC = 50 metre
Let, CD = x metre
∠ACB = 60° = ∠EAC
∠ADB = 30° = ∠EAD
In ΔABC,

$\tan 60° = \frac{AB}{BC}$

$\Rightarrow \sqrt{3} = \frac{h}{50}$

$\Rightarrow h = 50\sqrt{3}$ metre

In ΔABD,

$\tan 30° = \frac{AB}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{50\sqrt{3}}{50 + x}$

$\Rightarrow 50 + x = 50\sqrt{3} \times \sqrt{3} = 150$

$\Rightarrow x = 150 - 50 = 100$ metre

$\therefore$ Speed of boat $= \frac{\text{Distance}}{\text{Time}}$

$= \left(\frac{100}{8}\right)$ m/sec.

$= \left(\frac{100}{8} \times \frac{18}{5}\right)$ kmph

25. (1)

AB = transparent water-surface
∠CPM = 30°; ∠C'PM = 60°
CM = h
CB = h + 30
∴ C'B = h + 30
In ΔCMP,

$\tan 30° = \frac{CM}{PM}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{PM}$

$\Rightarrow PM = \sqrt{3}h$ ..... (i)

In ΔPMC'

$\tan 60° = \frac{C'M}{PM}$

$\Rightarrow \sqrt{3} = \frac{h + 30 + 30}{PM}$

$\Rightarrow PM = \frac{h + 60}{\sqrt{3}}$ ..... (ii)

$\therefore \sqrt{3}h = \frac{h + 60}{\sqrt{3}}$

$\Rightarrow 3h = h + 60$

$\Rightarrow 2h = 60 \Rightarrow h = 30$

∴ CB = BM + CM = 30 + 30
= 60 metre

26. (3)

AB = Lamp post = h metre
C and D = Positions of ships
CD = 300 metre; BC = x metre
$\angle ACB = 60$ metre; $\angle ADB = 45°$
In ΔABC,

$\tan 60° = \frac{AB}{BC}$

$\Rightarrow \sqrt{3} = \frac{h}{x}$

$\Rightarrow h = \sqrt{3}x$ ..... (i)

In ΔABD,

$\tan 45° = \frac{AB}{BD}$

$\Rightarrow 1 = \frac{h}{x+300}$

$\Rightarrow h = x + 300$

$\Rightarrow h = \frac{h}{\sqrt{3}} + 300$

$\Rightarrow h - \frac{h}{\sqrt{3}} = 300$

$\Rightarrow \frac{\sqrt{3}h - h}{\sqrt{3}} = 300$

$\Rightarrow h\left(\sqrt{3}-1\right) = 300\sqrt{3}$

$\Rightarrow h = \frac{300\left(\sqrt{3}\right)}{\sqrt{3}-1}$

$= \frac{300\sqrt{3}\left(\sqrt{3}+1\right)}{\left(\sqrt{3}-1\right)\left(\sqrt{3}+1\right)}$

$= \frac{300\left(3+\sqrt{3}\right)}{2}$

$= 150\left(3+\sqrt{3}\right)$ metre

= 45 kmph.

TYPE-V

1. (2)

AP = CP = BP
It is possible only when
OA = OB = OC i.e. radii of circum circle. or, (circumcentre)

2. (4)

$12\sqrt{3}$ cm.
BD = x cm. (let)

$\therefore$ CD = $\left(12\sqrt{3} - x\right)$ cm.

$\angle ADB = \angle ADC = 90°$
From Δ ABD,

$\tan 30° = \frac{AD}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AD}{x}$

$\Rightarrow AD = \frac{x}{\sqrt{3}}$ .... (i)

From Δ ACD,

$\tan 60° = \frac{AD}{CD}$

$\Rightarrow \sqrt{3} = \frac{AD}{12\sqrt{3} - x}$

$\Rightarrow AD = \sqrt{3}\,(12\sqrt{3} - x)$

$= 36 - \sqrt{3}\,x$ .... (ii)

$\therefore \frac{x}{\sqrt{3}} = 36 - \sqrt{3}\,x$

$\Rightarrow x = 36\sqrt{3} - 3x$

$\Rightarrow 4x = 36\sqrt{3}$

$\Rightarrow x = \frac{36\sqrt{3}}{4} = 9\sqrt{3}$

$\therefore AD = \frac{x}{\sqrt{3}} = \frac{9\sqrt{3}}{\sqrt{3}} = 9$ cm.

3. (3)

100 metre
BD = x metre (let)
$\therefore$ CD = $(100 - x)$ metre
AD $\perp$ BC; AD = y metre
From ΔABD,

$\tan 30° = \frac{AD}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{y}{x}$

$\Rightarrow x = \sqrt{3}\,y$ ....(i)

From ΔACD

$\tan 60° = \frac{y}{100 - x}$

$\Rightarrow \sqrt{3} = \frac{y}{100 - x}$

$\Rightarrow y = 100\sqrt{3} - \sqrt{3}\,x$

$\Rightarrow y = 100\sqrt{3} - \sqrt{3} \times \sqrt{3}\,y$

$\Rightarrow y = 100\sqrt{3} - 3y$

$\Rightarrow 4y = 100\sqrt{3}$

$\Rightarrow y = 25\sqrt{3}$ metre

4. (2)

AB = Tree = $\frac{26}{3}$ feet

BE = CD = 6 feet

AE = AB – BE = $\frac{26}{3} - 6$

$= \frac{26-18}{3} = \frac{8}{3}$ feet

DE = BC = $\frac{8}{\sqrt{3}}$ feet

From ΔAED,

$\tan\theta = \frac{AE}{ED} = \frac{\frac{8}{3}}{\frac{8}{\sqrt{3}}}$

$= \frac{8}{3} \times \frac{\sqrt{3}}{8} = \frac{1}{\sqrt{3}}$

$\therefore \tan\theta = \tan 30° \Rightarrow \theta = 30°$

5. (2) $x = a\cos\theta + b\sin\theta$ .... (i)
$y = b\cos\theta - a\sin\theta$ ... (ii)
On squaring both equations and adding.
$x^2 + y^2 = a^2\cos^2\theta + b^2\sin^2\theta + 2ab\sin\theta.\cos\theta + b^2\cos^2\theta + a^2\sin^2\theta - 2ab\sin\theta.\cos\theta$
$= a^2\cos^2\theta + a^2\sin^2\theta + b^2\sin^2\theta + b^2\cos^2\theta$
$= a^2(\cos^2\theta + \sin^2\theta) + b^2(\sin^2\theta + \cos^2\theta)$
$= a^2 + b^2$ [$\because \cos^2\theta + \sin^2\theta = 1$]

TEST YOURSELF

1. If $\sec\theta + \tan\theta = \sqrt{2}$, find the value of $\sin\theta$.

(1) $\frac{1}{2}$ (2) $\frac{1}{4}$

(3) $\frac{1}{\sqrt{2}}$ (4) $\frac{1}{3}$

2. If $\sin A = \frac{3}{5}$ and $\cos B = \frac{12}{13}$, what is the value of $\frac{\tan A - \tan B}{1 + \tan A \tan B}$; it being given that A and B are acute angles?

(1) $\frac{15}{63}$ (2) $\frac{19}{63}$

(3) $\frac{17}{65}$ (4) $\frac{16}{63}$

3. Find the value of $\sin^2 1° + \sin^2 3° + \sin^2 5° + \ldots\ldots \sin^2 87° + \sin^2 89°$.

(1) $23\frac{1}{2}$ (2) $22\frac{1}{2}$

(3) $11\frac{1}{2}$ (4) $12\frac{1}{2}$

4. To a man standing at the mid point of the line joining the feet of two vertical poles of same height. the angle of elevation of the tip of each pole is 30^0. When the man advances a distance of 40 metres towards one pole, the angle of elevation of the tip of this pole is 60°. What is the distance between the two poles ?

(1) 120 metre (2) 110 metre

(3) 130 metre (4) 115 metre

5. If α be an acute angle and $a \sin\alpha - b \cos\alpha = 0$, what will be the values of $\sin\alpha$ and $\cos\alpha$ in terms of a and b ?

(1) $\frac{b}{\sqrt{a^2+b^2}}, \frac{a}{\sqrt{a^2+b^2}}$

(2) $\frac{-b}{\sqrt{a^2+b^2}}, \frac{a}{\sqrt{a^2+b^2}}$

(3) $\frac{b}{\sqrt{a^2+b^2}}, \frac{-a}{\sqrt{a^2+b^2}}$

(4) $\frac{b^2}{\sqrt{a^2+b^2}}, \frac{a^2}{\sqrt{a^2+b^2}}$

6. Find the simplest numerical value of $3(\sin x - \cos x)^4 + 4(\sin^6 x + \cos^6 x) + 6(\sin x + \cos x)^2$

(1) 12 (2) 10

(3) 21 (4) 13

7. If $3\cos\theta + 4\sin\theta = 5$, then $\tan\theta = ?$

(1) $\frac{4}{3}$ (2) $\frac{3}{4}$

(3) $\frac{3}{5}$ (4) $\frac{5}{3}$

8. The angular elevation of the top of a tower from a distant point on the horizontal ground is observed to be 30° and proceeding 30 metres from the point towards the foot of the tower it is observed to be 45°. Find the height of the tower.

(1) 15 metre

(2) $15\sqrt{3}$ metre

(3) $15(\sqrt{3}+1)$ metre

(4) None of these

9. If $\tan\theta = \frac{a}{b}$, find the value of $\frac{a\sin^3\theta - b\cos^3\theta}{a\sin^3\theta + b\cos^3\theta}$.

(1) $\frac{a^4-b^4}{a^4+b^4}$ (2) $\frac{a^4+b^4}{a^4-b^4}$

(3) $\frac{a^3-b^3}{a^3+b^3}$ (4) $\frac{a^3+b^3}{a^3-b^3}$

10. If $0° < \theta < 90°$, and $\tan^2\theta - (\sqrt{3}+1)\tan\theta + \sqrt{3} = 0$, then $\theta = ?$

(1) 30° (2) 45°

(3) 60° (4) 45° or 60°

11. If $4x^2 - 4x\sec\theta + 1 = 0$, then $\sec\theta + \tan\theta = ?$

(1) $2x$ (2) $\frac{1}{2x}$

(3) $3x$ (4) $2x$ or $\frac{1}{2x}$

12. If $\cos\theta + \sec\theta = 2$, then $\cos^5\theta + \sec^5\theta = ?$

(1) 1 (2) 2

(3) –1 (4) –2

13. If $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$, then $\cos\theta + \sin\theta = ?$

(1) $2\cos\theta$ (2) $2\sin\theta$

(3) $\sqrt{2}\cos\theta$ (4) None of these

14. The shadow of a vertical tower becomes 30 metres longer when the altitude of the sun changes from 60° to 45°. Find the height of the tower.

(1) $15\sqrt{3}$ metres

(2) $15(3+\sqrt{3})$ metres

(3) $15(3-\sqrt{3})$ metres

(4) $12(3+\sqrt{3})$ metres

15. Evaluate :

$\frac{\sec 39°}{\operatorname{cosec} 51°} + \frac{2}{\sqrt{3}}(\tan 17° \cdot \tan 38° \cdot \tan 60° \cdot \tan 52° \cdot \tan 73° - 3(\sin^2 31° + \sin^2 59°)$

(1) 2 (2) 3

(3) 0 (4) –2

16. If $\frac{\cos\alpha}{\cos\beta} = m$ and $\frac{\cos\alpha}{\sin\beta} = n$, then $(m^2 + n^2)\cos^2\beta = ?$

(1) 1 (2) $2n^2$

(3) $n^2 + 3$ (4) n^2

17. If α, β and γ each is positive acute angle, and $\sin(\alpha+\beta-\gamma) = \frac{1}{2}$, $\cos(\beta+\gamma-\alpha) = \frac{1}{2}$ and $\tan(\gamma+\alpha-\beta) = 1$ then $2\alpha + \beta = ?$

(1) 105° (2) 115°

(3) 110° (4) 120°

18. Evaluate :

$$\frac{\tan^2 60° + 4\cos^2 45° + 3\sec^2 30° + 5\cos^2 90°}{\operatorname{cosec} 30° + \sec 60° - \cot^2 30°}$$

(1) 4 (2) 9

(3) 7 (4) 1

19. If A + B = 90°, then

$$\sqrt{\frac{\tan A \cdot \tan B + \tan A \cdot \cot B}{\sin A \cdot \sec B} - \frac{\sin^2 B}{\cos^2 A}} = ?$$

(1) $2\tan A$ (2) $\tan A$

(3) $\tan^2 A$ (4) $2\cot^2 B$

20. $\frac{\sin A - \sin B}{\cos A + \cos B} + \frac{\cos A - \cos B}{\sin A + \sin B} = ?$

(1) 1 (2) $\cos A$

(3) $\sin A$ (4) 0

21. $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) + 1 = ?$

(1) 1 (2) 0

(3) –1 (4) 2

22. If $\sin\theta + \sin^2\theta + \sin^3\theta = 1$, then, $\cos^6\theta - 4\cos^4\theta + 8\cos^2\theta = ?$

(1) 2 (2) 3

(3) 4 (4) 0

23. The shadow of a vertical tower increases 10 metre, when the altitude of the sun changes from 45° to 30°. What is the height of tower ? ($\pi = 1.73$)

(1) 12.65 metre (2) 13.65 metre

(3) 14.65 metre (4) 16.65 metre

24. The angle of elevation of an aeroplane from a point A on the ground is 60°. After a straight flight of the plane for 30 seconds, the angle of elevation becomes 30°. If the palne flies at a constant height of $3600\sqrt{3}$ metre, what is the speed of plane ?

(1) 864 kmph (2) 846 kmph

(3) 684 kmph (4) None of these

25. $\sin 75° + \sin 15°$ can be expressed as

(1) $\frac{\sqrt{3}}{2}$ (2) $\frac{2}{\sqrt{3}}$

(3) $\sqrt{\frac{2}{3}}$ (4) $\sqrt{\frac{3}{2}}$

26. What will be the value of $2\cos 45° \cdot \sin 15°$

(1) $\frac{\sqrt{3}+1}{2}$ (2) $\frac{\sqrt{3}-2}{2}$

(3) $\frac{\sqrt{3}-1}{2}$ (4) $\frac{2}{\sqrt{3}+1}$

27. The value of $\sin 22\frac{1}{2}^\circ$ will be

(1) $\sqrt{2}-1$ (2) $\frac{\sqrt{2}+1}{2\sqrt{2}}$

(3) $\frac{\sqrt{2}-1}{\sqrt{2}}$ (4) $\sqrt{\frac{\sqrt{2}-1}{2\sqrt{2}}}$

28. The value of $\frac{\cos\alpha + \cos\beta}{\sin\alpha + \sin\beta}$ will be

(1) $\tan\left(\frac{\alpha+\beta}{2}\right)$

(2) $\cot\left(\frac{\alpha+\beta}{2}\right)$

(3) $\tan\left(\frac{\alpha-\beta}{2}\right)$

(4) $\cot\left(\frac{\alpha-\beta}{2}\right)$

29. Which of the folliwing is correct ?

(1) $\sin 1° > \sin 1$

(2) $\sin 1° < \sin 1$

(3) $\sin 1° = \sin 1$

(4) $\sin 1° = \frac{\pi}{18°} \sin 1$

30. If $\tan\alpha = \frac{m}{m+1}$, $\tan\beta = \frac{1}{2m+1}$, then $\alpha + \beta$ equal to

(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{6}$

(3) $\frac{\pi}{3}$ (4) $\frac{\pi}{4}$

31. If $\alpha + \beta = \frac{\pi}{4}$, then the value of $(1 + \tan\alpha)(1 + \tan\beta)$ is

(1) 1 (2) 2

(3) –2 (4) 5

32. If $\tan A = \frac{1-\cos B}{\sin B}$, then $\tan 2A$ is equal to

(1) cot B (2) tan B

(3) cos B (4) cosec B

33. The value of $\sin(45° + \theta) - \cos(45° - \theta)$ is

(1) $2\cos\theta$ (2) $2\sin\theta$

(3) 1 (4) 0

34. The value of $2\cos\frac{\pi}{13}\cos\frac{9\pi}{13} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$ is

(1) $\frac{1}{2}$ (2) 0

(3) $-\frac{1}{2}$ (4) $\frac{1}{8}$

35. If $\sin\theta + \cos\theta = 1$, then the value of $\sin 2\theta$ is equal to

(1) 1 (2) $\frac{1}{2}$

(3) 0 (4) – 1

36. If $\frac{\sin(x+y)}{\sin(x-y)} = \frac{a+b}{a-b}$, then the value of $\frac{\tan x}{\tan y}$ is equal to

(1) $\frac{2a}{b}$ (2) $\frac{a}{b}$

(3) $\frac{a}{2b}$ (4) $\frac{2a}{3b}$

37. The value of $\frac{3\cos\theta + \cos 3\theta}{3\sin\theta - \sin 3\theta}$ is equal to

(1) $\tan^3\theta$ (2) $\cot^3\theta$

(3) $\sin^3\theta$ (4) $\cos^3\theta$

38. The value of $\sin\frac{5\pi}{12}\sin\frac{\pi}{12}$ is

(1) $\frac{1}{4}$ (2) $\frac{1}{8}$

(3) $\frac{1}{5}$ (4) $\frac{1}{6}$

39. The value of

$$\frac{\cos(\pi + x)\cos(-x)}{\sin(\pi - x)\cos\left(\frac{\pi}{2} + x\right)}$$ is

(1) $\tan^2 x$ (2) $\cos^2 x$

(3) $\cot^2 x$ (4) $\sec^2 x$

40. The value of

$$\frac{\sin 50°}{\sin 130°} + \frac{\cos 70°}{\cos 110°} - 2\tan^2$$

225° is equal to

(1) 1 (2) –2

(3) 2 (4) 0

41. What is the value of $\sin 240°$?

(1) $\frac{\sqrt{3}}{2}$ (2) $-\frac{\sqrt{3}}{2}$

(3) $\frac{1}{2}$ (4) $-\frac{1}{2}$

42. If $\cot(A + B) = x$, then value of x is

(1) $\frac{\cot A \cot B - 1}{\cot A + \cot B}$

(2) $\frac{\cot A \cot B + 1}{\cot A - \cot B}$

(3) $\frac{\cot A \cot B - 1}{\cot B - \cot A}$

(4) $\frac{\cot A \cdot \cot B - 1}{\cot A - \cot B}$

43. What is the value of $\cos\left(\frac{7\pi}{4}\right)$?

(1) 0 (2) 1

(3) 2 (4) $\frac{1}{\sqrt{2}}$

44. What is the value of $\tan\left(\frac{5\pi}{6}\right)\sin\left(\frac{7\pi}{6}\right)$?

(1) $\frac{1}{\sqrt{3}}$ (2) $\frac{2}{\sqrt{3}}$

(3) $\frac{1}{2\sqrt{3}}$ (4) $\frac{1}{2}$

45. What is the value of tan 56° ?

(1) $\frac{\cos 11° - \sin 11°}{\cos 11° + \sin 11°}$

(2) $\frac{\cos 11° + \sin 11°}{\cos 11° - \sin 11°}$

(3) $\frac{\cos 11° + \sin 11°}{\sin 11° - \cos 11°}$

(4) $\frac{\sin 11° - \cos 11°}{\cos 11° + \sin 11°}$

46. What is the value of A ?

$$A = \left(\frac{\cos\theta}{\sin(90° + \theta)} + \frac{\sin(-\theta)}{\sin(180° + \theta)} - \frac{\tan(90° + \theta)}{\cot + \theta}\right)?$$

(1) 1 (2) 2

(3) 3 (4) 4

47. What is the value of $\tan\left(\frac{\pi}{4} + x\right)$?

(1) $\frac{1 - \tan x}{1 + \tan x}$ (2) $\frac{1 + \tan x}{1 - \tan x}$

(3) $\frac{1 + \cot x}{1 - \cot x}$ (4) $\frac{1 - \cot x}{1 + \cot x}$

48. If cosC – cosD = y, then the value of y is

(1) $2\sin\left(\frac{C + D}{2}\right) \cdot \sin\left(\frac{C - D}{2}\right)$

(2) $2\cos\left(\frac{C + D}{2}\right)\cos\left(\frac{C - D}{2}\right)$

(3) $-2\sin\left(\frac{C + D}{2}\right) \cdot \sin\left(\frac{C - D}{2}\right)$

(4) $-2\cos\left(\frac{C + D}{2}\right) \cdot \cos\left(\frac{C - D}{2}\right)$

49. If $\sin x = \frac{1}{3}$, then the value of $\sin 3x$ will be

(1) $\frac{13}{27}$ (2) $\frac{27}{23}$

(3) $\frac{27}{13}$ (4) $\frac{23}{27}$

50. If $\sin x \cdot \cos y + \cos x \cdot \sin y = 1$, then the value of $x + y$ will be

(1) $\frac{\pi}{2}$ (2) $-\frac{\pi}{2}$

(3) $\frac{\pi}{3}$ (4) $\frac{\pi}{4}$

51. If $\cos x = -\frac{3}{5}$ and $\pi < x < \frac{3\pi}{2}$, then the value of $\sin 2x$ will be

(1) $\frac{12}{25}$ (2) $\frac{1}{15}$

(3) $\frac{24}{25}$ (4) $\frac{5}{26}$

52. What is the value of tan 330° ?

(1) $\frac{1}{\sqrt{3}}$ (2) 0

(3) 1 (4) $-\frac{1}{\sqrt{3}}$

53. The degree measure of $\left(\frac{5\pi}{12}\right)$ will be

(1) 105° (2) 75°

(3) 85° (4) 110°

54. The radian measure of 120° will be

(1) $\frac{\pi}{3}$ (2) $\frac{3\pi}{2}$

(3) $\frac{\pi}{2}$ (4) $\frac{2\pi}{3}$

55. If $\tan\theta = \frac{x - y}{x + y}$, the value of $\sin\theta$ is equal to

[If $0° \le \theta \le 90°$]

(1) $\frac{x - y}{\sqrt{2(x^2 + y^2)}}$

(2) $\frac{x + y}{\sqrt{2(x^2 + y^2)}}$

(3) $\frac{x + y}{\sqrt{2(x^2 - y^2)}}$

(4) $\frac{x - y}{\sqrt{2(x^2 - y^2)}}$

56. If sinC + sinD = x, then the value of x is

(1) $2\sin\left(\frac{C + D}{2}\right)\sin\left(\frac{C - D}{2}\right)$

(2) $2\sin\left(\frac{C - D}{2}\right)\cos\left(\frac{C + D}{2}\right)$

(3) $2\cos\left(\frac{C + D}{2}\right)\cos\left(\frac{C - D}{2}\right)$

(4) $2\sin\left(\frac{C + D}{2}\right)\cos\left(\frac{C - D}{2}\right)$

57. What is the angle in radian through which a pendulum swings and its length is 75 cm and the tip describes an arc of length 21 cm.

(1) $\left(\frac{3}{25}\right)^R$ (2) $\left(\frac{7}{25}\right)^R$

(3) $\left(\frac{4}{21}\right)^R$ (4) $\left(\frac{2}{15}\right)^R$

58. What will be the radius of circle in which a central angle of 60° intercepts an arc of length 37.4 cm.

(1) 35 cm (2) 34.7 cm

(3) 35.7 cm (4) 40 cm

59. What is the value of cosec (–1410°) ?

(1) $\frac{1}{\sqrt{3}}$ (2) 2

(3) $\frac{\sqrt{3}}{2}$ (4) $\frac{2}{\sqrt{3}}$

60. The value of cos $\left(\frac{\pi}{4} + x\right) + \cos\left(\frac{\pi}{4} - x\right)$ will be

(1) $\sqrt{2}\sin x$ (2) $\sqrt{2}\cos x$

(3) $\sqrt{2}\,\text{cosec}\, x$

(4) $\sqrt{2}\tan x$

61. The value of $\tan\frac{13\pi}{12}$ will be

(1) $\frac{\sqrt{3} + 1}{\sqrt{3} - 1}$ (2) $\frac{\sqrt{3} - 1}{\sqrt{3} + 1}$

(3) $\frac{\sqrt{3}}{\sqrt{3} + 1}$ (4) $\frac{1}{\sqrt{3} - 1}$

62. If $\cos\theta = -\frac{1}{2}$ and θ lies in third quadrant, then what will be the value of $\sin\theta + \tan\theta$

(1) $\frac{1}{2}$ (2) $\frac{2}{\sqrt{3}}$

(3) $\frac{\sqrt{3}}{2}$ (4) $\frac{1}{\sqrt{3}}$

63. What is the value of cos 105°?

(1) $\frac{1-\sqrt{3}}{2\sqrt{2}}$ (2) $\frac{1+\sqrt{3}}{2\sqrt{2}}$

(3) $\frac{\sqrt{3}-1}{2\sqrt{2}}$ (4) $\frac{\sqrt{3}}{2\sqrt{2}}$

64. The value of $\cos\left(\frac{\pi}{4}-\theta\right)$

$\cos\left(\frac{\pi}{4}-\phi\right) - \sin\left(\frac{\pi}{4}-\theta\right)$

$\sin\left(\frac{\pi}{4}-\phi\right)$ will be

(1) $\sin(\theta-\phi)$ (2) $\sin(\theta+\phi)$

(3) $\cos(\theta-\phi)$ (4) $\cos(\theta+\phi)$

SHORT ANSWERS

1. (4)	**2.** (4)	**3.** (2)	**4.** (1)
5. (1)	**6.** (4)	**7.** (1)	**8.** (3)
9. (1)	**10.** (4)	**11.** (4)	**12.** (2)
13. (3)	**14.** (2)	**15.** (3)	**16.** (4)
17. (4)	**18.** (2)	**19.** (2)	**20.** (4)
21. (2)	**22.** (3)	**23.** (2)	**24.** (1)
25. (4)	**26.** (3)	**27.** (4)	**28.** (2)
29. (2)	**30.** (4)	**31.** (2)	**32.** (2)
33. (4)	**34.** (2)	**35.** (3)	**36.** (2)
37. (2)	**38.** (1)	**39.** (3)	**40.** (2)
41. (2)	**42.** (1)	**43.** (4)	**44.** (3)
45. (2)	**46.** (3)	**47.** (2)	**48.** (3)
49. (4)	**50.** (1)	**51.** (3)	**52.** (4)
53. (2)	**54.** (4)	**55.** (1)	**56.** (4)
57. (2)	**58.** (3)	**59.** (2)	**60.** (2)
61. (2)	**62.** (3)	**63.** (1)	**64.** (2)

EXPLANATIONS

1. (4) $\sec\theta + \tan\theta = \sqrt{2}$ ....(i)

$\because \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

$\Rightarrow \sec\theta - \tan\theta = \frac{1}{\sqrt{2}}$ ....(ii)

On adding (i) and (ii),

$2\sec\theta = \sqrt{2} + \frac{1}{\sqrt{2}}$

$\Rightarrow \sec\theta = \frac{3}{2\sqrt{2}}$

On subtracting equation (ii) from (i),

$2\tan\theta = \sqrt{2} - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$

$\Rightarrow \tan\theta = \frac{1}{2\sqrt{2}}$

$\therefore \sin\theta = \frac{\tan\theta}{\sec\theta} = \frac{\frac{1}{2\sqrt{2}}}{\frac{3}{2\sqrt{2}}} = \frac{1}{3}$

2. (4) $\sin A = \frac{3}{5}$

$\therefore \cos A = \sqrt{1-\sin^2 A}$

$= \sqrt{1-\frac{9}{25}}$

$= \sqrt{\frac{25-9}{25}} = \sqrt{\frac{16}{25}} = \frac{4}{5}$

$\cos B = \frac{12}{13}$

$\sin B = \sqrt{1-\cos^2 B} = \sqrt{1-\left(\frac{12}{13}\right)^2}$

$= \sqrt{1-\frac{144}{169}} = \sqrt{\frac{169-144}{169}} = \sqrt{\frac{25}{169}} = \frac{5}{13}$

$\therefore \tan A = \frac{\sin A}{\cos A} = \frac{\frac{3}{5}}{\frac{4}{5}} = \frac{3}{4}$

$\tan B = \frac{\sin B}{\cos B} = \frac{\frac{5}{13}}{\frac{12}{13}} = \frac{5}{12}$

$\therefore \frac{\tan A - \tan B}{1+\tan A.\tan B} = \frac{\frac{3}{4}-\frac{5}{12}}{1+\frac{3}{4}.\frac{5}{12}}$

$= \frac{\frac{9-5}{12}}{1+\frac{5}{16}}$

$= \frac{\frac{1}{3}}{\frac{21}{16}} = \frac{1}{3}\times\frac{16}{21} = \frac{16}{63}$

3. (2) $\sin 89° = \sin(90° - 1°)$
$= \cos 1°$
$\sin 87° = \sin(90° - 3°)$
$= \cos 3°$
$\therefore \sin^2 1° + \sin^2 3° + ... + \sin^2 45° + ... + \sin^2 87° + \sin^2 89°$
$= (\sin^2 1° + \sin^2 89°) + (\sin^2 3° + \sin^2 87°) + ...$ to 22 terms $+ \sin^2 45°$
$= (\sin^2 1° + \cos^2 1°) + (\sin^2 3° + \cos^2 3°) + ...$ to 22 terms $+ \frac{1}{2}$

$= 22 + \frac{1}{2} = 22\frac{1}{2}$

4. (1)

AB = CD = pole = h metre
BO = OD = x metre
OE = 40 metre
ED = $(x - 40)$ metre
In Δ OCD,

$\tan 30° = \frac{CD}{OD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x}$

$\Rightarrow \sqrt{3}h = x$ ....(i)

In Δ CDE,

$\tan 60° = \frac{CD}{DE}$

$\Rightarrow \sqrt{3} = \frac{h}{x-40}$

$\Rightarrow \sqrt{3}(x-40) = h$

$\Rightarrow \sqrt{3}(x-40) = \frac{x}{\sqrt{3}}$

$\Rightarrow 3(x-40) = x$
$\Rightarrow 3x - 120 = x$
$\Rightarrow 2x = 120 \Rightarrow x = 60$
$\therefore$ BD = 2 × 60 = 120 metre

5. (1) $a\sin\alpha = b\cos\alpha$
$\Rightarrow a^2\sin^2\alpha = b^2\cos^2\alpha$
$\Rightarrow a^2\sin^2\alpha = b^2(1-\sin^2\alpha)$
$\Rightarrow a^2\sin^2\alpha + b^2\sin^2\alpha = b^2$
$\Rightarrow \sin^2\alpha(a^2+b^2) = b^2$

$\Rightarrow \sin^2\alpha = \frac{b^2}{a^2+b^2}$

$\Rightarrow \sin\alpha = \dfrac{b}{\sqrt{a^2+b^2}}$

Again,

$a^2 \sin^2\alpha = b^2 \cos^2\alpha$

$\Rightarrow a^2 (1 - \cos^2\alpha) = b^2 \cos^2\alpha$

$\Rightarrow a^2 = (a^2 + b^2) \cos^2 \alpha$

$\Rightarrow \cos^2 \alpha = \dfrac{a^2}{a^2+b^2}$

$\Rightarrow \cos \alpha = \dfrac{a}{\sqrt{a^2+b^2}}$

6. (4) $3 (\sin x - \cos x)^4$

$= 3 (\sin^2 x + \cos^2 x - 2 \sin x . \cos x)^2$

$= 3 (1 - 2\sin x. \cos x)^2$

$= 3 (1 + 4 \sin^2 x . \cos^2 x - 4 \sin x . \cos x)$

$4 (\sin^6 x + \cos^6 x)$

$= 4 [(\sin^2 x + \cos^2 x)^3 - 3 \sin^2 x.\cos^2 x (\sin^2 x + \cos^2 x)$

$[a^3 + b^3 = (a+b)^3 - 3ab (a+b)]$

$= 4 (1 - 3 \sin^2 x . \cos^2 x)$

$= 6 (\sin x + \cos x)^2$

$= 6 (\sin^2 x + \cos^2 x + 2 \sin x. \cos x)$

$= 6 (1 + 2 \sin x . \cos x)$

$\therefore$ Expression

$= 3 (1 + 4 \sin^2 x . \cos^2 x - 4 \sin x . \cos x)$

$+ 4 (1 - 3 \sin^2 x . \cos^2 x) + 6 (1 + 2 \sin x . \cos x)$

$= 3 + 4 + 6 = 13$

7. (1) $3 \cos \theta + 4 \sin \theta = 5$

Dividing by $\cos \theta$,

$3 + 4 \tan \theta = 5 \sec \theta$

On squaring,

$9 + 16 \tan^2\theta + 24 \tan \theta = 25 (1 + \tan^2\theta)$

$\Rightarrow 9 \tan^2\theta - 24 \tan \theta + 16 = 0$

$\Rightarrow (3 \tan \theta - 4)^2 = 0$

$\Rightarrow 3 \tan\theta = 4$

$\Rightarrow \tan\theta = \dfrac{4}{3}$

8. (3)

AB = tower = h metre

BD = x metre

From Δ ABC,

$\tan 30° = \dfrac{AB}{BC}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{h}{x+30}$

$\Rightarrow \sqrt{3}h = x + 30$ ....(i)

From Δ ABD,

$\tan 45° = \dfrac{AB}{BD}$

$\Rightarrow h = x$ .....(ii)

From equation (i)

$\Rightarrow \sqrt{3}h = h + 30$

$\Rightarrow (\sqrt{3} - 1)h = 30$

$\Rightarrow h = \dfrac{30}{\sqrt{3}-1} = \dfrac{30}{\sqrt{3}-1} \times \dfrac{\sqrt{3}+1}{\sqrt{3}+1}$

$= \dfrac{30(\sqrt{3}+1)}{2} = 15(\sqrt{3}+1)$ metre

9. (1) $\tan\theta = \dfrac{a}{b}$.

Expression

$= \dfrac{a \sin^3\theta - b\cos^3\theta}{a\sin^3\theta + b\cos^3\theta}$

Dividing numerator and denominator by $\cos^3 \theta$,

$= \dfrac{a\tan^3\theta - b}{a\tan^3\theta + b} = \dfrac{a \times \dfrac{a^3}{b^3} - b}{a \times \dfrac{a^3}{b^3} + b}$

$= \dfrac{a^4 - b^4}{a^4 + b^4}$

10. (4)

$\tan^2\theta - \sqrt{3}\tan\theta - \tan\theta + \sqrt{3} = 0$

$= \tan\theta (\tan\theta - \sqrt{3}) - 1 (\tan\theta - \sqrt{3}) = 0$

$= (\tan\theta - 1) (\tan\theta - \sqrt{3}) = 0$

$= \tan\theta = 1 = \tan 45°$

$= \theta = 45°$

Again,

$\tan\theta - \sqrt{3} = 0$

$\Rightarrow \tan\theta = \sqrt{3} = \tan 60°$

$\Rightarrow \theta = 60°$.

11. (4) $4x^2 - 4x \sec\theta + 1 = 0$

$= 4x \sec\theta = 4x^2 + 1$

$= \sec\theta = \dfrac{4x^2+1}{4x}$

$\therefore \tan\theta = \sqrt{\sec^2\theta - 1}$

$= \sqrt{\left(\dfrac{(4x^2+1)}{4x}\right)^2 - 1}$

$= \sqrt{\dfrac{16x^4 + 8x^2 + 1 - 16x^2}{16x^2}}$

$= \pm \dfrac{4x^2-1}{4x}$

$\therefore \sec\theta + \tan\theta$

$= \dfrac{4x^2+1}{4x} + \dfrac{4x^2-1}{4x}$

$= \dfrac{4x^2+1+4x^2-1}{4x} = \dfrac{8x^2}{4x}$

$= 2x$

or, $\sec\theta + \tan\theta$

$= \dfrac{4x^2+1}{4x} - \dfrac{4x^2-1}{4x}$

$= \dfrac{4x^2+1-4x^2+1}{4x}$

$= \dfrac{2}{4x} = \dfrac{1}{2x}$

12. (2) $\cos\theta + \sec\theta = 2$

$\Rightarrow \cos\theta + \dfrac{1}{\cos\theta} = 2$

$\Rightarrow \cos^2\theta - 2\cos\theta + 1 = 0$

$\Rightarrow (\cos\theta - 1)^2 = 0$

$\Rightarrow \cos\theta = 1$

$\therefore \cos^5\theta + \sec^5\theta = 1 + 1 = 2$

13. (3) $\cos\theta - \sin\theta = \sqrt{2} \sin\theta$ ..(i)

$\cos\theta + \sin\theta = x$ ....(ii)

On squaring both the equations and adding.

$2 (\cos^2\theta + \sin^2\theta) = 2\sin^2\theta + x^2$

$\Rightarrow x^2 = 2 - 2\sin^2\theta = 2 (1 - \sin^2\theta)$

$= 2\cos^2\theta$

$\Rightarrow x = \sqrt{2} \cos\theta$

14. (2)

AB = Tower = h metre

DC = 30 metre

BD = x metre

From Δ ABC,

$\tan 45° = \frac{AB}{BC} \Rightarrow 1 = \frac{h}{x+30}$

$\Rightarrow h = x + 30$ .....(i)

From Δ ABD,

$\tan 60° = \frac{AB}{BD} \Rightarrow \sqrt{3} = \frac{h}{x}$

$h = \sqrt{3}x$

$\Rightarrow x = \frac{h}{\sqrt{3}}$ ...(ii)

$\therefore h = x + 30$

$\Rightarrow h = \frac{h}{\sqrt{3}} + 30$

$\Rightarrow (\sqrt{3} - 1)h = 30\sqrt{3}$

$\Rightarrow h = \frac{30\sqrt{3}}{\sqrt{3} - 1}$

$= \frac{30\sqrt{3}(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$

$= 15(3 + \sqrt{3})$ metre

15. (3) $\frac{\sec 39°}{\sec(90°-51°)} + \frac{2}{\sqrt{3}} \tan 17° .$ $\tan 38° . \tan 60° . \cot(90° - 52°) . \cot(90° - 73°) - 3(\sin^2 31° + \cos^2(90° - 59°)$

$= \frac{\sec 39°}{\sec 39°} + \frac{2}{\sqrt{3}} . \tan 17° .$ $\tan 38° \times \sqrt{3} . \cot 38° . \cot 17° - 3(\sin^2 31° + \cos^2 31°)$

$= 1 + \frac{2}{\sqrt{3}} \times \sqrt{3} (\tan 17° . \cot 17°)$ $. (\tan 38° . \cot 38°) - 3 \times 1$

$= 1 + 2 - 3 = 0$

$\tan\theta . \cot\theta = 1$

$$\left[\begin{array}{l}\tan(90° - \theta) = \cot\theta; \\ \cot(90° - \theta) = \tan\theta; \\ \sec(90° - \theta) = \operatorname{cosec}\theta\end{array}\right]$$

16. (4) $(m^2 + n^2)\cos^2\beta$

$= \left(\frac{\cos^2\alpha}{\cos^2\beta} + \frac{\cos^2\alpha}{\sin^2\beta}\right)\cos^2\beta$

$= \left(\frac{\cos^2\alpha.\sin^2\beta + \cos^2\alpha.\cos^2\beta}{\cos^2\beta.\sin^2\beta}\right)\cos^2\beta$

$= \cos^2\alpha . \cos^2\beta \left(\frac{\sin^2\beta + \cos^2\beta}{\cos^2\beta.\sin^2\beta}\right)$

$= \frac{\cos^2\alpha}{\sin^2\beta} = \left(\frac{\cos\alpha}{\sin\beta}\right)^2 = n^2$

17. (4) $\sin(\alpha + \beta - \gamma) = \frac{1}{2}$,

$\cos(\beta + \gamma - \alpha) = \frac{1}{2}$

and $\tan(\gamma + \alpha - \beta) = 1$

$\Rightarrow \sin(\alpha + \beta - \gamma) = \sin 30°$,

$\cos(\beta + \gamma - \alpha) = \cos 60°$ and $\tan(\gamma + \alpha - \beta) = \tan 45°$

$\Rightarrow \alpha + \beta - \gamma = 30°$ .....(i)

$\beta + \gamma - \alpha = 60°$ .....(ii)

$\gamma + \alpha - \beta = 45°$ .....(iii)

By equations (i) + (ii) and equations (i) + (iii).

$2\beta = 90°$ and $2\alpha = 75°$

$\Rightarrow \beta = 45°$ and $2\alpha = 75°$

$\Rightarrow 2\alpha + \beta = 75° + 45° = 120°$

18. (2)

$$\frac{\tan^2 60° + 4\cos^2 45° + 3\sec^2 30° + 5\cos^2 90°}{\operatorname{cosec} 30° + \sec 60° - \cot^2 30°}$$

$$= \frac{(\sqrt{3})^2 + 4 \times \left(\frac{1}{\sqrt{2}}\right)^2 + 3\left(\frac{2}{\sqrt{3}}\right)^2 + 5 \times 0}{2 + 2 - (\sqrt{3})^2}$$

$$= \frac{3 + 4 \times \frac{1}{2} + \frac{3 \times 4}{3} + 0}{4 - 3}$$

$= 3 + 2 + 4 = 9$

19. (2) $A + B = 90° \Rightarrow B = 90° - A$

$$\therefore \sqrt{\frac{\tan A . \tan B + \tan A . \cot B}{\sin A . \sec B} - \frac{\sin^2 A}{\cos^2 A}}$$

$$= \sqrt{\frac{\tan A \tan(90° - A) + \tan A . \cot(90° - A)}{\sin A \sec(90° - A))} - \frac{\sin^2(90° - A)}{\cos^2 A}}$$

$$= \sqrt{\frac{\tan A.\cot A + \tan A.\tan A}{\sin A . \operatorname{cosec} A} - \frac{\cos^2 A}{\cos^2 A}}$$

$= \sqrt{1 + \tan^2 A - 1} = \sqrt{\tan^2 A} = \tan A$

20. (4) $\frac{\sin A - \sin B}{\cos A + \cos B} + \frac{\cos A - \cos B}{\sin A + \sin B}$

$$= \frac{(\sin A - \sin B)(\sin A + \sin B) + (\cos A + \cos B)(\cos A - \cos B)}{(\cos A + \cos B)(\sin A + \sin B)}$$

$$= \frac{\sin^2 A - \sin^2 B + \cos^2 A - \cos^2 B}{(\cos A + \cos B)(\sin A + \sin B)}$$

$$= \frac{(\sin^2 A + \cos^2 A) - (\sin^2 B + \cos^2 B)}{(\cos A + \cos B)(\sin A + \sin B)}$$

$$= \frac{1 - 1}{(\cos A + \cos B)(\sin A + \sin B)}$$

$= 0$

21. (2) $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) + 1$

$= 2[(\sin^2\theta)^3 + (\cos^2\theta)^3] - 3[(\sin^2\theta)^2 + (\cos^2\theta)^2] + 1$

$= 2(\sin^2\theta + \cos^2\theta)(\sin^4\theta + \cos^4\theta - \sin^2\theta . \cos^2\theta) - 3[(\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta . \cos^2\theta] + 1$

$[\because a^3 + b^3 = (a + b)(a^2 - ab + b^2)$; $a^2 + b^2 = (a + b)^2 - 2ab]$

$= 2\sin^4\theta + 2\cos^4\theta - 2\sin^2\theta . \cos^2\theta - 3 + 6\sin^2\theta . \cos^2\theta + 1$

$= 2[(\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta . \cos^2\theta] - 3 + 4\sin^2\theta . \cos^2\theta + 1$

$= 2 - 4\sin^2\theta . \cos^2\theta - 3 + 4\sin^2\theta \cos^2\theta + 1$

$= 2 - 3 + 1 = 0$

22. (3) $\sin\theta + \sin^2\theta + \sin^3\theta = 1$

$\Rightarrow \sin\theta + \sin^3\theta = 1 - \sin^2\theta$

$\Rightarrow \sin\theta(1 + \sin^2\theta) = \cos^2\theta$

$\Rightarrow \sin^2\theta(1 + \sin^2\theta)^2 = \cos^4\theta$

$\Rightarrow (1 - \cos^2\theta)\{1 + (1 - \cos^2\theta)\}^2 = \cos^4\theta$

$\Rightarrow (1 - \cos^2\theta)(2 - \cos^2\theta)^2 = \cos^4\theta$

$\Rightarrow (1 - \cos^2\theta)(4 - 4\cos^2\theta + \cos^4\theta) = \cos^4\theta$

$\Rightarrow 4 - 4\cos^2\theta + \cos^4\theta - 4\cos^2\theta + 4\cos^4\theta - \cos^6\theta = \cos^4\theta$

$\Rightarrow -\cos^6\theta + 4\cos^4\theta - 8\cos^2\theta + 4 = 0$

$\Rightarrow \cos^6\theta - 4\cos^4\theta + 8\cos^2\theta = 4$

23. (2)

AB = Tower = h Metre

CD = 10 metre, AC = x metre (let)

$\angle BCA = 45°$, $\angle BDA = 30°$

In ΔACB,

$\tan 45° = \frac{AB}{AC}$

$\Rightarrow 1 = \frac{h}{x}$

$\Rightarrow h = x$ --- (i)

In ΔDAB,

$\tan 30° = \frac{AB}{AD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+10}$

$\Rightarrow x + 10 = \sqrt{3}\,h$

$\Rightarrow h + 10 = \sqrt{3}\,h$

$\Rightarrow h\left(\sqrt{3}-1\right) = 10$

$\Rightarrow h = \frac{10}{\sqrt{3}-1}$

$= \frac{10}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$

$= \frac{10\left(\sqrt{3}+1\right)}{2} = 5\ (1.73 + 1)$

= 13.65 metre

24. (1)

P and Q = Positions of plane

$\angle PAB = 60°$, $\angle QAB = 30°$, PB = $3600\sqrt{3}$ metre

In Δ ABP,

$\tan 60° = \frac{BP}{AB}$

$\Rightarrow \sqrt{3} = \frac{3600\sqrt{3}}{AB}$

$\Rightarrow$ AB = 3600 metre

In ΔACQ,

$\tan 30° = \frac{CQ}{AC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{3600\sqrt{3}}{AC}$

$\Rightarrow$ AC = 3600 × 3

= 10800 metre

$\therefore$ PQ = BC = AC – AB

= 10800 – 3600

= 7200 metre

This distance is covered in 30 seconds.

$\therefore$ Speed of plane $= \frac{7200}{30}$

= 240 m/sec.

$= \left(240 \times \frac{18}{5}\right)$ kmph

= 864 kmph

25. (4)

$\sin 75° + \sin 15° = 2 \sin\left(\frac{75°+15°}{2}\right)\cdot\cos\left(\frac{75°-15°}{2}\right)$

$\because$ sinC + sinD

$= 2\sin\left(\frac{C+D}{2}\right)\cdot\cos\left(\frac{C-D}{2}\right)$

$= 2 \sin 45° \cdot \cos 30°$

$= 2\cdot\frac{1}{\sqrt{2}}\cdot\frac{\sqrt{3}}{2}$

$= \sqrt{\frac{3}{2}}$

26. (3) We know that,

2 cosA sinB = sin(A + B) – sin(A – B)

$\Rightarrow 2 \cos 45° \sin 15°$

= sin (45° + 15°) – sin (45° – 15°)

= sin 60° – sin 30°

$= \frac{\sqrt{3}}{2} - \frac{1}{2}$

$= \frac{\sqrt{3}-1}{2}$

27. (4) We know that,

$\cos 2A = 1 - 2\sin^2 A$

$\Rightarrow \cos A = 1 - 2\sin^2\frac{A}{2}$

Let A = 45°

$\Rightarrow \cos 45° = 1 - 2\sin^2\frac{45°}{2}$

$\Rightarrow 2\sin^2 22\frac{1}{2}^\circ = 1 - \cos 45°$

$2\sin^2 22\frac{1}{2}^\circ = 1 - \frac{1}{\sqrt{2}}$

$2\sin^2 22\frac{1}{2}^\circ = \frac{\sqrt{2}-1}{\sqrt{2}}$

$= \sin^2 22\frac{1}{2}^\circ = \frac{\sqrt{2}-1}{2\sqrt{2}}$

$= \sin 22\frac{1}{2}^\circ = \sqrt{\frac{\sqrt{2}-1}{2\sqrt{2}}}$

28. (2) $\frac{\cos\alpha + \cos\beta}{\sin\alpha + \sin\beta}$

$= \frac{2\cdot\cos\left(\frac{\alpha+\beta}{2}\right)\cdot\cos\left(\frac{\alpha-\beta}{2}\right)}{2\sin\left(\frac{\alpha+\beta}{2}\right)\cdot\cos\left(\frac{\alpha-\beta}{2}\right)}$

$= \frac{\cos\left(\frac{\alpha+\beta}{2}\right)}{\sin\left(\frac{\alpha+\beta}{2}\right)}$

$= \cot\left(\frac{\alpha+\beta}{2}\right)$

29. (2) We know that,

$1^R = \left(\frac{180°}{\pi}\right)$

$1^R = 57.29°$

As we know that the value of sinθ increases as θ increases.

$\Rightarrow \sin 1° < \sin 57.29°$

$\sin 1° < \sin\left(\frac{180}{\pi}\right)^\circ$

$\Rightarrow \sin 1° < \sin 1$

30. (4) We know that,

$\tan(\alpha+\beta) = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha\cdot\tan\beta}$

$\Rightarrow \tan(\alpha+\beta)$

$= \frac{\frac{m}{m+1} + \frac{1}{2m+1}}{1 - \frac{m}{(m+1)}\cdot\frac{1}{(2m+1)}}$

$\because \tan\alpha = \frac{m}{m+1}$

$\tan\beta = \frac{1}{2m+1}$

$$= \frac{\dfrac{2m^2 + m + m + 1}{(m+1)(2m+1)}}{\dfrac{2m^2 + 3m + 1 - m}{(m+1)(2m+1)}}$$

$$= \frac{2m^2 + 2m + 1}{2m^2 + 2m + 1}$$

$= 1$

$\Rightarrow \tan(\alpha + \beta) = 1$

$\tan(\alpha + \beta) = \tan\frac{\pi}{4}$

$\therefore \alpha + \beta = \frac{\pi}{4}$.

31. (2) Here, $\alpha + \beta = \frac{\pi}{4}$

$(1 + \tan\alpha)(1 + \tan\beta)$

$= 1 + \tan\beta + \tan\alpha + \tan\alpha\tan\beta$

$= 1 + \tan\alpha + \tan\beta + \tan\alpha\tan\beta$

Also, we know that,

$$\tan(\alpha + \beta) = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta}$$

$$\tan\frac{\pi}{4} = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta}$$

$\Rightarrow \boxed{1 - \tan\alpha\tan\beta = \tan\alpha + \tan\beta}$

$\Rightarrow (1 + \tan\alpha)(1 + \tan\beta)$

$= 1 + 1 - \tan\alpha\tan\beta + \tan\alpha\tan\beta$

$= 2$

32. (2) Here, $\tan A = \frac{1 - \cos B}{\sin B}$

We know that,

$$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$$

$$\tan 2A = \frac{2\cdot\left(\dfrac{1 - \cos B}{\sin B}\right)}{1 - \left(\dfrac{1 - \cos B}{\sin B}\right)^2}$$

$$= \frac{\dfrac{2(1 - \cos B)}{\sin B}}{\dfrac{\sin^2 B - (1 - \cos B)^2}{\sin^2 B}}$$

$$= \frac{2(1 - \cos B)\sin B}{1 - \cos^2 B - (1 - \cos B)^2}$$

$[\because \sin^2\theta = 1 - \cos^2\theta]$

$$= \frac{2(1 - \cos B)\sin B}{(1 - \cos B)[1 + \cos B - 1 + \cos B]}$$

$$= \frac{2\sin B}{2\cos B}$$

$= \tan B.$

33. (4) $\sin(45° + \theta) - \cos(45° - \theta)$

$= \sin 45° \cos\theta + \cos 45° \sin\theta$

$- (\cos 45° \cos\theta + \sin 45° \sin\theta)$

$\because \sin(A + B) = \sin A \cos B + \cos A \sin B$

$\cos(A - B) = \cos A \cos B + \sin A \sin B$

$$= \frac{\cos\theta}{\sqrt{2}} + \frac{\sin\theta}{\sqrt{2}} - \frac{\cos\theta}{\sqrt{2}} - \frac{\sin\theta}{\sqrt{2}}$$

$= 0$

34. (2) $2\cos\frac{\pi}{13}\cos\frac{9\pi}{13} + \cos\frac{3\pi}{13}$

$+ \cos\frac{5\pi}{13}$

$$= \cos\left(\frac{\pi}{13} + \frac{9\pi}{13}\right) + \cos\left(\frac{\pi}{13} - \frac{9\pi}{13}\right)$$

$+ \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$

$\because 2\cos A \cos B = \cos(A + B) + \cos(A - B)$

$$= \cos\frac{10\pi}{13} + \cos\left(-\frac{8\pi}{13}\right)$$

$+ \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$

$$= \cos\frac{10\pi}{13} + \cos\frac{8\pi}{13}$$

$+ \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$

$\because \cos(-\theta) = \cos\theta$

$$= \cos\left(\pi - \frac{3\pi}{13}\right) + \cos\left(\pi - \frac{5\pi}{13}\right)$$

$+ \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$

$$= -\cos\frac{3\pi}{13} - \cos\frac{5\pi}{13} + \cos\frac{3\pi}{13}$$

$+ \cos\frac{5\pi}{13}$

$= 0$

35. (3) Here,

$\sin\theta + \cos\theta = 1$

Squaring on both sides, we get

$(\sin\theta + \cos\theta)^2 = 1$

$\sin^2\theta + \cos^2\theta + 2\sin\theta \cdot \cos\theta = 1$

$1 + 2\sin\theta\cos\theta = 1$

$2\sin\theta \cdot \cos\theta = 0$

And we know that,

$\sin 2\theta = 2\sin\theta\cos\theta$

$\Rightarrow \sin 2\theta = 0$

36. (2) Here,

$$\frac{\sin(x + y)}{\sin(x - y)} = \frac{a + b}{a - b}$$

Using componendo and dividendo both sides we get,

$$\frac{\sin(x + y) + \sin(x - y)}{\sin(x + y) - \sin(x - y)}$$

$$= \frac{a + b + a - b}{a + b - (a - b)}$$

$$\frac{2\sin\left(\dfrac{x + y + x - y}{2}\right)\cdot\cos\left(\dfrac{x + y - x + y}{2}\right)}{2\sin\left(\dfrac{x + y - x + y}{2}\right)\cdot\cos\left(\dfrac{x + y + x - y}{2}\right)}$$

$$= \frac{2a}{2b}$$

$\because \sin C + \sin D$

$$= 2\sin\left(\frac{C + D}{2}\right)\cos\left(\frac{C - D}{2}\right)$$

$\sin C - \sin D$

$$= 2\cos\left(\frac{C + D}{2}\right)\sin\left(\frac{C - D}{2}\right)$$

$$\Rightarrow \frac{\sin x \cdot \cos y}{\sin y \cdot \cos x} = \frac{a}{b}$$

$$\Rightarrow \tan x \cdot \cot y = \frac{a}{b}$$

$$\frac{\tan x}{\tan y} = \frac{a}{b}$$

37. (2) $\frac{3\cos\theta + \cos 3\theta}{3\sin\theta - \sin 3\theta}$

$$= \frac{3\cos\theta + 4\cos^3\theta - 3\cos\theta}{3\sin\theta - (3\sin\theta - 4\sin^3\theta)}$$

$\because \cos 3\theta = 4\cos^3\theta - 3\cos\theta$

$\sin 3\theta = 3\sin\theta - 4\sin^3\theta$

$$= \frac{4\cos^3\theta}{4\sin^3\theta}$$

$= \cot^3\theta$

38. (1)

$$\sin\frac{5\pi}{12}\cdot\sin\frac{\pi}{12}$$

$$= \frac{1}{2}\times\left(2\sin\frac{5\pi}{12}\sin\frac{\pi}{12}\right)$$

$$= \frac{1}{2}\left[\cos\left(\frac{5\pi}{12}-\frac{\pi}{12}\right)-\cos\left(\frac{5\pi}{12}+\frac{\pi}{12}\right)\right]$$

$\because$ 2sin A sin B

= cos(A – B) – cos(A + B)

$$= \frac{1}{2}\left[\cos\left(\frac{4\pi}{12}\right)-\cos\left(\frac{6\pi}{12}\right)\right]$$

$$= \frac{1}{2}\left[\cos\left(\frac{\pi}{3}\right)-\cos\left(\frac{\pi}{2}\right)\right]$$

$$= \frac{1}{2}\cdot\frac{1}{2}$$

$$= \frac{1}{4}$$

39. (3)

$$\frac{\cos(\pi+x)\cos(-x)}{\sin(\pi-x)\cos\left(\frac{\pi}{2}+x\right)}$$

$$= \frac{-\cos x\cdot\cos x}{\sin x(-\sin x)}$$

$\because$ cos(π + θ) = – cosθ

cos(– θ) = cosθ

sin(π – θ) = – sinθ

$$\cos\left(\frac{\pi}{2}+\theta\right) = -\sin\theta$$

$$= \left(\frac{\cos x}{\sin x}\right)\cdot\left(\frac{\cos x}{\sin x}\right)$$

$= \cot x\cdot\cot x$

$= \cot^2 x.$

40. (2)

$$\frac{\sin 50^\circ}{\sin 130^\circ}+\frac{\cos 70^\circ}{\cos 110^\circ}$$

$$-2\tan^2 225^\circ$$

$$= \frac{\sin 50^\circ}{\sin(180^\circ-50^\circ)}$$

$$+\frac{\cos 70^\circ}{\cos(180^\circ-70^\circ)}$$

$$-2[\tan(180^\circ+45^\circ)]^2$$

$$= \frac{\sin 50^\circ}{\sin 50^\circ}+\frac{\cos 70^\circ}{-\cos 70^\circ}$$

$$-2\tan^2 45^\circ$$

$\because$ sin(180° – θ) = sinθ

cos(180° – θ) = – cosθ

tan(180° + θ) = tanθ

= 1 – 1 – 2

= –2

41. (2) sin 240° = sin(180° + 60°)

= –sin 60°

[$\because$ sin(180° + θ) = – sinθ]

$$= -\frac{\sqrt{3}}{2}$$

42. (1) We know that,

$$\cot(A+B) = \frac{\cot A\cdot\cot B-1}{\cot A+\cot B}$$

$$\Rightarrow x = \frac{\cot A\cdot\cot B-1}{\cot A+\cot B}$$

43. (4) $\cos\frac{7\pi}{4} = \cos\left(2\pi-\frac{\pi}{4}\right)$

$$= \cos\frac{\pi}{4}$$

$\because$ cos (2π – θ) = cosθ

$$= \frac{1}{\sqrt{2}}$$

44. (3) $\tan\left(\frac{5\pi}{6}\right)\cdot\sin\left(\frac{7\pi}{6}\right)$

$$= \tan\left(\pi-\frac{\pi}{6}\right)\cdot\sin\left(\pi+\frac{\pi}{6}\right)$$

[$\because$ tan (180° – θ) = –tanθ

sin (180° + θ) = –sinθ]

$$= -\tan\frac{\pi}{6}\cdot\left(-\sin\frac{\pi}{6}\right)$$

$$= \tan\frac{\pi}{6}\cdot\sin\frac{\pi}{6}$$

$$= \frac{1}{\sqrt{3}}\cdot\frac{1}{2}$$

$$= \frac{1}{2\sqrt{3}}$$

45. (2) tan 56° = tan(45° + 11°)

$$= \frac{\tan 45^\circ+\tan 11^\circ}{1-\tan 45^\circ\cdot\tan 11^\circ}$$

$$\because \tan(A+B) = \frac{\tan A+\tan B}{1-\tan A\tan B}$$

$\because$ tan 45° = 1

$$= \frac{1+\tan 11^\circ}{1-\tan 11^\circ}$$

$$= \frac{1+\frac{\sin 11^\circ}{\cos 11^\circ}}{1-\frac{\sin 11^\circ}{\cos 11^\circ}}$$

$$= \frac{\cos 11^\circ+\sin 11^\circ}{\cos 11^\circ-\sin 11^\circ}$$

46. (3)

$$\frac{\cos\theta}{\sin(90^\circ+\theta)}+\frac{\sin(-\theta)}{\sin(180^\circ+\theta)}$$

$$-\frac{\tan(90^\circ+\theta)}{\cot\theta}$$

$$= \frac{\cos\theta}{\cos\theta}+\left(\frac{-\sin\theta}{-\sin\theta}\right)+\frac{\cot\theta}{\cot\theta}$$

= 1 + 1 + 1

= 3

47. (2)

$$\tan\left(\frac{\pi}{4}+x\right) = \frac{\tan\frac{\pi}{4}+\tan x}{1-\tan\frac{\pi}{4}\cdot\tan x}$$

$$\left[\because \tan(A+B) = \frac{\tan A+\tan B}{1-\tan A\tan B}\right]$$

$$= \frac{1+\tan x}{1-\tan x}$$

48. (3) Here,

cosC – cosD = y

$\Rightarrow y$ = cosC – cosD

$\Rightarrow y = -2\sin$

$$\left(\frac{C+D}{2}\right)\cdot\sin\left(\frac{C-D}{2}\right)$$

[$\because$ It is the basic formula of cosC – cosD]

49. (4) Here,

$\sin x = \frac{1}{3}$

We know that,

$\sin 3x = 3\sin x - 4\sin^3 x$

On putting the value of $\sin x$, we get

$\sin 3x = 3\cdot\left(\frac{1}{3}\right) - 4\cdot\left(\frac{1}{3}\right)^3$

$= 1 - \frac{4}{27}$

$= \frac{27-4}{27}$

$\sin 3x = \frac{23}{27}$

50. (1) Here,

$\sin x \cdot \cos y + \cos x \cdot \sin y = 1$

$\Rightarrow \sin(x+y) = 1$

[$\because$ sin (A + B) = sinA cosB + cosA sinB]

$\Rightarrow \sin(x+y) = \sin\frac{\pi}{2}$

$\Rightarrow x + y = \frac{\pi}{2}$

51. (3) Here,

$\cos x = -\frac{3}{5}$ and $\pi < x < \frac{3\pi}{2}$

$\Rightarrow x$ lies in third quadrant, and we know that in third quadrant only tan and cot are positive.

Consider right angled Δ ABC,

Using pythagoras theorem,

$AC^2 = AB^2 + BC^2$

$\Rightarrow 5^2 = (-3)^2 + BC^2$

$16 = BC^2$

$\Rightarrow BC = 4$

We know that,

$\sin 2A = 2\sin A \cdot \cos A$

$\Rightarrow \sin 2x = 2 \cdot \sin x \cdot \cos x$

$= 2 \times \left(\frac{-4}{5}\right) \times \frac{-3}{5}$

$= \frac{24}{25}$

$\because$ Here, $\sin\theta$ is –ve

52. (4) $\tan 330° = \tan(360° - 30°)$

$= -\tan 30°$

$\because \tan(360° - \theta) = -\tan\theta$

$= \frac{-1}{\sqrt{3}}$

53. (2) We know that,

$1^R = \left(\frac{180}{\pi}\right)^\circ$

$\frac{5\pi}{12}^R = \left(\frac{180}{\pi} \times \frac{5\pi}{12}\right)^\circ = 75°$

54. (4) We know that,

$1° = \left(\frac{\pi}{180}\right)^R$

$\Rightarrow 120° = \left(\frac{\pi}{180} \times 120\right)^R$

$= \left(\frac{2\pi}{3}\right)^R$

55. (1) Here,

$\tan\theta = \frac{x-y}{x+y}$

Consider Δ ABC,

Using pythagoras theorem, we get

$AC^2 = AB^2 + BC^2$

$\Rightarrow AC^2 = (x+y)^2 + (x-y)^2$

$= x^2 + y^2 + 2xy + x^2 + y^2 - 2xy$

$AC^2 = 2(x^2 + y^2)$

$AC = \sqrt{2(x^2+y^2)}$

As θ lies in first quadrant,

$\because \sin\theta$ will be +ve

$\sin\theta = \frac{BC}{AC}$

$\sin\theta = \frac{x-y}{\sqrt{2(x^2+y^2)}}$

56. (4) Here, sinC + sinD = x

$\Rightarrow x = \sin C + \sin D$

$\Rightarrow x = 2\cdot\sin\left(\frac{C+D}{2}\right)\cdot\cos\left(\frac{C-D}{2}\right)$

[$\because$ it is the basic formula of sinC + sinD]

57. (2) We know that,

$\text{Angle} = \frac{\text{arc}}{\text{radius}}$

$\Rightarrow \theta = \frac{21}{75}$

$\theta = \left(\frac{7}{25}\right)^R$

58. (3) Here,

$\theta = 60°$

$l = 37.4$ cm

$r = ?$

We know that,

$1° = \left(\frac{\pi}{180°}\right)^R$

$$\Rightarrow 60^\circ\left(\frac{\pi}{180^\circ}\times 60\right)^R$$

$$\Rightarrow 60^\circ\left(\frac{\pi}{3}\right)^R$$

We know that,

$$\theta = \frac{l}{r}$$

$$\Rightarrow \frac{\pi}{3} = \frac{37.4}{r}$$

$$\Rightarrow r = \frac{37.4\times 3}{\pi}$$

$$r = \frac{37.4\times 3\times 7}{22}$$

$= 1.7 \times 21$

$= 35.7$ cm

59. (2)

cosec (–1410°) = – cosec (1410°)

$\because$ cosec (– θ) = – cosecθ

= –cosec (360° × 3 + 330°)

= –cosec (330°)

= –cosec (360° – 30°)

= cosec 30°

= 2

60. (2) $\cos\left(\frac{\pi}{4}+x\right)+\cos\left(\frac{\pi}{4}-x\right)$

$$= 2\cos\left(\frac{\frac{\pi}{4}+x+\frac{\pi}{4}-x}{2}\right)$$

$$\cdot\cos\left(\frac{\frac{\pi}{4}+x-\frac{\pi}{4}+x}{2}\right)$$

$\because$ cosC + cosD

$$= 2\cos\left(\frac{C+D}{2}\right)\cdot\cos\left(\frac{C-D}{2}\right)$$

$$= 2\cos\left(\frac{\pi}{4}\right)\cdot\cos x$$

$$= \frac{2}{\sqrt{2}}\cdot\cos x$$

$$= \sqrt{2}\cos x$$

61. (2) $\tan\frac{13\pi}{12}$

$$= \tan\left(\pi+\frac{\pi}{12}\right)$$

$$= \tan\frac{\pi}{12}$$

[$\because$ tan(π + θ) = tanθ]

$$= \tan\left(\frac{\pi}{3}-\frac{\pi}{4}\right)$$

$$\because \frac{1}{12} = \frac{1}{3}-\frac{1}{4}$$

$$= \frac{\tan\frac{\pi}{3}-\tan\frac{\pi}{4}}{1+\tan\frac{\pi}{3}\tan\frac{\pi}{4}}$$

$\because$ tan (A – B)

$$= \frac{\tan A-\tan B}{1+\tan A\tan B}$$

$$= \frac{\sqrt{3}-1}{1+\sqrt{3}}$$

$$= \frac{\sqrt{3}-1}{\sqrt{3}+1}$$

62. (3) Here, $\cos\theta = -\frac{1}{2}$ and θ, lies in third quadrant

Consider ΔABC, Using Pythagoras theorem,

$AC^2 = AB^2 + BC^2$

$2^2 = (-1)^2 + BC^2$

$\Rightarrow BC^2 = 4 - 1$

$BC^2 = 3$

$BC = \sqrt{3}$

$$\tan\theta + \sin\theta = -\left(\frac{\sqrt{3}}{-1}\right) + -\left(\frac{\sqrt{3}}{2}\right)$$

$\because$ In third quadrant sinθ is negative and tanθ is positive.

$$= \frac{\sqrt{3}}{2}$$

63. (1) cos 105° = cos(60° + 45°)

= cos 60° · cos 45°

– sin 60° · sin 45°

[$\because$ cos (A + B) = cosA cosB – sinA sinB]

$$= \frac{1}{2}\cdot\frac{1}{\sqrt{2}} - \frac{\sqrt{3}}{2}\cdot\frac{1}{\sqrt{2}}$$

$$= \frac{1-\sqrt{3}}{2\sqrt{2}}$$

64. (2) Here,

$$\cos\left(\frac{\pi}{4}-\theta\right)\cos\left(\frac{\pi}{4}-\phi\right)$$

$$-\sin\left(\frac{\pi}{4}-\theta\right)\sin\left(\frac{\pi}{4}-\phi\right) = ?$$

Let

$$\frac{\pi}{4}-\theta = A$$

$$\frac{\pi}{4}-\phi = B$$

$$\Rightarrow \cos\left(\frac{\pi}{4}-\theta\right)\cos\left(\frac{\pi}{4}-\phi\right)$$

$$-\sin\left(\frac{\pi}{4}-\theta\right)\sin\left(\frac{\pi}{4}-\phi\right)$$

= cosA cosB – sinA SinB

= cos(A + B)

$$= \cos\left[\frac{\pi}{4}-\theta+\frac{\pi}{4}-\phi\right]$$

$$= \cos\left[\frac{\pi}{2}-\theta-\phi\right]$$

$$= \cos\left[\frac{\pi}{2}-(\theta+\phi)\right]$$

$= \sin\ (\theta + \phi)$

$$\because \cos\left(\frac{\pi}{2}-\theta\right) = \sin\theta$$

19 GEOMETRY

Importance : It is very important chapter for competitive exams and questions on different difficulty levels are asked.

Scope of questions : Questions are based on angles, ratio/measure of sides angles or bisectors, measure/ratio of trapesium/square/rectangle/parallelogram/pentagon sides/angles, centre, radius, diameter, angle, area and circumference of circle.

Way to success : The complete and thorough study of this chapter is a must.

- **Line :** A figure formed by joining collinear or non-collinear points is known as line. It has no width e.g.

There are two types of line :

(i) **Straight line :** A line travels a distance without any diversion on straight path, is called straight line. It represents the shortest path between any two points lying on it.

(ii) **Curved line :** Line when travels on a diverted path, that is called curved line.

Line segment : A line segment has two end points. i.e. it can not be extended in any direction. Sometimes, a line and a line segment may be used in same sense as that of a line.

- **Ray :** A ray can be extended in one direction only, which is denoted by an arrow. On the other side we have an end point, called the initial point.

A ●——→ B represents as $\overrightarrow{AB}$

- **Parallel lines :** Two lines are said to be parallel, if they do not intersect each other at any point and the distance (perpendicular distance h) between them is constant. They are denoted by the symbol ||.

In the above figure AB || CD.

- **Transversal line :** A line that intersects two or more parallel lines at different points, is called a transversal.

Here, $l_1 \parallel l_2 \parallel l_3$ and AB and CD are two transversal lines.

- **Intersecting lines :** Two lines that intersect each other or in other words, share a common point (Called point of intersection) are called intersecting lines.

- **Perpendicular lines :** Two lines that intersect each other at right angle (90°) are called perpendicular lines. They are denoted by the symbol "⊥".

- **Concurrent lines :** Three or more lines are said to be concurrent if they all intersect at one common point as shown below.

- **Coplanar lines :** The lines that lie in the same plane are said to be coplanar lines, otherwise they are called non. coplanar lines. Same holds good for coplanar points (i.e., points that lie in the same plane) and non-coplanar points. (Points that not lie in the same plane.)

Points to remember :

- Three or more points lying on the same line are called collinear points.
- Only one line can be drawn through any two given points.
- Two line can intersect maximum at one point.
- If two different lines are perpendicular to a third line, then the former are parallel to each other, as shown below.

Here, $m_1 \perp AB$ and $m_2 \perp AB$. Hence, as per above rule $m_1 \parallel m_2$

- There are infinite number of points on a straight line.
- Infinite number of lines can be made from a single point

ANGLES

- Angle : When two rays have same starting point or an ending point, then an angle is formed.

Types of Angles :

- **Acute angle :** An angle greater than 0° but less than 90° (i.e. $\frac{\pi}{2}$ radians) is an acute angle.

Here $0° < \theta < 90°$ or $0 < \frac{\pi}{2}$

- **Obtuse angle :** An angle which is greater than 90° and less than 180° (π radians) is an obtuse angle.

Here $90° < \theta < 180°$ or $\frac{\pi}{2} < \theta < \pi$

- **Right angle :** An angle equals to 90° (or $\frac{\pi}{2}$ radians) is right angle.

- **Straight angle :** An angle equals to 180° (or π radians) is straight angle.

- **Reflex angle :** It is an angle greater than 180° and (or π radians) but less than 360°(2π radians).

Here, $180° < \theta < 360°$ ($\angle\theta = 360° - \angle 1$)
or $\pi < \theta < 2\pi$

- **Complementary angle :** Two angles are said to be complementary if their sum is equal to 90° (or $\frac{\pi}{2}$ radians).

Case-I

Case-II

($\angle 3 + \angle 4 = 90°$)

In the above figure, $\angle 1 + \angle 2 = 90°$: Hence, they are complementary angles. Also $\angle 3 + \angle 4 = 90°$, therefore, they are also complementary angles.

- **Supplementary angles :** If the sum of the angles is equal to 180°, then they are called supplementary angles. For example supplementary (or π radians) angle of 50° is = 180° – 50° = 130°

- **Linear pair :** In the case I above, ∠1 and ∠2 form a linear pair. Two angles form a linear pair, if they have one side common between them and the two angles are supplementary.
- **Adjacent angles :** ∠1 and ∠2 are called adjacent angles, since they have one side common between them.

L_1 & L_2 are adjacent angles.

- **Vertically opposite angles :** Let L_1 and L_2 be two intersecting lines as shown below, then ∠1 and ∠2 are said to be vertically opposite angles. Also, ∠3 and ∠4 are vertically opposite angles.

- **Angles between parallel lines :** Let AB and CD be two parallel lines that are intercepted by a transversal T_1, then we have.

Corresponding angles : ∠1 = ∠5, ∠2 = ∠6, ∠4 = ∠8, and ∠3 = ∠7 are pair of corresponding angles will be equal.

Interior Alternate angles : ∠3 = ∠6, ∠4 = ∠5.

- **Vertically opposite angles :** ∠1 = ∠4, ∠2 = ∠3, ∠5 = ∠8, ∠6 = ∠7 are pair of vertically opposite angles.
- **Opposite interior angles :** ∠3 + ∠5 = 180° and ∠4 + ∠6 = 180°.

TRIANGLES

Types of Triangle : According to Sides :

(i) **Equilateral Triangle :** A triangle whose all the three sides are equal, is called an equilateral Δ. If in ΔABC, if AB = BC = AC, then ΔABC is an equilateral triangle.

Also, all angles of an equilateral triangle are equal i.e., ∠A = ∠B = ∠C = 60°.

(ii) **Isosceles triangle :** A triangle with two equal sides is an isosceles triangle.

Also, angles opposite to equal sides are equal.

In isosceles ΔABC, if AB = AC

then ∠ACB = ∠ABC.

(iii) **Scalene triangle :** A triangle in which none of the three sides is equal is called a scalene triangle. In a scalene triangle AB ≠ BC ≠ CA and ∠A ≠ ∠B ≠ ∠C

According to Angles :

(i) **Acute angled triangle :** It is one in which all the angles are less than 90° or in other words, all the angles are acute.

(ii) **Right angled triangle :** It is one with one angle equals to 90°. side opposite to 90° is called hypotenuse.

(iii) **Obtuse angled triangle :** A triangle with one of its angle greater than 90° or obtuse.

- **Similar Triangles :** If all the angles of a triangle are equal to the angles of another triangle, then both are called similar triangles [relation [represented as ~] to each other.

Here, $\angle A = \angle A'$, $\angle B = \angle B'$.$\angle C = \angle C'$, then ΔABC and $\Delta A'B'C$ will be similar. So. $\Delta ABC \sim \Delta A'B'C'$

$$\therefore \frac{AB}{A'B'} = \frac{BC}{B'C'} = \frac{CA}{C'A'}$$

- **Congruent Triangles :** Any two triangles are called congruent triangles (relation represented as $\cong$), when a triangle covers totally the other triangle. In other words if both triangles are exactly same (identical) to each other in sides or angles.

Here, in ΔABC and ΔDEF

$\angle A = \angle D$, $\angle B = \angle E$, $\angle C = \angle F$, and AB = DE, BC = EF, CA = FD then

$\therefore \Delta ABC \cong \Delta DEF$.

Congruency conditions :

- **S-S-S (Side-Side-Side) :** Here, AB = DE, BC = EF and AC = DF, then

  $\therefore \Delta ABC \cong \Delta DEF$ by S-S-S congruency condition.

- **S-A-S (Side-Angle-Side) :**

  Here, AB = DE, AC = DF

  and $\angle A = \angle D$ then

  $\therefore \Delta ABC \cong \Delta DEF$ by SAS congruency condition.

Note : The angle involved in SAS condition must lie between the sides.

- **A-S-A (Angle-Side-Angle) :** Here, $\angle A = \angle D$, $\angle C = \angle F$ and AC = DF, then

  $\therefore \Delta ABC \cong \Delta DEF$ by ASA congruency condition.

Note : The side involved in ASA condition must lie between the angles.

R.H.S (Right-Hypotenuse-Side) :

If any two sides of a right angled triangle are equal (separately) to any two corresponding sides of another right angled triangle then both triangles are congruent.

Here, $\angle B = \angle D = 90°$ and AB = DE and AC = EF, then

$\therefore$ $\Delta ABC = \cong$ DEF.

Median :

A line drawn from a vertex to the opposite side of a triangle, which divides the side into 2 equal parts is called a median.

Here, AD, BE and CF are medians and

BD = DC, CE = AE and

AF = BF

Centroid (Centre of gravity) :

A Centroid (point in figure) is the point of intersection of three medians.

Rule 1. The centroid divides a median in the ratio of 2 : 1 with the larger part towards the vertex, i.e., G divides BE, CF and AD in the ratio of 2 : 1.

$$\therefore \frac{AO}{OD} = \frac{BO}{OE} = \frac{CO}{OF} = \frac{2}{1}$$

The medians make 6 triangles of equal areas. as–

ar ΔAFO = ar ΔFOB = ar ΔOBD = ar ΔODC = ar ΔCOE

= ar ΔAOE.= $\frac{1}{6}$ ar ΔABC

- **Altitude :** An altitude is nothing but the height of a triangle. It is a perpendicular drawn from a vertex to the opposite side.

A triangle can have three altitudes. In case of an obtuse triangle atleast one altitude lies out side the triangle. AD, BE and CF are altitudes.

- **Perpendicular Bisector :** A line that bisect a side of the triangle at right angle is called the perpendicular Bisector. OD is the perpendicular bisector of BC if BD = DC and $\angle ODC = \angle ODB = 90°$.

- **Ortho centre :** It is the point of intersection of three Altitudes of a triangle. In ΔABC, O is the Orthocentre.

Here, AD, BE and CF are altitudes of ΔABC.

$\therefore$ $\angle BOC + \angle A = 180°$

$\angle AOB + \angle C = 180°$

$\angle COA + \angle B = 180°$

- **Incentre :** The point of intersection of the Angle Bisectors of a triangle is called the Incentre.

In ΔABC, given above AD, BE and CF are the angle bisectors of A, B and C respectively. Therefore O is the incentre, and OH, OI and OG are in-radii.

Circumcentre :

The point of intersection of the Perpendicular Bisectors of the sides of a triangle is called the circumcentre.

Here, O is the circum centre and OA, OB and OC are circum radii.

Here, $\angle BOC = 2\angle A$, $\angle COA = 2\angle B$, $\angle AOB = 2\angle C$.

Properties of Triangles :

(1) **Pythagoras theorem :** In any right angled triangle $AB^2 + BC^2 = AC^2$, where

AB is Perpendicular, BC is Base, AC is Hypoteneuse

(2) If in a certain triangle ABC, $\angle B$ is obtuse angle, and $AD \perp BC$, then

$AC^2 = AB^2 + BC^2 + 2BC.AD$

(3) If in a certain ΔABC,

$\angle C$ is acute angle, and $AD \perp BC$, then $AB^2 = BC^2 + AC^2 - 2BC.DC$.

(4) Sum of interior angles of a triangle is 180° and sum of exterior angles is 360°

$\therefore \angle 1 + \angle 2 + \angle 3 = 180°$. $\angle x + \angle y + \angle z = 360°$.

(5) In a triangle, sum of two sides is always greater than third side.

(6) In the given ΔABC

$\angle 4 = \angle 1 + \angle 2$ and $\angle 3 + \angle 4 = 180°$.

(7) In the given ΔABC If OB and OC are the bisectors of angles of triangle ∠B and ∠C, then ∠BOC

$= 90° + \frac{\angle A}{2}$

(8) If in the ΔABC, the sides AB and AC are extended and the bisectors of exterior angles of ∠B and ∠C meet at O then $\angle BOC = 90 - \frac{\angle A}{2}$

(9) In the given ΔABC, AD, BE and CF are the medians, then

$$AD + BE + CF > \frac{AB + BC + CA}{2}$$

(10) In the given ΔABC, if AD, BE and CF are the Perpendiculars, then, AB + BC + CA > AD + BE + CF.

(11) If a line intersects two parallel lines, then bisectors of the interior angles make a rectangle.

∴ LNMP is a rectangle.

(12) In the given ΔABC, AM is the bisector of angle ∠BAC and AN ⊥ BC then $\angle MAN = \frac{1}{2}(\angle B - \angle C)$

(13) In ΔABC, If BC is extended to D, and AL is the bisector of exterior angle ∠A then ∠ABC + ∠ACD = 2 ∠ALC.

Here, BA is extended to BE.

(14) In a ΔABC, if BC is extended to D and BE and CE are the bisectors of ∠ABC and ∠ACD which meet at E, then $\angle BEC = \frac{1}{2}\angle A$

(15) In the given quadrilateral, the bisectors of adjacent angles meet at P, then, $\angle APB = -\frac{1}{2}(\angle C - \angle D)$ where < C > < D

(16) In any ΔABC, if AD is the median then $\frac{AB}{AC} = \frac{BD}{DC}$.

(17) In any ΔABC, if AD is the bisector of angle $\angle A$ then,

$$\frac{AB}{AC} = \frac{BD}{DC}$$

(18) In any ΔABC, D and E are the mid-point of sides AB and AC respectively, then DE|| BC and $DE = \frac{1}{2}$ BC, area $\Delta ADE = \frac{1}{4}$ area (ΔABC) and $\frac{AD}{BD} = \frac{AE}{EC}$

According to figure, F is mid-point of BC then area $\Delta DEF = \frac{1}{4}$ area (ΔABC)

(19) In ΔABC, AD is the bisector of exterior angle $\angle A$, then, $\frac{BD}{DC} = \frac{AB}{AC}$

(20) In an equilateral ΔABC, if $AD \perp BC$, then, $\frac{(AB)^2}{(AD)^2} = \frac{4}{3}$

$\therefore\ 3(AB)^2 = 4(AD)^2$

(21) Here, ΔABC and ΔDEF are similar, then

$$\frac{\text{area } \Delta ABC}{\text{area } \Delta DEF} = \left(\frac{AB}{DE}\right)^2 = \left(\frac{BC}{EF}\right)^2 = \left(\frac{AC}{DF}\right)^2 = \left(\frac{AX}{DY}\right)^2$$

$$= \left(\frac{P_1}{P_2}\right)^2$$

P_1 = Perimeter of ΔABC

P_2 = Perimeter of ΔDEF

(22) In the given figure, ΔABC is a right angled triangle, in which P and Q are the mid-point on the side AB and BC.

then $4((AQ)^2 + (CP)^2) = 5(AC)^2 = 20(PQ)^2$

(23) If in ΔABC, BN and CM are the medians of the triangle intersecting at 90°, then $(AB)^2 + (AC)^2 = 5(BC)^2$.

(24) In ΔABC, ∠B = 90° and X and Y are the points on sides AB and BC respectively,

then $(AY)^2 + (XC)^2 = (AC)^2 + (XY)^2$

(26) Circumcentre of a right angled triangle lies on the mid-point of the hypotenuse, therefore, AD = BD = DC = radius of circumcircle

(27) If ΔABC is a right angled Δ, such that ∠B = 90°.

And BD ⊥ AC.

then, $BD = \sqrt{AD \times DC}$. and $BD = \frac{AB \times BC}{AC}$

(28) In the given figure $\Delta ABC \sim \Delta DEF$

P_1 = Perimeter of ΔABC

P_2 = Perimeter of ΔDEF

$$\therefore \frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = \frac{AX}{DY} = \frac{P_1}{P_2}$$

(29) In the given figure, ▢ ABCD is a trapezium with AB | | DC

then, $\frac{OA}{OC} = \frac{OB}{OD}$.

(30) If all of these medians bisect the angles from where it start, then Δ will be equilateral. In the given figure, AD and BE are medians of ΔABC, then BD = DC, AE = CE, $\angle BAD = \angle CAD$, $\angle EBC = \angle EBA$ then AB = BC = AC

$\therefore$ ΔABC is an equilateral triangle.

(31) In the given ΔABC, AD, BE and CF are the medians. If AD = BE = CF, then AB = BC = AC So, triangle ΔABC will be an equilateral triangle.

(32) In the triangle ABC If medians BE and CF are equal i.e., BE = CF then AB = AC

$\therefore$ ΔABC is an isosceles triangle.

(33) Triangles on the same base and between two parallel lines are equal in area.

$\therefore$ Area ΔABC = Area ΔBDC. (as both triangles lie on base BC)

(34) If a parallelogram and a triangle lie on same base and between two parallel lines, then area of ΔABC

$= \frac{1}{2}$ (Area parallelogram EBCD)

(35) The perimeter of a quadrilateral is greater than the sum of its diagonals.

$\therefore$ AB + BC + CD + DA > AC + BD.

(36) ABCD is a trapezium, AD || BC and E and F are the mid-points of AB and DC respectively, then EF $= \frac{1}{2}$ (AB + CD)

(37) ABCD is a trapezium, then AB || DC, P and Q are the mid-points of diagonals BD and AC respectively, then PQ = $\frac{|DC - AB|}{2}$

(38) ABCD is a rectangle, O is any point in ABCD. then. $OA^2 + OC^2 = OB^2 + OD^2$.

QUADRILATERALS

- **Quadrilaterals :** Quadrilateral is a figure which is bounded by four straight lines. Here, ABCD is a quadrilateral in which BD and AC are two diagonals, which cut each other at O. $\angle A + \angle B + \angle C + \angle D = 360°$

- **Square :** The quadrilateral whose all sides are equal is called square. Every angle is right angle (90°). Diagonals AC and BD are equal and cut each other at 90°.

  ∴ (i) AB = BC = CA = AD = side = a

  (ii) diagonal (AC) = diagonal (BD) = $\sqrt{2}$ side = a $\sqrt{2}$

  (iii) $\angle A = \angle B = \angle C = \angle D = 90°$ (every angle)

  (iv) OD = OB = OA = OC

  (v) Note that square is a special kind of rectangle as well as rhombus. Hence, all properties of Rectangle and Rhombus will be satisfied for a square.

- **Rectangle :** ABCD is a rectangle whose properties are –

  (i) AB = CD and AB || CD, BC = DA and BC || AD.

  (ii) Diagonal AC = Diagonal BD.

  (iii) $\angle A = \angle B = \angle C = \angle D = 90°$

  (iv) $AC^2 = AB^2 + BC^2 = BD^2 = BC^2 + CD^2$

  (v) AC bisects BD and vice versa

Parallelogram :

ABCD is a parallelogram whose properties are–

(i) AB = CD and AB || CD and BC = DA and BC || DA.

(ii) diagonals AC and BD bisect each other means OA = OC and OB = OD, but AC ≠ BD. [Note]

(iii) $\angle A = \angle C$, $\angle B = \angle D$ (opposite angles are equal)

(iv) $\angle A + \angle B = \angle B + \angle C = \angle C + \angle D = \angle D + \angle A = 180°$ (Sum of adjacent angles is 180°)

Rhombus :

□ABCD is a Rhombus whose properties are–

(i) AB = BC = CD = DA (all sides are equal)

(ii) AD || BC, and AB || CD.

(iii) $\angle A = \angle C$ and $\angle B = \angle D$ (but not equal to 90°)

(iv) $\angle A + \angle B = 180°$, $\angle B + \angle C = 180°$, $\angle C + \angle D = 180°$, $\angle D + \angle A = 180°$ [i.e. sum of Adjacent angles is 180°]

(v) The diagonals AC and BD bisect each other at 90°. It means AC ⊥ BD and OA = OC and OD = OB but AC ≠ BD. [Note]

- **Trapezium :** □ABCD is a quadrilateral in which two sides (AB || DC) are parallel to each other but they are not equal (AB ≠ DC), that is called trapezium.

Here, AB || DC But AD ≠ BC

- **Rhomboid :** The quadrilateral in which two adjacent sides are equal to each other.

Some Properties of Quadrilaterals

- **Polygon :** Polygon is a sector (2D-shape) which is bounded by three or more than three straight lines. On the basis of number of sides, there are different names of polygon. In Regular Polygons all sides are equal.

Polygon	No. of sides
Quadrilateral	4
Pentagon	5
Hexagon	6
Heptagon	7
Octagon	8
Nonagon	9
Decagon	10

Properties of Regular Polygons :

(i) Sum of interior angles of a polygon

$= (n - 2) \times 180°$ where n is no. of sides.

(ii) Each exterior angle of a polygon = 180° – (every interior angle).

(iii) Each interior angle of a polygon = $\frac{(n-2) \times 180°}{n}$

(iv) Sum of all exterior angles of a polygon is 360°

(v) Every exterior angle of a polygon = $\frac{360°}{n}$.

(vi) Measurement of each angle at the centr e made by any side of a polygon = $\frac{360°}{n}$

(vii) Number of diagonals of a polygon = $\frac{n(n-3)}{2}$

Area of polygon :

(i) The area of a polygon of n sides

$= \frac{na^2}{4} \cot\left(\frac{\pi}{n}\right)$, where n = no. of sides, a = length of side.

(ii) Radius of outer circle of a polygon having n sides

(R) = $\frac{a}{2} \operatorname{cosec} \frac{180°}{n}$.

(iii) Radius of inner circle of a polygon having n sides (r)

$= \frac{a}{2} \cot \frac{180°}{n}$.

CIRCLE

- **Circle :** A circle is a set of points, lying at a constant distance from a fixed point. That constant distance is called radius (r) and the fixed point is called its centre.

- **Centre :** The fixed point is called the centre of the circle. In the above figure, O is the centre of the circle.
- **Radius :** OA, OB. OC are the radii of circle in the above figure. A radius is the distance from centre of a circle to any point on it's circumference.
- **Chord :** Any line segment whose end points lie on the circle is called a chord. PQ is the chord of circle with centre O as shown above.
- **Diameter :** Diameter is the longest chord of the circle. It is that chord, which passes through the centre.

  A diameter is twice the radius of a circle.
- **Secant :** A line segment that intersects a circle at two points is called a secant. Here, PQ is the secant that intersects the circle at points A and B.

- **Tangent :** A line that touches the circle at one and only one point is called a tangent.

Note : Radius is always perpendicular to the tangent.

$\therefore$ $\angle ORB = \angle ORA = 90°$, So, $OR \perp AB$.

- **Semi-circle :** As the name suggest, semicircle is half the circle.

  A diameter divides a circle into two semi-circles. APB and AQB are two semicircles made by diameter AB. Measure of a semicircle = 180°

- **Arc :** In the given circle, let A and B be any two points on the circle.

  We get two arcs here (by two points) i.e. minor arc AB and major arc AB. An arc is denoted by the symbol $\frown$ e.g. arc AB or ($\overline{AB}$)

- **Sector :** The part of the circle which is bounded by an arc and two radius is called sector.

Here, OAPB is a sector.

- **Segment :** A circle is divided into two parts by a chord, which are called segments. In the given figure, chord AB divides circle into two segments, minor segment and major segment.

- **Circumference :** The perimeter of a circle is called its circumference (C) and it is equal to $2\pi r$. i.e. $C = 2\pi r$

- **Area of Sector :** Area of sector OACB = $\frac{\pi r^2 \theta}{360°}$, where θ is the angle sub-tended at centre by $\widehat{ACB}$.

- **Concentric circles :** Two circles are said to be concentric if they have the same centre.

In the given figure, we have two concentric circles with radius r and R, but with same centre O.

- **Congruent Circles :** Two circles having equal radii, are called congruent circles.
- **Central angle :** Angle subtended at the centre is called the central angle.
- **Circumcircle :** It is the circle drawn around a triangle, in such a way that the vertices of a triangle lie on the circle, as shown here.

- **Incircle :** It is the circle drawn inside a triangle such that all the three sides of triangle are tangents to the circle.
  Since radius is perpendicular to the tangent OA ⊥ XZ, OC ⊥ YZ and OB ⊥ XY. Also OA = OB = OC = r, O is the incentre.

- **Cyclic Quadrilateral :** It is a quadrilateral whose all four vertices lie on the circle. Also the sum of opposite angles is equal to 180°.
  $\therefore\ \angle 1 + \angle 2 = 180°$, also $\angle 2 + \angle 3 = 180°$
  $\Rightarrow\ \angle 1 = \angle 3$.
  i.e. In a cyclic quadrilateral, exterior angle is equal to interior opposite angle.

Properties of Circles :

- If a point lies outside the circle, then distance from that point to centre is greater than radius i.e. OP > OA

- If a point lies inside the circle, then distance from that i.e. OP < OA point to centre is less than radius.

- In the given figure. In two circles of same radii.

If $m\,\widehat{AB} = m\,\widehat{CD}$ then $\widehat{AB} \cong \widehat{CD}$

It means, $\angle AOB = \angle CO'D$ then arc AB $\cong$ arc CD

Again, if $\widehat{AB} \cong \widehat{CD}$ then $m\,\widehat{AB} = m\,\widehat{CD}$

i.e. if arc AB $\cong$ arc CD then $\angle AOB = \angle CO'D$.

* In the given circle,

If $\widehat{AB} = \widehat{CD}$

$\therefore$ AB = CD (Chords)

- In the given figure chord AB = Chord CD, then minor arc AB $\cong$ minor arc CD as chord AC = Chord BD

  $\therefore$ $\widehat{AC} \cong \widehat{BD}$

- In the given figure, if OD $\perp$ AB

  $\therefore$ AD = BD = $\dfrac{AB}{2}$

  $\therefore$ OD = $\sqrt{OA^2 - (AD)^2}$

- If two circles do not touch each other then 4 tangents can be drawn.

- If two circles touch each other externally, then 3 tangents can be drawn.

- If two circles cut each other, then two tangents can be drawn.

- If one circle touches another circle internally, then only one tangent can be drawn.

- There is no common tangent of two concentric circles.

- In the given figure if OP bisect AB, such that AP = BP, then OP $\perp$ AB.

- Only one circle can be drawn through 3 non-collinear points.
- In the given figure, if AB = CD, then OM = ON where OM ⊥ AB and ON ⊥ CD

Converse : If OM = ON then, AB = CD.

- In the given figure, ∠AOB = 2 ∠ACB. i.e. Angle made by an Arc on centre = 2 × Angle made at circumference by same arc.

- Two angles subtended by the same arc AB on two different points C&D at circumference are equal i.e. ∠ACB = ∠ADB.

- Angles subtended by semicircle is right angle i.e. (90°), . ∠ACB = ∠ADB = 90°

- Angles lying on both sides of segments subtended by a chord are supplementary to each other. Here AC is a chord, then, ∠α + ∠β = 180°

- If a circle drawn interior to a parallelogram touches all its sides, then the parallelogram is a Rhombus.

  ∴ □ABCD is a rhombus.

- Only one tangent can be drawn through a point on circumference of circle.
- Two circles touch each other at point P then their centres O and O' and P will be collinear.

- AB and CD are chords of circle which cut each other at O. then OA × OB = OC × OD.

- According to given figure, chords AB and CD cut each other at P externally, then,
  PA × PB = PC × PD.

- According to figure, PT is tangent at point T and AB is a chord, then, PA × PB = $(PT)^2$.

- According to figure, AB is tangent at point P, then, ∠APX = ∠PYX, ∠BPY = ∠PXY.

- In the given figure, PA and PB are two tangents, from a point P, then PA = PB.

- Here, C_1C_2 is the distance between centre of circles.
  ∴ length of each of the common tangent

  $AB = CD = \sqrt{(C_1C_2)^2 - (r_1 - r_2)^2}$

and length of the transverse tangent

$= PS = QR = \sqrt{(C_1C_2)^2 - (r_1 + r_2)^2}$

- If a circle touches all the four sides of a quadrilateral then sum of the opposite sides is equal.
  ∴ AB + DC = AD + BC

- If C_1 and C_2 are two concentric circles and AB is common chord and point P is such that OP ⊥ AB, then AC = BD

- C_1 and C_2 are two circles having centres O and O' and AC and AD diameters respectively. Both circles cut each other at A and B. Then, C, B and D will be collinear.

  $\boxed{\text{B lies on CD.}}$ ∴ ∠CBD = 180°

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. The in-radius of an equilateral triangle is of length 3 cm. Then the length of each of its medians is

(1) 12 cm (2) $\frac{9}{2}$ cm

(3) 4 cm (4) 9 cm

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

2. If the orthocentre and the centroid of a triangle are the same, then the triangle is :

(1) Scalene
(2) Right angled
(3) Equilateral
(4) Obtuse angled

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

3. If in a triangle, the circumcentre, incentre, centroid and orthocentre coincide, then the triangle is

(1) Acute angled (2) Isosceles
(3) Right angled (4) Equilateral

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

4. In a triangle, if three altitudes are equal, then the triangle is

(1) Obtuse (2) Equilateral
(3) Right (4) Isosceles

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

5. If ABC is an equilateral triangle and D is a point on BC such that AD ⊥ BC, then

(1) AB : BD = 1 : 1
(2) AB : BD = 1 : 2
(3) AB : BD = 2 : 1
(4) AB : BD = 3 : 2

(SSC Graduate Level Tier-II Exam. 29.09.2013

6. The side QR of an equilateral triangle PQR is produced to the point S in such a way that QR = RS and P is joined to S. Then the measure of ∠PSR is

(1) 30° (2) 15°
(3) 60° (4) 45°

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

7. If the circumradius of an equilateral triangle be 10 cm, then the measure of its in-radius is

(1) 5 cm. (2) 10 cm.
(3) 20 cm. (4) 15 cm.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

8. If the incentre of an equilateral triangle lies inside the triangle and its radius is 3 cm, then the side of the equilateral triangle is

(1) $9\sqrt{3}$ cm (2) $6\sqrt{3}$ cm

(3) $3\sqrt{3}$ cm (4) 6 cm

(SSC Graduate Level Tier-II Exam.16.09.2012)

9. In a triangle, if orthocentre, circumcentre, incentre and centroid coincide, then the triangle must be

(1) obtuse angled
(2) isosceles
(3) equilateral
(4) right-angled

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

10. If ABC is an equilateral triangle and P, Q, R respectively denote the middle points of AB, BC, CA then.

(1) PQR must be an equilateral triangle
(2) PQ + QR + PR = AB
(3) PQ + QR + PR = 2 AB
(4) PQR must be a right angled triangle

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

11. Let ABC be an equilateral triangle and AX, BY, CZ be the altitudes. Then the right statement out of the four given responses is

(1) AX = BY = CZ
(2) AX ≠ BY = CZ
(3) AX = BY ≠ CZ
(4) AX ≠ BY ≠ CZ

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

12. ABC is an equilateral triangle and CD is the internal bisector of ∠ C. If DC is produced to E such that AC = CE, then ∠ CAE is equal to

(1) 45° (2) 75°
(3) 30° (4) 15°

(SSC CGL Tier-I Exam. 26.10.2014)

13. G is the centroid of the equilateral Δ ABC. If AB = 10 cm then length of AG is

(1) $\frac{5\sqrt{3}}{3}$ cm (2) $\frac{10\sqrt{3}}{3}$ cm

(3) $5\sqrt{3}$ cm (4) $10\sqrt{3}$ cm

(SSC CGL Tier-II Exam. 21.09.2014)

14. The radius of the incircle of the equilateral triangle having each side 6 cm is

(1) $2\sqrt{3}$ cm (2) $\sqrt{3}$ cm

(3) $6\sqrt{3}$ cm (4) 2 cm

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

15. If the three medians of a triangle are same then the triangle is

(1) equilateral (2) isosceles
(3) right-angled (4) obtuse-angle

(SSC CHSL DEO & LDC Exam. 9.11.2014)

16. If in a triangle ABC as drawn in the figure, AB = AC and ∠ACD = 120°, then ∠A is equal to

(1) 50° (2) 60°
(3) 70° (4) 80°

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

17. The side BC of a triangle ABC is extended to D. If ∠ACD = 120° and ∠ABC = $\frac{1}{2}$ ∠CAB, then the value of ∠ABC is

(1) 80° (2) 40°
(3) 60° (4) 20°

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

18. For an equilateral triangle, the ratio of the in-radius and the ex-radius is

(1) 1 : 2 (2) 1 : $\sqrt{2}$

(3) 1 : 3 (4) 1 : $\sqrt{3}$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

19. If the three angles of a triangle are :

$(x + 15°)$, $\left(\frac{6x}{5} + 6°\right)$ and $\left(\frac{2x}{3} + 30°\right)$, then the triangle is :

(1) isosceles (2) right angled

(3) equilateral (4) scalene

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

20. Let ABC be an equilateral triangle and AD perpendicular to BC. Then

$AB^2 + BC^2 + CA^2 = ?$

(1) $2AD^2$ (2) $3AD^2$

(3) $4AD^2$ (4) $5AD^2$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

21. The centroid of an equilateral triangle ABC is G and AB = 10 cm. The length of AG (in cm) is :

(1) $3\frac{1}{3}$ (2) $\frac{10}{\sqrt{3}}$

(3) $\frac{10\sqrt{3}}{3}$ (4) $\frac{\sqrt{3}}{3}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

22. Let AX ⊥ BC of an equilateral triangle ABC. Then the sum of the perpendicular distances of the sides of ΔABC from any point inside the triangle is :

(1) Equal to BC

(2) Equal to AX

(3) Less than AX

(4) Greater than AX

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

23. Let G be the centroid of the equilateral triangle ABC of perimeter 24 cm. Then the length of AG is

(1) $2\sqrt{3}$ cm (2) $\frac{8}{\sqrt{3}}$ cm

(3) $8\sqrt{3}$ cm (4) $4\sqrt{3}$ cm

(SSC CGL Tier-II Online Exam.01.12.2016)

24. O is the orthocentre of ΔABC, and if ∠BOC = 110°, then ∠BAC will be

(1) 110° (2) 70°

(3) 100° (4) 90°

(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

25. The altitude of an equilateral triangle of side $\frac{2}{\sqrt{3}}$ cm is :

(1) $\frac{4}{3}$ m (2) $\frac{4}{\sqrt{3}}$ m

(3) $\frac{4}{3}$ m (4) 1 m

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

26. ABC is an equilateral triangle. Points D, E, F are taken in sides AB, BC, CA respectively, so that AD = CF. Then AE, BF, CD enclosed a triangle which is :

(1) equilateral triangle

(2) isosceles triangle

(3) right angle triangle

(4) None of these

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

27. The centroid of an equilateral triangle ABC is G. If AB is 6 cms, the length of AG is

(1) $\sqrt{3}$ cm (2) $2\sqrt{3}$ cm

(3) $3\sqrt{2}$ cm (4) $2\sqrt{2}$ cm

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting) and (SSC CGL Tier-II (CBE) Exam. 30.11.2016) and (SSC CGL Tier-II (CBE) Exam. 30.11.2016)

28. In ΔABC, the line parallel to BC intersects AB and AC at P and Q respectively. If AB : AP = 5 : 3, then AQ : QC is :

(1) 3 : 2 (2) 2 : 3

(3) 3 : 5 (4) 1 : 2

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

29. The ratio of circumradius and radius of an equilateral triangle is

(1) 1 : 2 (2) 3 : 1

(3) 2 : 1 (4) 1 : 3

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

30. If one angle of a triangle is equal to half the sum of the other two equal angles, then the triangle is :

(1) isosceles (2) scalene

(3) equilateral (4) right angled

(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

31. G is the centroid of the equilateral triangle ABC. If AB = 9 cm, then AG is equal to

(1) $3\sqrt{3}$ cm. (2) 3 cm.

(3) $\frac{3\sqrt{3}}{2}$ cm. (4) 6 cm.

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

32. The lengths of the sides of a triangle are a, b and c respectively. If $a^2 + b^2 + c^2 = ab + bc + ca$, then the triangle is :

(1) isosceles (2) equilateral

(3) scalene (4) right-angled

(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

33. PQR is an equilateral triangle. MN is drawn parallel to QR such that M is on PQ and N is on PR. If PN = 6 cm, then the length of MN is

(1) 3 cm (2) 6 cm

(3) 12 cm (4) 4.5 cm

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

TYPE–II

1. If ΔABC is an isosceles triangle with ∠C = 90° and AC = 5 cm, then AB is :

(1) 5 cm (2) 10 cm

(3) $5\sqrt{2}$ cm (4) 2.5 cm

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

2. ABC is an isosceles triangle such that AB = AC and ∠B = 35°. AD is the median to the base BC. Then ∠BAD is:

(1) 70° (2) 35°

(3) 110° (4) 55°

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

3. ABC is an isosceles triangle with AB = AC. A circle through B touching AC at the middle point intersects AB at P. Then AP : AB is :
(1) 4 : 1 (2) 2 : 3
(3) 3 : 5 (4) 1 : 4
(SSC Graduate Level Tier-I Exam. 21.04.2013)

4. In an isosceles triangle, if the unequal angle is twice the sum of the equal angles, then each equal angle is
(1) 120° (2) 60°
(3) 30° (4) 90°
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

5. Δ ABC is an isosceles triangle and $\overline{AB} = \overline{AC} = 2a$ unit, $\overline{BC} = a$ unit. Draw $\overline{AD} \perp \overline{BC}$, and find the length of $\overline{AD}$.
(1) $\sqrt{15}\,a$ unit (2) $\frac{\sqrt{15}}{2}\,a$ unit
(3) $\sqrt{17}\,a$ unit (4) $\frac{\sqrt{17}}{2}\,a$ unit
(SSC Graduate Level Tier-II Exam. 29.09.2013

6. An isosceles triangle ABC is right-angled at B.D is a point inside the triangle ABC. P and Q are the feet of the perpendiculars drawn from D on the side AB and AC respectively of Δ ABC. If AP = a cm, AQ = b cm and ∠BAD = 15°, sin 75°=
(1) $\frac{2b}{\sqrt{3}\,a}$ (2) $\frac{a}{2b}$
(3) $\frac{\sqrt{3}a}{2b}$ (4) $\frac{2a}{\sqrt{3}\,b}$
(SSC Graduate Level Tier-II Exam. 29.09.2013

7. ABC is an isosceles triangle with AB = AC. The side BA is produced to D such that AB = AD. If ∠ABC = 30°, then ∠BCD is equal to
(1) 45° (2) 90°
(3) 30° (4) 60°
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

8. In a triangle ABC, AB = AC, ∠BAC = 40° Then the external angle at B is :
(1) 90° (2) 70°
(3) 110° (4) 80°
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

9. If Δ FGH is isosceles and FG < 3 cm, GH = 8 cm, then of the following, the true relation is.
(1) GH = FH (2) GF = GH
(3) FH > GH (4) GH < GF
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

10. If angle bisector of a triangle bisect the opposite side, then what type of triangle is it ?
(1) Right angled (2) Scalene
(3) Similar (4) Isosceles
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

11. ABC is an isosceles triangle such that AB = AC and AD is the median to the base BC with ∠ABC = 35°. Then ∠BAD is
(1) 35° (2) 55°
(3) 70° (4) 110°
(SSC CGL Tier-II Exam. 21.09.2014)

12. In Δ ABC, BD and CE are perpendicular to AC and AB respectively. If BD = CE, then Δ ABC is
(1) Equilateral (2) Isosceles
(3) Right–angled (4) Scalene
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

13. In an isosceles triangle, if the vertex angle is twice the sum of the base angles, then the measure of the half of the vertex angle of the triangle is
(1) 60° (2) 70°
(3) 80° (4) 50°
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

14. ΔABC is an isosceles triangle with AB = AC = 10 cm, AD = 8 cm is the median on BC from A. The length of BC is
(1) 8 cm (2) 12 cm
(3) 10 cm (4) 6 cm
(SSC CGL Tier-I Re-Exam, 30.08.2015)

15. ABC is an isosceles triangle inscribed in a circle. If AB = AC = $12\sqrt{5}$ cm and BC = 24 cm then the radius of circle is
(1) 10 cm. (2) 15 cm.
(3) 12 cm. (4) 14 cm.
(SSC CGL Tier-II Online Exam.01.12.2016)

16. ABC is an isosceles triangle where AB = AC which is circumscribed about a circle. If P is the point where the circle touches the side BC, then which of the following is true?
(1) BP = PC (2) BP > PC
(3) BP < PC (4) BP = $\frac{1}{2}$PC
(SSC CGL Tier-II Online Exam.01.12.2016)

17. In an isosceles triangle ABC, AB = AC, XY || BC. If ∠A = 30°, then ∠BXY = ?
(1) 75° (2) 30°
(3) 150° (4) 105°
(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

18. The vertical angle A of an isosceles triangle ΔABC is three times the angle B of it. The measure of the angle A is
(1) 90° (2) 108°
(3) 100° (4) 36°
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

19. ΔABC is isosceles having AB = AC and ∠A = 40°. Bisectors PO and OQ of the exterior angles ∠ABD and ∠ACE formed by producing BC on both sides, meet at O. Then the value of ∠BOC is
(1) 70° (2) 110°
(3) 80° (4) 55°
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

20. ΔABC is an isosceles triangle with AB = AC = 15 cm and altitude from A to BC is 12 cm. The length of side BC is :
(1) 9 cm. (2) 12 cm.
(3) 18 cm. (4) 20 cm.
(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (Ist Sitting)

21. In an isosceles ΔABC, AD is the median to the unequal side meeting BC at D. DP is the angle bisector of ∠ADB and PQ is drawn parallel to BC meeting AC at Q. Then the measure of ∠PDQ is :
(1) 130° (2) 90°
(3) 180° (4) 45°
(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (Ist Sitting)

22. In the figure (not drawn to scale) given below, if AD = DC = BC and ∠BCE = 96°, then ∠DBC is :

(1) 32° (2) 84°
(3) 64° (4) 96°

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

23. In an isosceles triangle ΔABC, AB = AC and ∠A = 80°. The bisector of ∠B and ∠C meet at D. The ∠BDC is equal to
(1) 90° (2) 100°
(3) 130° (4) 80°

(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

24. ΔABC is an isosceles right angled triangle having ∠C = 90°. If D is any point on AB, then $AD^2 + BD^2$ is equal to
(1) CD^2 (2) $2CD^2$
(3) $3CD^2$ (4) $4CD^2$

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–III

1. The sides of a triangle are in the ratio 3 : 4 : 6. The triangle is :
(1) acute-angled
(2) right-angled
(3) obtuse-angled
(4) either acute-angled or right-angled

(SSC CPO Sub-Inspector Exam. 16.12.2007)

2. O and C are respectively the orthocentre and circumcentre of an acute-angled triangle PQR. The points P and O are joined and produced to meet the side QR at S. If ∠PQS = 60° and ∠QCR = 130°, then ∠RPS =
(1) 30° (2) 35°
(3) 100° (4) 60°

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

3. In Δ ABC, AD is the internal bisector of ∠A, meeting the side BC at D. If BD = 5 cm, BC = 7.5 cm, then AB : AC is
(1) 2 : 1 (2) 1 : 2
(3) 4 : 5 (4) 3 : 5

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

4. If the circumcentre of a triangle lies outside it, then the triangle is
(1) Equilateral
(2) Acute angled
(3) Right angled
(4) Obtuse angled

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

5. Taking any three of the line segments out of segments of length 2 cm, 3 cm, 5 cm and 6 cm, the number of triangles that can be formed is :
(1) 3 (2) 2
(3) 1 (4) 4

(SSC Graduate Level Tier-I Exam. 21.04.2013)

6. If the length of the sides of a triangle are in the ratio 4 : 5 : 6 and the inradius of the triangle is 3 cm, then the altitude of the triangle corresponding to the largest side as base is :
(1) 7.5 cm (2) 6 cm
(3) 10cm (4) 8 cm

(SSC Graduate Level Tier-I Exam. 21.04.2013)

7. ABC is a triangle. The bisectors of the internal angle ∠B and external angle ∠C intersect at D. If ∠BDC= 50°, then ∠A is
(1) 100° (2) 90°
(3) 120° (4) 60°

(SSC Graduate Level Tier-I Exam. 21.04.2013)

8. In a triangle ABC, the side BC is extended up to D. Such that CD = AC, if ∠BAD = 109° and ∠ACB = 72° then the value of ∠ABC is
(1) 35° (2) 60°
(3) 40° (4) 45°

(SSC Graduate Level Tier-I Exam. 21.04.2013)

9. The sum of three altitudes of a triangle is
(1) equal to the sum of three sides
(2) less than the sum of sides
(3) greater than the sum of sides
(4) twice the sum of sides

(SSC Graduate Level Tier-I Exam. 19.05.2013)

10. I is the incentre of Δ ABC, ∠ABC = 60° and ∠ACB = 50°. Then ∠ BIC is :
(1) 55° (2) 125°
(3) 70° (4) 65°

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

11. I is the incentre of a triangle ABC. If ∠ABC = 65° and ∠ACB = 55°, then the value of ∠BIC is
(1) 130° (2) 120°
(3) 140° (4) 110°

(SSC Graduate Level Tier-II Exam.16.09.2012)

12. If two angles of a triangle are 21° and 38°, then the triangle is
(1) Right-angled triangle
(2) Acute-angled triangle
(3) Obtuse-angled triangle
(4) Isosceles triangle

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

13. In ΔABC, ∠C is an obtuse angle. The bisectors of the exterior angles at A and B meet BC and AC produced at D and E respectively. If AB = AD = BE, then ∠ACB =
(1) 105° (2) 108°
(3) 110° (4) 135°

(SSC CGL Tier-I Exam. 19.10.2014)

14. A man goes 24 m due west and then 10 m due north. Then the distance of him from the starting point is
(1) 17 m (2) 26 m
(3) 28 m (4) 34 m

(SSC CGL Tier-II Exam. 21.09.2014)

15. The perpendiculars drawn from the vertices to the opposite sides of a triangle, meet at the point whose name is
(1) incentre
(2) circumcentre
(3) centroid
(4) orthocentre

(SSC CHSL DEO & LDC Exam. 20.10.2013)

16. If in Δ ABC, ∠ABC = 5 ∠ACB and ∠BAC = 3 ∠ACB, then ∠ABC = ?
(1) 130° (2) 80°
(3) 100° (4) 120°

(SSC CHSL DEO & LDC Exam. 20.10.2013)

17. The exterior angles obtained on producing the base BC of a triangle ABC in both ways are 120° and 105°, then the vertical ∠A of the triangle is of measure
(1) 36° (2) 40°
(3) 45° (4) 55°

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

18. If AD, BE and CF are medians of ΔABC, then which one of the following statements is correct ?
(1) (AD + BE + CF) < AB + BC + CA
(2) AD+BE + CF > AB + BC + CA
(3) AD+BE + CF = AB + BC + CA
(4) AD+BE+CF= $\sqrt{2}$ (AB+BC+ CA)

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

19. In ΔABC, the internal bisectors of ∠ABC and ∠ACB meet at I and ∠BAC = 50°. The measure of ∠BIC is
(1) 105° (2) 115°
(3) 125° (4) 130°
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

20. AD is the median of a triangle ABC and O is the centroid such that AO = 10 cm. The length of OD (in cm) is
(1) 4 (2) 5
(3) 6 (4) 8
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

21. O is the incentre of ΔABC and ∠A = 30°, then ∠BOC is
(1) 100° (2) 105°
(3) 110° (4) 90°
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

22. Let *O* be the in-centre of a triangle *ABC* and *D* be a point on the side *BC* of Δ*ABC*, such that *OD* ⊥ *BC*. If ∠*BOD* = 15°, then ∠*ABC* =
(1) 75° (2) 45°
(3) 150° (4) 90°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

23. In a triangle ABC, incentre is O and ∠BOC = 110°, then the measure of ∠BAC is :
(1) 20° (2) 40°
(3) 55° (4) 110°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

24. The equidistant point from the vertices of a triangle is called its :
(1) Centroid (2) Incentre
(3) Circumcentre (4) Orthocentre
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

25. O is the in-centre of the ΔABC, if ∠BOC = 116°, then ∠BAC is
(1) 42° (2) 62°
(3) 58° (4) 52°
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

26. The external bisector of ∠B and ∠C of ΔABC (where AB and AC extended to E and F respectively) meet at point P. If ∠BAC = 100°, then the measure of ∠BPC is
(1) 50° (2) 80°
(3) 40° (4) 100°
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

27. The points D and E are taken on the sides AB and AC of ΔABC such that AD = $\frac{1}{3}$ AB, AE = $\frac{1}{3}$ AC. If the length of BC is 15 cm, then the length of DE is :
(1) 10 cm (2) 8 cm
(3) 6 cm (4) 5 cm
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

28. *D* is any point on side *AC* of • *ABC*. If *P, Q, X, Y* are the mid-points of *AB*, *BC*, *AD* and *DC* respectively, then the ratio of *PX* and *QY* is
(1) 1 : 2 (2) 1 : 1
(3) 2 : 1 (4) 2 : 3
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

29. In Δ ABC, PQ is parallel to BC. If AP : PB = 1 : 2 and AQ = 3 cm; AC is equal to
(1) 6 cm (2) 9 cm
(3) 12 cm (4) 8 cm
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

30. In a triangle ABC, AB + BC = 12 cm, BC + CA = 14 cm and CA + AB = 18 cm. Find the radius of the circle (in cm) which has the same perimeter as the triangle.
(1) $\frac{5}{2}$ (2) $\frac{7}{2}$
(3) $\frac{9}{2}$ (4) $\frac{11}{2}$
(SSC Graduate Level Tier-II Exam.16.09.2012)

31. If I be the incentre of Δ ABC and ∠B = 70° and ∠C = 50°, then the magnitude of ∠BIC is
(1) 130° (2) 60°
(3) 120° (4) 105°
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

32. For a triangle ABC, D, E, F are the mid-points of its sides. If ΔABC = 24 sq. units then ΔDEF is
(1) 4 sq. units (2) 6 sq. units
(3) 8 sq. units (4) 12 sq. units
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

33. Angle between sss ∠B is
(1) 50° (2) 80°
(3) 40° (4) 60°
(SSC CGL Tier-II Exam. 21.09.2014)

42. In a Δ ABC, ∠ A + ∠ B = 70° and ∠ B + ∠ C = 130°, value of ∠ A is
(1) 20° (2) 50°
(3) 110° (4) 30°
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

43. In a Δ ABC, if 2 ∠ A = 3 ∠ B = 6 ∠C, value of ∠ B is
(1) 60° (2) 30°
(3) 45° (4) 90°
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

44. If in a triangle ABC, D and E are on the sides AB and AC, such that, DE is parallel to BC and $\frac{AD}{BD} = \frac{3}{5}$. If AC = 4 cm, then AE is
(1) 1.5 cm (2) 2.0 cm
(3) 1.8 cm (4) 2.4 cm
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

45. AD is the median of a triangle ABC and O is the centroid such that AO = 10 cm. Length of OD (in cm) is
(1) 2 (2) 4
(3) 5 (4) 7
(SSC CHSL DEO & LDC Exam. 16.11.2014)

46. The measure of the angle between the internal and external bisectors of an angle is
(1) 60° (2) 70°
(3) 80° (4) 90°
(SSC CHSL DEO & LDC Exam. 16.11.2014)

47. The internal bisectors of the angles B and C of a triangle ABC meet at I. If ∠BIC = $\frac{\angle A}{2}$ + X, then X is equal to
(1) 60° (2) 30°
(3) 90° (4) 45°
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

48. In a ΔABC, the medians AD, BE and CF meet at G, then which of the following is true ?

(1) $AD + BE + CF > \frac{1}{2}(AB + BC + AC)$
(2) $2(AD + BE + CF) > (AB + BC + AC)$
(3) $3(AD + BE + CF) > 4(AB + BC + AC)$
(4) $AB + BC + AC > AD + BE + CF$

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

49. In ΔABC, D is the mid-point of BC. Length AD is 27 cm. N is a point in AD such that the length of DN is 12 cm. The distance of N from the centroid of ΔABC is equal to

(1) 3 cm (2) 6 cm
(3) 9 cm (4) 15 cm

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

50. In a Δ ABC, $\frac{AB}{AC} = \frac{BD}{DC}, \angle B = 70°$ and $\angle C = 50°$, then $\angle BAD$ = ?

(1) 60° (2) 20°
(3) 30° (4) 50°

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

51. In a Δ ABC, AD, BE and CF are three medians. The perimeter of Δ ABC is always

(1) equal to $\left(\overline{AD} + \overline{BE} + \overline{CF}\right)$
(2) greater than $\left(\overline{AD} + \overline{BE} + \overline{CF}\right)$
(3) less than $\left(\overline{AD} + \overline{BE} + \overline{CF}\right)$
(4) None of these

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

52. In a Δ ABC, $\overline{AD}$, $\overline{BE}$ and $\overline{CF}$ are three medians. Then the ratio $\left(\overline{AD} + \overline{BE} + \overline{CF}\right)$: $\left(\overline{AB} + \overline{AC} + \overline{BC}\right)$ is

(1) equal to $\frac{3}{4}$
(2) less than $\frac{3}{4}$
(3) greater than $\frac{3}{4}$
(4) equal to $\frac{1}{2}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

53. In ΔABC, $\angle A < \angle B$. The altitude to the base divides vertex angle C into two parts C_1 and C_2, with C_2, adjacent to BC. Then

(1) $C_1 + C_2 = A + B$
(2) $C_1 - C_2 = A - B$
(3) $C_1 - C_2 = B - A$
(4) $C_1 + C_2 = B - A$

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

54. If O is the in-centre of ΔABC; if $\angle BOC = 120°$, then the measure of $\angle BAC$ is

(1) 30° (2) 60°
(3) 150° (4) 75°

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

55. In Δ ABC, $\angle B = 60°$, $\angle C = 40°$, AD is the bisector of $\angle A$ and AE is drawn perpendicular on BC from A. Then the measure of $\angle EAD$ is

(1) 40° (2) 30°
(3) 10° (4) 80°

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

56. If the sides of a triangle are extended in both the sides then the sum of the exterior angles so formed in both sides is

(1) 360° (2) 540°
(3) 720° (4) 180°

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

57. In ΔABC, $\angle A = 90°$, BP and CQ are two medians. Then the value of $\frac{BP^2 + CQ^2}{BC^2}$ is

(1) $\frac{4}{5}$ (2) $\frac{5}{4}$
(3) $\frac{3}{4}$ (4) $\frac{3}{5}$

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

58. In Δ ABC, AB = AC, O is a point on BC such that BO = CO and OD is perpendicular to AB and OE is perpendicular to AC. If $\angle BOD = 30°$ then measure of $\angle AOE$ is

(1) 45° (2) 60°
(3) 75° (4) 30°

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

59. O is the orthocentre of ΔABC. Then $\angle BOC + \angle BAC$ is equal to

(1) 120° (2) 135°
(3) 180° (4) 90°

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

60. ABC is a triangle and the sides AB, BC and CA are produced to E, F and G respectively. If $\angle CBE = \angle ACF = 130°$ then the value of $\angle GAB$ is

(1) 100° (2) 130°
(3) 80° (4) 90°

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

61. The measures of two angles of a triangle are in the ratio 4 : 5. If the sum of these two measures is equal to the measure of the third angle, find the smallest angle.

(1) 10° (2) 50°
(3) 90° (4) 40°

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

62. Internal bisectors of $\angle Q$ and $\angle R$ of ΔPQR intersect at O. If $\angle ROQ = 96°$ then the vlaue of $\angle RPQ$ is

(1) 36° (2) 24°
(3) 12° (4) 6°

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

63. G is the centroid of ΔABC. The medians AD and BE intersect at right angles. If the lengths of AD and BE are 9 cm and 12 cm respectively; then the length of AB (in cm) is

(1) 9.5 (2) 10
(3) 11 (4) 10.5

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

64. In ΔABC, D and E are two mid points of sides AB and AC respectively. If $\angle BAC = 40°$ and $\angle ABC = 65°$ then $\angle CED$ is :

(1) 130° (2) 75°
(3) 125° (4) 105°

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

65. O is the incentre of ΔPQR and $\angle QPR = 50°$, then the measure of $\angle QOR$ is :
(1) 125° (2) 100°
(3) 130° (4) 115°
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

66. The internal bisectors of the $\angle B$ and $\angle C$ of the ΔABC, intersect at O. If $\angle A = 100°$, then the measure of $\angle BOC$ is :
(1) 140° (2) 120°
(3) 110° (4) 130°
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

67. In Δ ABC $\angle BAC = 90°$ and AD $\perp$ BC. If BD = 3 cm and CD = 4 cm, then the length of AD is
(1) 3.5 cm (2) 5 cm
(3) $2\sqrt{3}$ cm (4) 6 cm
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

68. AD is perpendicular to the internal bisector of $\angle ABC$ of Δ ABC. DE is drawn through D and parallel to BC to meet AC at E. If the length of AC is 12 cm, then the length of AE (in cm.) is
(1) 3 (2) 8
(3) 4 (4) 6
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

69. What is the position of the circumcentre of an obtuse–angled triangle?
(1) It lies inside the triangle.
(2) It lies outside the triangle.
(3) It is the mid–point of the largest side.
(4) It is the vertex opposite to the largest side.
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

70. In ΔABC, the external bisectors of the angles $\angle B$ and $\angle C$ meet at the point O. If $\angle A = 70°$, then the measure of $\angle BOC$ is :
(1) 55° (2) 75°
(3) 60° (4) 50°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

71. E is the mid-point of the median AD of ΔABC. BE is joined and produced to meet AC at F. F divides AC in the ratio :
(1) 2 : 3 (2) 2 : 1
(3) 1 : 3 (4) 3 : 2
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

72. In Δ ABC, the internal bisectors of $\angle B$ and $\angle C$ meet at point O. If $\angle A = 80°$, then $\angle BOC$ is equal to :
(1) 100° (2) 120°
(3) 130° (4) 140°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

73. The sides of a triangle are in the ratio of 7 : 9 : 12. The difference between the lengths of largest and smallest sides is 15 cm. The length of the largest side would be :
(1) 36 cm (2) 12 cm
(3) 60 cm (4) 24 cm
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

74. In ΔABC, $\angle B = 60°$, and $\angle C = 40°$, AD and AE are respectively the bisector of $\angle A$ and perpendicular on BC. The measure of $\angle EAD$ is :
(1) 11° (2) 10°
(3) 12° (4) 9°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

75. The side BC of a triangle ABC is produced to D. If $\angle ACD = 112°$ and $\angle B = \frac{3}{4} \angle A$, then the measure of $\angle B$ is
(1) 30° (2) 48°
(3) 45° (4) 64°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

76. In a triangle ABC, if $\angle A + \angle C = 140°$ and $\angle A + 3\angle B = 180°$, then $\angle A$ is equal to
(1) 80° (2) 40°
(3) 60° (4) 20°
(SSC CGL Tier-I (CBE) Exam.10.09.2016)

77. Which of the set of three sides can't form a triangle?
(1) 5 cm, 6 cm, 7 cm
(2) 5 cm, 8 cm, 15 cm
(3) 8 cm, 15 cm, 18 cm
(4) 6 cm, 7 cm, 11 cm
(SSC CGL Tier-I (CBE) Exam.10.09.2016)

78. The orthocentre of a triangle is the point where
(1) the medians meet
(2) the altitudes meet
(3) the right bisectors of the sides meet
(4) the bisectors of the angles meet
(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

79. G is the centroid of ΔABC. If AG = BC, then measure of $\angle BGC$ is
(1) 45° (2) 60°
(3) 90° (4) 120°
(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

80. B_1 is a point on the side AC of ΔABC and B_1B is joined. A line is drawn through A parallel to B_1B meeting BC at A_1 and another line is drawn through C parallel to B_1B meeting AB produced at C_1. Then
(1) $\frac{1}{CC_1} - \frac{1}{AA_1} = \frac{1}{BB_1}$
(2) $\frac{1}{CC_1} + \frac{1}{AA_1} = \frac{1}{BB_1}$
(3) $\frac{1}{BB_1} - \frac{1}{AA_1} = \frac{2}{CC_1}$
(4) $\frac{1}{AA_1} - \frac{1}{CC_1} = \frac{2}{BB_1}$
(SSC CGL Tier-II Online Exam.01.12.2016)

81. Astha cuts a triangle out of a cardboard and tries to balance the triangle horizontally at the tip of her finger. On what point will she be able to balance the shape for any kind of triangle?
(1) Incentre
(2) Circumcentre
(3) Centroid
(4) Orthocentre
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

82. BE and CF are two altitudes of a triangle ABC. If AB = 6 cm, AC = 5 cm and CF = 4 cm, then the length of BE is
(1) 4.8 cm (2) 7.5 cm
(3) 3.33 cm (4) 5.5 cm
(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

83. In a ΔABC, BC is extended upto D. $\angle ACD = 120°$, $\angle B = \frac{1}{2} \angle A$. Then $\angle A$ is
(1) 60° (2) 75°
(3) 80° (4) 90°
(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

84. In ΔABC, D is the mid–point of BC and G is the centroid. If GD = 5 cm, then the length of AD is :
(1) 10 cm (2) 12 cm
(3) 15 cm (4) 20 cm
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

85. Possible measures of three angles of a triangle are
(1) 33°, 42°, 115°
(2) 40°, 70°, 80°
(3) 30°, 60°, 100°
(4) 50°, 60°, 70°
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

86. BD and CE are two medians of the triangle ABC. If EO = 7cm, then the length of CE is

(1) 28 cm (2) 14 cm
(3) 21 cm (4) 35 cm
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

87. In ΔABC, AB = $a - b$, AC = $\sqrt{a^2+b^2}$ and BC = $\sqrt{2ab}$, then find angle B.
(1) 60° (2) 30°
(3) 90° (4) 45°
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

88. Possible lengths of the three sides of a triangle are :
(1) 2 cm, 3 cm and 6 cm
(2) 3 cm, 4 cm and 5 cm
(3) 2.5 cm, 3.5 cm and 6 cm
(4) 4 cm, 4 cm and 9 cm
(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

89. AD is the median of Δ ABC. If O is the centroid and AO = 10 cm, then OD is
(1) 5 cm (2) 20 cm
(3) 10 cm (4) 30 cm
(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

90. Incentre of Δ ABC is I. ∠ABC = 90° and ∠ACB = 70°. ∠AIC is
(1) 115° (2) 100°
(3) 110° (4) 105°
(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

91. If in ΔABC, DE||BC, AB = 7.5 cm, BD = 6 cm. and DE = 2cm, then the length of BC in cm is :
(1) 6 (2) 8
(3) 10 (4) 10.5
(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

92. Suppose that the medians BD, CE and AF of a triangle ABC meet at G. Then AG : GF is
(1) 1 : 2 (2) 2 : 1
(3) 1 : 3 (4) 2 : 3
(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

93. In case of an acute angled triangle, its orthocentre lies
(1) inside the triangle
(2) outside the triangle
(3) on the traingle
(4) on one of the vertices of the triangle
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

94. The centroid of a triangle is the point where
(1) the medians meet
(2) the altitudes meet
(3) the right bisectors of the sides of the triangle meet
(4) the bisectors of the angles of the triangle meet
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

95. In a triangle PQR, the side QR is extended to S. ∠QPR = 72° and ∠PRS = 110°, then the value of ∠PQR is :
(1) 38° (2) 32°
(3) 25° (4) 29°
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

96. In ΔABC, ∠B = 70° and ∠C = 60°. The internal bisectors of the two smallest angles of ΔABC meet at O. The angle so formed at O is
(1) 125° (2) 120°
(3) 115° (4) 110°
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

97. If the angles of a triangle are in the ratio of 2 : 3 : 4, then the difference of the measure of greatest angle and smallest angle is
(1) 20° (2) 30°
(3) 40° (4) 50°
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

98. In ΔABC, ∠A = 90°, AD ⊥ BC and AD = BD = 2 cm. The length of CD is
(1) 3 cm (2) 3.5 cm
(3) 3.2 cm (4) 2 cm
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

99. The side BC of ΔABC is extended to the point D. If ∠ACD = 112° and ∠B = $\frac{3}{4}$ ∠A, then the value of ∠B is
(1) 64° (2) 48°
(3) 46° (4) 50°
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

100. The lengths of side AB and side BC of a scalene triangle ABC are 12 cm and 8 cm respectively. The size of angle C is 90°. Find the **approximate** length of side AC.
(1) 12 (2) 9
(3) 14 (4) 16
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

101. In ΔABC, DE||BC such that $\frac{AD}{BD} = \frac{3}{5}$. If AC = 5.6 cm., then AE is equal to
(1) 4.2 cm. (2) 3.1 cm.
(3) 2.8 cm. (4) 2.1 cm.
(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

102. In a triangle PQR, PQ = PR and ∠Q is twice that of ∠P. Then ∠Q is equal to
(1) 72° (2) 36°
(3) 144° (4) 108°
(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

103. G and AD are respectively the centroid and median of the triangle ΔABC.The ratio AG:AD is equal to
(1) 3:2 (2) 2:3
(3) 2:1 (4) 1:2
(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

104. A point P lying inside a triangle is equidistant from the vertices of the triangle. Then the triangle has P as its
(1) Centroid (2) Incentre
(3) Orthocentre (4) Circumcentre
(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

105. In ΔABC if the median $\frac{1}{2}$ AD = BC, then $\angle BAC$ is equal to
(1) 90° (2) 45°
(3) 60° (4) 75°
(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

106. In ΔABC two medians BE and CF intersect at the point O and P, Q are the midpoints of BO and CO respectively. If the length of PQ = 3cm, then the length of FE will be
(1) 3 cm (2) 6 cm
(3) 9 cm (4) 12 cm
(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

107. In a triangle PQR, S and T are the points on PQ and PR respectively, such that ST || QR and $\frac{PS}{SQ} = \frac{3}{5}$, PR = 6 cm, then PT is
(1) 2 cm (2) 2.25 cm
(3) 3.5 cm (4) 4 cm
(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

108. The point where the all three medians of a triangle meet is called
(1) Centroid (2) Incentre
(3) Circumcentre (4) Orthocentre
(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

109. An exterior angle of a triangle is 115° and one of the interior opposite angles is 45°. Then the other two angles are
(1) 65°, 70° (2) 60°, 75°
(3) 45°, 90° (4) 50°, 85°
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

110. In a ΔABC, $\angle A + \angle B = 75°$ and $\angle B + \angle C = 140°$, then $\angle B$ is
(1) 40° (2) 35°
(3) 55° (4) 45°
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

111. In ΔPQR, straight line parallel to the base QR cuts PQ at X and PR at Y. If PX : XQ = 5 : 6, then XY : QR will be
(1) 5 : 11 (2) 6 : 5
(3) 11 : 6 (4) 11 : 5
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

112. The mid points of AB and AC of the ΔABC are P and Q respectively. If PQ = 6 cm., then the side BC is
(1) 10 cm. (2) 12 cm.
(3) 8 cm. (4) 14 cm.
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

113. The difference between the largest and the smallest angles of a triangle whose angles are in the ratio of 5 : 3 : 10 is
(1) 20° (2) 30°
(3) 50° (4) 70°
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

114. In ΔABC, AC = BC and $\angle ABC$ = 50°, the side BC is produced to D so that BC = CD then the value of $\angle BAD$ is
(1) 80° (2) 40°
(3) 90° (4) 50°
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

115. ΔABC is a triangle, PQ is line segment intersecting AB in P and AC in Q and PQ || BC. The ratio of AP : BP = 3 : 5 and length of PQ is 18 cm. The length of BC is
(1) 28 cm. (2) 48 cm.
(3) 84 cm. (4) 42 cm.
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

116. The mid-points of sides AB and AC of a triangle ABC are respectively X and Y. If (BC + XY) = 12 units, then the value of (BC – XY) is :
(1) 2 units (2) 6 units
(3) 8 units (4) 4 units
(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (Ist Sitting) and (SSC CGL Tier-I (CBE) Exam. 29.08.2016 (Ist Sitting))

117. In a triangle ABC, OB and OC are the bisectors of angles $\angle B$ and $\angle C$ respectively. $\angle BAC = 60°$. The angle $\angle BOC$ will be :
(1) 150° (2) 120°
(3) 100° (4) 90°
(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

118. If the difference between the measures of the two smaller angles of a right angled triangle is 8°, then the smallest angle is :
(1) 37° (2) 41°
(3) 42° (4) 49°
(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

119. Let O be the orthocentre of the triangle ABC. If $\angle BOC = 150°$, Then $\angle BAC$ is
(1) 30° (2) 60°
(3) 90° (4) 120°
(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

120. The orthocentre of a triangle lies on one of the sides. Then
(1) The orthocentre lies on a vertex
(2) circumcentre lies outside the triangle
(3) circumcentre lies on the same side
(4) centroid coincides with orthocentre
(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

121. Three sides of a triangle are 5 cm, 9 cm and x cm. The minimum integral value of x is :
(1) 2 (2) 3
(3) 4 (4) 5
(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

122. If the measures of the angles of a triangle are in the ratio. 1 : 2 : 3 and if the length of the smallest side of the triangle is 10 cm, then the length of the longest side is
(1) 20 cm. (2) 25 cm.
(3) 30 cm. (4) 35 cm.
(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

123. In ΔABC, the height CD intersects AB at D. The mid-points of AB and BC are P and Q respectively. If AD = 8 cm and CD = 6 cm, then the length of PQ is
(1) 3 cm (2) 7 cm
(3) 9 cm (4) 5 cm
(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

124. The lengths of three line segments are given. Is construction of a triangle possible with the segments in the given cases?
(1) 8 cm, 7 cm, 18 cm
(2) 8 cm, 15 cm, 17 cm
(3) 10 cm, 6 cm, 4 cm
(4) 8 cm, 10 cm, 20 cm
(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

125. The point equidistant from the vertices of a triangle is called its
(1) incentre (2) circumcentre
(3) orthocentre (4) centroid
(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

126. The sum of two angles of a triangle is 116° and their difference is 24°. The measure of the smallest angle of the triangle is :
(1) 38° (2) 28°
(3) 46° (4) 64°
(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

127. In a ΔABC, DE || BC. D and E lie on AB and AC respectively. If AB = 7 cm and BD = 3 cm, then find BC : DE.
(1) 2 : 3 (2) 3 : 2
(3) 3.5 : 2 (4) 7 : 2
(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

128. In ΔABC, $\angle B = 35°$, $\angle C = 65°$ and the bisector of $\angle BAC$ meets BC in D. Then $\angle ADB$ is :
(1) 40° (2) 75°
(3) 90° (4) 105°
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

129. The orthocentre of an obtuseangled triangle lies
(1) inside the triangle
(2) outside the triangle
(3) on one side of a triangle
(4) None of these
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

130. In an acute–angled triangle ABC if $\sin(B + C - A) = \frac{\sqrt{3}}{2}$ and $\tan(C + A - B) = 1$, then C is equal to
(1) 37.5° (2) 67.5°
(3) 52.5° (4) 72.5°
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

131. In a triangle XYZ, which of the following conditions is true?
(1) XY – YZ > ZX
(2) XY + YZ < ZX
(3) XY – YZ < XZ
(4) XY + ZX < YZ
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

132. In ΔABC, if $\angle BAC = 90°$ and AB = AC, then $\angle ABC$ is :
(1) 30° (2) 60°
(3) 45° (4) 25°
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

133. The point equidistant from the sides of a triangle is called
(1) Circumcentre
(2) Incentre
(3) Orthocentre
(4) Centroid
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

134. In ΔABC and ΔDEF, if $\angle A = 50°$, $\angle B = 70°$, $\angle C = 60°$, $\angle D = 60°$, $\angle E = 70°$ and $\angle F = 50°$, then
(1) $\Delta ABC \sim \Delta FED$
(2) $\Delta ABC \sim \Delta DFE$
(3) $\Delta ABC \sim \Delta EDF$
(4) $\Delta ABC \sim \Delta DEF$
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

135. In a ΔABC, if $4\angle A = 3\angle B = 12\angle C$, find $\angle A$.
(1) 22.5° (2) 90°
(3) 67.5° (4) 112.5°
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

136. Which one of the following combination of measurements can form the sides of a triangle?
(1) 9 cm., 6 cm., 2 cm..
(2) 11 cm., 3 cm., 12 cm.
(3) 3 cm., 5 cm., 8 cm.
(4) 5 cm., 7 cm., 13 cm.
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

137. In triangle ABC, $\angle BAC = 90°$ and AD is perpendicular to BC. If AD = 6 cm and BD = 4 cm, then the length of BC is :
(1) 10 cm. (2) 12 cm.
(3) 13 cm. (4) 15 cm.
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

138. D and E are the points on the sides AB and AC respectively of a ΔABC and AD = 8 cm, DB = 12 cm, AE = 6 cm and EC = 9 cm, then BC is equal to :
(1) $\frac{2}{5}DE$ (2) $\frac{5}{2}DE$
(3) $\frac{3}{2}DE$ (4) $\frac{2}{3}DE$
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

139. If in ΔABC, $\angle B = 5\angle C$ and $\angle A = 3\angle C$, then the measure of $\angle C$ is
(1) 45° (2) 30°
(3) 20° (4) 5°
(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

140. X and Y are the mid-points of sides AB and AC of a triangle ABC. If (BC + XY) = 12 units, then (BC – XY) is
(1) 8 units (2) 4 units
(3) 6 units (4) 2 units
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

141. In ΔPQR, L and M are two points on the sides PQ and PR respectively such that LM is parallel to QR. If PL = 2cm. LQ = 6 cm and PM = 1.5 cm, then MR (in cm) is
(1) 0.5 (2) 4.5
(3) 9 (4) 8
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

142. The point of intersection of all the three medians of a triangle is called its
(1) orthocentre (2) incentre
(3) centroid (4) circumcentre
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

143. In a triangle, the distance of the centroid from the three vertices is 4 cm, 6 cm and 8 cm respectively. Then the length of the smallest median is :
(1) 8 (2) 7
(3) 6 (4) 5
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

144. The ratio of the angles of a triangle is $1 : \frac{2}{3} : 3$. Then the smallest angle is :
(1) $21\frac{4°}{7}$ (2) 25°
(3) $25\frac{5°}{7}$ (4) $38\frac{4°}{7}$
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

145. In ΔABC, DE || AC, where D and E are two points lying on AB and BC respectively. If AB = 5 cm and AD = 3 cm, then BE : EC is
(1) 2 : 3 (2) 3 : 2
(3) 5 : 3 (4) 3 : 5
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

146. In a ΔABC, if $\angle A + \angle B = 135°$ and $\angle C + 2\angle B = 180°$, then the correct relation is :
(1) CA > AB (2) CA = AB
(3) CA < AB (4) CA + AB = CB
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

147. In a ΔABC, D and E are points on AC and BC respectively, AB and DE are perpendicular to BC. If AB = 9 cm , DE = 3 cm and AC = 24 cm, then AD is :
(1) 32cm (2) 16cm
(3) 8 cm (4) 4 cm
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

148. I is the incentre of ΔABC and if $\angle BAC = 70°$, then $\angle BIC$ is
(1) 140° (2) 55°
(3) 125° (4) 35°
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

149. In a triangle the length of the side opposite the angle which measures 45° is 8 cm, what is the length of the side opposite to the angle which measures 90°?
(1) $8\sqrt{2}$ cm. (2) $4\sqrt{2}$ cm.
(3) $8\sqrt{3}$ cm. (4) $4\sqrt{3}$ cm.
(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

150. In a triangle ABC, ∠A = 70°, ∠B = 80° and D is the incentre of ΔABC. ∠ACB = $2x°$ and ∠BDC = $y°$. The values of x and y, respectively are
(1) 15, 130 (2) 15, 125
(3) 35, 40 (4) 30, 150
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

151. If O is the orthocentre of a triangle ABC and ∠BOC = 100°, the measure of ∠BAC is
(1) 100° (2) 180°
(3) 80° (4) 200°
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–IV

1. Two medians AD and BE of ΔABC intersect at G at right angles. If AD = 9 cm and BE = 6 cm, then the length of BD (in cm) is
(1) 10 (2) 6
(3) 5 (4) 3
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

2. In ΔABC, $\angle BAC = 90°$ and $AB = \frac{1}{2}BC$. Then the measure of ∠ACB is :
(1) 60° (2) 30°
(3) 45° (4) 15°
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

3. If the length of the three sides of a triangle are 6 cm, 8 cm and 10 cm, then the length of the median to its greatest side is
(1) 8 cm (2) 6 cm
(3) 5 cm (4) 4.8 cm
(SSC Data Entry Operator Exam. 31.08.2008)

4. The length of the three sides of a right angled triangle are $(x-2)$ cm, x cm and $(x+2)$ cm respectively. Then the value of x is
(1) 10 (2) 8
(3) 4 (4) 0
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

5. Suppose ΔABC be a right-angled triangle where ∠A = 90° and AD ⊥ BC. If Δ ABC = 40 cm², ΔACD = 10 cm² and $\overline{AC}$ = 9 cm, then the length of BC is
(1) 12 cm (2) 18 cm
(3) 4 cm (4) 6 cm
(SSC Graduate Level Tier-II Exam.16.09.2012)

6. In a triangle ABC, ∠BAC = 90° and AD is perpendicular to BC. If AD = 6 cm and BD = 4 cm, then the length of BC is
(1) 8 cm (2) 10 cm
(3) 9 cm (4) 13 cm
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

7. In a right angled ΔABC, ∠ABC = 90°; BN is perpendicular to AC, AB = 6 cm, AC = 10 cm. Then AN : NC is
(1) 3 : 4 (2) 9 :16
(3) 3 : 16 (4) 1 : 4
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

8. For a triangle, base is $6\sqrt{3}$ cm and two base angles are 30° and 60°. Then height of the triangle is
(1) $3\sqrt{3}$ cm (2) 4.5 cm
(3) $4\sqrt{3}$ cm (4) $2\sqrt{3}$ cm
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

9. ABC is a right angled triangle, right angled at C and p is the length of the perpendicular from C on AB. If a, b and c are the length of the sides BC, CA and AB respectively, then
(1) $\frac{1}{p^2} = \frac{1}{b^2} - \frac{1}{a^2}$
(2) $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$
(3) $\frac{1}{p^2} + \frac{1}{a^2} = -\frac{1}{b^2}$
(4) $\frac{1}{p^2} = \frac{1}{a^2} - \frac{1}{b^2}$
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

10. In ΔABC, ∠A = 90° and AD ⊥ BC where D lies on BC. If BC = 8 cm, AC = 6 cm, then ΔABC : ΔACD =?
(1) 4 : 3 (2) 25 : 16
(3) 16 : 9 (4) 25 : 9
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

11. If the median drawn on the base of a triangle is half its base, the triangle will be:
(1) right-angled
(2) acute-angled
(3) obtuse-angled
(4) equilateral
(SSC Graduate Level Tier-I Exam. 21.04.2013)

12. In a right-angled triangle ABC, ∠ABC = 90°, AB = 5 cm and BC = 12 cm. The radius of the circumcircle of the triangle ABC is
(1) 7.5 cm (2) 6 cm
(3) 6.5 cm (4) 7 cm
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

13. In a right-angled triangle, the product of two sides is equal to half of the square of the third side i.e., hypotenuse. One of the acute angle must be
(1) 60° (2) 30°
(3) 45° (4) 15°
(SSC Graduate Level Tier-II Exam. 29.09.2013

14. A point D is taken from the side BC of a right-angled triangle ABC, where AB is hypotenuse. Then
(1) $AB^2 + CD^2 = BC^2 + AD^2$
(2) $CD^2 + BD^2 = 2\ AD^2$
(3) $AB^2 + AC^2 = 2\ AD^2$
(4) $AB^2 = AD^2 + BD^2$
(SSC Graduate Level Tier-II Exam. 29.09.2013

15. D and E are two points on the sides AC and BC respectively of Δ ABC such that DE = 18 cm, CE = 5 cm and ∠DEC = 90°. If tan ∠ABC = 3.6, then AC : CD =
(1) BC : 2 CE (2) 2 CE : BC
(3) 2 BC : CE (4) CE : 2 BC
(SSC Graduate Level Tier-II Exam. 29.09.2013

16. BL and CM are medians of ΔABC right-angled at A and BC = 5 cm. If BL = $\frac{3\sqrt{5}}{2}$ cm, then the length of CM is
(1) $2\sqrt{5}$ cm (2) $5\sqrt{2}$ cm
(3) $10\sqrt{2}$ cm (4) $4\sqrt{5}$ cm
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

17. The ortho centre of a right angled triangle lies
(1) outside the triangle
(2) at the right angular vertex
(3) on its hypotenuse
(4) within the triangle
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

18. If the measures of the sides of triangle are $(x^2 - 1)$, $(x^2 + 1)$ and $2x$ cm, then the triangle would be
(1) equilateral
(2) acute-angled
(3) isosceles
(4) right-angled
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

19. If each angle of a triangle is less than the sum of the other two, then the triangle is
(1) obtuse angled
(2) right angled
(3) acute angled
(4) equilateral
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

20. ABC is a right-angled triangle with AB = 6 cm and BC = 8 cm. A circle with centre O has been inscribed inside ΔABC. The radius of the circle is
(1) 1 cm (2) 2 cm
(3) 3 cm (4) 4 cm
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

21. If the sides of a right angled triangle are three consecutive integers, then the length of the smallest side is
(1) 3 units (2) 2 units
(3) 4 units (4) 5 units
(SSC CHSL DEO & LDC Exam. 9.11.2014)

22. The angle in a semi-circle is
(1) a reflex angle
(2) an obtuse angle
(3) an acute angle
(4) a right angle
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

23. In Δ ABC, ∠BAC = 90° and D is the mid–point of BC. Then which of the following relations is true?
(1) AD = BD = CD
(2) AD = BD = 2CD
(3) AD = 2BD = CD
(4) 2AD = BD = CD
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

24. If the sides of a triangle are in the ratio $3 : 1\frac{1}{4} : 3\frac{1}{4}$, then the triangle is
(1) Right triangle
(2) Obtuse triangle
(3) Equiangular triangle
(4) Acute triangle
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

25. A ship after sailing 12 km towards south from a particular place covered 5 km more towards east. Then the straightway distance of the ship from that place is
(1) 11 km (2) 18 km
(3) 15 km (4) 13 km
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

26. If the measure of three angles of a triangle are in the ratio 2 : 3 : 5, then the triangle is :
(1) right angled
(2) isosceles
(3) obtuse angled
(4) equilateral
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

27. ΔABC is a right angled triangle with AB = 6 cm, AC = 8 cm, ∠BAC = 90°. Then the radius of the incircle is
(1) 4 cm. (2) 2 cm.
(3) 6 cm. (4) 3 cm.
(SSC CGL Tier-I Re-Exam, 30.08.2015)

28. In ΔABC, AD ⊥ BC and AD^2 = BD.DC. The measure of ∠BAC is:
(1) 60° (2) 75°
(3) 90° (4) 45°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

29. ∠A of ΔABC is a right angle. AD is perpendicular on BC. If BC = 14 cm and BD = 5 cm, then measure of AD is :
(1) $2\sqrt{5}$ cm. (2) $\sqrt{5}$ cm.
(3) $3\sqrt{5}$ cm. (4) $3.5\sqrt{5}$ cm.
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

30. In ΔABC, ∠B = 90°, AB = 8 cm and BC = 15 cm, then sinC = ?
(1) $\frac{15}{17}$ (2) $\frac{8}{17}$
(3) $\frac{15}{8}$ (4) $\frac{8}{15}$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

31. In ΔABC, AB = BC = k, AC = $\sqrt{2}$ k, then ΔABC is a :
(1) Isosceles triangle
(2) Right-angled triangle
(3) Equilateral triangle
(4) Right isosceles triangle
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

32. The sides of a right triangle ABC are a, b and c, where c is the hypotenuse. What will be the radius of the in circle of this triangle?
(1) $\frac{(a+b+c)}{2}$ (2) $\frac{(a+b-c)}{2}$
(3) $\frac{(b+c-a)}{2}$ (4) $\frac{(a+c-b)}{2}$
(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

33. In ΔABC, ∠B is right angle, D is the mid–point of the side AC. If AB = 6 cm, BC = 8 cm, then the length of BD is
(1) 4 cm. (2) 5 cm.
(3) 8 cm. (4) 12 cm.
(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

34. In a right angled triangle if hypotenuse is 20 cm and ratio of other two sides is 4 : 3, the lengths of the sides are
(1) 4 cm. and 3 cm.
(2) 8 cm. and 6 cm.
(3) 12 cm. and 9 cm.
(4) 16 cm. and 12 cm.
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

35. XYZ is a right angled triangle and ∠Y = 90°. If XY = 2.5 cm and YZ = 6 cm then the circumradius of ΔXYZ is :
(1) 6.5 cm (2) 3.25 cm
(3) 3 cm (4) 2.5 cm
(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

36. In a right angled triangle ΔDEF, if the length of the hypotenuse EF is 12 cm, then the length of the median DX is
(1) 3 cm. (2) 4 cm.
(3) 6 cm. (4) 12 cm.
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–V

1. In Δ ABC and Δ DEF, AB = DE and BC = EF. Then one can infer that

Δ ABC ≅ Δ DEF, when

(1) ∠BAC = ∠EDF

(2) ∠ACB = ∠EDF

(3) ∠ACB = ∠DFE

(4) ∠ ABC = ∠DEF

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

2. In ΔPQR, S and T are points on sides PR and PQ respectively such that ∠PQR =∠PST. If PT = 5 cm, PS = 3 cm and TQ = 3 cm, then length of SR is

(1) 5 cm (2) 6 cm

(3) $\frac{31}{3}$ cm (4) $\frac{41}{3}$ cm

(SSC CGL Tier-I Exam. 19.10.2014)

3. The perimeters of two similar triangles ΔABC and ΔPQR are 36 cm and 24 cm respectively. If PQ = 10 cm, then AB is

(1) 15 cm (2) 12 cm

(3) 14 cm (4) 26 cm

(SSC CHSL DEO & LDC Exam. 9.11.2014)

4. In ΔABC, two points D and E are taken on the lines AB and BC respectively in such a way that AC is parallel to DE. Then ΔABC and ΔDBE are

(1) similar only if D lies outside the line segment AB

(2) congruent only if D lies outside the line segment AB

(3) always similar

(4) always congruent

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

5. Inside a triangle ABC, a straight line parallel to BC intersects AB and AC at the point P and Q respectively. If AB = 3 PB, then PQ : BC is

(1) 1 : 3 (2) 3 : 4

(3) 1 : 2 (4) 2 : 3

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

6. In ΔABC, D and E are points on AB and AC respectively such that DE || BC and DE divides the ΔABC into two parts of equal areas. Then ratio of AD and BD is

(1) 1 : 1 (2) $1 : \sqrt{2} - 1$

(3) $1 : \sqrt{2}$ (4) $1 : \sqrt{2} + 1$

(SSC Graduate Level Tier-II Exam.16.09.2012)

7. In ΔABC, DE ∥ AC. D and E are two points on AB and CB respectively. If AB = 10 cm and AD = 4 cm, then BE : CE is

(1) 2 : 3 (2) 2 : 5

(3) 5 : 2 (4) 3 : 2

(SSC Graduate Level Tier-I Exam. 19.05.2013)

8. For a triangle ABC,D and E are two points on AB and AC such that AD = $\frac{1}{4}$ AB, AE = $\frac{1}{4}$ AC. If BC = 12 cm, then DE is

(1) 5 cm (2) 4 cm

(3) 3 cm (4) 6 cm

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

9. In triangle ABC a straight line parallel to BC intersects AB and AC at D and E respectively. If AB = 2AD then DE : BC is

(1) 2 : 3 (2) 2 : 1

(3) 1 : 2 (4) 1 : 3

(SSC CGL Tier-II Exam. 21.09.2014)

10. In a Δ ABC, D and E are two points on AB and AC respectively such that DE || BC, DE bisects the ΔABC in two equal areas. Then the ratio DB : AB is

(1) $1 : \sqrt{2}$ (2) 1 : 2

(3) $(\sqrt{2} - 1) : \sqrt{2}$ (4) $\sqrt{2} : 1$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

11. In ΔABC, E and D are points on sides AB and AC respectively such that ∠ABC = ∠ADE. If AE = 3 cm, AD = 2 cm and EB = 2 cm, then length of DC is

(1) 4 cm (2) 4.5 cm

(3) 5.0 cm (4) 5.5 cm

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

12. Δ ABC and Δ DEF are similar. Also ∠A = ∠D and ∠B = ∠E. If 4AB = DE and BC = 12 cm, then EF is equal to

(1) 3 cm (2) 24 cm

(3) 16 cm (4) 48 cm

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

13. In Δ ABC the straight line parallel to the side BC meets AB and AC at the points P and Q respectively. If AP = QC, the length of AB is 12 units and the length of AQ is 2 units, then the length (in units) of CQ is

(1) 4 (2) 6

(3) 8 (4) 10

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

14. ABC is a triangle in which DE || BC and AD : DB = 5 : 4. Then DE : BC is

(1) 4 : 5 (2) 4 : 9

(3) 9 : 5 (4) 5 : 9

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

15. If in a triangle ABC, BE and CF are two medians perpendicular to each other and if AB = 19cm and AC = 22 cm then the length of BC is

(1) 19.5 cm (2) 26 cm

(3) 20.5 cm (4) 13 cm

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

16. The medians CD and BE of a triangle ABC interest each other at O. The ratio ΔODE : ΔABC is equal to

(1) 12 : 1 (2) 4 : 3

(3) 3 : 4 (4) 1 : 12

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

17. ΔABC and ΔDEF are two similar triangles and the perimeters of ΔABC and ΔDEF are 30 cm and 18 cm respectively. If the length of DE = 36 cm, then length of AB is

(1) 60 cm. (2) 40 cm.

(3) 45 cm. (4) 50 cm.

(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

18. If ΔPQR and ΔLMN are similar and 3PQ = LM and MN = 9 cm, then QR is equal to :

(1) 12 cm (2) 6 cm

(3) 9 cm (4) 3 cm

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

19. The perimeter of two similar triangles ABC and PQR are 36 cms and 24 cms respectively. If PQ = 10 cm then the length of AB is
(1) 18 cm (2) 12 cm
(3) 15 cm (4) 30 cm
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

20. Which of the following is a true statement?
(1) Two similar triangles are always congruent.
(2) Two similar triangles have equal areas
(3) Two triangles are similar if their corresponding sides are proportional.
(4) Two polygons are similar if their corresponding sides are proportional.
(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

21. The perimeter of two similar triangles ΔABC and ΔPQR are 60 cm and 36 cm respectively. If PQ = 18 cm, then AB is :
(1) 20 cm (2) 24 cm
(3) 36 cm (4) 30 cm
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

TYPE–VI

1. Q is a point in the interior of a rectangle ABCD. If QA = 3 cm, QB = 4 cm and QC = 5 cm, then the length of QD (in cm) is
(1) $3\sqrt{2}$ (2) $5\sqrt{2}$
(3) $\sqrt{34}$ (4) $\sqrt{41}$
(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

2. ABCD is a rectangle where the ratio of the length of AB and BC is 3 : 2. If P is the mid-point of AB, then the value of sin ∠CPB is
(1) $\frac{3}{5}$ (2) $\frac{2}{5}$
(3) $\frac{3}{4}$ (4) $\frac{4}{5}$
(SSC Graduate Level Tier-II Exam. 29.09.2013)

3. If the opposite sides of a quadrilateral and also its diagonals are equal, then each of the angles of the quadrilateral is
(1) 90° (2) 120°
(3) 100° (4) 60°
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

4. The length of the two adjacent sides of a rectangle inscribed in a circle are 5 cm and 12 cm respectively. Then the radius of the circle will be
(1) 6 cm (2) 6.5 cm
(3) 8 cm (4) 8.5 cm
(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

5. PQRA is a rectangle, AP = 22 cm, PQ = 8 cm. ΔABC is a triangle whose vertices lie on the sides of PQRA such that BQ = 2 cm and QC = 16 cm. Then the length of the line joining the mid points of the sides AB and BC is
(1) $4\sqrt{2}$ cm. (2) 5 cm.
(3) 6 cm. (4) 10 cm.
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–VII

1. Inside a square ABCD, Δ BEC is an equilateral triangle. If CE and BD intersect at O, then ∠BOC is equal to
(1) 60° (2) 75°
(3) 90° (4) 120°
(SSC Graduate Level Tier-II Exam. 29.09.2013

2. A square is inscribed in a quarter-circle in such a manner that two of its adjacent vertices lie on the two radii at an equal distance from the centre, while the other two vertices lie on the circular arc. If the square has sides of length x, then the radius of the circle is
(1) $\sqrt{2}x$ (2) $\frac{16x}{\pi+4}$
(3) $\frac{2x}{\sqrt{\pi}}$ (4) $\frac{\sqrt{5}x}{\sqrt{2}}$
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

TYPE–VIII

1. Each interior angle of a regular polygon is three times its exterior angle, then the number of sides of the regular polygon is :
(1) 9 (2) 8
(3) 10 (4) 7
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

2. In a regular polygon, the exterior and interior angles are in the ratio 1 : 4. The number of sides of the polygon is
(1) 10 (2) 12
(3) 15 (4) 16
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

3. The difference between the exterior and interior angles at a vertex of a regular polygon is 150°. The number of sides of the polygon is
(1) 10 (2) 15
(3) 24 (4) 30
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

4. Each interior angle of a regular polygon is 144°. The number of sides of the polygon is
(1) 8 (2) 9
(3) 10 (4) 11
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

5. If the sum of the interior angles of a regular polygon be 1080°, the number of sides of the polygon is
(1) 6 (2) 8
(3) 10 (4) 12
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

6. The number of sides in two regular polygons are in the ratio 5 : 4 and the difference between each interior angle of the polygons is 6°. Then the number of sides are
(1) 15, 12 (2) 5, 4
(3) 10, 8 (4) 20, 16
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

7. Each internal angle of regular polygon is two times its external angle. Then the number of sides of the polygon is :
(1) 8 (2) 6
(3) 5 (4) 7
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone) & (SSC CHSL DEO & LDC Exam. 27.10.2013)

8. Ratio of the number of sides of two regular polygons is 5 : 6 and the ratio of their each interior angle is 24 : 25. Then the number of sides of these two polygons are
(1) 20, 24 (2) 15, 18
(3) 10, 12 (4) 5, 6
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

9. Measure of each interior angle of a regular polygon can never be :
(1) 150° (2) 105°
(3) 108° (4) 144°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

10. The sum of all interior angles of a regular polygon is twice the sum of all its exterior angles. The number of sides of the polygon is
(1) 10 (2) 8
(3) 12 (4) 6
(SSC Graduate Level Tier-II Exam.16.09.2012)

11. The ratio between the number of sides of two regular polygons is 1 : 2 and the ratio between their interior angles is 2 : 3. The number of sides of these polygons is respectively
(1) 6, 12 (2) 5, 10
(3) 4, 8 (4) 7, 14
(SSC Graduate Level Tier-II Exam.16.09.2012)

12. There are two regular polygons with number of sides equal to $(n-1)$ and $(n+2)$. Their exterior angles differ by 6°. The value of n is
(1) 14 (2) 12
(3) 13 (4) 11
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

13. If each interior angle of a regular polygon is 150°, the number of sides of the polygon is
(1) 8 (2) 10
(3) 15 (4) None of these
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

14. The sum of interior angles of a regular polygon is 1440°. The number of sides of the polygon is
(1) 10 (2) 12
(3) 6 (4) 8
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting and SSC CHSL DEO & LDC Exam. 9.11.2014)

15. Among the angles 30°, 36°, 45°, 50° one angle cannot be an exterior angle of a regular polygon. The angle is
(1) 30° (2) 36°
(3) 45° (4) 50°
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

16. If the sum of interior angles of a regular polygon is equal to two times the sum of exterior angles of that polygon, then the number of sides of that polygon is
(1) 5 (2) 6
(3) 7 (4) 8
(SSC CGL Tier-I Exam. 19.10.2014)

17. An interior angle of a regular polygon is 5 times its exterior angle. Then the number of sides of the polygon is
(1) 14 (2) 16
(3) 12 (4) 18
(SSC CGL Tier-II Exam. 21.09.2014)

18. The interior angle of a regular polygon is 140°. The number of sides of that polygon is
(1) 9 (2) 8
(3) 7 (4) 6
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

19. In a regular polygon if one of its internal angle is greater than the external angle by 132°, then the number of sides of the polygon is
(1) 14 (2) 12
(3) 15 (4) 16
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

20. If the ratio of an external angle and an internal angle of a regular polygon is 1 : 17, then the number of sides of the regular polygon is
(1) 20 (2) 18
(3) 36 (4) 12
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

21. The sum of all internal angles of a regular polygon whose one external angle is 20° is
(1) 6400° (2) 3200°
(3) 2880° (4) 1440°
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

22. The sum of the internal angles of a regular polygon is 1440° The number of sides is
(1) 8 (2) 10
(3) 12 (4) 6
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

23. The ratio of each interior angle to each exterior angle of a regular polygon is 3 : 1. The number of sides of the polygon is
(1) 9 (2) 7
(3) 6 (4) 8
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

24. PQRST is a cyclic pentagon and PT is a diameter, then ∠PQR + ∠RST is equal to
(1) 180° (2) 270°
(3) 216° (4) 144°
(SSC CGL Tier-I Re-Exam, 30.08.2015)

25. The interior angle of a regular polygon exceeds its exterior angle by 108°. The number of the sides of the polygon is
(1) 12 (2) 16
(3) 14 (4) 10
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

26. Measure of each interior angle of a regular hexagon is :
(1) 100° (2) 60°
(3) 45° (4) 120°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

27. If the sum of all interior angles of a regular polygon is 14 right angles, then its number of sides is
(1) 8 (2) 9
(3) 7 (4) 6
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

28. The measure of each interior angle of a regular polygon with 8 sides is
(1) 135° (2) 120°
(3) 100° (4) 45°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

29. A polygon has 54 diagonals. The number of sides in the polygon is
(1) 7 (2) 9
(3) 12 (4) 15
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

30. Two regular polygons are such that the ratio between their number of sides is 1 : 2 and the ratio of measures of their interior angles is 3 : 4. Then the number of sides of each polygon is
(1)10 and 20 (2) 4 and 8
(3) 3 and 6 (4) 5 and10
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

31. If an interior of a regular polygon is 170°, then the number of sides of the polygon is
(1) 36 (2) 20
(3) 18 (4) 27
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

TYPE–IX

1. The length of the diagonal BD of the parallelogram ABCD is 18 cm. If P and Q are the centroid of the Δ ABC and Δ ADC respectively then the length of the line segment PQ is
(1) 4 cm (2) 6 cm
(3) 9 cm (4) 12 cm
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

2. The side AB of a parallelogram ABCD is produced to E in such way that BE = AB. DE intersects BC at Q. The point Q divides BC in the ratio
(1) 1 : 2 (2) 1 : 1
(3) 2 : 3 (4) 2 : 1
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

3. In a parallelogram PQRS, angle P is four times of angle Q, then the measure of ∠R is
(1) 144° (2) 36°
(3) 72° (4) 130°
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

TYPE–X

1. ABCD is a cyclic parallelogram. The angle ∠B is equal to :
(1) 30° (2) 60°
(3) 45° (4) 90°
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

2. ABCD is a cyclic trapezium such that AD | | BC, if ∠ABC = 70°, then the value of ∠BCD is:
(1) 60° (2) 70°
(3) 40° (4) 80°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

3. ABCD is a cyclic trapezium whose sides AD and BC are parallel to each other. If ∠ABC = 72°, then the measure of the ∠BCD is
(1) 162° (2) 18°
(3) 108° (4) 72°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

4. If an exterior angle of a cyclic quadrilateral be 50°, then the interior opposite angle is :
(1) 130° (2) 40°
(3) 50° (4) 90°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

5. ABCD is a cyclic quadrilateral and O is the centre of the circle. If ∠COD = 140° and ∠BAC = 40°, then the value of ∠BCD is equal to
(1) 70° (2) 90°
(3) 60° (4) 80°
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

6. ABCD is a cyclic trapezium with AB || DC and AB = diameter of the circle. If ∠CAB = 30°, then ∠ADC is
(1) 60° (2) 120°
(3) 150° (4) 30°
(SSC Graduate Level Tier-I Exam. 21.04.2013)

7. ABCD is a cyclic quadrilateral. AB and DC are produced to meet at P. If ∠ADC = 70° and ∠DAB = 60°, then the ∠PBC + ∠PCB is
(1) 130° (2) 150°
(3) 155° (4) 180°
(SSC Graduate Level Tier-I Exam. 21.04.2013)

8. A cyclic quadrilateral ABCD is such that AB = BC, AD = DC, AC ⊥ BD, ∠CAD = θ. Then the angle ∠ABC =
(1) θ (2) $\frac{\theta}{2}$
(3) 2θ (4) 3θ
(SSC Graduate Level Tier-I Exam. 19.05.2013)

9. The diagonals AC and BD of a cyclic quadrilateral ABCD intersect each other at the point P. Then, it is always true that
(1) BP . AB = CD . CP
(2) AP . CP = BP . DP
(3) AP . BP = CP . DP
(4) AP . CD = AB . CP
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

10. A quadrilateral ABCD circumscribes a circle and AB = 6 cm, CD = 5 cm and AD = 7 cm. The length of side BC is
(1) 4 cm (2) 5 cm
(3) 3 cm (4) 6 cm
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

11. In a cyclic quadrilateral ABCD $m\angle A + m\angle B + m\angle C + m\angle D = ?$
(1) 90° (2) 360°
(3) 180° (4) 120°
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

12. ABCD is a cyclic quadrilateral. The side AB is extended to E in such a way that BE = BC. If ∠ADC = 70°, ∠BAD = 95°, then ∠DCE is equal to
(1) 140° (2) 120°
(3) 165° (4) 110°
(SSC CGL Tier-I Exam. 19.10.2014)

13. In a cyclic quadrilateral
∠A + ∠C = ∠B + ∠D = ?

(1) 270° (2) 360°
(3) 90° (4) 180°
(SSC CGL Tier-I Exam. 26.10.2014)

14. If ABCD be a cyclic quadrilateral in which ∠A=4x°, ∠B = 7x°, ∠C = 5y°, ∠D = y°, then $x : y$ is
(1) 3 : 4 (2) 4 : 3
(3) 5 : 4 (4) 4 : 5
(SSC CGL Tier-II Exam. 21.09.2014)

15. ABCD is a cyclic quadrilateral and AD is a diameter. If ∠DAC = 55° then value of ∠ABC is
(1) 55° (2) 35°
(3) 145° (4) 125°
(SSC CGL Tier-II Exam. 21.09.2014)

16. The point of intersection of the diagonals AC and BD of the cyclic quadrilateral ABCD is P. If ∠APB = 64° and ∠CBD = 28°, the measure of ∠ADB is
(1) 32° (2) 36°
(3) 56° (4) 28°
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

17. ABCD is a cyclic quadrilateral. Diagonals AC and BD meets at P. If ∠APB = 110° and ∠CBD = 30°, then ∠ADB measures
(1) 55° (2) 30°
(3) 70° (4) 80°
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

18. ABCD is a cyclic quadrilateral. AB and DC when produced meet at P, if PA = 8 cm, PB = 6 cm, PC = 4 cm, then the length (in cm) of PD is
(1) 8 cm (2) 6 cm
(3) 10 cm (4) 12 cm
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

19. The three successive angles of a cyclic quadrilateral are in the ratio 1 : 3 : 4, find the measure of the fourth angle?
(1) 72° (2) 108°
(3) 36° (4) 30°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

20. If ABCD is a cyclic quadrilateral with ∠A = 50°, ∠B = 80°, then ∠C and ∠D are
(1) 100°, 130° (2) 115°, 115°
(3) 110°, 120° (4) 130°, 100°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

21. The measures of three angles of a quadrilateral are in the ratio 1 : 2 : 3. If the sum of these three measures is equal to the measrue of the fourth angle, find the smallest angle.
(1) 30° (2) 40°
(3) 60° (4) 50°
(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

22. In a cyclic quadrilateral ABCD, ∠BCD=120° and passes through the centre of the circle. Then ∠ABD = ?
(1) 30° (2) 40°
(3) 50° (4) 60°
(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (Ist Sitting)

23. ABCD is a quadrilateral in which BD and AC are diagonals then
(1) AB + BC + CD + AD < AC + BD
(2) AB + BC + CD + DA > AC + BD
(3) AB + BC + CD + DA = AC + BD
(4) AB + BC + CD + DA > 2 (AC + BD)
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

24. Three consecutive angles of a cyclic quadrilateral are in the ratio of 1 : 4 : 5. The measure of fourth angle is :
(1) 120° (2) 60°
(3) 30° (4) 80°
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

25. In a cyclic quadrilateral ABCD, the side AB is extended to a point X. If ∠XBC = 82° and ∠ADB = 47°, then the value of ∠BDC is :
(1) 40° (2) 35°
(3) 30° (4) 25°
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

26. ABCD is a cyclic quadrilateral of which AB is the diameter. Diagonals AC and BD intersect at E. If ∠DBC = 35°, then ∠AED measures
(1) 35° (2) 45°
(3) 55° (4) 90°
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–XI

1. ABCD is a rhombus. A straight line through C cuts AD produced at P and AB produced at Q. If DP = $\frac{1}{2}$ AB, then the ratio of the length of BQ and AB is
(1) 2 : 1 (2) 1 : 2
(3) 1 : 1 (4) 3 : 1
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

2. In a quadrilateral *ABCD*, with unequal sides if the diagonals *AC* and *BD* intersect at right angles, then
(1) $AB^2 + BC^2 = CD^2 + DA^2$
(2) $AB^2 + CD^2 = BC^2 + DA^2$
(3) $AB^2 + AD^2 = BC^2 + CD^2$
(4) $AB^2 + BC^2 = 2(CD^2 + DA^2)$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

3. The ratio of the angles ∠A and ∠B of a non-square rhombus ABCD is 4 : 5, then the value of ∠C is :
(1) 50° (2) 45°
(3) 80° (4) 95°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

4. ABCD is a rhombus whose side AB = 4 cm and ∠ABC = 120°, then the length of diagonal BD is equal to :
(1) 1 cm (2) 2 cm
(3) 3 cm (4) 4 cm
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

5. ABCD is a rhombus. AB is produced to F and BA is produced to E such that AB = AE = BF. Then :
(1) ED > CF
(2) ED ⊥ CF
(3) $ED^2 + CF^2 = EF^2$
(4) ED ∥ CF
(SSC Graduate Level Tier-I Exam. 21.04.2013)

6. ABCD is a trapezium whose side $\overline{AD}$ is parallel to $\overline{BC}$. Diagonals $\overline{AC}$ and $\overline{BD}$ intersect at O. If $\overline{AO} = 3$, $\overline{CO} = x - 3$, $\overline{BO} = 3x - 19$ and $\overline{DO} = x - 5$, the value(s) of x will be :
(1) 7, 6 (2) 12, 6
(3) 7, 10 (4) 8, 9
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

7. In a quadrilateral ABCD, the bisectors of ∠A and ∠B meet at O. If ∠C = 70° and ∠D = 130°, then measure of ∠AOB is
(1) 40° (2) 60°
(3) 80° (4) 100°
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

8. ABCD is a trapezium where AD ∥ BC. The diagonal AC and BD intersect each other at the point O. If AO = 3, CO = $x - 3$, BO = $3x - 19$ and DO = $x - 5$, the value of x is
(1) – 8, 9 (2) 8, – 9
(3) – 8, – 9 (4) 8, 9
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

9. If PQRS is a rhombus and ∠SPQ = 50°, then ∠RSQ is
(1) 55° (2) 65°
(3) 75° (4) 45°
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

10. ABCD is a cyclic trapezium whose sides AD and BC are parallel to each other. If ∠ABC = 75° then the measure of ∠BCD is :
(1) 75° (2) 95°
(3) 45° (4) 105°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

11. If ABCD be a rhombus, AC is its smallest diagonal and ∠ABC = 60°, find length of a side of the rhombus when AC = 6 cm.
(1) 6 cm. (2) 3 cm.
(3) $6\sqrt{2}$ cm. (4) $3\sqrt{3}$ cm.
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

12. AB is a diameter of a circle having centre at O. PQ is a chord which does not intersect AB. Join AP and BQ. If $\angle BAP = \angle ABQ$, then ABQP is a :
(1) cyclic square
(2) cyclic trapezium
(3) cyclic rhombus
(4) cyclic rectangle
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

13. ABCD is a cyclic trapezium in which AD || BC. If $\angle ABC = 70°$, then $\angle BCD$ is
(1) 110° (2) 80°
(3) 70° (4) 90
(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

14. ABCD is a cyclic trapezium with AD || BC. If $\angle A = 105°$, then other three angles are
(1) $\angle B = 75°$, $\angle C = 75°$, $\angle D = 105°$
(2) $\angle B = 105°$, $\angle C = 75°$, $\angle D = 75°$
(3) $\angle B = 75°$, $\angle C = 105°$, $\angle D = 75°$
(4) $\angle B = 105°$, $\angle C = 105°$, $\angle D = 75°$
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

15. If the parallel sides of a trapezium are 8 cm. and 4 cm., M and N are the mid-points of the diagonals of the trapezium, then length of MN is
(1) 12 cm. (2) 6 cm.
(3) 1 cm. (4) 2 cm.
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

16. ABCD is a trapezium in which AD || BC and AB = DC = 10 m. then the distance of AD from BC is :

(1) $10\sqrt{2}$ m (2) $4\sqrt{2}$ m
(3) $5\sqrt{2}$ m (4) $6\sqrt{2}$ m
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

17. At least two pairs of consecutive angles are congruent in a _____.
(1) Parallelogram
(2) Isosceles trapezium
(3) Rhombus
(4) Kite
(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

TYPE–XII

1. Two equal circles of radius 4 cm intersect each other such that each passes through the centre of the other. The length of the common chord is :
(1) $2\sqrt{3}$ cm (2) $4\sqrt{3}$ cm
(3) $2\sqrt{2}$ cm (4) 8 cm
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

2. One chord of a circle is known to be 10.1 cm. The radius of this circle must be:
(1) 5 cm
(2) greater than 5 cm
(3) greater than or equal to 5 cm
(4) less than 5 cm
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

3. The length of the chord of a circle is 8 cm and perpendicular distance between centre and the chord is 3 cm. Then the radius of the circle is equal to :
(1) 4 cm (2) 5 cm
(3) 6 cm (4) 8 cm
(FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 28.10.2012) (Ist Sitting)

4. The length of a chord of a circle is equal to the radius of the circle. The angle which this chord subtends in the major segment of the circle is equal to
(1) 30° (2) 45°
(3) 60° (4) 90°
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone) & (SSC GL Exam. 11.11.2012 (Ist Sitting)

5. AB = 8 cm and CD = 6 cm are two parallel chords on the same side of the centre of a circle. The distance between them is 1 cm. The radius of the circle is
(1) 5 cm (2) 4 cm
(3) 3 cm (4) 2 cm
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

6. The length of two chords AB and AC of a circle are 8 cm and 6 cm and $\angle BAC = 90°$, then the radius of circle is
(1) 25 cm (2) 20 cm
(3) 4 cm (4) 5 cm
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

7. The distance between two parallel chords of length 8 cm each in a circle of diameter 10 cm is
(1) 6 cm (2) 7 cm
(3) 8 cm (4) 5·5 cm
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

8. The length of the common chord of two intersecting circles is 24 cm. If the diameter of the circles are 30 cm and 26 cm, then the distance between the centre (in cm) is
(1) 13 (2) 14
(3) 15 (4) 16
(SSC Graduate Level Tier-II Exam.16.09.2012)

9. In a circle of radius 21 cm, an arc subtends an angle of 72° at the centre. The length of the arc is
(1) 21.6 cm (2) 26.4 cm
(3) 13.2 cm (4) 19.8 cm
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

10. A unique circle can always be drawn through x number of given non-collinear points, then x must be :
(1) 2 (2) 3
(3) 4 (4) 1
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

11. Two parallel chords are drawn in a circle of diameter 30 cm. The length of one chord is 24 cm and the distance between the two chords is 21 cm. The length of the other chord is
(1) 10 cm (2) 18 cm
(3) 12 cm (4) 16 cm
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

12. If two equal circles whose centres are O and O′, intersect each other at the point A and B, OO′ = 12 cm and AB = 16 cm, then the radius of the circle is
(1) 10 cm (2) 8 cm
(3) 12 cm (4) 14 cm
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

13. Chords AB and CD of a circle intersect externally at P. If AB = 6 cm, CD = 3 cm and PD = 5 cm, then the length of PB is
(1) 5 cm (2) 7.35 cm
(3) 6 cm (4) 4 cm
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

14. A circle (with centre at O) is touching two intersecting lines AX and BY. The two points of contact A and B subtend an angle of 65° at any point C on the circumference of the circle. If P is the point of intersection of the two lines, then the measure of ∠APO is
(1) 25° (2) 65°
(3) 90° (4) 40°
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

15. AB and CD are two parallel chords on the opposite sides of the centre of the circle. If $\overline{AB}$ = 10 cm, $\overline{CD}$ = 24 cm and the radius of the circle is 13 cm, the distance between the chords is
(1) 17 cm (2) 15 cm
(3) 16 cm (4) 18 cm
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

16. AB and CD are two parallel chords of a circle such that AB = 10 cm and CD = 24 cm. If the chords are on the opposite sides of the centre and distance between them is 17 cm, then the radius of the circle is :
(1) 11 cm (2) 12 cm
(3) 13 cm (4) 10 cm
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

17. A chord AB of a circle C_1 of radius $\left(\sqrt{3}+1\right)$ cm touches a circle C_2 which is concentric to C_1. If the radius of C_2 is $\left(\sqrt{3}-1\right)$ cm., the length of AB is :
(1) $2\sqrt[4]{3}$ cm (2) $8\sqrt{3}$ cm
(3) $4\sqrt[4]{3}$ cm (4) $4\sqrt{3}$ cm
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

18. The length of the common chord of two circles of radii 30 cm and 40 cm whose centres are 50 cm apart, is (in cm)
(1) 12 (2) 24
(3) 36 (4) 48
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

19. Chords AB and CD of a circle intersect at E and are perpendicular to each other. Segments AE, EB and ED are of lengths 2 cm, 6 cm and 3 cm respectively. Then the length of the diameter of the circle (in cm) is
(1) $\sqrt{65}$ (2) $\frac{1}{2}\sqrt{65}$
(3) 65 (4) $\frac{65}{2}$
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

20. Two circles with centre P and Q intersect at B and C. A, D are points on the circle such that A, C, D are collinear. If ∠APB = 130°, and ∠BQD = x^o, then the value of x is
(1) 65 (2) 130
(3) 195 (4) 135
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

21. Two circles of same radius 5 cm, intersect each other at A and B. If AB = 8 cm, then the distance between the centre is :
(1) 6 cm (2) 8 cm
(3) 10 cm (4) 4 cm
(SSC Graduate Level Tier-I Exam. 21.04.2013)

22. AB is the chord of a circle with centre O and DOC is a line segment originating from a point D on the circle and intersecting AB produced at C such that BC = OD. If ∠BCD = 20°, then ∠AOD = ?
(1) 20° (2) 30°
(3) 40° (4) 60°
(SSC Graduate Level Tier-I Exam. 21.04.2013)

23. In a circle of radius 17 cm, two parallel chords of length 30 cm and 16 cm are drawn. If both the chords are on the same side of the centre, then the distance between the chords is
(1) 9 cm (2) 7 cm
(3) 23 cm (4) 11 cm
(SSC Graduate Level Tier-I Exam. 21.04.2013)

24. A square ABCD is inscribed in a circle of unit radius. Semicircles are described on each side as a diameter. The area of the region bounded by the four semicircles and the circle is
(1) 1 sq. unit (2) 2 sq. unit
(3) 1.5 sq. unit (4) 2.5 sq. unit
(SSC Graduate Level Tier-I Exam. 21.04.2013)

25. Two circles touch each other internally. Their radii are 2 cm and 3 cm. The biggest chord of the greater circle which is outside the inner circle is of length
(1) $2\sqrt{2}$ cm (2) $3\sqrt{2}$ cm
(3) $2\sqrt{3}$ cm (4) $4\sqrt{2}$ cm
(SSC Graduate Level Tier-I Exam. 21.04.2013)

26. Two circles touch each other externally. The distance between their centre is 7 cm. If the radius of one circle is 4 cm, then the radius of the other circle is
(1) 3.5 cm (2) 3 cm
(3) 4 cm (4) 2 cm
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

27. A, B and C are the three points on a circle such that the angles subtended by the chords AB and AC at the centre O are 90° and 110° respectively. ∠BAC is equal to
(1) 70° (2) 80°
(3) 90° (4) 100°
(SSC Graduate Level Tier-I Exam. 19.05.2013)

28. N is the foot of the perpendicular from a point P of a circle with radius 7 cm, on a diameter AB of the circle. If the length of the chord PB is 12 cm, the distance of the point N from the point B is
(1) $6\frac{5}{7}$ cm (2) $12\frac{2}{7}$ cm
(3) $3\frac{5}{7}$ cm (4) $10\frac{2}{7}$ cm
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

29. A, B, C, D are four points on a circle. AC and BD intersect at a point E such that ∠BEC = 130° and ∠ECD = 20°. ∠BAC is
(1) 120° (2) 90°
(3) 100° (4) 110°
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

30. If two concentric circles are of radii 5 cm and 3 cm, then the length of the chord of the larger circle which touches the smaller circle is

(1) 6 cm (2) 7 cm
(3) 10 cm (4) 8 cm

(SSC Graduate Level Tier-II Exam. 29.09.2013

31. A chord 12 cm long is drawn in a circle of diameter 20 cm. The distance of the chord from the centre is

(1) 8 cm (2) 6 cm
(3) 10 cm (4) 16 cm

(SSC CHSL DEO & LDC Exam. 20.10.2013)

32. If the chord of a circle is equal to the radius of the circle, then the angle subtended by the chord at a point on the minor arc is

(1) 150° (2) 60°
(3) 120° (4) 30°

(SSC CHSL DEO & LDC Exam. 10.11.2013 (IInd Sitting)

33. The angle subtended by a chord at its centre is 60°, then the ratio between chord and radius is

(1) 1 : 2 (2) 1 : 1
(3) $\sqrt{2}$:1 (4) 2 : 1

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

34. Each of the circles of equal radii with centres A and B pass through the centre of one another circle they cut at C and D then ∠DBC is equal to

(1) 60° (2) 100°
(3) 120° (4) 140°

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

35. For a triangle circumcentre lies on one of its sides. The triangle is

(1) right angled
(2) obtused angled
(3) isosceles
(4) equilateral

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

36. The three equal circles touch each other externally. If the centres of these circles be A, B, C then ABC is

(1) a right angle triangle
(2) an equilateral triangle
(3) an isosceles triangle
(4) a scalene triangle

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

37. In a right angled triangle, the circumcentre of the triangle lies

(1) inside the triangle
(2) outside the triangle
(3) on midpoint of the hypotenuse
(4) on one vertex

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

38. 'O' is the centre of the circle, AB is a chord of the circle, OM ⊥ AB. If AB = 20 cm, OM = $2\sqrt{11}$ cm, then radius of the circle is

(1) 15 cm (2) 12 cm
(3) 10 cm (4) 11 cm

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

39. In ΔABC, ∠ABC = 70°, ∠BCA = 40°. O is the point of intersection of the perpendicular bisectors of the sides, then the angle ∠BOC is

(1) 100° (2) 120°
(3) 130° (4) 140°

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

40. A, B, C are three points on the circumference of a circle and if $\overline{AB} = \overline{AC} = 5\sqrt{2}$ cm and ∠BAC = 90°, find the radius.

(1) 10 cm (2) 5 cm
(3) 20 cm (4) 15 cm

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

41. In the given figure, ∠ ONY = 50° and ∠ OMY = 15°. Then the value of the ∠ MON is

(1) 30° (2) 40°
(3) 20° (4) 70°

(SSC CGL Tier-I Exam. 26.10.2014)

42. Two chords of lengths a metre and b metre subtend angles 60° and 90° at the centre of the circle respectively. Which of the following is true ?

(1) $b = \sqrt{2}a$ (2) $a = \sqrt{2}b$
(3) a = 2b (4) $b = 2a$

(SSC CGL Tier-II Exam. 21.09.2014)

43. Two chords AB and CD of a circle with centre O, intersect each other at P. If ∠AOD = 100° and ∠BOC = 70°, then the value of ∠APC is

(1) 80° (2) 75°
(3) 85° (4) 95°

(SSC CGL Tier-II Exam. 21.09.2014)

44. Chords AC and BD of a circle with centre O intersect at right angles at E. If ∠OAB = 25°, then the value of ∠EBC is

(1) 30° (2) 25°
(3) 20° (4) 15°

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

45. Two circles touch externally at P. QR is a common tangent of the circles touching the circles at Q and R. Then measure of ∠ QPR is

(1) 60° (2) 30°
(3) 90° (4) 45°

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

46. Two circles intersect each other at the points A and B, A straight line parallel to AB intersects the circles at C, D, E and F. If CD = 4.5 cm, then the measure of EF is

(1) 1.50 cm (2) 2.25 cm
(3) 4.50 cm (4) 9.00 cm

(SSC CHSL DEO & LDC Exam. 9.11.2014)

47. Two circles C_1 and C_2 touch each other internally at P. Two lines PCA and PDB meet the circles C_1 in C, D and C_2 in A, B respectively. If ∠BDC = 120°, then the value of ∠ABP is equal to

(1) 60° (2) 80°
(3) 100° (4) 120°

(SSC CHSL DEO & LDC Exam. 16.11.2014)

48. Two circles having radii r units intersect each other in such a way that each of them passes through the centre of the other. Then the length of their common chord is

(1) $\sqrt{2}r$ units (2) $\sqrt{3}r$ units
(3) $\sqrt{5}r$ units (4) r units

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

49. Two circles with centres A and B of radii 5 cm and 3 cm respectively touch each other internally. If the perpendicular bisector of AB meets the bigger circle in P and Q, then the value of PQ is

(1) $\sqrt{6}$ cm (2) $2\sqrt{6}$ cm

(3) $3\sqrt{6}$ cm (4) $4\sqrt{6}$ cm

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

50. Two parallel chords of a circle of diameter 20 cm are 12 cm and 16 cm long. If the chords are in the same side of the centre, then the distance between them is

(1) 28 cm (2) 2 cm

(3) 4 cm (4) 8 cm

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

51. Chords AB and CD of a circle intersect at E. If AE = 9 cm, BE = 12 cm and CE = 3DE, then the length of DE (in cm) is

(1) $\frac{9}{4}$ (2) 4

(3) 6 (4) 7

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

52. Let O be the centre of a circle. A, B, C and D are four points on the circumference of the circle in the given order, such that ∠ AOC = 130°. Then the measure of ∠ ABC and ∠ ADC are respectively.

(1) 65°, 115° (2) 65°, 65°

(3) 115°, 65° (4) 115°, 115°

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

53. Chords PQ and RS of a circle, when produced, meet at a point O. If PQ = 6 cm, OQ = 8 cm and OS = 7 cm, then length (in cm) of the chord RS is

(1) 10 (2) 12

(3) 16 (4) 9

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

54. Three circles of radius 6 cm each touches each other externally. Then the distance of the centre of one circle from the line joining the centres of other two circles is equal to

(1) $6\sqrt{5}$ cm (2) $6\sqrt{3}$ cm

(3) $6\sqrt{2}$ cm (4) $6\sqrt{7}$ cm

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

55. Two circles of radii 10 cm and 8 cm intersect and the length of the common chord is 12 cm. Then the distance between their centres is

(1) 10 cm (2) 8 cm

(3) 13.3 cm (4) 15 cm

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

56. In a given circle, the chord PQ is of length 18 cm. AB is the perpendicular bisector of PQ at M. If MB = 3 cm, then the length of AB is

(1) 27 cm. (2) 30 cm.

(3) 28 cm. (4) 25 cm.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

57. Two chords of length a unit and b unit of a circle make angles 60° and 90° at the centre of a circle respectively, then the correct relation is

(1) $b = \frac{3}{2}a$ (2) $b = \sqrt{2}a$

(3) $b = 2a$ (4) $b = \sqrt{3}a$

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

58. AB and CD are two parallel chords of a circle lying on the opposite side of the centre and the distance between them is 17 cm. The length of AB and CD are 10 cm and 24 cm respectively. The radius (in cm) of the circle is :

(1) 13 (2) 9

(3) 18 (4) 15

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

59. The distance between the centres of the two circles of radii r_1 and r_2 is d. They will touch each other internally if

(1) $d = r_1$ or r_2 (2) $d = r_1 + r_2$

(3) $d = r_1 - r_2$ (4) $d = \sqrt{r_1 r_2}$

(SSC CGL Tier-I Re-Exam, 30.08.2015)

60. In a circle with centre O, AB and CD are two diameters perpendicular to each other. The length of chord AC is

(1) 2 AB (2) $\sqrt{2}$ AB

(3) $\frac{1}{2}$ AB (4) $\frac{1}{\sqrt{2}}$ AB

(SSC CGL Tier-I Re-Exam, 30.08.2015)

61. AB is the diameter of a circle with centre O. P be a point on it. If ∠ POA = 120°. Then, ∠ PBO = ?

(1) 60° (2) 120°

(3) 45° (4) 50°

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

62. In a circle with centre at O (0, 0) and radius 5 cm, AB is a chord of length 8 cm. If OM is perpendicular to AB, then the length of OM is:

(1) 2.5 cm. (2) 3 cm.

(3) 4 cm. (4) 1 cm.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

63. AB is the diameter of a circle with centre O and P is a point on its circumference. If ∠POA = 120°, then the value of ∠PBO is :

(1) 30° (2) 60°

(3) 50° (4) 40°

(SSC CGL Tier-I (CBE) Exam.10.09.2016)

64. An arc of 30° in one circle is double an arc in a second circle, the radius of which is three times the radius of the first. Then the angles subtended by the arc of the second circle at its centre is

(1) 3° (2) 4°

(3) 5° (4) 6°

(SSC CGL Tier-I (CBE) Exam.10.09.2016)

65. In a circle, a chord, $5\sqrt{2}$ cm long, makes a right angle at the centre. Then the length of the radius of the circle will be
(1) 2.5 cm (2) 5 cm
(3) 7.5 cm (4) 10 cm
(SSC CGL Tier-II Online Exam.01.12.2016)

66. The perpendicular from the centre of a circle to a chord is 16 cm. If the diameter of the circle is 40 cm, what is the length of the chord ?
(1) 12 cm (2) 16 cm
(3) 24 cm (4) 30 cm
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

67. Two parallel chords of lengths 40 cm and 48 cm are drawn in a circle of radius 25 cm. What will be the distance between the two chords ?
(1) 8 cm (2) 15 cm
(3) 22 cm
(4) Either 8 cm or 22 cm
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

68. If the length of a chord of a circle is equal to that of the radius of the circle, then the angle subtended, in radians, at the centre of the circle by the chord is
(1) 1 (2) $\frac{\pi}{2}$
(3) $\frac{\pi}{3}$ (4) $\frac{\pi}{4}$
(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

69. In the adjoining figure $\angle AOC = 140°$ where O is the centre of the circle then $\angle ABC$ is equal to :

(1) 110° (2) 100°
(3) 90° (4) 40°
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

70. Chord PQ is the perpendicular bisector of radius OA of circle with centre O (A is a point on the edge of the circle). If the length of Arc PAQ = $\frac{2\pi}{3}$. What is the length of chord PQ ?
(1) 2 (2) $\sqrt{3}$
(3) $2\sqrt{3}$ (4) 1
(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

71. A chord of length 16 cm is drawn in a circle of radius 10 cm. The distance of the chord from the centre of the circle is
(1) 8 cm (2) 6 cm
(3) 4 cm (4) 12 cm
(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

72. An angle in a semicircle is
(1) 45° (2) 60°
(3) 90° (4) 120°
(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

73. AB is a chord of a circle with 0 as centre. C is a point on the circle such that OC ⊥ AB and OC intersects AB at P. If PC = 2 cm and AB = 6 cm then the diameter of the circle is
(1) 6 cm (2) 6.5 cm
(3) 13 cm (4) 12 cm
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

74. Two circles touch each other internally. The greater circle has its radius as 6 cm and the distance between the centres of the circles is 2 cm. The radius of the other circle is
(1) 3 cm. (2) 4 cm.
(3) 2 cm. (4) 5 cm.
(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

75. If the length of a chord of a circle is 16 cm and is at a distance of 15 cm from the centre of the circle, then the radius of the circle (in cm) is :
(1) 15 (2) 16
(3) 17 (4) 34
(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

76. AB is a diameter of the circle with centre O, CD is chord of the circle. If $\angle BOC = 120°$, then the value of $\angle ADC$ is
(1) 42° (2) 30°
(3) 60° (4) 35°
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

77. Two chords AB and PQ of a circle intersect at D inside a circle. If AD = 4 cm., DB = 6 cm., QD = 3 cm., the length of PQ is equal to
(1) 11 cm. (2) 8 cm.
(3) 9 cm. (4) 10 cm.
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

78. Two circles touch each other internally. The radius of the larger circle is 6 cm and the distance between the centre is 2 cm, then the radius (in cms) of the other circle is
(1) 8 (2) 2
(3) 4 (4) 3
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

79. In a circle, a diameter AB and a chord PQ (which is not a diameter) intersect each other at X perpendicularly. If AX : BX = 3 : 2 and the radius of the circle is 5 cm, then the length of chord PQ is
(1) $2\sqrt{13}$ cm. (2) $5\sqrt{3}$ cm.
(3) $4\sqrt{6}$ cm. (4) $6\sqrt{5}$ cm.
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

80. In a circle with centre O, AB is a diameter and CD is a chord which is equal to the radius OC. AC and BD are extended in such a way that they intersect each other at a point P, exterior to the circle. The measure of $\angle APB$ is
(1) 30° (2) 45°
(3) 60° (4) 90°
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

81. Two chords AB and CD of a circle with centre O intersect at P. If $\angle APC = 40°$. Then the value of $\angle AOC + \angle BOD$ is
(1) 50° (2) 60°
(3) 80° (4) 120°
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

82. The length of a chord which is at a distance of 5 cm from the centre of a circle of radius 13 cm is :
(1) 18 cm. (2) 24 cm.
(3) 25 cm. (4) 30 cm.
(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

83. Two circles of radii 17 cm and 8 cm are concentric. The length of a chord of greater circle which touches the smaller circle is
(1) 15 cm (2) 16 cm
(3) 30 cm (4) 34 cm
(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

84. In the figure ΔABC is inscribed in a circle with centre O. If ∠ABC = 30° then ∠ACB is equal to

(1) 30° (2) 60°
(3) 50° (4) 90°
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

85. In a circle, two arcs of unequal length subtend angles in the ratio 5 : 3. If the smaller angle is 45° then the measure of other angle in degrees is :
(1) 75° (2) 72°
(3) 60° (4) 78°
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

86. A 8 cm long perpendicular is drawn from the centre of a circle to a 12 cm long chord. The diameter of the circle is :
(1) 10 cm. (2) 12 cm.
(3) 16 cm. (4) 20 cm.
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

87. The length of the radius of a circle with centre O is 5 cm and the length of the chord AB is 8 cm. The distance of the chord AB from the point O is
(1) 2 cm. (2) 3 cm.
(3) 4 cm. (4) 15 cm.
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

88. Two circles touch each other externally. The distance between their centres is 7 cm. If the radius of one circle is 4 cm, then the radius of the other circle will be
(1) 3 cm. (2) 4 cm.
(3) 5.5 cm. (4) 3.5 cm.
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

89. Points P, Q and R are on a circle such that ∠PQR = 40° and ∠QRP = 60°. Then the subtended angle by arc QR at the centre is :
(1) 80° (2) 120°
(3) 140° (4) 160°
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

90. The length of a chord which is at a distance of 12 cm from the centre of a circle of radius 13 cm is
(1) 10 cm. (2) 5 cm.
(3) 6 cm. (4) 12 cm.
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

91. Number of circles that can be drawn through three non-collinear points is :
(1) exactly one
(2) two
(3) three
(4) more than three
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

92. Two circles touch each other internally. The radius of the smaller circle is 6 cm and the distance between the centre of two circles is 3 cm. The radius of the larger circle is :
(1) 7.5 cm (2) 9 cm
(3) 8 cm (4) 10 cm
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

93. Length of a chord PQ of a circle with centre O is 4 cm. If the distance of PQ from the point O is 2 cm, then the length of the diameter is:
(1) $2\sqrt{2}$ cm. (2) $3\sqrt{2}$ cm.
(3) $5\sqrt{2}$ cm. (4) $4\sqrt{2}$ cm.
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

94. A chord of length 39 cm is at a distance of 10.4 cm from the centre of a circle. Find the radius of the circle.
(1) 19.5 cm. (appr.)
(2) 22.1 cm.(appr.)
(3) 28.6 cm. (appr.)
(4) 2. 21 cm. (appr.)
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

95. A chord of length 10 cm subtends an angle 120° at the centre of a circle . Distance of the chord from the centre is
(1) $5\sqrt{3}$ cm. (2) $\frac{5\sqrt{3}}{2}$ cm.
(3) $\frac{5}{\sqrt{3}}$ cm. (4) 5 cm.
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

TYPE–XIII

1. The radius of two concentric circles are 9 cm and 15 cm. If the chord of the greater circle be a tangent to the smaller circle, then the length of that chord is
(1) 24 cm (2) 12 cm
(3) 30 cm (4) 18 cm
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

2. If a chord of a circle of radius 5 cm is a tangent to another circle of radius 3 cm, both the circles being concentric, then the length of the chord is
(1) 10 cm (2) 12.5 cm
(3) 8 cm (4) 7 cm
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

3. The tangents are drawn at the extremities of diameter *AB* of a circle with centre *P*. If a tangent to the circle at the point *C* intersects the other two tangents at *Q* and *R*, then the measure of the ∠*QPR* is
(1) 45° (2) 60°
(3) 90° (4) 180°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

4. *AB* is a chord to a circle and *PAT* is the tangent to the circle at *A*. If ∠*BAT* = 75° and ∠*BAC* = 45°, *C* being a point on the circle, then ∠*ABC* is equal to
(1) 40° (2) 45°
(3) 60° (4) 70°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

5. The tangents at two points A and B on the circle with centre O intersects at P ; If in quadrilateral PAOB, ∠AOB: ∠APB = 5 : 1, then measure of ∠APB is :
(1) 30° (2) 60°
(3) 45° (4) 15°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

6. Two circles touch each other externally at point A and PQ is a direct common tangent which touches the circles at P and Q respectively. Then ∠PAQ =
(1) 45° (2) 90°
(3) 80° (4) 100°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

7. PR is tangent to a circle, with centre O and radius 4 cm, at point Q. If $\angle POR = 90°$, OR = 5 cm and OP = $\frac{20}{3}$ cm, then (in cm) the length of PR is :

(1) 3 (2) $\frac{16}{3}$

(3) $\frac{23}{3}$ (4) $\frac{25}{3}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

8. Two circles touch each other externally at P. AB is a direct common tangent to the two circles, A and B are point of contact and $\angle$ PAB = 35°. Then $\angle$ ABP is

(1) 35° (2) 55°
(3) 65° (4) 75°

(SSC Graduate Level Tier-II Exam.16.09.2012)

9. If the radii of two circles be 6 cm and 3 cm and the length of the transverse common tangent be 8 cm, then the distance between the two centres is

(1) $\sqrt{145}$ cm (2) $\sqrt{140}$ cm

(3) $\sqrt{150}$ cm (4) $\sqrt{135}$ cm

(SSC Graduate Level Tier-II Exam.16.09.2012)

10. The distance between the centre of two equal circles, each of radius 3 cm, is 10 cm. The length of a transverse common tangent is

(1) 8 cm (2) 10 cm
(3) 4 cm (4) 6 cm

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

11. The radii of two circles are 5cm and 3cm, the distance between their centre is 24 cm. Then the length of the transverse common tangent is

(1) 16 cm (2) $15\sqrt{2}$ cm

(3) $16\sqrt{2}$ cm (4) 15 cm

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

12. P and Q are two points on a circle with centre at O. R is a point on the minor arc of the circle, between the points P and Q. The tangents to the circle at the points P and Q meet each other at the point S. If $\angle PSQ$ = 20°, then $\angle PRQ$ = ?

(1) 80° (2) 200°
(3) 160° (4) 100°

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

13. Two circles intersect at A and B. P is a point on produced BA. PT and PQ are tangents to the circles. The relation of PT and PQ is

(1) PT = 2PQ (2) PT < PQ
(3) PT > PQ (4) PT = PQ

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

14. The length of the tangent drawn to a circle of radius 4 cm from a point 5 cm away from the centre of the circle is

(1) 3 cm (2) $4\sqrt{2}$ cm

(3) $5\sqrt{2}$ cm (4) $3\sqrt{2}$ cm

(SSC Graduate Level Tier-I Exam. 19.05.2013)

15. From a point P, two tangents PA and PB are drawn to a circle with centre O. If OP is equal to diameter of the circle, then $\angle$APB is

(1) 45° (2) 90°
(3) 30° (4) 60°

(SSC CHSL DEO & LDC Exam. 20.10.2013)

16. The radii of two concentric circles are 13 cm and 8 cm. AB is a diameter of the bigger circle and BD is a tangent to the smaller circle touching it at D and the bigger circle at E. Point A is joined to D. The length of AD is

(1) 20 cm (2) 19 cm
(3) 18 cm (4) 17 cm

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

17. PQ is a chord of length 8 cm, of a circle with centre O and of radius 5 cm. The tangents at P and Q intersect at a point T. The length of TP is

(1) $\frac{20}{3}$ cm (2) $\frac{21}{4}$ cm

(3) $\frac{10}{3}$ cm (4) $\frac{15}{4}$ cm

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

18. The minimum number of common tangents drawn to two circles when both the circles touch each other externally is

(1) 1 (2) 2
(3) 3 (4) 0

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

19. The length of a tangent from an external point to a circle is $5\sqrt{3}$ unit. If radius of the circle is 5 units, then the distance of the point from the circle is

(1) 5 units (2) 15 units
(3) -5 units (4) -15 units

(SSC CGL Tier-I Exam. 19.10.2014)

20. Two circles are of radii 7 cm and 2 cm their centres being 13cm apart. Then the length of direct common tangent to the circles between the points of contact is

(1) 12 cm (2) 15 cm
(3) 10 cm (4) 5 cm

(SSC CGL Tier-I Exam. 19.10.2014)

21. The radius of a circle is 6 cm. The distance of a point lying outside the circle from the centre is 10 cm. The length of the tangent drawn from the outside point to the circle is

(1) 5 cm (2) 6 cm
(3) 7 cm (4) 8 cm

(SSC CGL Tier-II Exam. 21.09.2014)

22. DE is a tangent to the circumcircle of ΔABC at the vertex A such that DE || BC. If AB = 17 cm, then the length of AC is equal to

(1) 16.0 cm (2) 16.8 cm
(3) 17.3 cm (4) 17 cm

(SSC CHSL DEO & LDC Exam. 16.11.2014)

23. The distance between the centres of two circles with radii 9 cm and 16 cm is 25 cm. The length of the segment of the tangent between them is

(1) 24 cm (2) 25 cm

(3) $\frac{50}{3}$ cm (4) 12 cm

(SSC CHSL DEO & LDC Exam. 16.11.2014)

24. ST is a tangent to the circle at P and QR is a diameter of the circle. If $\angle RPT$ = 50°, then the value of $\angle SPQ$ is

(1) 40° (2) 60°
(3) 80° (4) 100°

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

25. If PA and PB are two tangents to a circle with centre O such that $\angle AOB = 110°$, then $\angle APB$ is

(1) 90° (2) 70°
(3) 60° (4) 55°

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

26. Two circles with radii 25 cm and 9 cm touch each other externally. The length of the direct common tangent is

(1) 34 cm (2) 30 cm
(3) 36 cm (4) 32 cm

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

27. In a circle with centre O, AB is a chord, and AP is a tangent to the circle. If $\angle AOB = 140°$, then the measure of $\angle PAB$ is

(1) 35° (2) 55°
(3) 70° (4) 75°

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

28. If two circles of radii 9 cm and 4 cm touch externally, then the length of a common tangent is

(1) 5 cm (2) 7 cm
(3) 8 cm (4) 12 cm

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

29. AB is a diameter of a circle with centre O. The tangents at C meets AB produced at Q. If $\angle CAB = 34°$, then measure of $\angle CBA$ is

(1) 56° (2) 34°
(3) 68° (4) 124°

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

30. Let P and Q be two points on a circle with centre O. If two tangents of the circle through P and Q meet at A with $\angle PAQ = 48°$, then $\angle APQ$ is

(1) 96° (2) 48°
(3) 66° (4) 60°

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

31. The distance between the centres of two circles having radii 8 cm and 3 cm, is 13 cm. The length (in cm) of the direct common tangent of the two circles is

(1) 15 (2) 16
(3) 18 (4) 12

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

32. In the given figure, PAB is a secant and PT is a tangent to the circle from P. If PT = 5 cm, PA = 4 cm and AB = x cm, then x is

(1) $\frac{4}{9}$ cm (2) $\frac{9}{4}$ cm
(3) 5 cm (4) $\frac{2}{3}$ cm

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

33. Two circles of diameters 10 cm and 6 cm have the same centre. A chord of the larger circle is a tangent of the smaller one. The length of the chord is

(1) 4 cm. (2) 8 cm.
(3) 6 cm. (4) 10 cm.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

34. Two circles with their centres at O and P and radii 8 cm and 4 cm respectively touch each other externally. The length of their common tangent is

(1) 8.5 cm. (2) $\frac{8}{\sqrt{2}}$ cm.
(3) $8\sqrt{2}$ cm. (4) 8 cm.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

35. A tangent is drawn to a circle of radius 6 cm from a point situated at a distance of 10 cm from the centre of the circle. The length of the tangent will be

(1) 7 cm (2) 4 cm
(3) 5 cm (4) 8 cm

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

36. XY and XZ are tangents to a circle, ST is another tangent to the circle at the point R on the circle, which intersects XY and XZ at S and T respectively. If XY = 15 cm and TX = 9 cm, then RT is

(1) 4.5 cm (2) 7.5 cm
(3) 6 cm (4) 3 cm

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

37. AC is transverse common tangent to two circles with centres P and Q and radii 6 cm and 3 cm at the point A and C respectively. If AC cuts PQ at the point B and AB = 8cm then the length of PQ is :

(1) 13 cm (2) 12 cm
(3) 10 cm (4) 15 cm

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

38. A point Q is 13 cm from the centre of a circle. The length of the tangent drawn from Q to a circle is 12 cm. The distance of Q from the nearest point of the circle is

(1) 7 cm (2) 8 cm
(3) 5 cm (4) 12 cm

(SSC CGL Tier-I Re-Exam, 30.08.2015)

39. A and B are centres of two circles of radii 11 cm and 6 cm, respectively. PQ is a direct common tangent to the circles. If $\overline{AB}$ = 13 cm, then length of $\overline{PQ}$ will be

(1) 8.5 cm (2) 13 cm
(3) 12 cm (4) 17 cm

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

40. AB and AC are tangents to a circle with centre O. A is the external point of the circle. The line AO intersect the chord BC at D. The measure of the $\angle BDO$ is

(1) 60° (2) 90°
(3) 45° (4) 75°

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

41. The distance between the centres of two circles of radii 6 cm and 3 cm is 15 cm. The length of the transverse common tangent to the circles is :

(1) 12 cm (2) $6\sqrt{6}$ cm
(3) $7\sqrt{6}$ cm (4) 18 cm

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

42. Two circles of radii 5 cm and 3cm touch externally, then the ratio in which the direct common tangent to the circles divides externally the line joining the centers of the circles is:
(1) 5 : 3 (2) 3 : 5
(3) 2.5 : 1.5 (4) 1.5 : 2.5
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

43. The distance between centres of two circles of radii 3 cm and 8 cm is 13 cm. If the points of contact of a direct common tangent to the circles are P and Q, then the length of the line segment PQ is :
(1) 11.9 cm (2) 12 cm
(3) 11.58 cm (4) 11.5 cm
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

44. If PA and PB are two tangents to a circle with centre O such that ∠APB = 80°, then, ∠AOP = ?
(1) 40° (2) 50°
(3) 60° (4) 70°
(SSC CGL Tier-I (CBE) Exam.10.09.2016)

45. A and B are the centres of two circles with radii 11 cm and 6 cm respectively. A common tangent touches these circles at P and Q respectively. If AB = 13 cm., then the length of PQ is
(1) 13 cm. (2) 17 cm.
(3) 8.5 cm. (4) 12 cm.
(SSC CGL Tier-II Online Exam.01.12.2016)

46. 2 equal tangents PA and PB are drawn from an external point P on a circle with centre O. What is the length of each tangent, if P is 12 cm from the centre and the angle between the tangents is 120°?
(1) 24 cm. (2) 6 cm.
(3) 8 cm.
(4) Cannot be determined
(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

47. O is the centre of a circle and AB is the tangent to it touching at B. If OB = 3 cm. and OA = 5 cm, then the measure of AB in cm is
(1) $\sqrt{34}$ (2) 2
(3) 8 (4) 4
(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

48. Two concentric circles are drawn with radii 12 cm and 13 cm. What will be the length of any chord of the larger circle that is tangent to the smaller circle?
(1) 5 cm (2) 8 cm
(3) 10 cm (4) 25 cm
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

49. In the figure below, AB is a chord of a circle with centre O. A tangent AT is drawn at point A so that ∠BAT=50°. Then ∠ADB=?

(1) 120° (2) 130°
(3) 140° (4) 150°
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

50. A chord of a circle is equal to its radius. A tangent is drawn to the circle at an extremity of the chord. The angle between the tangent and the chord is
(1) 30° (2) 45°
(3) 60° (4) 75°
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

51. How many common tangents can be drawn on two circles touching each other exter-nally?
(1) Infinity (2) 0
(3) 2 (4) 3
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

52. The maximum number of common tangents that can be drawn to two disjoint circles is
(1) 1 (2) 2
(3) 4 (4) Infinitely many
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

53. There are two equal circles of radius 3 cm each and distance between their centres is 10 cm. The length of one of their transverse common tangents is
(1) 7 cm (2) 9 cm
(3) 10 cm (4) 8 cm
(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

54. ΔABC is inscribed in a circle so that BC is diameter. The tangent at a point C intersects BA when produced at a point D. If ∠ABC = 36° then the value of ∠ADC is
(1) 36° (2) 44°
(3) 48° (4) 54°
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

55. PQ is a tangent to the circle at T. If TR = TS where R and S are points on the circle and ∠RST = 65°, the ∠PTS = ?
(1) 65° (2) 130°
(3) 115° (4) 55°
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

56. From an external point two tangents to a circle are drawn. The chord passing through the points of contact subtends an angle72° at the centre. The angle between the tangents is
(1) 36° (2) 72°
(3) 108° (4) 144°
(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

57. AB is a diameter of a circle. C is a point on the tangent drawn at A. If AB = 8 cm and AC = 6 cm, then the length of BC is :
(1) 10 cm. (2) 14 cm.
(3) 5 cm. (4) 7 cm.
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

58. A, B and C are three points on a circle with centre O. The tangent at C meets BA produced to T. If ∠ATC = 30° and ∠ACT = 48°, then what is the value of ∠AOB ?
(1) 78° (2) 96°
(3) 102° (4) 108°
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

59. If PA and PB are tangents to the circle with centre O such that ∠APB = 50°, then ∠OAB is equal to
(1) 25° (2) 30°
(3) 40° (4) 50°
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

60. T is a point on the common tangents at P of two circles and if TA and TB are respectively the other tangents at A and B to the two circles drawn from the point T then

(1) TA = 2 TB (2) TA = TB

(3) TA = $\frac{1}{2}$TB (4) 3TA = TB

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

61. If PQ and PR be the two tangents to a circle with centre O such that ∠QPR = 120°, then ∠POQ is :

(1) 90° (2) 45°

(3) 30° (4) 60°

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

62. O is the centre of a circle. P is an external point of it at a distance of 13 cm from O. The radius of the circle is 5 cm. Then the length of a tangent to the circle from P upto the point of contact is :

(1) $\sqrt{194}$ cm. (2) 10 cm.

(3) 12 cm. (4) 8 cm.

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

63. The chord AB of a circle of centre O subtends an angle θ with the tangent at A to the circle. Then measure of ∠ABO is :

(1) θ (2) 90°–θ

(3) 90° + θ (4) 2 (180° – θ)

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

64. PT is a tangent to a circle with centre O and radius 6 cm. If PT is 8 cm then length of OP is

(1) 10 cm. (2) 12 cm.

(3) 16 cm. (4) 9 cm.

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

65. A circle has its centre at O. A tangent drawn from a point P, which is situated outside the circle, touches the circle at A.

If PA = 4 cm and PO = 5 cm, then the length of the radius of the circle is

(1) 1 cm. (2) 2 cm.

(3) 3 cm. (4) 4 cm.

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

TYPE–XIV

1. AC is the diameter of a circumcircle of ΔABC. Chord ED is parallel to the diameter AC. If ∠CBE = 50°, then the measure of ∠DEC is

(1) 50° (2) 90°

(3) 60° (4) 40°

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

2. The length of the two sides forming the right angle of a right-angled triangle are 6 cm and 8 cm. The length of its circum-radius is :

(1) 5 cm (2) 7 cm

(3) 6 cm (4) 10 cm

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

3. The length of radius of a circumcircle of a triangle having sides 3cm, 4cm and 5cm is :

(1) 2 cm (2) 2.5 cm

(3) 3 cm (4) 1.5 cm

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

4. I and O are respectively the in-centre and circumcentre of a triangle ABC. The line AI produced intersects the circumcircle of Δ ABC at the point D. If ∠ABC = $x°$, ∠BID = $y°$ and ∠BOD = $z°$, then $\frac{z+x}{y}$ =

(1) 3 (2) 1

(3) 2 (4) 4

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

5. The radius of the circumcircle of a right angled triangle is 15 cm and the radius of its inscribed circle is 6 cm. Find the sides of the triangle.

(1) 30, 40, 41 (2) 18, 24, 30

(3) 30, 24, 25 (4) 24, 36, 20

(SSC Graduate Level Tier-I Exam. 21.04.2013)

6. If the ΔABC is right angled at B, find its circumradius if the sides AB and BC are 15 cm and 20 cm respectively.

(1) 25 cm (2) 20 cm

(3) 15 cm (4) 12.5 cm

(SSC Constable (GD) Exam. 12.05.2013)

7. If the circumradius of an equilateral triangle ABC be 8 cm, then the height of the triangle is

(1) 16 cm (2) 6 cm

(3) 8 cm (4) 12 cm

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

8. Triangle PQR circumscribes a circle with centre O and radius r cm such that ∠PQR = 90°. If PQ = 3 cm, QR = 4 cm, then the value of r is :

(1) 2 (2) 1.5

(3) 2.5 (4) 1

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

9. The radius of two concentric circles are 17cm and 10cm. A straight line ABCD intersects the larger circle at the point A and D and intersects the smaller circle at the points B and C. If BC = 12 cm, then the length of AD (in cm) is :

(1) 20 (2) 24

(3) 30 (4) 34

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

10. P and Q are centre of two circles with radii 9 cm and 2 cm respectively, where PQ = 17 cm. R is the centre of another circle of radius x cm, which touches each of the above two circles externally. If ∠PRQ = 90°, then the value of x is

(1) 4 cm (2) 6 cm

(3) 7 cm (4) 8 cm

(SSC GL Tier-II Exam. 16.09.2012) & (SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 10.11.2013 (Ist Sitting)

11. O is the circumcentre of ΔABC, given ∠BAC = 85° and ∠BCA = 55°, find ∠OAC.

(1) 40° (2) 50°

(3) 60° (4) 80°

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

12. In a ΔPQR, ∠RPQ = 90°, $\overline{PR}$ = 6 cm and $\overline{PQ}$ = 8 cm, then the radius of the circumcircle of ΔPQR is

(1) 5 cm (2) 3 cm

(3) 4 cm (4) 4.5 cm

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

13. ABC is an equilateral triangle and O is its circumcentre, then the $\angle AOC$ is

(1) 100° (2) 110°
(3) 120° (4) 130°

(SSC CGL Tier-I Exam. 19.10.2014)

14. The circumcentre of a triangle ABC is O. If $\angle BAC = 85°$ and $\angle BCA = 75°$, then the value of $\angle OAC$ is

(1) 40° (2) 60°
(3) 70° (4) 90°

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

15. If AB = 5 cm, AC = 12 cm and $AB \perp AC$, then the radius of the circumcircle of ΔABC is

(1) 6.5 cm (2) 6 cm
(3) 5 cm (4) 7 cm

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

16. In a circle if PQ is the diameter of the circle and R is on the circumference of the circle such that $\angle PQR = 30°$, then $\angle RPQ = ?$

(1) 90° (2) 60°
(3) 30° (4) 45°

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

17. The radii of two concentric circles are 17 cm and 25 cm. A straight line PQRS intersects the larger circle at the points P and S and intersects the smaller circle at the points Q and R. If QR = 16 cm, then the length (in cm.) of PS is

(1) 41 (2) 32
(3) 33 (4) 40

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

18. In Δ ABC, the bisector of $\angle BAC$ intersects BC at D and the circumcircle of Δ ABC at E. If AB : AD = 3 : 5, then AE : AC is

(1) 5 : 3 (2) 3 : 2
(3) 2 : 3 (4) 3 : 5

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

19. 'O' is the circumcentre of triangle ABC. If $\angle BAC = 50°$ then $\angle OBC$ is

(1) 50° (2) 100°
(3) 130° (4) 40°

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

20. The chord of a circle is equal to its radius. The angle subtended by this chord at the minor arc of the circle is

(1) 75° (2) 60°
(3) 150° (4) 120°

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

21. ABC is a cyclic triangle and the bisectors of $\angle BAC$, $\angle ABC$ and $\angle BCA$ meet the circle at P, Q, and R respectively. Then the angle $\angle RQP$ is

(1) $90° - \frac{B}{2}$ (2) $90° + \frac{B}{2}$

(3) $90° + \frac{C}{2}$ (4) $90° - \frac{A}{2}$

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

22. O is the circumcentre of ΔABC. If $\angle BAC = 85°$, $\angle BCA = 75°$, then $\angle OAC$ is equal to :

(1) 60° (2) 70°
(3) 50° (4) 40°

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

23. O is the circumcentre of the triangle ABC and $\angle BAC = 85°$, $\angle BCA = 75°$, then the value of $\angle OAC$ is

(1) 55° (2) 150°
(3) 20° (4) 70°

(SSC CGL Tier-I Re-Exam, 30.08.2015)

24. If O is the circumcentre of a triangle ABC lying inside the triangle, then $\angle OBC + \angle BAC$ is equal to

(1) 90° (2) 60°
(3) 110° (4) 120°

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

25. A chord of a circle is equal to its radius. The angle subtended by this chord at a point on the circumference is

(1) 80° (2) 60°
(3) 30° (4) 90°

(SSC CGL Tier-II Online Exam.01.12.2016)

26. Let two chords AB and AC of the larger circle touch the smaller circle having same centre at X and Y. Then XY = ?

(1) BC (2) $\frac{1}{2}BC$

(3) $\frac{1}{3}BC$ (4) $\frac{1}{4}BC$

(SSC CGL Tier-II Online Exam.01.12.2016)

27. O is the circumcentre of the isosceles ΔABC. Given that AB = AC = 17 cm. and BC = 6 cm. The radius of the circle is

(1) 3.015 cm. (2) 3.205 cm.
(3) 3.025 cm. (4) 3.125 cm.

(SSC CGL Tier-II Online Exam.01.12.2016)

28. In the given diagram, an incircle DEF is circumscribed by the right angled triangle in which AF = 6 cm and EC = 15 cm. Then find the difference between CD and BD.

(1) 1 cm. (2) 3 cm.
(3) 4 cm. (4) 5 cm.

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

29. ΔABC is a right angled triangle with AB = 6 cm, BC = 8 cm. O is the in-centre of the triangle. The radius of the in-circle is :

(1) 3 cm (2) 4 cm
(3) 2 cm (4) 5 cm

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

30. The ratio of inradius and circumradius of an equilateral triangle is :
(1) 1 : 2 (2) 2 : 1
(3) 1 : $\sqrt{2}$ (4) $\sqrt{2}$: 1
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

31. Δ ABC a right angled triangle has $\angle B = 90°$ and AC is hypotenuse. D is its circumcentre and AB = 3 cm, BC = 4 cm. The value of BD is
(1) 3 cm. (2) 4 cm.
(3) 2.5 cm. (4) 5.5 cm.
(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

32. The circum-centre of a triangle ABC is O. If $\angle BAC = 85°$, $\angle BCA = 75°$, then $\angle OAC$ is of
(1) 70° (2) 72°
(3) 75° (4) 74°
(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (Ist Sitting)

33. O is the circumcentre of a triangle ΔABC. The point A and th chord BC are on the opposite side of O. If $\angle BOC = 150°$. Then the angle $\angle BAC$ is :
(1) 65° (2) 60°
(3) 70° (4) 75°
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

34. From the circumcentre I of the triangle ABC, perpendicular ID is drawn on BC. If $\angle BAC = 60°$, then the value of $\angle BID$ is :
(1) 60° (2) 80°
(3) 75° (4) 45°
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

35. Point 'O' is the incentre of the Δ PQR. If $\angle POR = 115°$, then value of $\angle PQR$ is :
(1) 40° (2) 65°
(3) 50° (4) 25°
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

TYPE–XV

1. Ashok has drawn an angle of measure 45°27' when he was asked to draw an angle of 45°. The percentage error in his drawing is
(1) 0.5% (2) 1.0%
(3) 1.5% (4) 2.0%
(SSC CPO S.I. Exam. 05.09.2004)

2. Two line segments PQ and RS intersect at X in such a way that XP = XR. If $\angle PSX = \angle RQX$, then one must have
(1) PR = QS
(2) PS = RQ
(3) $\angle XSQ = \angle XRP$
(4) ar(ΔPXR) = ar(ΔQXS)
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

3. Two chords AB and CD of circle whose centre is O, meet at the point P and $\angle AOC = 50°$, $\angle BOD = 40°$. Then the value of $\angle BPD$ is
(1) 60° (2) 40°
(3) 45° (4) 75°
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

4. A straight line parallel to BC of ΔABC intersects AB and AC at points P and Q respectively. AP = QC, PB= 4 units and AQ = 9 units, then the length of AP is :
(1) 25 units (2) 3 units
(3) 6 units (4) 6.5 units
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

5. In a ΔABC, $\overline{AB}^2 + \overline{AC}^2 = \overline{BC}^2$ and $\overline{BC} = \sqrt{2}\,\overline{AB}$, then $\angle ABC$ is :
(1) 30° (2) 45°
(3) 60° (4) 90°
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

6. Two chords AB and CD of a circle with centre O intersect each other at the point P. If $\angle AOD = 20°$ and $\angle BOC = 30°$, then $\angle BPC$ is equal to:
(1) 50° (2) 20°
(3) 25° (4) 30°
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

7. ABCD is a quadrilateral inscribed in a circle with centre O. If $\angle COD = 120°$ and $\angle BAC = 30°$, then $\angle BCD$ is :
(1) 75° (2) 90°
(3) 120° (4) 60°
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

8. If ΔABC is similar to ΔDEF, such that $\angle A = 47°$ and $\angle E = 63°$ then $\angle C$ is equal to :
(1) 40° (2) 70°
(3) 65° (4) 37°
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

9. The internal bisectors of $\angle ABC$ and $\angle ACB$ of ΔABC meet each other at O. If $\angle BOC = 110°$, then $\angle BAC$ is equal to
(1) 40° (2) 55°
(3) 90° (4) 110°
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

10. In ΔABC, $\angle B = 60°$ and $\angle C = 40°$. If AD and AE be respectively the internal bisector of $\angle A$ and perpendicular on BC, then the measure of $\angle DAE$ is
(1) 5° (2) 10°
(3) 40° (4) 60°
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

11. A circle (with centre at O) is touching two intersecting lines AX and BY. The two points of contact A and B subtend an angle of 65° at any point C on the circumference of the circle. If P is the point of intersection of the two lines, then the measure of $\angle APO$ is
(1) 25° (2) 65°
(3) 90° (4) 40°
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

12. Internal bisectors of $\angle B$ and $\angle C$ of ΔABC intersect at O. If $\angle BOC = 102°$, then the value of $\angle BAC$ is
(1) 12° (2) 24°
(3) 48° (4) 60°
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

13. The angle between the external bisectors of two angles of a triangle is 60°. Then the third angle of the triangle is
(1) 40° (2) 50°
(3) 60° (4) 80°
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

14. I is the incentre of Δ ABC. If $\angle ABC = 60°$, $\angle BCA = 80°$, then the $\angle BIC$ is
(1) 90° (2) 100°
(3) 110° (4) 120°
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

15. In Δ ABC, draw BE $\perp$ AC and CF $\perp$ AB and the perpendicular BE and CF intersect at the point O. If $\angle$ BAC = 70°, then the value of $\angle$ BOC is
(1) 125° (2) 55°
(3) 150° (4) 110°
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

16. O is the centre and arc ABC subtends an angle of 130° at O. AB is extended to P. Then ∠PBC is
(1) 75° (2) 70°
(3) 65° (4) 80°
(SSC Delhi Police Sub-Inspector (SI) Exam. 19.08.2012)

17. Internal bisectors of angles ∠B and ∠C of a triangle ABC meet at O. If ∠BAC = 80°, then the value of ∠BOC is
(1) 120° (2) 140°
(3) 110° (4) 130°
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012) & (SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

18. In triangle PQR, points A, B and C are taken on PQ, PR and QR respectively such that QC=AC and CR = CB. If ∠QPR = 40°, then ∠ACB is equal to :
(1) 140° (2) 40°
(3) 70° (4) 100°
(SSC CHSL DEO & LDC Exam. 21.10.2012, IInd Sitting)

19. Two chords AB, CD of a circle with centre O intersect each other at P. ∠ADP = 23° and ∠APC = 70°, then the ∠BCD is
(1) 45° (2) 47°
(3) 57° (4) 67°
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

20. In a ΔABC ∠A : ∠B : ∠C = 2 : 3 : 4. A line CD drawn || to AB, then the ∠ACD is :
(1) 40° (2) 60°
(3) 80° (4) 20°
(SSC Graduate Level Tier-I Exam. 21.04.2013)

21. In triangle ABC, ∠ BAC = 75°, ∠ABC = 45°. $\overline{BC}$ is produced to D. If ∠ ACD = x^o, then $\frac{x}{3}$ % of 60° is
(1) 30° (2) 48°
(3) 15° (4) 24°
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

22. In a Δ ABC, AB = AC and BA is produced to D such that AC = AD. Then the ∠ BCD is
(1) 100° (2) 60°
(3) 80° (4) 90°
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

23. In Δ ABC, ∠A + ∠B = 65°, ∠B + ∠C = 140°, then find ∠B.
(1) 40° (2) 25°
(3) 35° (4) 20°
(SSC Graduate Level Tier-I Exam. 19.05.2013)

24. In a triangle ABC, ∠A = 90°, ∠C = 55°, $\overline{AD} \perp \overline{BC}$. What is the value of ∠BAD ?
(1) 35° (2) 60°
(3) 45° (4) 55°
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

25. If O be the circumcentre of a triangle PQR and ∠ QOR = 110°, ∠ OPR = 25°, then the measure of ∠ PRQ is
(1) 65° (2) 50°
(3) 55° (4) 60°
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

26. In the following figure, AB be diameter of a circle whose centre is O. If ∠AOE = 150°, ∠DAO = 51° then the measure of ∠CBE is :

(1) 115° (2) 110°
(3) 105° (4) 120°
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

27. In a triangle ABC, BC is produced to D so that CD = AC. If ∠BAD=111° and ∠ACB = 80°, then the measure of ∠ABC is :
(1) 31° (2) 33°
(3) 35° (4) 29°
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

28. In ΔABC, ∠A + ∠B = 145° and ∠C + 2∠B = 180°. State which one of the following relations is true ?
(1) CA = AB (2) CA < AB
(3) BC > AB (4) CA > AB
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

29. ∠A, ∠B, ∠C are three angles of a triangle. If ∠A – ∠B = 15°, ∠B – ∠C = 30°, then ∠A, ∠B and ∠C are
(1) 80°, 60°, 40° (2) 70°, 50°, 60°
(3) 80°, 65°, 35° (4) 80°, 55°, 45°
(SSC Graduate Level Tier-II Exam. 29.09.2013)

30. All sides of a quadrilateral ABCD touch a circle. If AB = 6 cm, BC = 7.5 cm, CD = 3 cm, then DA is
(1) 3.5 cm (2) 4.5 cm
(3) 2.5 cm (4) 1.5 cm
(SSC Graduate Level Tier-II Exam. 29.09.2013)

31. D is a point on the side BC of a triangle ABC such that AD ⊥ BC. E is a point on AD for which AE : ED = 5 : 1. If ∠BAD = 30° and tan (∠ ACB) = 6 tan (∠ DBE), then ∠ ACB =
(1) 30° (2) 45°
(3) 60° (4) 15°
(SSC Graduate Level Tier-II Exam. 29.09.2013)

32. In ΔABC ∠A = ∠B = 60°, AC = $\sqrt{13}$ cm. The lines AD and BD intersect at D with ∠D = 90°. If DB = 2 cm, then the length of AD is
(1) 3 cm (2) 3.5 cm
(3) 4 cm (4) 4.7 cm
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

33. Two supplementary angles are in the ratio 2 : 3. The angles are
(1) 33°, 57° (2) 66°, 114°
(3) 72°, 108° (4) 36°, 54°
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

34. If the angles of a triangle ABC are in the ratio 2 : 3 : 1, then the angles ∠A, ∠B and ∠C are
(1) ∠A = 60°, ∠B = 90°, ∠C = 30°
(2) ∠A = 40°, ∠B = 120°, ∠C = 20°
(3) ∠A = 20°, ∠B = 60°, ∠C = 60°
(4) ∠A = 45°, ∠B = 90°, ∠C = 45°
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

35. A tree of hight 'h' metres is broken by a storm in such a way that its top touches the ground at a distance of 'x' metres from its root. Find the height at which the tree is broken. (Here $h > x$)
(1) $\frac{h^2 + x^2}{2h}$ metre
(2) $\frac{h^2 - x^2}{2h}$ metre
(3) $\frac{h^2 + x^2}{4h}$ metre
(4) $\frac{h^2 - x^2}{4h}$ metre
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

36. Two poles of height 7 metre and 12 metre stand on a plane ground. If the distance between their feet is 12 metre, the distance between their top will be

(1) 15 metre (2) 13 metre
(3) 19 metre (4) 17 metre

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

37. The measure of an angle whose supplement is three times as large as its complement, is

(1) 75° (2) 30°
(3) 45° (4) 60°

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

38. If two supplementary angles differ by 44°, then one of the angles is

(1) 68° (2) 65°
(3) 102° (4) 72°

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

39. If D, E and F are the mid points of BC, CA and AB respectively of the ΔABC then the ratio of area of the parallelogram DEFB and area of the trapezium CAFD is :

(1) 2 : 3 (2) 3 : 4
(3) 1 : 2 (4) 1 : 3

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

40. The three angles of a triangle are in the ratio 3 : 4 : 5. Then the angles respectively are :

(1) 45°, 60°, 75° (2) 60°, 45°, 75°
(3) 60°, 75°, 45° (4) 75°, 60°, 45°

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

41. If the complement of an angle is one–fourth of its supplementary angle, then the angle is

(1) 60° (2) 30°
(3) 90° (4) 120°

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

42. If the ratio of the angles of a quadrilateral is 2 : 7 : 2 : 7, then it is a

(1) trapezium (2) parallelogram
(3) square (4) rhombus

(SSC CGL Tier-II Exam. 12.04.2015 (TF No. 567 TL 9)

43. If angles of measure $(5y + 62°)$ and $(22° + y)$ are supplementary, then value of y is :

(1) 16° (2) 32°
(3) 8° (4) 1°

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

44. PQRSTU is a cyclic hexagon. Then $\angle P + \angle R + \angle T$ is equal to

(1) 720° (2) 360°
(3) 540° (4) 180°

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

45 . P, Q and R are the points so that PR = 3 cm, QR = 5 cm and PQ = 8 cm. The number of circles passing through the points P, Q and R is :

(1) 3 (2) 2
(3) 1 (4) 0

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

SHORT ANSWERS

TYPE-I

1. (4)	**2.** (3)	**3.** (4)	**4.** (2)
5. (3)	**6.** (1)	**7.** (1)	**8.** (2)
9. (3)	**10.** (1)	**11.** (1)	**12.** (4)
13. (2)	**14.** (2)	**15.** (1)	**16.** (2)
17. (2)	**18.** (1)	**19.** (3)	**20.** (4)
21. (3)	**22.** (2)	**23.** (2)	**24.** (2)
25. (4)	**26.** (1)	**27.** (2)	**28.** (1)
29. (3)	**30.** (3)	**31.** (1)	**32.** (2)
33. (2)			

TYPE-II

1. (3)	**2.** (4)	**3.** (4)	**4.** (3)
5. (2)	**6.** (3)	**7.** (2)	**8.** (3)
9. (1)	**10.** (4)	**11.** (2)	**12.** (2)
13. (1)	**14.** (2)	**15.** (2)	**16.** (1)
17. (4)	**18.** (2)	**19.** (1)	**20.** (3)
21. (2)	**22.** (3)	**23.** (3)	**24.** (3)

TYPE-III

1. (3)	**2.** (2)	**3.** (1)	**4.** (4)
5. (2)	**6.** (1)	**7.** (1)	**8.** (1)
9. (2)	**10.** (2)	**11.** (2)	**12.** (3)
13. (2)	**14.** (2)	**15.** (4)	**16.** (3)
17. (3)	**18.** (1)	**19.** (2)	**20.** (2)
21. (2)	**22.** (3)	**23.** (2)	**24.** (3)
25. (4)	**26.** (3)	**27.** (4)	**28.** (2)
29. (2)	**30.** (2)	**31.** (3)	**32.** (2)
33. (3)	**34.** (3)	**35.** (1)	**36.** (4)
37. (4)	**38.** (3)	**39.** (4)	**40.** (2)
41. (2)	**42.** (2)	**43.** (1)	**44.** (1)
45. (3)	**46.** (4)	**47.** (3)	**48.** (4)
49. (1)	**50.** (3)	**51.** (2)	**52.** (*)
53. (3)	**54.** (2)	**55.** (3)	**56.** (3)
57. (2)	**58.** (2)	**59.** (3)	**60.** (1)
61. (4)	**62.** (3)	**63.** (2)	**64.** (4)
65. (4)	**66.** (1)	**67.** (3)	**68.** (4)
69. (2)	**70.** (1)	**71.** (2)	**72.** (3)
73. (1)	**74.** (2)	**75.** (2)	**76.** (3)
77. (2)	**78.** (2)	**79.** (3)	**80.** (2)
81. (3)	**82.** (1)	**83.** (3)	**84.** (3)
85. (4)	**86.** (3)	**87.** (3)	**88.** (2)
89. (1)	**90.** (*)	**91.** (3)	**92.** (2)
93. (1)	**94.** (1)	**95.** (1)	**96.** (1)
97. (3)	**98.** (4)	**99.** (2)	**100.** (2)
101. (4)	**102.** (1)	**103.** (2)	**104.** (4)
105. (1)	**106.** (1)	**107.** (2)	**108.** (1)
109. (1)	**110.** (2)	**111.** (1)	**112.** (2)
113. (4)	**114.** (3)	**115.** (2)	**116.** (4)
117. (2)	**118.** (2)	**119.** (1)	**120.** (1)
121. (4)	**122.** (1)	**123.** (4)	**124.** (2)
125. (4)	**126.** (3)	**127.** (3)	**128.** (4)
129. (2)	**130.** (3)	**131.** (3)	**132.** (3)
133. (2)	**134.** (1)	**135.** (3)	**136.** (2)
137. (3)	**138.** (2)	**139.** (3)	**140.** (2)
141. (2)	**142.** (3)	**143.** (3)	**144.** (3)
145. (1)	**146.** (1)	**147.** (2)	**148.** (3)
149. (1)	**150.** (2)	**151.** (3)	

TYPE-IV

1. (3)	**2.** (2)	**3.** (3)	**4.** (2)
5. (2)	**6.** (4)	**7.** (2)	**8.** (2)
9. (2)	**10.** (3)	**11.** (1)	**12.** (3)
13. (3)	**14.** (1)	**15.** (3)	**16.** (1)
17. (2)	**18.** (4)	**19.** (3)	**20.** (2)
21. (1)	**22.** (4)	**23.** (1)	**24.** (1)
25. (4)	**26.** (1)	**27.** (2)	**28.** (3)
29. (3)	**30.** (2)	**31**. (2)	**32.** (2)
33. (2)	**34.** (4)	**35.** (2)	**36.** (3)

TYPE-V

1. (4)	**2.** (3)	**3.** (1)	**4.** (3)
5. (4)	**6.** (2)	**7.** (4)	**8.** (3)
9. (3)	**10.** (3)	**11.** (4)	**12.** (4)
13. (1)	**14.** (4)	**15.** (3)	**16.** (4)
17. (1)	**18.** (4)	**19.** (3)	**20.** (3)
21. (4)			

TYPE-VI

1. (1)	**2.** (4)	**3.** (1)	**4.** (2)
5. (2)			

TYPE-VII

1. (2)	**2.** (4)		

TYPE-VIII

1. (2)	**2.** (1)	**3.** (3)	**4.** (3)
5. (2)	**6.** (1)	**7.** (2)	**8.** (3)
9. (2)	**10.** (4)	**11.** (3)	**12.** (3)
13. (4)	**14.** (1)	**15.** (4)	**16.** (2)
17. (3)	**18.** (1)	**19.** (3)	**20.** (3)
21. (3)	**22.** (2)	**23.** (4)	**24.** (2)
25. (4)	**26.** (4)	**27.** (2)	**28.** (1)
29. (3)	**30.** (4)	**31.** (1)	

TYPE-IX

1. (2)	**2.** (2)	**3.** (1)	

TYPE-X

1. (4)	**2.** (2)	**3.** (4)	**4.** (3)
5. (1)	**6.** (2)	**7.** (1)	**8.** (3)
9. (2)	**10.** (1)	**11.** (2)	**12.** (1)
13. (4)	**14.** (2)	**15.** (3)	**16.** (2)
17. (4)	**18.** (4)	**19.** (1)	**20.** (4)
21. (1)	**22.** (1)	**23.** (2)	**24.** (2)
25. (2)	**26.** (3)		

TYPE-XI

1. (1)	**2.** (2)	**3.** (3)	**4.** (4)
5. (2)	**6.** (4)	**7.** (4)	**8.** (4)
9. (2)	**10.** (1)	**11.** (1)	**12.** (2)
13. (3)	**14.** (1)	**15.** (4)	**16.** (3)
17. (2)			

TYPE-XII

1. (2)	**2.** (2)	**3.** (2)	**4.** (1)
5. (1)	**6**. (4)	**7.** (1)	**8.** (2)
9. (2)	**10.** (2)	**11.** (2)	**12.** (1)
13. (2)	**14.** (1)	**15.** (1)	**16.** (3)
17. (3)	**18.** (4)	**19.** (1)	**20.** (2)
21. (1)	**22.** (3)	**23.** (2)	**24.** (2)
25. (4)	**26.** (2)	**27.** (2)	**28.** (4)
29. (4)	**30.** (4)	**31.** (1)	**32.** (2)
33. (2)	**34.** (3)	**35.** (1)	**36.** (2)
37. (3)	**38.** (2)	**39.** (4)	**40.** (2)
41. (4)	**42.** (1)	**43.** (4)	**44.** (2)
45. (3)	**46.** (3)	**47.** (1)	**48.** (2)
49. (4)	**50.** (2)	**51.** (3)	**52.** (2)
53. (4)	**54.** (2)	**55.** (3)	**56.** (2)
57. (2)	**58.** (1)	**59.** (3)	**60.** (4)
61. (1)	**62.** (2)	**63.** (2)	**64.** (3)
65. (2)	**66.** (3)	**67.** (4)	**68.** (3)
69. (1)	**70.** (2)	**71.** (2)	**72.** (3)
73. (2)	**74.** (2)	**75.** (3)	**76.** (2)
77. (1)	**78.** (3)	**79.** (3)	**80.** (3)
81. (3)	**82.** (2)	**83.** (3)	**84.** (2)
85. (1)	**86.** (4)	**87.** (2)	**88.** (1)
89. (4)	**90.** (1)	**91.** (1)	**92.** (2)
93. (4)	**94.** (2)	**95.** (3)	

TYPE-XIII

1. (1)	**2.** (3)	**3.** (3)	**4.** (3)
5. (1)	**6.** (2)	**7.** (4)	**8.** (2)
9. (1)	**10.** (1)	**11.** (3)	**12.** (4)
13. (4)	**14.** (1)	**15.** (4)	**16.** (2)
17. (1)	**18.** (3)	**19.** (1)	**20.** (1)
21. (4)	**22.** (4)	**23.** (1)	**24.** (1)
25. (2)	**26.** (2)	**27.** (3)	**28.** (4)
29. (1)	**30.** (3)	**31.** (4)	**32.** (2)
33. (2)	**34.** (3)	**35.** (4)	**36.** (3)
37. (4)	**38.** (2)	**39.** (3)	**40.** (2)
41. (1)	**42.** (1)	**43.** (2)	**44.** (2)
45. (4)	**46.** (2)	**47.** (4)	**48.** (3)
49. (2)	**50.** (1)	**51.** (4)	**52.** (3)
53. (4)	**54.** (4)	**55.** (3)	**56.** (3)
57. (1)	**58.** (4)	**59.** (1)	**60.** (2)
61. (3)	**62.** (3)	**63.** (2)	**64.** (1)
65. (3)			

TYPE-XIV

1. (4)	**2.** (1)	**3.** (2)	**4.** (1)
5. (2)	**6.** (4)	**7.** (4)	**8.** (4)
9. (3)	**10.** (2)	**11.** (2)	**12.** (1)
13. (3)	**14.** (3)	**15.** (1)	**16.** (2)
17. (4)	**18.** (4)	**19.** (4)	**20.** (3)
21. (1)	**22.** (2)	**23.** (4)	**24.** (1)
25. (3)	**26.** (2)	**27.** (4)	**28.** (1)
29. (3)	**30.** (1)	**31.** (3)	**32.** (1)
33. (4)	**34.** (1)	**35.** (3)	

TYPE-XV

1. (2)	**2.** (2)	**3.** (3)	**4.** (3)
5. (2)	**6.** (3)	**7.** (2)	**8.** (2)
9. (1)	**10.** (2)	**11.** (1)	**12.** (2)
13. (3)	**14.** (3)	**15.** (4)	**16.** (3)
17. (4)	**18.** (4)	**19.** (2)	**20.** (2)
21. (4)	**22.** (4)	**23.** (2)	**24.** (4)
25. (4)	**26.** (3)	**27.** (4)	**28.** (4)
29. (3)	**30.** (4)	**31**. (3)	**32**. (1)
33. (3)	**34.** (1)	**35.** (2)	**36.** (2)
37. (3)	**38.** (1)	**39.** (1)	**40.** (1)
41. (1)	**42.** (2)	**43.** (1)	**44.** (2)
45. (4)			

EXPLANATIONS

TYPE-I

1. (4)

In equilateral triangle centroid, incentre, orthocentre coincide at the same point.

$\therefore \dfrac{\text{Height}}{3} = \text{in radius}$

$\therefore$ Height = Median = 3 × 3 = 9 cm.

2. (3) In equilateral triangle orthocentre and centroid lie at the same point.

3. (4) In an equilateral triangle, centroid, incentre etc lie at the same point.

4. (2) Triangle will be equilateral.

5. (3)

Let AB = $2x$ units

$\Rightarrow$ BD = DC = x units

$\therefore$ AB : BD = 2 : 1

6. (1)

$\angle PRQ = 60°$

$\angle PRS = 180° - 60° = 120°$;

$\Rightarrow \angle PSR + \angle RPS = 60°$

As RS = PR

$\therefore \angle PSR = \angle RPS$

$\therefore \angle PSR = \dfrac{60°}{2} = 30°$

7. (1)

Let AB = x cm.

$\therefore$ BD = $\dfrac{x}{2}$

AD = $\sqrt{x^2 - \dfrac{x^2}{4}} = \dfrac{\sqrt{3}}{2}x$ cm.

$\therefore$ OD = $\dfrac{1}{3} \times \dfrac{\sqrt{3}}{2}x = \dfrac{x}{2\sqrt{3}}$ cm.

OB = $\sqrt{BD^2 + OD^2}$

$= \sqrt{\dfrac{x^2}{4} + \dfrac{x^2}{12}} = \sqrt{\dfrac{4x^2}{12}} = \dfrac{x}{\sqrt{3}}$ cm.

$\therefore \dfrac{x}{\sqrt{3}} = 10 \Rightarrow x = 10\sqrt{3}$ cm.

Hence,

OD = $\dfrac{x}{2\sqrt{3}} = \dfrac{10\sqrt{3}}{2\sqrt{3}} = 5$ cm.

8. (2) In radius = $\dfrac{\text{Side}}{2\sqrt{3}}$

$\Rightarrow 3 = \dfrac{\text{Side}}{2\sqrt{3}} \Rightarrow$ Side = $3 \times 2\sqrt{3}$

$= 6\sqrt{3}$ cm

9. (3) In an equilateral triange, orthocentre, cirum-centre, incentre and centroid coincide.

10. (1) The line segments joining the mid points of the sides of a triangle form four triangles, each of which is similar to the original triangle.

11. (1) In an equilateral ΔABC,

$\angle A = \angle B = \angle C = 60°$

AB = BC = CA

$\therefore$ AX = BY = CZ

12. (4)

$\angle BCD = \angle DCA = 30°$

$\angle DCE = 180°$

$\therefore \angle ACE = 180° - 30° = 150°$

AC = CE

$\therefore \angle CAE = \angle CEA = \dfrac{30°}{2} = 15°$

13. (2)

AB = 10 cm

BD = 5 cm

$\angle ADB = 90°$

$\therefore$ AD = $\sqrt{AB^2 - BD^2}$

$= \sqrt{10^2 - 5^2} = \sqrt{100 - 25}$

$= \sqrt{75}$

$= 5\sqrt{3}$ cm

AG = $\dfrac{2}{3}$AD = $\dfrac{2}{3} \times 5\sqrt{3}$

$= \dfrac{10\sqrt{3}}{3}$ cm

14. (2)

E = In-centre, AD $\perp$ BC

AB = 6 cm, BD = 3 cm

$\angle ADB = 90°$

$\therefore$ AD = $\sqrt{AB^2 - BD^2}$

$= \sqrt{6^2 - 3^2} = \sqrt{36 - 9}$

$= \sqrt{27} = 3\sqrt{3}$ cm

$\therefore$ In-radius $= \frac{1}{3}$AD

$= \frac{1}{3} \times 3\sqrt{3} = \sqrt{3}$ cm

15. (1) The medians of an equilateral triangle are equal.

16. (2)

$\angle$ ACB = 180° – 120° = 60°

AB = AC

$\therefore \angle$ ABC = $\angle$ ACB = 60°

$\therefore \angle$ BAC = 60°

17. (2)

$\angle$CAB = 2 $\angle$ABC

$\angle$ACB + $\angle$ACD = 180°

$\Rightarrow \angle$ACB + 120° = 180°

$\Rightarrow \angle$ACB = 180° – 120° = 60°

$\therefore \angle$A + $\angle$B = 180° – 60° = 120°

$\Rightarrow 2\angle$B + $\angle$B = 120°

$\Rightarrow 3\angle$B = 120°

$\Rightarrow \angle B = \frac{120°}{3} = 40°$

18. (1) In–radius $= \frac{\text{Side}}{2\sqrt{3}}$

Circum–radius $= \frac{\text{Side}}{\sqrt{3}}$

$\therefore$ Required ratio $= \frac{\text{Side}}{2\sqrt{3}} : \frac{\text{Side}}{\sqrt{3}}$

$= \sqrt{3} : 2\sqrt{3} = 1 : 2$

19. (3) Sum of all angles of a triangle = 180°

$\therefore x + 15° + \frac{6x}{5} + 6° + \frac{2x}{3} + 30° = 180°$

$\Rightarrow x + \frac{6x}{5} + \frac{2x}{3} + 51° = 180°$

$\Rightarrow \frac{15x + 18x + 10x}{15}$

$= 180° - 51° = 129°$

$\Rightarrow 43x = 129 \times 15$

$\Rightarrow x = \frac{129 \times 15}{43} = 45°$

$\therefore$ The angles of triangle are :

$x + 15° = 45° + 15° = 60°$

$\frac{6x}{5} + 6° = \frac{6 \times 45}{5} + 6° = 60°$

and $\frac{2x}{3} + 30° = \frac{2 \times 45}{3} + 30°$

= 60°

It is an equilateral triangle.

20. (4)

AD $\perp$ BC

$\therefore$ BD = DC

AD $= \frac{\sqrt{3}}{2}$ AB $= \frac{\sqrt{3}}{2}$ BC

$= \frac{\sqrt{3}}{2}$ AC

$\Rightarrow$ AB $= \frac{2}{\sqrt{3}}$ AD = BC = AC

$\therefore AB^2 + BC^2 + AC^2$

$= \left(\frac{4}{3} + \frac{4}{3} + \frac{4}{3}\right) AD^2 = 4AD^2$

21. (3)

BD = DC = 5 cm

$\angle$ADB = 90°

$\therefore AB^2 = BD^2 + AD^2$

$\Rightarrow 10^2 = 5^2 + AD^2$

$\Rightarrow 100 = 25 + AD^2$

$\Rightarrow AD^2 = 100 - 25 = 75$

$\therefore$ AD $= \sqrt{75} = 5\sqrt{3}$

$\therefore$ AG $= \frac{2}{3}$ AD $= \frac{2}{3} \times 5\sqrt{3}$

$= \frac{10\sqrt{3}}{3}$ cm.

22. (2)

Let O be a point inside the triangle.

OD $\perp$ BC, OE $\perp$ AC

and OF $\perp$ AB

AB = BC = CA

Area of (Δ OAB + Δ OBC + Δ OAC) = Area of Δ ABC

$\Rightarrow \frac{1}{2}$ AB $\times$ OF + $\frac{1}{2}$ BC $\times$ OD + $\frac{1}{2} \times$ AC $\times$ OE

$= \frac{1}{2} \times$ BC $\times$ AX

$\Rightarrow$ OF + OD + OE = AX

23. (2)

AB = BC = CA $= \frac{24}{3} = 8$ cm.

BD = DC = 4 cm.; AD $\perp$ BC

In ΔABD,

AD $= \sqrt{AB^2 - BD^2} = \sqrt{8^2 - 4^2}$

$= \sqrt{64 - 16} = \sqrt{48} = 4\sqrt{3}$ cm.

$\therefore$ AG $= \frac{2}{3}$ AD $= \frac{2}{3} \times 4\sqrt{3}$

$= \frac{8}{\sqrt{3}}$ cm.

24. (2)

Point O is orthocentre.

$\therefore \angle BOC = 180° - \angle A$

$\therefore 110° = 180° - \angle A$

$\Rightarrow \angle A = 180° - 110° = 70°$

25. (4)

$AB = \frac{2}{\sqrt{3}}$ cm.

$BD = \frac{BC}{2}$

$= \frac{2}{2\sqrt{3}} = \frac{1}{\sqrt{3}}$ cm.

$\therefore AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{\frac{4}{3} - \frac{1}{3}}$

$= \sqrt{\frac{3}{3}} = 1$ cm.

26. (1)

$\because AB = BC = AC$

$\therefore AD = BE \Rightarrow BD = EC = CF = AF$

$\therefore$ D, E and F are the mid points of AB, BC and CA respectively.

$DF \parallel BC$ and $DF = \frac{1}{2}$ BC

$EF \parallel AB$ and $EF = \frac{1}{2}$ AB

$DE \parallel AC$ and $DE = \frac{1}{2}$ AC

$\therefore DE = EF = FD$

$\therefore \Delta DEF$ is an equilateral triangle

27. (2)

$AB = 6$ cm.; $AD \perp BC$

$\therefore BD = DC = 3$ cm.

In ΔABD,

$AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{6^2 - 3^2} = \sqrt{36 - 9}$

$= \sqrt{27} = 3\sqrt{3}$ cm.

$\therefore AG = \frac{2}{3}AD = \frac{2}{3} \times 3\sqrt{3}$

$= 2\sqrt{3}$ cm.

28. (1)

$PQ \parallel BC$

$\therefore \angle APQ = \angle ABC$

$\angle AQP = \angle ACB$

$\therefore$ By AA - similarity theorem,

$\Delta APQ \sim \Delta ABC$

$\therefore \frac{AB}{AP} = \frac{AC}{AQ} = \frac{5}{3}$

$\Rightarrow \frac{AC}{AQ} - 1 = \frac{5}{3} - 1$

$\Rightarrow \frac{AC - AQ}{AQ} = \frac{5-3}{3}$

$\Rightarrow \frac{QC}{AQ} = \frac{2}{3}$

$\therefore \frac{AQ}{QC} = \frac{3}{2}$

29. (3) For an equilateral triangle,

Circum-radius $= \frac{a}{\sqrt{3}}$

In-radius $= \frac{a}{2\sqrt{3}}$

$\therefore$ Required ratio $= \frac{a}{\sqrt{3}} : \frac{a}{2\sqrt{3}}$

$= 2 : 1$

30. (3) Let one angle of the triangle be $x°$.

$\therefore$ Sum of remaining two angles $= 180° - x$

According to the question,

$x = \frac{180° - x}{2}$

$\Rightarrow 2x + x = 180°$

$\Rightarrow 3x = 180°$

$\Rightarrow x = 60°$

$\therefore$ Other each angle $= 60°$

31. (1)

$AD = \frac{\sqrt{3}}{2} \times$ Side

$= \frac{\sqrt{3}}{2} \times 9 = \frac{9\sqrt{3}}{2}$ cm.

$\therefore AG = \frac{2}{3}AD = \frac{2}{3} \times \frac{9\sqrt{3}}{2}$ cm.

$= 3\sqrt{3}$ cm.

32. (2) $a^2 + b^2 + c^2 = ab + bc + ca$

$\Rightarrow 2a^2 + 2b^2 + 2c^2 = 2ab + 2bc + 2ca$

$\Rightarrow a^2 + b^2 - 2ab + b^2 + c^2 - 2bc + c^2 + a^2 - 2ca = 0$

$\Rightarrow (a-b)^2 + (b-c)^2 + (c-a)^2 = 0$

$\therefore a - b = 0 \Rightarrow a = b$

$b - c = 0 \Rightarrow b = c$

$c - a = 0 \Rightarrow c = a$

$\therefore a = b = c$

$\therefore$ It is an equilateral triangle.

33. (2)

$MN \parallel QR$

$\therefore \angle PMN = \angle PQR$
$\angle PNM = \angle PRQ$
By AA-similarity,
$\Delta PMN \sim \Delta PQR$
ΔPMN will also be an equilateral triangle.
$\therefore$ MN = PN = PM = 6 cm.

TYPE-II

1. (3)

AC = BC = 5 cm

$\therefore AB = \sqrt{AC^2 + BC^2}$

$= \sqrt{5^2 + 5^2} = \sqrt{50} = 5\sqrt{2}$ cm

2. (4)

AB = AC
$\Rightarrow \angle ABC = \angle ACB = 35°$
Now, $\angle ADB = 90°$
$\therefore \angle BAD = 55°$

3. (4)

Let AB = AC = $2x$
$\Rightarrow AQ = QC = x$
$\because$ AB is a secant.
$\Rightarrow AP \times AB = AQ^2$
$\Rightarrow AP \times 2x = x^2$

$\Rightarrow AP = \frac{x}{2}$

$\therefore \frac{AP}{AB} = \frac{x}{2 \times 2x} = \frac{1}{4}$ or 1 : 4

4. (3)

$\angle B = \angle C$
$\therefore \angle A = 2(\angle B + \angle C)$
$\Rightarrow \angle A = 4\angle C$
$\therefore 4\angle C + \angle C + \angle C = 180°$
$\Rightarrow 6\angle C = 180°$
$\Rightarrow \angle C = 30°$

5 (2)

AB = AC = $2a$ units
BC = a units

BD = DC = $\frac{a}{2}$ units

$AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{4a^2 - \frac{a^2}{4}} = \sqrt{\frac{15a^2}{4}}$

$= \frac{\sqrt{15}}{2}a$ units

6. (3)

From ΔAQD,

$\sin 60° = \frac{AQ}{AD}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{b}{AD}$

$\Rightarrow AD = \frac{2b}{\sqrt{3}}$

From ΔAPD,

$\sin 75° = \frac{AP}{AD} = \frac{a}{\frac{2b}{\sqrt{3}}} = \frac{\sqrt{3}a}{2b}$

7. (2)

AB = AC = AD
$\Rightarrow \angle ABC = \angle ACB = 30°$
$\Rightarrow \angle BAC = 180° - 60° = 120°$
Now, $\angle DAC = 180° - 120° = 60°$
$\Rightarrow \angle ADC + \angle ACD = 120°$

$\therefore \angle ACD = \frac{120°}{2} = 60°$

$\therefore \angle BCD = \angle ACB + \angle ACD$
$= 30° + 60° = 90°$

8. (3)

$\angle ABC = \angle ACB$ [$\because$ AB = AC]
$\angle BAC = 40°$
$\Rightarrow \angle ABC + \angle ACB = 140°$
$\Rightarrow \angle ABC = 70°$
$\therefore \angle ABD = 180° - 70° = 110°$

9. (1)

F G < 3 cm
G H = 8 cm
Clearly, FH = GH
The sum of two sides of a triangle is greater than its third side.

10. (4)

AB = AC
BD = DC
$\angle ADB = 90°$
The triangle will be either isosceles or equilateral.

11. (2)

BD = DC
AB = AC
$\therefore \angle ADB = \angle ADC = 90°$
$\angle ABC = 35°$
In ΔABD,
$\angle BAD + \angle ABD = 90°$
$\therefore \angle BAD = 90° - 35° = 55°$

12. (2)

Area of Δ ABC = $\frac{1}{2}$ AB × CE

= $\frac{1}{2}$ AC × BD

$\Rightarrow$ AB = AC [$\because$ BD = CE]

$\therefore$ Δ ABC is an isosceles triangle.

13. (1)

In ΔABC,
AB = AC
$\therefore \angle ABC = \angle ACB = x°$
$\therefore \angle BAC = 4x$
$\therefore 4x + x + x = 180°$
$\Rightarrow 6x = 180° \Rightarrow x = 30°$
$\therefore \angle BAC = 4 \times 30° = 120°$

$\angle BAD = \frac{1}{2} \angle BAC = 60°$

14. (2)

D, is the mid–point of BC.
AB = AC = 10 cm.
$AD \perp BC$
From ΔABD,

$BD = \sqrt{AB^2 - AD^2}$

$= \sqrt{10^2 - 8^2} = \sqrt{100 - 64}$

$= \sqrt{36} = 6$ cm.

$\therefore$ BC = 2 BD = 2 × 6 = 12 cm.

15. (2)

$AD \perp BC$
BD = DC = 12 cm.
OC = OA = Circum-radius
= r cm.

$AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{\left(12\sqrt{5}\right)^2 - (12)^2}$

$= \sqrt{144 \times 5 - 144}$

$= \sqrt{144(5-1)} = \sqrt{144 \times 4}$

= 24 cm.
In ΔOCD,
OD = (24 – r) cm.
$\therefore OC^2 = OD^2 + CD^2$
$\Rightarrow r^2 = (24 - r)^2 + 12^2$
$\Rightarrow r^2 = 576 - 48r + r^2 + 144$
$\Rightarrow 48r = 720$

$\Rightarrow r = \frac{720}{48} = 15$ cm.

16. (1)

Tangents drawn on a circle from an exterior point are equal.

AQ = AR
$\because$ AB = AC
$\therefore$ BQ = RC
Again, BQ = BP; CP = CR
$\therefore$ BP = PC

17. (4)

Δ ABC is an isosceles triangle.
$\therefore \angle ABC = \angle ACB$

$= \frac{180° - 30°}{2} = 75°$

XY || BC
$\therefore \angle AXY = \angle ABC = 75°$
$\therefore \angle BXY = 180° - 75° = 105°$

18. (2)

In ΔABC,
AB = AC
$\therefore \angle B = \angle C$
$\because \angle A + \angle B + \angle C = 180°$

$\therefore \angle A + \frac{\angle A}{3} + \frac{\angle A}{3} = 180°$

$\Rightarrow \frac{3\angle A + \angle A + \angle A}{3} = 180°$

$\Rightarrow \frac{5\angle A}{3} = 180°$

$\Rightarrow \angle A = \frac{180° \times 3}{5} = 108°$

19. (1)

AB = AC

$\therefore \angle ABC = \angle ACB = \frac{140}{2} = 70°$

$\therefore \angle ABD = \angle ACE = 180° \; 70° = 110°$
$\therefore \angle PBD = 55° = \angle CBO$
$\angle QCE = \angle BCO = 55°$
$\therefore \angle BOC = 180° - 2 \times 55°$
$= 180° - 110° = 70°$

20. (3)

AB = AC = 15 cm.
AD ⊥ BC ; AD = 12 cm.
∴ BD = DC
In, ΔABD

$BD = \sqrt{AB^2 - AD^2}$

$= \sqrt{15^2 - 12^2}$

$= \sqrt{(15+12)(15-12)}$

$= \sqrt{27 \times 3} = 9$ cm.

∴ BC = 2 × BD = 2 × 9
= 18 cm.

21. (2)

AB = AC
Point D is the mid-point of side BC.
∴ ∠ADB = 90° = ∠ADC
PD is internal bisector of ∠ADB.
∴ ∠PDA = 45°
PQ ∥ BC
∴ ∠ADQ = 45°
∴ PDQ = 45° + 45° = 90°

22. (3)

Let ∠ACD = a = ∠DAC
∴ ∠CDB = $2a$ = ∠CBD
The angles of the base of an isosceles triangle are equal.
∴ ∠ACB = 180° − 96° = 84°
⇒ ∠ACD + ∠DCB = 84°
⇒ a + 180° − 4a = 84°
⇒ 180° − 3a = 84°
⇒ 3a = 180° − 84° = 96°

$\Rightarrow a = \frac{96}{3} = 32°$

⇒ ∠DBC = 2a = 64°

23. (3)

AB = AC
∴ ∠ABC = ∠ACB
∠A = 80°
∴ ∠B + ∠C = 180° − 80°
= 100°

$\therefore \angle B = \frac{100}{2} = 50° = \angle C$

$\therefore \angle DBC = \angle DCB = \frac{50}{2} = 25°$

∴ ∠BDC = 180° − (∠DBC + ∠DCB)
= 180° − 50° = 130°

24. (2)

$AC^2 + CB^2 = AB^2$
⇒ $2BC^2 = (AD + DB)^2$
⇒ $2BC^2$
$= AD^2 + DB^2 + 2AD.BD$ ..... (i)
ΔCEB and ΔCED are right angles.
$CD^2 = CE^2 + ED^2$
and, $BC^2 = CE^2 + BE^2$
$BC^2 - CD^2 = BE^2 - DE^2$
= (BE + DE) (BE − DE)
= (AE + DE) (BE − DE)
= AD . BD ..... (ii)
∴ From equations (i) and (ii)
$AD^2 + DB^2 = 2CD^2$

TYPE-III

1. (3) Let the sides of the triangle be 3x, 4x and 6x units.
Clearly, $(3x)^2 + (4x)^2 < (6x)^2$
∴ The triangle will be obtuse angled.

2. (2)

∠PQS = 60°
∠QCR = 130°

$\therefore \angle QPR = \frac{1}{2} \times 130° = 65°$

⇒ ∠QRP = 180° − 60° − 65° = 55°
⇒ ∠PCQ = 110°
∴ In Δ QCR,
QC = CR
⇒ ∠CQR = ∠CRQ = 25°
[∵ ∠CQR + ∠CRQ = 50°]
∴ ∠PQC = ∠QPC = 35°
[∵ ∠PQC + ∠QPC = 70°]
Similarly, ∠CPR = 30°
∴ ∠RPS = 35°

3. (1)

AD is the internal bisector of ∠A.

$\therefore \frac{AB}{AC} = \frac{BD}{DC} = \frac{5}{7.5 - 5}$

$= \frac{5}{2.5} = 2 : 1$

4. (4) The right bisectors of the sides of a triangle meet at a point. The point of intersection is called circum-centre. For an obtuse angled triangle, circum-centre lies outside the triangle.

5. (2) The sum of two sides of a triangle should be greater than the third side.
(3, 5, 6) and (2, 5, 6)

6. (1)

Let AB = 4x , BC = 5x , CA = 6x
ΔOBA + Δ BOC + ΔAOC
= ΔABC

$\Rightarrow \frac{1}{2} \times 4x \times 3 + \frac{1}{2} \times 5x \times 3$

$+ \frac{1}{2} \times 6x \times 3 = \frac{1}{2} \times 6x \times h$

$\Rightarrow 6x + \frac{15x}{2} + 9x = 3xh$

⇒ 12 + 15 + 18 = 6h
⇒ 45 = 6h

$\Rightarrow h = \frac{15}{2} = 7.5$ cm

7. (1)

[Exterior angle is sum of opp. interior angles]

$\angle ACE = \angle BAC + \angle ABC$

$\Rightarrow 2y = \angle A + 2x$

Similarly,

$\angle DCE = \angle DBC + \angle BDC$

$\Rightarrow y = 50° + x$

$\Rightarrow \angle A = 2y - 2x$

$= 100 + 2x - 2x = 100°$

8. (1)

$\angle ACD = 180° - \angle ACB$ (Linear Pair)

$= 180° - 72° = 108°$

$\angle CAD = \angle ADC = \frac{72}{2} = 36°$

$\therefore \angle ABC = 180° - 109° - 36°$

$= 35°$

9. (2)

$AP < AB$

$BQ < BC$

$CR < AC$

$\therefore AP + BQ + CR < AB + BC + AC$

$\Rightarrow$ The sum of three altitudes of a triangle is less than the sum of sides.

10. (2)

$\angle ABC = 60°$, $ACB = 50°$

$\angle IBC = \frac{1}{2} \angle ABC = 30°$

$\angle ICB = \frac{1}{2} \angle ACB = 25°$

$\therefore \angle BIC = 180° - 30° - 25° = 125°$

11. (2)

$\angle IBC = \frac{1}{2}\angle ABC = \frac{65}{2} = 32.5°$

$\angle ICB = \frac{1}{2}\angle ACB = \frac{55}{2} = 27.5°$

$\therefore \angle BIC = 180° - 32.5° - 27.5°$

$= 120°$

12. (3) Third angle of triangle

$= 180° - (21° + 38°)$

$= 180° - 59° = 121° > 90°$

i.e., obtuse angle

13. (2)

$\angle DAC = \frac{1}{2}(180° - A)$

$= 90° - \square\angle \frac{A}{2}$

In Δ ADB,

$\angle DAB + \angle ADB + \angle DBA = 180°$

$\Rightarrow 90° - \angle \frac{A}{2} + \angle A + 2\angle B = 180°$

[$\because AD = AB \Rightarrow \angle ADB$

$= \angle DBA = \angle B$]

$\Rightarrow 90° + \angle \frac{A}{2} + 2\angle B = 180°$

$\Rightarrow \angle A + 4\angle B = 180°$ ....(i)

In Δ ABE,

$AB = BE \therefore \angle BAE = \angle AEB$

$\therefore \angle ABE + \angle BAE + \angle BEA$

$= 180°$

$90° - \frac{B}{2} + \angle B + 2\angle A = 180°$

$\Rightarrow 90° + \frac{\angle B}{2} + 2\angle A = 180°$

$\Rightarrow \angle B + 4\angle A = 180°$ ....(ii)

From equations (i) and (ii),

$\angle A + 4\angle B = 4\angle A + \angle B$

$\Rightarrow 3\angle A = 3\angle B$

$\Rightarrow \angle A = \angle B$

$\therefore \angle A + 4\angle B = 180°$

$\Rightarrow 5\angle B = 180°$

$\Rightarrow \angle B = \frac{180}{5} = 36° = \angle A$

$\therefore \angle ACB = 180° - 36° - 36°$

$= 180° - 72° = 108°$

14. (2)

$\angle ABC = 90°$

AB = 24 metre , BC = 10metre

$\therefore AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{24^2 + 10^2}$

$= \sqrt{576 + 100} = \sqrt{676}$

= 26 metre

15. (4)

O = Orthocentre

16. (3) $\angle ABC + \angle ACB + \angle BAC = 180°$

$\Rightarrow \angle ABC + \frac{1}{5}\angle ABC + \frac{3}{5}\angle ABC$

$= 180°$

$\Rightarrow \angle ABC + \frac{4}{5}\angle ABC = 180°$

or $\frac{9}{5}\angle ABC = 180°$

$\Rightarrow 9\angle ABC = 180 \times 5$

$\Rightarrow \angle ABC = 100°$

17. (3)

$\angle ABD = 120°$

$\therefore \angle ABC = 180° - 120° = 60°$

$\angle ACE = 105°$

$\therefore \angle ACB = 180° - 105° = 75°$

$\therefore \angle BAC = 180° - 60° - 75° = 45°$

18. (1)

Points D, E, F are midpoints of BC, CA and AB respectively.

Any two sides of a triangle are together greater than twice the median drawn to the third side.

$\therefore AB + AC > 2AD$

$AB + BC > 2BE$

$BC + CA > 2CF$

On adding,

$2(AB + BC + CA) > 2(AD + BE + CF)$

$\Rightarrow AB + BC + CA > AD + BE + CF$

19. (2)

$\angle B + \angle C = 180 - 50 = 130°$

In ΔBIC,

$\angle IBC + \angle ICB + \angle BIC = 180°$

$\Rightarrow \frac{\angle B}{2} + \frac{\angle C}{2} + \angle BIC = 180°$

$\Rightarrow \angle BIC = 180° - \frac{1}{2}(\angle B + \angle C)$

$= 180° - \frac{130}{2}$

$= 180° - 65° = 115°$

20. (2) D, is the mid-point of side BC. Point O is the centroid that divides AD in the ratio 2 : 1.

$AO = 10$ cm

$\therefore OD = 5$ cm.

21. (2)

$\angle BAC = 30°$

Now, $\angle BOC = 90° + \frac{1}{2}\angle BAC$

$= 90° + 15° = 105°$

22. (3)

BO is the internal bisector of $\angle B$

$\angle ODB = 90°$; $\angle BOD = 15°$

$\therefore \angle OBD = 180° - 90° - 15° = 75°$

$\Rightarrow \angle ABC = 2 \times 75° = 150°$

23. (2)

$\angle BOC = 90° + \frac{\angle A}{2}$

$\Rightarrow 110 = 90° + \frac{\angle A}{2}$

$\Rightarrow \angle A = 2 \times 20 = 40°$

24. (3) The right bisectors of sides meet at a point called circumcentre.

25. (4)

The point of intersection of internal bisectors of a triangle is called in-centre.

$\angle BOC = 90° + \frac{\angle A}{2}$

$\Rightarrow 116° = 90° + \frac{\angle A}{2}$

$\Rightarrow \frac{\angle A}{2} = 116 - 90° = 26°$

$\therefore \angle A = 26 \times 2 = 52°$

26. (3)

In ΔABC,

$\angle A = x$, $\angle B = y$; $\angle C = z$

In ΔPBC,

$\angle PBC + \angle PCB + \angle BPC = 180°$

$\Rightarrow \frac{1}{2}\angle EBC + \frac{1}{2}\angle FCB + \angle BPC = 180°$

$\Rightarrow \angle EBC + \angle FCB + 2\angle BPC = 360°$

$\Rightarrow (180° - y) + (180° - z) + 2\angle BPC = 360°$

$\Rightarrow 360° - (y + z) + 2\angle BPC = 360°$

$\Rightarrow 2\angle BPC = y + z$

$\Rightarrow 2\angle BPC = 180° - x$

$= 180° - \angle BAC$

$\therefore \angle BPC = 90° - \frac{1}{2}\angle BAC$

$= 90° - 50° = 40°$

27. (4)

$\frac{AD}{AB} = \frac{AE}{AC} = \frac{1}{3}$

$\therefore \frac{DE}{BC} = \frac{1}{3}$

$\Rightarrow DE = \frac{15}{3} = 5$ cm

28. (2)

PX || BD and PX = $\frac{1}{2}$BD

QY || BD and QY = $\frac{1}{2}$ BD

$\therefore$ PX : QY = 1 : 1

29. (2)

$\frac{AP}{PB} = \frac{AQ}{QC} = \frac{1}{2}$

$\Rightarrow \frac{QC}{AQ} = \frac{2}{1} \Rightarrow \frac{QC + AQ}{AQ} = \frac{3}{1}$

$\Rightarrow$ AC = 3AQ = 9 cm

30. (2) AB + BC = 12

BC + CA = 14

CA + AB = 18

$\therefore$ 2 (AB + BC + CA)

= 12 + 14 + 18 = 44

$\Rightarrow$ AB + BC + CA = 22

$\therefore$ $2\pi r = 22$

$\Rightarrow 2 \times \frac{22}{7} \times r = 22$

$\Rightarrow r = \frac{7}{2}$ cm

31. (3)

$\angle ICB = \frac{70°}{2} = 35°$;

$\angle ICB = \frac{50°}{2} = 25°$;

$\therefore \angle BIC = 180° - 35° - 25°$

$= 180° - 60° = 120°$

32. (2)

Δ DEF = $\frac{1}{4}\Delta$ ABC

$= \frac{1}{4} \times 24 = 6$ sq. units

33. (3)

$\angle BPC = 120°$

$\therefore \angle PBC + \angle PCB = 180° - 120° = 60°$

$\therefore \angle ABC + \angle ACB = 2 \times 60° = 120°$

$\therefore \angle A = 180 - 120 = 60°$

34. (3)

OG = $\frac{1}{3}$ AO

$\Rightarrow$ AO = 3 × OG

= 3 × 2 = 6 cm

35. (1) The smallest angle

$= \frac{2}{(2+3+7)} \times 180°$

$= \frac{2}{12} \times 180° = 30°$

36. (4)

AB = BC

$\therefore \angle BAC = \angle BCA$

$\therefore \angle A + \angle B + \angle C = 180°$

$\Rightarrow 2\angle A + \angle B = 180°$

$\Rightarrow 2(2x - 20) + x = 180°$

$\Rightarrow 4x - 40 + x = 180°$

$\Rightarrow 5x = 180 + 40 = 220°$

$\Rightarrow x = 220 \div 5 = 44° = \angle B$

37. (4)

AG = $\frac{2}{3}$AD

$\Rightarrow \frac{AG}{AD} = \frac{2}{3} = 2 : 3$

38. (3)

AO = 2 OD

$\Rightarrow$ OD = $\frac{AO}{2} = \frac{10}{2} = 5$ cm

39. (4) In Δ ABC,

$\angle A + \angle B + \angle C = 180°$

$\angle A + \angle B = 118°$

$\therefore \angle C = 180° - 118° = 62°$

$\therefore \angle A + \angle C = 96°$

$\Rightarrow \angle A + 62° = 96°$

$\Rightarrow \angle A = 96° - 62° = 34°$

40. (2)

In Δ ABD,

$AB^2 = AD^2 + BD^2$

In Δ ADC,

$AC^2 = AD^2 + CD^2$

$\therefore AB^2 + CD^2 = AD^2 + BD^2 + CD^2$
$= AD^2 + CD^2 + BD^2$
$= AC^2 + BD^2$

41. (2) $\angle A + \angle B + \angle C = 180°$ ...(i)

$\angle A + \frac{\angle B}{2} + \angle C = 140°$ ...(ii)

By equation (i) – (ii),

$\frac{\angle B}{2} = 180° - 140°$

$\Rightarrow \frac{\angle B}{2} = 40°$

$\Rightarrow \angle B = 80°$

42. (2) In Δ ABC,

$\angle A + \angle B + \angle C = 180°$

$\angle A + \angle B = 70°$

$\angle B + \angle C = 130°$

$\therefore \angle A = (\angle A + \angle B + \angle C) - (\angle B + \angle C)$

$= 180 - 130° = 50°$

43. (1) $2\angle A = 3\angle B = 6\angle C$

$\Rightarrow \frac{2\angle A}{6} = \frac{3\angle B}{6} = \frac{6\angle C}{6}$

$\Rightarrow \frac{\angle A}{3} = \frac{\angle B}{2} = \frac{\angle C}{1}$

$\Rightarrow \angle A : \angle B : \angle C = 3 : 2 : 1$

$\therefore \angle B = \left(\frac{2}{1+2+3}\right) \times 180°$

$= \frac{2}{6} \times 180° = 60°$

44. (1)

DE || BC $\therefore \frac{AD}{AB} = \frac{AE}{AC}$

$\frac{AD}{BD} = \frac{3}{5} \Rightarrow \frac{BD}{AD} = \frac{5}{3}$

$\Rightarrow \frac{BD}{AD} + 1 = \frac{5}{3} + 1$

$\Rightarrow \frac{BD + AD}{AD} = \frac{5+3}{3}$

$\Rightarrow \frac{AB}{AD} = \frac{8}{3}$

$\Rightarrow \frac{AD}{AB} = \frac{3}{8}$

$\therefore \frac{AD}{AB} = \frac{AE}{AC}$

$\Rightarrow \frac{3}{8} = \frac{AE}{4} \Rightarrow AE = \frac{3 \times 4}{8}$

= 1. 5 cm.

45. (3)

Point 'O' is centroid and AD is median.

$\therefore AO = \frac{2}{3}AD$

$\Rightarrow 10 = \frac{2}{3}AD$

$\Rightarrow AD = \frac{10 \times 3}{2} = 15$ cm

$\therefore OD = \frac{1}{3}AD = \frac{15}{3} = 5$ cm

46. (4)

$\angle ACF = \angle FCB = \frac{\angle C}{2}$

$\angle ACE = \angle ECD = \frac{180° - \angle C}{2}$

$= 90° - \frac{\angle C}{2}$

$\therefore \angle FCE = \angle FCA + \angle ACE$

$= \frac{\angle C}{2} + 90° - \frac{\angle C}{2} = 90°$

47. (3)

In ΔABC,

$\angle A + \angle B + \angle C = 180°$

$\therefore \angle B + \angle C = 180° - \angle A$

$\therefore \frac{1}{2}(\angle B + \angle C) = 90° - \frac{\angle A}{2}$

In ΔBIC,

$\frac{\angle B}{2} + \frac{\angle C}{2} + \angle BIC = 180°$

$\therefore 90° - \frac{\angle A}{2} + \angle BIC = 180°$

$\Rightarrow \angle BIC = 180° - 90° + \frac{\angle A}{2}$

$= 90° + \frac{\angle A}{2}$

$\therefore X = 90°$

48. (4) In any triangle the sum of the squares of any two sides is equal to twice the square of half of the third side together with twice the square of the median bisecting it.

$\therefore AB^2 + AC^2 = 2(AD^2 + BD^2)$

$\Rightarrow AB^2 + AC^2 = 2(AD^2 + \frac{BC^2}{4})$

$\Rightarrow 2(AB^2 + AC^2) = 4\,AD^2 + BC^2$

Similarly,

$2(AB^2 + BC^2) = 4\,BE^2 + AC^2$

$2(AC^2 + BC^2) = 4\,CF^2 + AB^2$

On adding all three,

$4(AB^2 + BC^2 + AC^2) = 4(AD^2 + BE^2 + CF^2) + BC^2 + AC^2 + AB^2$

$\Rightarrow 3(AB^2 + BC^2 + AC^2) = 4(AD^2 + BE^2 + CF^2)$

Again,

$AB + AC > 2AD$

$AB + BC > 2BE$

$BC + AC > 2CF$

$\therefore 2(AB + BC + AC) > 2(AD + BE + CF)$

$\Rightarrow AB + BC + AC > AD + BE + CF$

49. (1)

AD = 27 cm

Centroid = O

$\therefore OD = \frac{1}{3} AD$

$= \frac{1}{3} \times 27 = 9$ cm

ND = 12 cm

$\therefore ON = DN - OD$

$= 12 - 9 = 3$ cm

50. (3)

$\frac{AB}{AC} = \frac{BD}{DC}$

$\therefore$ AD is the bisector of $\angle A$.

$\therefore \angle BAD = \frac{1}{2}(\angle BAC)$

$= \frac{180 - 70 - 50}{2} = \frac{60}{2} = 30°$

51. (2)

We know that sum of any two sides of a triangle is greater than twice the mediun bisecting the third side.

Here, D, E and F are the mid-point of the sides BC, AC and AB.

$\therefore AB + AC > 2\ AD$

$AB + BC > 2BE$

$BC + AC > 2\ CF$

Adding all three,

$2\ (AB + BC + AC) > 2\ (AD + BE + CF)$

$\Rightarrow AB + BC + AC > AD + BE + CF$

52. (*) In any triangle, the sum of the squares of any two sides is equal to twice the square of half of the third side together with twice the square of the median bisecting it.

$\therefore AB^2 + AC^2 = 2\ (AD^2 + BD^2)$

$\Rightarrow AB^2 + AC^2 = 2\left(AD^2 + \frac{BC^2}{4}\right)$

$\Rightarrow 2\ (AB^2 + AC^2) = 4\ AD^2 + BC^2$

Similarly,

$2\ (AB^2 + BC^2) = 4\ BE^2 + AC^2$

$2\ (AC^2 + BC^2) = 4\ CF^2 + AB^2$

On adding all three,

$4\ (AB^2 + BC^2 + AC^2)$

$= 4\ (AD^2 + BE^2 + CF^2)$

$+ BC^2 + AC^2 + AB^2$

$\Rightarrow 3\ (AB^2 + BC^2 + AC^2)$

$= 4\ (AD^2 + BE^2 + CF^2)$

53. (3)

$\angle BAC < \angle CBA$

$\angle CDA = \angle CDB = 90°; \angle C_1 > \angle C_2$

$\angle A + \angle C_1 = 90°$

$\angle B + \angle C_2 = 90°$

$\therefore \angle A + \angle C_1 = \angle B + \angle C_2$

$\therefore \angle B - \angle A = \angle C_1 - \angle C_2$

54. (2)

BO, CO and AO are internal bisectors of $\angle B$, $\angle C$ and $\angle A$ respectively.

$\therefore \angle BOC = 90° + \frac{\angle A}{2}$

$\Rightarrow 120° = 90° + \frac{\angle A}{2}$

$\Rightarrow \frac{\angle A}{2} = 120° - 90° = 30°$

$\therefore \angle A = 30 \times 2 = 60°$

55. (3)

$\angle BAC = 180° - 60° - 40° = 80°$

$\angle BAD = \angle DAC = 40°$

In Δ ABE,

$\angle BAE = 90° - 60° = 30°$

$\angle EAD = 40° - 30° = 10°$

56. (3)

$\angle ABC + \angle BCA + \angle BAC = 180°$

Again, $\angle ACB + \angle ACD = 180°$

$\angle ABC + \angle ABF = 180°$

$\angle BAC + \angle EAC = 180°$

$\therefore \angle ACD + \angle ABF + \angle CAE$

$= 540 - 180° = 360°$

$\therefore$ Required answer

$= 2 \times 360° = 720°$

57. (2)

In Δ AQC,

$\angle A = 90°$

$\Rightarrow CQ^2 = AC^2 + QA^2$

$\Rightarrow 4CQ^2 = 4AC^2 + 4QA^2$

$\Rightarrow 4CQ^2 = 4AC^2 + (2QA)^2$

$\Rightarrow 4CQ^2 = 4AC^2 + AB^2$

[$\because AB = 2QA$]

In Δ BPA,

$BP^2 = BA^2 + AP^2$

$\Rightarrow 4BP^2 = 4BA^2 + 4AP^2$

$\Rightarrow 4BP^2 = 4BA^2 + AC^2$

[$\because AC = 2AP$]

$\therefore 4\,CQ^2 + 4\,BP^2 = 4\,AC^2 + AB^2 + 4\,AB^2 + AC^2$

$\Rightarrow 4(CQ^2 + BP^2) = 5(AC^2 + AB^2)$

$= 5\,BC^2$

$$\Rightarrow \frac{BP^2 + CQ^2}{BC^2} = \frac{5}{4}$$

58. (2)

$\angle BDO = 90°$

$\angle BOD = 30°$

$\therefore \angle DBO = 60°$

$\angle B = \angle C = 60°$

$\therefore \angle EOC = 30°$

AO is bisector of BC.

$\therefore \angle DOE = 120°$

$\therefore \angle AOE = \angle AOD = 60°$

59. (3)

$\therefore \angle BOC = 180° - \angle A$

$\Rightarrow \angle BOC + \angle BAC = 180°$

60. (1)

$\angle CBE = 130°$

$\therefore \angle ABC = 180° - 130° = 50°$

$\angle ACF = 130°$

$\therefore \angle ACB = 180° - 130° = 50°$

$\therefore \angle BAC = 180° - 50° - 50° = 80°$

$\therefore \angle GAB = 180° - 80° = 100°$

61. (4) Two angles of triangle

$= 4x$ and $5x$ (let)

According to the question,

$2(4x + 5x) = 180°$

$\Rightarrow 18x = 180°$

$$\Rightarrow x = \frac{180°}{18} = 10°$$

$\therefore$ The smallest angle

$= 4x = 4 \times 10 = 40°$

62. (3)

$\angle ROQ = 96°$

In ΔOQR

$\angle OQR + \angle ORQ + \angle QOR = 180°$

$$\Rightarrow \frac{1}{2}\angle PQR + \frac{1}{2}\angle PRQ + 96°$$

$= 180°$

$$\Rightarrow \frac{1}{2}(\angle PQR + \angle PRQ)$$

$= 180° - 96° = 84°$

$\Rightarrow \angle PQR + \angle PRQ = 2 \times 84°$

$= 168°$

In ΔPQR,

$\therefore \angle QPR = 180° - 168° = 12°$

63. (2)

AD = 9 cm.

$$\therefore AG = \frac{2}{3} \times 9 = 6 \text{ cm.}$$

BE = 12 cm.

$$\therefore BG = \frac{2}{3} \times 12 = 8 \text{ cm.}$$

$\angle AGB = 90°$

$\therefore$ From ΔABG,

$$AB = \sqrt{AG^2 + BG^2}$$

$$= \sqrt{6^2 + 8^2} = \sqrt{36 + 64}$$

$$= \sqrt{100} = 10 \text{ cm.}$$

64. (4)

$\angle BAC = 40°$,

$\angle ABC = 65°$

$\therefore \angle ACB = 180° - 40° - 65°$

$= 75°$

DE || BC

$\therefore \angle AED = \angle ACB = 75°$

$\therefore \angle CED = 180° - 75° = 105°$

65. (4)

$\angle QPR = 50°$

$\therefore \angle PQR + \angle PRQ$

$= 180° - 50° = 130°$

$$\therefore \frac{1}{2}\angle PQR + \frac{1}{2}\angle PRQ = 65°$$

The point of intersection of internal bisectors of angles is in-centre.

$\therefore\ \angle OQR = \frac{1}{2}\ \angle PQR;$

$\angle ORQ = \frac{1}{2}\ \angle PRQ$

In ΔOQR,

$\angle OQR + \angle QOR + \angle ORQ$

$= 180°$

$\Rightarrow\ \angle QOR = 180° - 65° = 115°$

66. (1)

$\angle OBC = \frac{1}{2}\ \angle ABC$;

$\angle OCB = \frac{1}{2}\angle ACB$

From Δ OBC,

$\angle OBC + \angle OCB + \angle BOC$

$= 180°$

$\frac{1}{2}\ (\angle ABC + \angle ACB) + \angle BOC$

$= 180°$

$\Rightarrow \frac{1}{2}\ (180° - \square\angle BAC) + \angle BOC$

$= 180°$

$\Rightarrow \frac{1}{2}\ (180° - 100) + \angle BOC$

$= 180°$

$\Rightarrow \square\angle BOC = 180° - 40° = 140°$

67. (3)

BD = 3 cm

CD = 4 cm

In Δ ABC,

$AB^2 + AC^2 = 7^2$

$\Rightarrow\ AB^2 + AC^2 = 49$ ....(i)

In Δ ABD,

$AB^2 = AD^2 + 3^2 = AD^2 + 9$ ....(ii)

In Δ ADC,

$AC^2 = AD^2 + 16$ ....(iii)

On adding equations (ii) and (iii),

$AB^2 + AC^2 = AD^2 + 9 + AD^2 + 16$

$\Rightarrow\ 49 = 2AD^2 + 25$

$\Rightarrow\ 2AD^2 = 49 - 25 = 24$

$\Rightarrow\ AD^2 = 12$

$\Rightarrow AD = \sqrt{12} = 2\sqrt{3}$ cm.

68. (4)

DE || BC

and E is the mid-point of AC.

$\therefore\ AE = \frac{1}{2}\ AC$

$= \frac{1}{2} \times 12 = 6$ cm.

69. (2)

According to question, circumcentre lies outside the triangle.

70. (1)

The sides AB and AC of a triangle ΔABC are produced to P and Q respectively. If the bisectors of $\angle PBC$ and $\angle QCB$ interest at O, then

$\angle BOC = 90° - \frac{1}{2}\ \angle A$

Here, $\angle A = 70°$

$\therefore\ \angle BOC = 90° - \frac{70°}{2}$

$= 90° - 35° = 55°$

71. (2)

AD is the median.

E is the mid–point of AD.

DG || BF

In ΔBCF,

D is the mid–point of BC and

DG || BF.

$\therefore$ G is the mid–point of CF.

$\therefore$ FG = GC

In ΔADG,

EF || DG

E is the mid–point of AD.

$\therefore$ AF = FG

$\therefore$ AF = FG = GC

$AF = \frac{1}{3} AC$

$FC = \frac{2}{3} AC$

$\therefore$ FC : AF = 2 : 1

72. (3)

$\angle OBC = \frac{1}{2}\ \angle ABC$

$\angle OCB = \frac{1}{2}\ \angle ACB$

$\therefore\ \angle OBC + \angle OCB$

$= \frac{1}{2}\ (\angle ABC + \angle ACB)$

$= \frac{1}{2}\ (180° - \angle BAC)$

$= \frac{1}{2}\ (180° - 80°)$

$= \frac{100°}{2} = 50°$

$\therefore$ In ΔOBC,
$\angle BOC$
$= 180° - (\angle OBC + \angle OCB)$
$= 180° - 50° = 130°$

73. (1) Let the sides of the triangle be $7x$, $9x$ and $12x$ cm.
According to the question,
$12x - 7x = 15$

$\Rightarrow 5x = 15 \Rightarrow x = \frac{15}{5} = 3$

$\therefore$ Largest side $= 12x$
$= 12 \times 3 = 36$ cm.

74. (2)

$\angle B + \angle C = 60° + 40° = 100°$
$\therefore \angle A = 180° - 100° = 80°$
$\therefore \angle BAD = 40°$
In ΔABE,
$\angle AEB = 90°$
$\therefore \angle BAE = 180° - 90° - 60°$
$= 30°$
$\therefore \angle EAD = \angle BAD - \angle BAE$
$= 40° - 30° = 10°$

75. (2)

Exterior angle of a triangle is equal to the sum of remaining two interior angles.

$\therefore \angle A + \angle B = 112°$

$\therefore \frac{4}{3} \angle B + \angle B = 112°$

$\Rightarrow \frac{4\angle B + 3\angle B}{3} = 112$

$\Rightarrow \frac{7\angle B}{3} = 112$

$\Rightarrow \angle B = \frac{112 \times 3}{7} = 48°$

76. (3) In a ΔABC,
$\angle A + \angle B + \angle C = 180°$
$\Rightarrow \angle B + 140° = 180°$
$\Rightarrow \angle B = 180° - 140° = 40°$
$\therefore \angle A + 3\ \angle B = 180°$
$\Rightarrow \angle A + 3 \times 40° = 180°$
$\Rightarrow \angle A = 180° - 120° = 60°$.

77. (2) The sum of two sides of a triangle is greater than the third side.
$(5 + 8) < 15$
$(5 + 15) > 8$
$(15 + 8) > 5$

78. (2) The point of intersection of altitudes from the vertices of a triangle to opposite sides is called orth-centre.

79. (3)

Length of median on the hypotenuse in a right angled triangle is equal to ($\frac{1}{2}$ × hypotenuse)

D is the mid-point of BC.
AG = 2GD
AG = BC

$\therefore GD = \frac{BC}{2}$

$\therefore \angle BGC = 90°$

80. (2)

In ΔAA_1C and ΔBB_1C,
$BB_1 \parallel AA_1 \Rightarrow \Delta AA_1C \sim \Delta BB_1C$

$\therefore \frac{AA_1}{BB_1} = \frac{AC}{B_1C}$ ..... (i)

In ΔACC_1 and ΔABB_1,
$BB_1 \parallel CC_1 \Rightarrow \Delta ACC_1 \sim \Delta ABB_1$

$\therefore \frac{CC_1}{BB_1} = \frac{AC}{AB_1}$

$\Rightarrow \frac{BB_1}{CC_1} = \frac{AB_1}{AC} = \frac{AC - B_1C}{AC}$

$\Rightarrow \frac{BB_1}{CC_1} = 1 - \frac{B_1C}{AC}$

$\Rightarrow \frac{BB_1}{CC_1} = 1 - \frac{BB_1}{AA_1}$
[From equation (i)

$\Rightarrow \frac{BB_1}{CC_1} + \frac{BB_1}{AA_1} = 1$

$\Rightarrow \frac{1}{CC_1} + \frac{1}{AA_1} = \frac{1}{BB_1}$

81. (3) The centroid is the centre of gravity.

82. (1)

Area of $\Delta ABC = \frac{1}{2} \times AB \times CF$

$= \frac{1}{2} \times 6 \times 4 = 12$ sq. cm.

Again, area of ΔABC

$= \frac{1}{2} \times AC \times BE$

$\Rightarrow 12 = \frac{1}{2} \times 5 \times BE$

$\Rightarrow 5 \times BE = 2 \times 12 = 24$

$\Rightarrow BE = \frac{24}{5}$

$= 4.8$ cm.

83. (3)

Exterior $\angle ACD$
= Interior ($\angle BAC + \angle ABC$)

$\Rightarrow 120° = \angle A + \frac{\angle A}{2}$

$\Rightarrow 240 = 2\ \angle A + \angle A$

$\Rightarrow 3\angle A = 240°$

$\Rightarrow \angle A = \dfrac{240°}{3}$

$= 80°$

84. (3)

AG : GD = 2 : 1

AD = 3GD

= 3 × 5 = 15 cm.

85. (4) The sum of all the angles of a triangle is 180°.

From option (4)

50° + 60° + 70° = 180°

86. (3)

Point 'O' is the centroid of triangle ABC.

$\therefore$ OE = $\dfrac{1}{3}$ CE

$\Rightarrow 7 = \dfrac{1}{3}$ CE

$\therefore$ CE = 21 cm

87. (3)

AB = $a - b$; BC = $\sqrt{2ab}$;

AC = $\sqrt{a^2 + b^2}$

$\therefore AB^2 + BC^2 = (a - b)^2 + (\sqrt{2ab})^2$

$= a^2 + b^2 - 2ab + 2ab = a^2 + b^2$

$= AC^2$

$\therefore \angle ABC = 90°$

88. (2) The sum of two sides of a triangle is greater than the third side.

Clearly,

3 + 4 > 5

4 + 5 > 3

5 + 3 > 4

89. (1)

Point O, is the centroid of ΔABC.

AO : OD = 2 : 1

$\Rightarrow \dfrac{10}{OD} = \dfrac{2}{1} \Rightarrow 2 \times OD = 10$

$\Rightarrow OD = \dfrac{10}{2} = 5$ cm.

90. (*)

The point of intersection of internal bisectors of the angles of a triangle is incentre.

$\angle BAC = 180° - 90° - 70° = 20°$

$\therefore \angle AIC = 180° - \dfrac{\angle A}{2} - \dfrac{\angle C}{2}$

$= 180° - 10° - 35°$

$= 135°$

91. (3)

In Δ ADE and Δ ABC,

$\because$ DE || BC

$\because$ $\angle D = \angle B$; $\angle E = \angle C$

$\therefore$ By AA - similarity,

Δ ADE ~ Δ ABC

$\therefore \dfrac{AD}{AB} = \dfrac{DE}{BC}$

$\Rightarrow \dfrac{AB - BD}{AB} = \dfrac{DE}{BC}$

$\Rightarrow \dfrac{7.5 - 6}{7.5} = \dfrac{2}{BC}$

$\Rightarrow \dfrac{1.5}{7.5} = \dfrac{2}{BC}$

$\Rightarrow \dfrac{1}{5} = \dfrac{2}{BC} \Rightarrow BC = 2 \times 5$

= 10 cm.

92. (2)

Point G is the centroid of Δ ABC.

Point G divides AF (each median) in the ratio 2 : 1.

Proof

Reflect Δ ABC on side AC.

$ABCB_1$ is a parallelogram.

BEB_1 is a straight line. and

$\because$ CD = AD, and CD || AD_1

DCD_1A is a parallelogram.

DG || CG_1

$\because$ BD = DC and DG || CG, and

BG = GG_1

$\therefore$ BG : GG_1 = 1 : 1

$\because$ GE = EG_1, BG = GE = 2 : 1

93. (1) The ortho-centre of an acute angled triangle lies inside the triangle.

94. (1) The point of intersection of medians of a triangle is called centroid.

95. (1)

$\angle PRS = 110°$

$\therefore \angle PRQ = 180° - 110° = 70°$

$\therefore \angle PQR$

$= 180° - \angle QPR - \angle PRQ$

$= 180° - 72° - 70° = 38°$

96. (1)

$\angle B = 70°$; $\angle C = 60°$

$\therefore \angle A = 180° - 70° - 60°$

$= 50°$

According to the question,

$\angle OAC = 25°$;

$\angle OCA = 30°$

$\therefore \angle AOC = 180° - 25° - 30°$

$= 125°$

97. (3) Sum of three angles of a triangle = 180°

A : B : C = 2 : 3 : 4

Sum of the terms of ratio = 2 + 3 + 4 = 9

Required difference

$= \left(\frac{4}{9} - \frac{2}{9}\right) \times 180°$

$= \frac{2}{9} \times 180° = 40°$

98. (4)

In ΔABD,

AD = BD = 2 cm.

$\therefore AB = \sqrt{2^2 + 2^2} = \sqrt{8}$

$= 2\sqrt{2}$ cm.

$\Delta ABD \sim \Delta BCA$

$\therefore \frac{AB}{BC} = \frac{BD}{AB}$

$\Rightarrow AB^2 = BC \times BD$

$\Rightarrow \left(2\sqrt{2}\right)^2 = BC \times 2$

$\Rightarrow 8 = BC \times 2$

$\Rightarrow BC = \frac{8}{2} = 4$ cm.

$\therefore CD = BC - BD$

$= (4 - 2)$ cm. $= 2$ cm.

99. (2)

$\because$ Exterior angle of triangle is equal to the sum of two opposite angles.

$\because \angle ACD = 112°$

$\therefore \angle A + \angle B = 112°$

$\Rightarrow \frac{4}{3}\angle B + \angle B = 112°$

$\Rightarrow \frac{4\angle B + 3\angle B}{3} = 112°$

$\left[\because \angle B = \frac{3}{4}\angle A \Rightarrow \angle A = \frac{4}{3}\angle B\right]$

$\Rightarrow 7 \times \angle B = 112 \times 3$

$\Rightarrow \angle B = \frac{112 \times 3}{7} = 48°$

100. (2)

$\angle C = 90°$

AB = 12 cm., BC = 8 cm.

$\therefore AC = \sqrt{AB^2 - BC^2}$

$= \sqrt{12^2 - 8^2} = \sqrt{144 - 64}$

$= \sqrt{80} \approx 9$ cm.

101. (4)

DE || BC

$\therefore \angle ADE = \angle ABC$

$\angle AED = \angle ACB$

By AA – similarity,

$\Delta ADE \cong \Delta ABC$

$\frac{AB}{AD} = \frac{AC}{AE}$

$\Rightarrow \frac{AB}{AD} - 1 = \frac{AC}{AE} - 1$

$\Rightarrow \frac{AB - AD}{AD} = \frac{AC - AE}{AE}$

$\Rightarrow \frac{BD}{AD} = \frac{AC - AE}{AE}$

$\Rightarrow \frac{5}{3} = \frac{5.6 - AE}{AE}$

$\Rightarrow 5AE = 16.8 - 3AE$

$\Rightarrow 5AE + 3AE = 16.8$

$\Rightarrow 8AE = 16.8$

$\Rightarrow AE = \frac{16.8}{8} = 2.1$ cm.

102. (1)

PQ = PR

$\therefore \Delta PQR$ is an isosceles triangle.

$\therefore \angle PQR = \angle PRQ$

and $\angle PQR = 2\angle QPR$

In ΔPQR,

$\angle P + \angle Q + \angle R = 180°$

$\Rightarrow \frac{\angle Q}{2} + \angle Q + \angle Q = 180°$

$\Rightarrow \frac{5}{2}\angle Q = 180°$

$\therefore \angle Q = \frac{180 \times 2}{5} = 72°$

103. (2)

The point of intersection of medians of a triangle is called centroid. It divides each median in the ratio 2 : 1.

$\therefore \frac{AG}{GD} = \frac{2}{1} \Rightarrow \frac{GD}{AG} = \frac{1}{2}$

$\Rightarrow \frac{GD}{AG} + 1 = \frac{1}{2} + 1$

$\Rightarrow \frac{GD + AG}{AG} = \frac{1+2}{2}$

$\Rightarrow \frac{AD}{AG} = \frac{3}{2}$

$\Rightarrow AG : AD = 2 : 3$

104. (4) The right bisectors of the sides of a triangle meet at the point called circum-centre. It is equidistant from the vertices of the triangle

105. (1)

Point 'D' is the mid-point of side BC.

$AD = \frac{1}{2}$ BC

$\Rightarrow 2AD = BC$

$\therefore AD = BD = DC$

$\therefore AB = AC$

$\therefore AD \perp BC$

$\therefore \angle ABD = \angle DAB = 45°$

$\therefore \angle BAC = 90°$

106. (1)

The line joining the mid-points of two sides of a triangle is parallel to the third side and half of that one.

$\therefore FE = \frac{1}{2}$ BC (From ΔABC)

$PQ = \frac{1}{2}$ BC (From ΔBOC)

$\therefore FE = PQ = 3$ cm.

107. (2)

In ΔPST and ΔPQR,

$\angle PST = \angle PQR$ ($\because ST \parallel QR$)

$\angle PTS = \angle PRQ$

$\therefore$ By AA– similarity,

$\Delta PST \sim \Delta PQR$

$$\therefore \frac{PS}{PQ} = \frac{PT}{PR}$$

$$\Rightarrow \frac{PQ}{PS} = \frac{PR}{PT}$$

$$\Rightarrow \frac{PS + SQ}{PS} = \frac{6}{PT}$$

$$\Rightarrow 1 + \frac{SQ}{PS} = \frac{6}{PT}$$

$$\Rightarrow 1 + \frac{5}{3} = \frac{6}{PT}$$

$$\Rightarrow \frac{8}{3} = \frac{6}{PT}$$

$\Rightarrow 8\ PT = 6 \times 3$

$$\Rightarrow PT = \frac{6 \times 3}{8} = \frac{9}{4} = 2.25 \text{ cm.}$$

108. (1) The point of intersection of medians of a triangle is called centroid.

109. (1) The exterior angle of a triangle is equal to the sum of two remaining opposite angles.

$\therefore \angle ACD = \angle A + \angle B$

$\Rightarrow 115° = 45° + \angle B$

$\Rightarrow \angle B = 115° - 45° = 70°$

$\therefore \angle ACB = 180° - 115° = 65°$

OR

$\angle ACB = 180° - \angle ACD$

$= 180° - 115° = 65°$

$\therefore \angle B = 180° - 65° - 45° = 70°$

110. (2) In ΔABC,

$\angle A + \angle B + \angle C = 180°$

$\therefore \angle B = (\angle A + \angle B + \angle B + \angle C) - (\angle A + \angle B + \angle C)$

$= 75° + 140° - 180° = 35°$

111. (1)

$XY \parallel QR$

$\angle PXY = \angle PQR$

$\angle PYX = \angle PRQ$

By AA–similarity,

$\Delta PXY \sim \Delta PQR$

$$\therefore \frac{PQ}{PX} = \frac{QR}{XY}$$

$$\because \frac{PX}{XQ} = \frac{5}{6}$$

$$\Rightarrow \frac{XQ}{PX} = \frac{6}{5}$$

$$\Rightarrow \frac{XQ + PX}{PX} = \frac{6+5}{5} = 5 : 11$$

$$\Rightarrow \frac{PQ}{PX} = \frac{11}{5}$$

$$\Rightarrow \frac{PX}{PQ} = \frac{XY}{QR} = \frac{5}{11}$$

112. (2)

The straight line joining the mid–points of the two sides of a triangle is parallel to the third side and half of it.

$\therefore BC = 2 \times PQ = 2 \times 6$

$= 12$ cm.

113. (4) In ΔABC,

A : B : C = 5 : 3 : 10

Sum of the terms of ratio

$= 5 + 3 + 10 = 18$

$\angle A + \angle B + \angle C = 180°$

$\therefore$ Required difference

$$= \left(\frac{10-3}{18}\right) \times 180 = 70°$$

114. (3)

AC = BC

$\angle ABC = \angle BAC = 50°$

$\therefore\ \angle ACB = 180° - 100° = 80°$

$\therefore\ \angle ACD = 180° - 80° = 100$

$\angle CAD = \angle CDA = \frac{80°}{2} = 40°$

$\therefore\ \angle BAD = \angle BAC + \angle CAD$

$= 50° + 40° = 90°$

115. (2)

$PQ \parallel BC$

$\therefore\ \angle APQ = \angle ABC$

$\angle AQP = \angle ACB$

By AA – similarity theorem,

$\Delta APQ \sim \Delta ABC$

$\therefore\ \frac{AB}{AP} = \frac{BC}{PQ}$

$\Rightarrow \frac{AB - AP}{AP} = \frac{BC - PQ}{PQ}$

$\Rightarrow \frac{BP}{AP} = \frac{BC - PQ}{PQ}$

$\Rightarrow \frac{5}{3} = \frac{BC - 18}{18}$

$\Rightarrow BC - 18 = \frac{5}{3} \times 18 = 30$

$\Rightarrow BC = 30 + 18 = 48$ cm.

116. (4)

Point X is the mid-point of AB.

Point Y is the mid-Point of AC.

$\therefore\ XY \parallel BC$

$\angle AXY = \angle ABC$

$\angle AYX = \angle ACB$

By AA–similarity,

$\Delta AXY \sim \Delta ABC$

$\therefore\ \frac{AX}{AB} = \frac{XY}{BC}$

$\Rightarrow \frac{AX}{2AX} = \frac{XY}{BC} \Rightarrow \frac{BC}{XY} = 2$

By componendo and dividendo,

$\frac{BC + XY}{BC - XY} = \frac{2+1}{2-1}$

$\Rightarrow \frac{12}{BC - XY} = 3$

$\Rightarrow BC - XY$

$= \frac{12}{3} = 4$ units.

117. (2)

In ΔABC,

$\angle BAC = 60°$

$\therefore\ \angle ABC + \angle ACB = 180° - 60°$

$= 120°$

$\Rightarrow \frac{1}{2}(\angle ABC + \angle ACB) = 60°$

In ΔBOC,

$\Rightarrow \angle OBC + \angle OCB + \angle BOC = 180°$

$\Rightarrow \frac{1}{2}(\angle ABC + \angle ACB) + \angle BOC = 180°$

$\Rightarrow \angle BOC = 180° - 60° = 120°$

118. (2)

$\angle A = 90°$

$\therefore\ \angle B + \angle C = 90°$

Let, $\angle B = x°$ and $\angle C = (x + 8)°$

$\therefore\ x + x + 8° = 90°$

$\Rightarrow 2x = 90° - 8° = 82°$

$\Rightarrow x = \frac{82}{2} = 41°$ = smallest angle

119. (1)

$O \Rightarrow$ Ortho-centre

$\angle BOC = 150°$

$\angle BOC = 180° - \angle A$

$\Rightarrow \angle BAC = 180° - 150° = 30°$

120. (1) If the orthocentre of a triangle lies on the side, it lies on the vertex.

121. (4) The sum of the two sides of a triangle is greater than the third side.

$\therefore\ 5 + x > 9$

$\Rightarrow x > 9 - 5$

$\Rightarrow x > 4$

$\therefore$ Required answer = 5

122. (1) Angles of triangle $= x°, 2x°$ and $3x°$ (let)

$\therefore\ x + 2x + 3x = 180°$

$\Rightarrow 6x = 180°$

$\Rightarrow x = 30°$

$\therefore$ Angles of triangle $= 30°, 60°$ and $90°$

$\angle ABC = 90°$

$\angle BAC = 30°$

$\therefore$ BC = 10 cm.

$\cos 60° = \frac{BC}{AC}$

$\Rightarrow \frac{1}{2} = \frac{10}{AC}$

$\Rightarrow$ AC = 20 cm.

123. (4)

From ΔACD,
AD = 8 cm.
CD = 6 cm.
$\angle CDA = 90°$

$\therefore$ AC = $\sqrt{AD^2 + DC^2}$

= $\sqrt{8^2 + 6^2}$ = $\sqrt{64 + 36}$

= $\sqrt{100}$ = 10 cm

The straight line joining the mid-points of two sides of a triangle is parallel to the third side and half of third side.

$\therefore$ PQ = $\frac{1}{2}$AC = $\frac{10}{2}$ = 5 cm.

124. (2) The sum of two sides of a triangle is greater than the third side.
Clearly,
(8 + 15) > 17
(15 + 17) > 8
(8 + 17) > 15

125. (4) The circumcentre of a triangle is equidistant from its vertices.

126. (3) Three angles of triangle
= x, y and z
According to the question,
$x + y = 116°$
$x - y = 24$
On adding,
$2x = 116 + 24 = 140$

$\Rightarrow x = \frac{140}{2} = 70°$

$\therefore x + y = 116°$
$\Rightarrow 70° + y = 116°$
$\therefore y = 116° - 70° = 46°$
Third angle (z)
$= 180° - 116° = 64°$

127. (3)

DE ∥ BC
$\therefore \angle ADE = \angle ABC$
$\angle AED = \angle ACB$
$\therefore$ By AA - similarity theorem,
$\Delta ADE \sim \angle ABC$

$\frac{AB}{AD} = \frac{BC}{DE}$

$\Rightarrow \frac{AB}{AB - BD} = \frac{BC}{DE}$

$\Rightarrow \frac{7}{7-3} = \frac{BC}{DE}$

$\Rightarrow \frac{BC}{DE} = \frac{7}{4} = \frac{3.5}{2}$ - 3.5 : 2

128. (4)

$\angle ABC = 35°$
$\angle ACB = 65°$
$\therefore \angle BAC = 180° - 35° - 65°$
$= 180° - 100° = 80°$
$\angle BAD = \angle DAC = 40°$
$\therefore \angle ADB = 180° - 35° - 40°$
$= 105°$

129. (2) The orthocentre of an obtuse angled triangle lies outside the triangle.

130. (3) sin (B + C – A) = $\frac{\sqrt{3}}{2}$
= sin 60°
$\Rightarrow$ B + C – A = 60° ..... (i)
Again,
tan (C + A – B) = 1 = tan 45°
$\Rightarrow$ C + A – B = 45° ..... (ii)
On adding (i) and (ii)
B + C – A + C + A – B
= 60° + 45°
$\Rightarrow$ 2C = 105°

$\Rightarrow C = \frac{105°}{2} = 52.5°$

131. (3) The difference between two sides of a triangle is less than the third side.
$\therefore$ In ΔXYZ,
XY – YZ < XZ

132. (3)

AB = AC

$\therefore \angle ABC = \angle ACB = \frac{90°}{2} = 45°$

133. (2)

The point of intersection of the internal bisectors of the angles of a triangle meet at a point that is incentre-equidistant from the sides.

134. (1) In ΔABC and ΔDEF,
$\angle A = \angle F = 50°$
$\angle B = \angle E = 70°$
$\angle C = \angle D = 60°$
$\therefore \Delta ABC \sim \Delta FED$

135. (3) $4\angle A = 3\angle B = 12\angle C$

$\Rightarrow \frac{4\angle A}{12} = \frac{3\angle B}{12} = \frac{12\angle C}{12}$

$\Rightarrow \frac{\angle A}{3} = \frac{\angle B}{4} = \frac{\angle C}{1}$

$\therefore \angle A : \angle B : \angle C = 3 : 4 : 1$;
$\angle A + \angle B + \angle C = 180°$
$\therefore$ Sum of the terms of ratio
= 3 + 4 + 1 = 8

$\therefore \angle A = \frac{3}{8} \times 180° = 67.5°$

136. (2) The sum of the two sides of a triangle is greater than the third side.
For option, 11 cm., 3 cm., and 12 cm,
11 + 3 = 14 > 12
3 + 12 = 15 > 11
11 + 12 = 23 > 3

137. (3)

AD = 6 cm.
BD = 4 cm.

$\therefore$ AB = $\sqrt{AD^2 + BD^2}$

= $\sqrt{6^2 + 4^2}$

$= \sqrt{36+16} = \sqrt{52}$ cm.

$\therefore$ BD $= \dfrac{AB^2}{BC} \Rightarrow 4 = \dfrac{52}{BC}$

$\Rightarrow$ BC $= \dfrac{52}{4} = 13$ cm.

138. (2)

According to the question,

$\dfrac{AD}{DB} = \dfrac{8}{12} = \dfrac{2}{3}$

$\dfrac{AE}{EC} = \dfrac{6}{9} = \dfrac{2}{3}$

$\therefore \dfrac{AD}{DB} = \dfrac{AE}{EC} = \dfrac{2}{3}$

$\Rightarrow \dfrac{DB}{AD} = \dfrac{EC}{AE} = \dfrac{3}{2}$

$\Rightarrow \dfrac{DB+AD}{AD} = \dfrac{3+2}{2} = \dfrac{EC+AE}{AE}$

$\Rightarrow \dfrac{AB}{AD} = \dfrac{5}{2} = \dfrac{AC}{AE}$

$\therefore \Delta ABC \sim \Delta ADE$

$\therefore \dfrac{AB}{AD} = \dfrac{BC}{DE} = \dfrac{5}{2}$

$\Rightarrow$ BC $= \dfrac{5}{2}$DE

139. (3) In a triangle ABC,

$\angle B = 5\angle C$; $\angle A = 3\angle C$

$\therefore \angle A + \angle B + \angle C = 180°$

$\Rightarrow 3\angle C + 5\angle C + \angle C = 180°$

$\Rightarrow 9\angle C = 180°$

$\Rightarrow \angle C = \dfrac{180°}{9} = 20°$

140. (2)

The line joining the mid–points of two sides of a triangle is parallel to the third side and half of the base.

$\therefore$ XY $= \dfrac{1}{2}$BC

$\Rightarrow$ BC = 2XY

$\therefore$ BC + XY = 12

$\Rightarrow$ 2XY + XY = 12

$\Rightarrow$ 3XY = 12

$\Rightarrow$ XY $= \dfrac{12}{3} = 4$ units

$\therefore$ BC = 12 – 4 = 8 units

$\therefore$ BC – XY = 8 – 4 = 4 units

141. (2)

LM || QR

$\therefore \angle PLM = \angle PQR$

$\angle PML = \angle PRQ$

$\therefore$ By AA–similarity theorem,

$\Delta PLM \sim \Delta PQR$

$\therefore \dfrac{PL}{LQ} = \dfrac{PM}{MR} \Rightarrow \dfrac{2}{6} = \dfrac{1.5}{MR}$

$\Rightarrow 2MR = 1.5 \times 6$

$\Rightarrow$ MR $= \dfrac{1.5 \times 6}{2} = 4.5$ cm.

142. (3) The point of intersection of the medians of a triangle is called centroid.

143. (3)

AO = 4 cm.

$\Rightarrow \dfrac{2}{3}$AD = 4

$\Rightarrow$ AD $= \dfrac{4 \times 3}{2} = 6$ cm.

BO = 6 cm.

$\Rightarrow$ BE $= \dfrac{3 \times 6}{2} = 9$ cm.

CO = 8 cm.

$\Rightarrow$ CF $= \dfrac{8 \times 3}{2} = 12$ cm.

144. (3) In a ΔABC,

$\angle A : \angle B : \angle C = 1 : \dfrac{2}{3} : 3$

$= 3 : 2 : 9$

Sum of the terms of ratio

$= 3 + 2 + 9 = 14$

$\therefore$ Lowest angle $= \angle B$

$= \dfrac{2}{14} \times 180°$

$= \dfrac{180}{7} = 25\dfrac{5°}{7}$

145. (1)

In ΔBDE and ΔABC,

DE || AC

$\therefore \angle BDE = \angle BAC$

$\angle BED = \angle BCA$

By AA–similarity,

$\Delta BDE \sim \Delta BAC$

$\therefore \dfrac{DB}{AD} = \dfrac{BE}{EC}$

$\Rightarrow \dfrac{AB - AD}{AD} = \dfrac{BE}{EC}$

$\Rightarrow \dfrac{5-3}{3} = \dfrac{BE}{EC}$

$\Rightarrow \dfrac{BE}{EC} = \dfrac{2}{3}$

146. (1)

$\angle A + \angle B = 135°$

$\angle A + \angle B + \angle C = 180°$

$\therefore \angle C = 180° - 135° = 45°$

$\therefore \angle C + 2\angle B = 180°$

$\Rightarrow 2\angle B = 180° - \angle C$

$= 180° - 45°$

$= 135°$

$\therefore \angle B = \dfrac{135°}{2} = 67.5°$

$\therefore \angle A = \angle B$

$\Rightarrow$ BC = AC

$\angle C < \angle B$

$\Rightarrow$ AB < AC

147. (2)

In ΔABC and ΔDEC

$AB \parallel DE$

$\therefore \angle ABC = \angle DEC = 90°$

$\angle CAB = \angle CDE$

By AA-similarity theorem,

$\Delta ABC \sim \Delta DEC$

$\therefore \frac{AB}{DE} = \frac{AC}{CD}$

$\Rightarrow \frac{9}{3} = \frac{24}{CD}$

$\Rightarrow 3 = \frac{24}{CD}$

$\Rightarrow CD = \frac{24}{3} = 8$ cm

$\therefore AD = AC - CD$

$= 24 - 8 = 16$ cm

148. (3)

BI and CI are bisectors of angles $\angle B$ and $\angle C$.

$\angle BAC = 70°$

$\therefore \angle ABC + \angle ACB = 180° - 70°$

$= 110°$

$\therefore 2\angle IBC + 2\angle ICB = 110°$

$\Rightarrow \angle IBC + \angle ICB = 55°$

$\therefore \angle BIC = 180° - 55° = 125°$

149. (1)

According to the question,

AB = 8 cm.

$\angle ABC = 90°$

$\therefore \sin 45° = \frac{AB}{AC}$

$\Rightarrow \frac{1}{\sqrt{2}} = \frac{8}{AC}$

$\Rightarrow AC = 8\sqrt{2}$ cm.

150. (2)

The point of intersection of internal bisectors of angles of a triangle is in-centre.

$\angle A = 70°$; $\angle B = 80°$

$\therefore \angle C = 180° - (70° + 80°)$

$= 30°$

$\therefore \angle ACB = 2x° = 30°$

$\Rightarrow x = 15°$

$\angle BDC = 180° - \frac{\angle B}{2} - \frac{\angle C}{2}$

$= 180° - \frac{80°}{2} - \frac{30°}{2}$

$= 180° - 40° - 15° = 125° = y$

151. (3)

$\angle BOC = 180° - \angle A$

$\Rightarrow \angle A = 180° - \angle BOC$

$= 180° - 100° = 80°$

TYPE-IV

1. (3)

AD = 9 cm.

$\Rightarrow GD = \frac{1}{3} \times 9 = 3$ cm

BE = 6 cm

$\Rightarrow BG = \frac{2}{3} \times 6 = 4$ cm

$\therefore BD = \sqrt{3^2 + 4^2} = \sqrt{9+16}$

$= 5$ cm.

2. (2)

If AB = x; BC = $2x$ units

$\Rightarrow AC = \sqrt{4x^2 - x^2} = \sqrt{3}x$

$\therefore \sin \angle ACB = \frac{AB}{BC} = \frac{1}{2} = \sin 30°$

$\therefore \angle ACB = 30°$

3. (3)

Here, $6^2 + 8^2 = 10^2$

$\therefore \Delta ABC$ is a right angled triangle.

AC = 10 cm

Point D is the mid-point of side BC.

Point D is equidistant from the vertices A, B and C.

$\therefore AD = BD = CD = 5$ cm

4. (2) In a right angled triangle,

$(\text{Hypotenuse})^2$

$= (\text{Perpendicular})^2 + (\text{Base})^2$

$\Rightarrow (x + 2)^2 = (x - 2)^2 + x^2$

$\Rightarrow x^2 + 4x + 4 = x^2 - 4x + 4 + x^2$

$\Rightarrow x^2 - 8x = 0$

$\Rightarrow x(x - 8) = 0 \Rightarrow x = 8$

5. (2) In ΔACD and ΔABC,

$\angle CDA = \angle CAB = 90°$

$\angle C$ is common.

$\therefore \Delta ACD \sim \Delta ABC$

$\therefore \frac{\Delta ACD}{\Delta ABC} = \frac{AC^2}{BC^2}$

$\Rightarrow \frac{10}{40} = \frac{9^2}{BC^2}$

$\Rightarrow BC^2 = 4 \times 9^2$

$\therefore BC = 2 \times 9 = 18$ cm

6. (4)

$\angle BAC = 90°$

$AB = \sqrt{AD^2 + BD^2}$

$= \sqrt{36+16} = \sqrt{52}$ cm

ΔABD and ΔABC are similar.

$\therefore \frac{AB}{BC} = \frac{BD}{AB}$

$\Rightarrow AB^2 = BC \times BD$

$\Rightarrow 52 = BC \times 4$

$\Rightarrow BC = \frac{52}{4} = 13$ cm

7. (2)

$BC = \sqrt{10^2 - 6^2} = \sqrt{100-36}$

$= \sqrt{64} = 8$ cm

Area of Δ ABC,

$= \frac{1}{2} \times BC \times AB$

$= \frac{1}{2} \times 8 \times 6 = 24$ sq.cm

Again, $\frac{1}{2} AC \times BN = 24$

$\Rightarrow \frac{1}{2} \times 10 \times BN = 24$

$\Rightarrow BN = \frac{24}{5}$

$\therefore NC = \sqrt{BC^2 - BN^2}$

$= \sqrt{64 - \frac{576}{25}} = \frac{32}{5}$ cm

$AN = 10 - \frac{32}{5} = \frac{50-32}{5} = \frac{18}{5}$

$\therefore AN : NC = \frac{18}{5} : \frac{32}{5} = 9 : 16$

8. (2)

$\sin 30° = \frac{AC}{BC}$

$\Rightarrow \frac{1}{2} = \frac{AC}{6\sqrt{3}} \Rightarrow AC = 3\sqrt{3}$

Also, $\sin 60° = \frac{AD}{AC}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{AD}{3\sqrt{3}}$

$\Rightarrow AD = \frac{3\sqrt{3} \times \sqrt{3}}{2} = 4.5$ cm

9. (2)

$BC = a$, $AC = b$

$\therefore AB = \sqrt{AC^2 + BC^2} = \sqrt{b^2 + a^2}$

Area of Δ ABC

$= \frac{1}{2} \times BC \times AC$

$= \frac{1}{2} ab$

Again, area of Δ ABC

$= \frac{1}{2} \times AB \times CD$

$= \frac{1}{2} \times \sqrt{a^2 + b^2} \times p$

$\therefore \frac{1}{2} ab = \frac{1}{2} \sqrt{a^2 + b^2} \times p$

$\Rightarrow ab = \sqrt{a^2 + b^2} \times p$

On squaring both sides,

$a^2 b^2 = (a^2 + b^2) p^2$

$\Rightarrow \frac{1}{p^2} = \frac{a^2 + b^2}{a^2 b^2}$

$\Rightarrow \frac{1}{p^2} = \frac{a^2}{a^2 b^2} + \frac{b^2}{a^2 b^2}$

$\Rightarrow \frac{1}{p^2} = \frac{1}{b^2} + \frac{1}{a^2} = \frac{1}{a^2} + \frac{1}{b^2}$

10. (3)

In

Δ ABC, AD $\perp$ BC

$\Rightarrow \Delta$ BAC ~ Δ ADC $\therefore$ Ratio of area of triangles = ratio of square of their corresponding sides Hence,

$\frac{ar(BAC)}{ar(ADC)} = \frac{BC^2}{AC^2} = \frac{64}{36}$

$= \frac{16}{9} = 16 : 9$

11. (1)

I ~ ΔABC, Let BC = x Since AD is the median, $\therefore$ BD = DC = $\frac{x}{2}$

Also, AD = $\frac{1}{2}$ BC = $\frac{1}{2}$ x or $\frac{x}{2}$

In Δ ABD, AD = BD $\Rightarrow \angle BAD = \angle ABD$ Similarly in

Δ ADC, $\angle DAC = \angle ACD$,

$\angle A = a + b$.

Thus, $a + b + a + b = 180°$

$\Rightarrow a + b = 90° \Rightarrow \angle A = 90°$

12. (3)

AC = Diameter of circum circle

$= \sqrt{5^2 + 12^2} = 13$ cm

$\therefore$ Circum-radius $= \frac{13}{2}$

= 6.5 cm

13. (3)

$AB \times BC = \frac{AC^2}{2}$

$\Rightarrow AC^2 = 2\ AB \times BC$

$\Rightarrow AB^2 + BC^2 = 2\ AB \times BC$

$\Rightarrow (AB - BC)^2 = 0$

$\Rightarrow AB = BC$

$\therefore \angle BAC = \angle ACB = 45°$

14. (1)

In ΔABC, $AC^2 + BC^2 = AB^2$

In ΔACD, $AD^2 = AC^2 + CD^2$

$\Rightarrow AD^2 - CD^2 = AC^2$

$\therefore AB^2 + AC^2$

$= AC^2 + BC^2 + AD^2 - CD^2$

$\Rightarrow AB^2 = BC^2 + AD^2 - CD^2$

$\Rightarrow AB^2 + CD^2 = BC^2 + AD^2$

15. (3)

$\angle DEC = 90°$

DE = 18 cm

CE = 5 cm

$\therefore \tan C = \frac{DE}{CE} = \frac{18}{5} = 3.6$

$\tan \angle ABC = 3.6$

$\Rightarrow \angle C = \angle B$

$\therefore AC = AB$

$\angle C + \angle D = 90°$

$\Rightarrow 2\angle C + 2\angle D = 180°$

$\angle C + \angle A + \angle B = 180°$

$\Rightarrow 2C + \angle A = 180°$

$\therefore \angle A = 2\angle D$

$\therefore \frac{AC}{CB} = \frac{2CD}{CE}$

$\Rightarrow \frac{AC}{CD} = \frac{2CB}{CE}$ or 2BC CE

16. (1)

Since BL is the Median AL = LC = x (say). Since CM is the Median, BM = MA = y (say)

$AB^2 + AC^2 = 25$ ...(i)

$\Rightarrow \left(\frac{3\sqrt{5}}{2}\right)^2 = (2y)^2 + x^2$

$\Rightarrow \frac{9 \times 5}{4} = 4y^2 + x^2$

$\Rightarrow 4y^2 = \frac{45}{4} - x^2$ ...(ii)

In ΔABC, $BC^2 = AB^2 + AC^2$

$\Rightarrow 25 = (2y)^2 + (2x)^2$

$25 = 4y^2 + 4x^2 \Rightarrow 25$

$= \frac{45}{4} - x^2 + 4x^2$

$3x^2 = \frac{55}{4} \Rightarrow x^2 = \frac{55}{12}$

Put in (ii) $\Rightarrow 4y^2 = \frac{45}{4} - \frac{55}{12}$

$= \frac{135 - 55}{12}$

$\Rightarrow 4y^2 = \frac{80}{12} \Rightarrow y^2 = \frac{80}{12 \times 4} = \frac{5}{3}$

Now , CM

$= \sqrt{y^2 + 4x^2} = \sqrt{\frac{5}{3} + 4\left(\frac{55}{12}\right)}$

$= \sqrt{\frac{5}{3} + \frac{55}{3}} = \sqrt{\frac{60}{3}}$

$= \sqrt{20} = 2\sqrt{5}$ cm.

17. (2) When orthocentre lies at right angular vertex, then the triangle is right angled.

18. (4) $(2x)^2 + (x^2 - 1)^2$

$= 4x^2 + x^4 - 2x^2 + 1$

$= x^4 + 2x^2 + 1 = (x^2 + 1)^2$

It is a right angled triangle,

19. (3)

In right angled Δ ABC,

$\angle B = \angle A + \angle C$

In an equilateral triangle ABC,

$\angle B = \frac{\angle A + \angle C}{2}$

In obtuse angled triangle,

$\angle B > \angle A + \angle C$

In acute angled triangle ABC,

$\angle A < \angle B + \angle C$

$\angle B < \angle A + \angle C$

20. (2)

$AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{6^2 + 8^2}$

$= \sqrt{36 + 64} = \sqrt{100} = 10$ cm

OD = OE = OF = radii

$= r$ cm

$\therefore$ Area of [$\Delta AOB + \Delta BOC + \Delta AOC$]

$= \Delta ABC$

$\Rightarrow \frac{1}{2} \times 6 \times r + \frac{1}{2} \times 8 \times r +$

$\frac{1}{2} \times 10 \times r = \frac{1}{2} \times 8 \times 6$

$\Rightarrow 3r + 4r + 5r = 24$

$\Rightarrow 12r = 24$

$\Rightarrow r = \frac{24}{12} = 2$ cm

21. (1) In right angled triangle PQR,

$PQ^2 + QR^2 = PR^2$

Here, $3^2 + 4^2 = 5^2$

$\therefore$ The smallest side = 3 units

22. (4) Angle in a semi-circle is a right angle.

23. (1)

$BD = DC = \frac{1}{2}$ BC

$\therefore$ $AC^2 = AD^2 + CD^2$

$AB^2 = AD^2 + BD^2$

$= AD^2 + CD^2$

On adding,

$AB^2 + AC^2 = 2AD^2 + 2CD^2$

$\Rightarrow BC^2 = 2AD^2 + 2CD^2$

$\Rightarrow 4CD^2 = 2AD^2 + 2CD^2$

$\Rightarrow AD^2 = CD^2$

$\Rightarrow AD = CD = BD$

Mid point on the hypotenuse of a right angled triangle is equidistant from the vertices.

24. (1) Ratio of sides = $3 : \frac{5}{4} : \frac{13}{4}$

$= 12 : 5 : 13$

$5^2 + 12^2 = 13^2$

It is a right angled triangle.

25. (4)

$\therefore$ $OB = \sqrt{OA^2 + AB^2}$

$= \sqrt{12^2 + 5^2}$

$= \sqrt{144 + 25} = \sqrt{169} = 13$ km.

26. (1) Angles of triangle = $2x^\circ$, $3x^\circ$ and $5x^\circ$ (let)

$\therefore 2x^\circ + 3x^\circ + 5x^\circ = 180^\circ$

$\Rightarrow 10x^\circ = 180^\circ$

$\Rightarrow x^\circ = \frac{180}{10} = 18^\circ$

Angles of triangle = $2x = 2 \times 18 = 36^\circ$,

$3x = 3 \times 18 = 54^\circ$,

$5x = 5 \times 18 = 90^\circ$,

Hence, it is a right angled triangle.

27. (2)

$\angle BAC = 90^\circ$

From ΔABC,

$BC = \sqrt{AB^2 + AC^2}$

$= \sqrt{6^2 + 8^2} = \sqrt{36 + 64}$

$= \sqrt{100} = 10$ cm.

$\therefore$ Semi–perimeter of $\Delta ABC = s$

$= \frac{6 + 8 + 10}{2} = \frac{24}{2} = 12$ cm.

Area of $\Delta ABC = \frac{1}{2} \times AC \times AB =$

$\frac{1}{2} \times 8 \times 6 = 24$ sq. cm.

$\therefore$ In–radius $= \frac{\Delta}{s} = \frac{24}{12} = 2$ cm.

28. (3)

In right angled Δ ABD and Δ ADC,

$AB^2 = AD^2 + BD^2$

and, $AC^2 = AD^2 + DC^2$

On adding,

$AB^2 + AC^2 = 2AD^2 + BD^2 + CD^2$

$\Rightarrow AB^2 + AC^2 = 2BD \times CD + BD^2 + CD^2$

[$\because AD^2 = BD \times CD$]

$\Rightarrow AB^2 + AC^2 = (BD + CD)^2$

$= BC^2$

$\therefore \angle BAC = 90^\circ$

29. (3)

In Δ ABC and Δ DAC,

$\angle ADC = \angle BAC$, $\angle C = \angle C$

By AA – similarity criterion,

$\Delta ABC \sim \Delta DAC$

$\therefore \dfrac{AB}{DA} = \dfrac{BC}{AC} = \dfrac{AC}{DC}$

$\Rightarrow \dfrac{CB}{CA} = \dfrac{CA}{CD}$

$\Rightarrow CA^2 = CB \times CD$

$= BC\ (BC - BD)$

$= 14 \times (14 - 5) = 14 \times 9$

$= 126$ sq. cm.

$\therefore$ From Δ ADC

$CA^2 = AD^2 + C'D^2$

$\Rightarrow 126 = AD^2 + 9^2$

$\Rightarrow AD^2 = 126 - 81 = 45$

$\Rightarrow AD = \sqrt{45} = 3\sqrt{5}$ cm.

30. (2)

$\therefore AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{8^2 + 15^2}$

$= \sqrt{64 + 225}$

$= \sqrt{289} = 17$ cm.

$\therefore \sin C = \dfrac{AB}{AC} = \dfrac{8}{17}$

31. (2) $AB = BC = k$,

$AC = \sqrt{2}\,k$

$AB^2 + BC^2 = k^2 + k^2$

$= 2k^2 = AC^2$

$\therefore \Delta ABC$ is a right angled triangle.

32. (2)

In radius = r units

Area of ($\Delta OAC + \Delta OBC + \Delta OAB$)

= Area of ΔABC

$\Rightarrow \dfrac{1}{2}\,br + \dfrac{1}{2}\,ar + \dfrac{1}{2}\,cr$

$= \dfrac{1}{2}\,ab$

$r\,(a + b + c) = ab$

$\Rightarrow r = \dfrac{ab}{a+b+c}$ ..... (i)

In right angled triangle ΔABC,

$a^2 + b^2 = c^2$

$\Rightarrow (a + b)^2 - 2ab = c^2$

$\Rightarrow (a + b)^2 - c^2 = 2ab$

$\Rightarrow (a + b + c)\,(a + b - c) = 2ab$

$\therefore$ From equation (i),

$r = \dfrac{ab}{a+b+c}$

$= \dfrac{(a+b+c)\,(a+b-c)}{2\,(a+b+c)}$

$= \dfrac{a+b-c}{2}$

33. (2)

In ΔABC,

$AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{6^2 + 8^2}$

$= \sqrt{36 + 64} = \sqrt{100} = 10$ cm.

A circle will pass through the points A, B, and C such that AC is diameter as $\angle B = 90°$.

$\therefore$ AD = BD = DC = 5 cm.

34. (4) Let the other sides of right angled triangle be $4x$ and $3x$ cm.

$\because$ (Perpendicular)^2 + (Base)^2 = (Hypotenuse)^2

$\Rightarrow (4x)^2 + (3x)^2 = (20)^2$

$\Rightarrow 16x^2 + 9x^2 = 400$

$\Rightarrow 25x^2 = 400$

$\Rightarrow x^2 = \dfrac{400}{25} = 16$

$\therefore x = \sqrt{16} = 4$

$\therefore$ Other sides of triangle

$= 4 \times 4 = 16$ cm.

and $3 \times 4 = 12$ cm.

35. (2)

XY = 2.5 cm

YZ = 6 cm

$\therefore XZ = \sqrt{XY^2 + YZ^2}$

$= \sqrt{(2.5)^2 + (6)^2}$

$= \sqrt{6.25 + 36}$

$= \sqrt{42.25} = 6.5$ cm

The angle of semi-circle is right angle.

$\therefore$ XZ = Diameter of circle

$\therefore$ Circum-radius $= \dfrac{6.5}{2}$

$= 3.25$ cm

36. (3)

The median splits the right triangle into two isosceles triangles and the median is half the length of the hypotenuse.

$\therefore$ EF = 12 cm.

$\Rightarrow$ DX = XE = XF = 6 cm.

TYPE-V

1. (4)

Two triangles are congruent if two sides and the included angle of one are equal to the corresponding sides and the included angle of the other triangle. (SAS criterion).

2. (3)

$\angle PQR = \angle PST$

$\angle P = \angle P$

$\therefore \Delta PST$ and ΔPQR are similar,

$$\therefore \frac{PQ}{PS} = \frac{PR}{PT}$$

$$\Rightarrow \frac{8}{3} = \frac{PR}{5}$$

$$\Rightarrow PR = \frac{8 \times 5}{3} = \frac{40}{3}$$

$$\therefore SR = PR - PS = \frac{40}{3} - 3$$

$$= \frac{40-9}{3} = \frac{31}{3} \text{ cm.}$$

3. (1)

In similar triangles ΔABC and ΔPQR,

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$

$$= \frac{AB + BC + AC}{PQ + QR + PR}$$

$$\Rightarrow \frac{AB}{10} = \frac{36}{24} = \frac{3}{2}$$

$$\Rightarrow AB = \frac{3}{2} \times 10 = 15 \text{ cm}$$

4. (3)

In ΔABC and ΔDBE,

$DE \parallel AC$

$\therefore \angle BAC = \angle BDE$

$\angle BCA = \angle BED$

$\therefore$ By AA–similarity

$\Delta ABC \sim \Delta DBE$

5. (4)

In ΔABC, $PQ \parallel BC$

$\Rightarrow \Delta APQ \sim ABC$

$$\Rightarrow \frac{AP}{AB} = \frac{PQ}{BC} = \frac{2x}{3x} = \frac{2}{3} = 2 : 3$$

[Let $PB = x \Rightarrow AB = 3x$ and $AP = 3x - x = 2x$]

6. (2)

$DE \parallel BC$

$\angle ADE = \angle ABC$

$\angle AED = \angle ACB$

$\therefore \Delta ADE \sim \Delta ABC$

$$\text{Now, } \frac{\square BDEC}{\Delta ADE} = \frac{1}{1}$$

[DE divides Δ into two equal parts]

$$\Rightarrow \frac{\square BDEC}{\Delta ADE} + 1 = 1 + 1$$

$$\Rightarrow \frac{\Delta ABC}{\Delta ADE} = 2 = \frac{AB^2}{AD^2}$$

$$\Rightarrow \frac{AB}{AD} = \sqrt{2}$$

$$\Rightarrow \frac{AB}{AD} - 1 = \sqrt{2} - 1$$

$$\Rightarrow \frac{BD}{AD} = \sqrt{2} - 1$$

$$\Rightarrow \frac{AD}{BD} = \frac{1}{\sqrt{2} - 1}$$

or $1 : \sqrt{2} - 1$

7. (4)

$DE \parallel AC$

$\Delta BDE \sim \Delta BAC$

$$\Rightarrow \frac{BD}{DA} = \frac{BE}{EC}$$

$$\Rightarrow \frac{6}{4} = \frac{BE}{EC}$$

$\Rightarrow BE : CE = 3 : 2$

8. (3)

$\frac{AD}{AE} = \frac{AB}{AC}$

$\Delta ADE \sim \Delta ABC$

$\therefore DE = \frac{1}{4}BC$

$= \frac{1}{4} \times 12 = 3$ cm

9. (3)

$\frac{AB}{AD} = \frac{2}{1}$

$\Delta ADE \sim \Delta ABC$

$\frac{AB}{AD} = \frac{BC}{DE} = \frac{2}{1}$

$\therefore \frac{DE}{BC} = \frac{1}{2} = 1 : 2$

10. (3)

$\Delta ADE = \boxed{}$ BDEC (Given)

$\Rightarrow \Delta\, 2ADE = \Delta\, ABC$

$DE \parallel BC$

$\therefore \Delta ADE \sim \Delta ABC$

$\therefore \frac{\Delta ADE}{\Delta ABC} = \frac{1}{2} = \frac{AD^2}{AB^2}$

$\Rightarrow \frac{AB}{AD} = \sqrt{2}$

$\Rightarrow \frac{AB}{AD} - 1 = \sqrt{2} - 1$

$\Rightarrow \frac{AB - AD}{AD} = \sqrt{2} - 1$

$\Rightarrow \frac{BD}{AD} = \sqrt{2} - 1$

$\therefore \frac{BD}{AB} = \frac{BD}{AD} \times \frac{AD}{AB} = \frac{\sqrt{2}-1}{\sqrt{2}}$

11. (4)

In ΔADE and ΔABC,

$\angle ABC = \angle ADE$

$\angle A = \angle A$

$\therefore \Delta ABC \sim \Delta ADE$

$\therefore \frac{AB}{AD} = \frac{BC}{DE} = \frac{AC}{AE}$

$\therefore \frac{AE + EB}{AD} = \frac{AC}{AE}$

$\Rightarrow \frac{3+2}{2} = \frac{AC}{3}$

$\Rightarrow \frac{5}{2} = \frac{AC}{3}$

$\Rightarrow 2AC = 5 \times 3 \Rightarrow AC = \frac{15}{2}$

$\therefore DC = AC - AD$

$= \frac{15}{2} - 2 = \frac{15-4}{2} = \frac{11}{2}$

$= 5.5$ cm

12. (4)

$\Delta ABC \sim \Delta DEF$ and $4AB = DE$

$\Rightarrow \frac{AB}{DE} = \frac{1}{4}$

$\therefore \frac{AB}{DE} = \frac{BC}{EF}$

$\Rightarrow \frac{1}{4} = \frac{12}{EF}$

$\Rightarrow EF = 48$ cm.

13. (1)

$\angle P = \angle B$

$\angle Q = \angle C$

$\therefore$ By AA — similarity,

$\Delta APQ \sim \Delta ABC$

$\therefore \frac{AP}{AB} = \frac{AQ}{AC}$

$\Rightarrow \frac{AB}{AP} = \frac{AC}{AQ}$

$\Rightarrow \frac{AB}{AP} - 1 = \frac{AC}{AQ} - 1$

$= \frac{AC - AQ}{AQ}$

$\Rightarrow \frac{AB}{AP} - 1 = \frac{QC}{AQ}$

$\Rightarrow \frac{12}{QC} - 1 = \frac{QC}{2}$

$\Rightarrow \frac{12}{x} - 1 = \frac{x}{2}$

$(QC = x)$

$\Rightarrow \dfrac{12-x}{x} = \dfrac{x}{2}$

$\Rightarrow x^2 + 2x - 24 = 0$

$\Rightarrow x^2 + 6x - 4x - 24 = 0$

$\Rightarrow x(x+6) - 4(x+6) = 0$

$\Rightarrow (x-4)(x+6) = 0$

$\Rightarrow x = 4$ because $x \neq -6$

14. (4)

DE || BC

$\therefore \angle ADE = \angle ABC$

$\angle AED = \angle ACB$

By AA – similarly,

$\Delta ADE \sim \Delta ABC$

$\therefore \dfrac{AB}{AD} = \dfrac{BC}{DE}$

$\therefore \dfrac{DB}{AD} = \dfrac{4}{5}$

$\Rightarrow \dfrac{DB}{AD} + 1 = \dfrac{4}{5} + 1$

$\Rightarrow \dfrac{DB + AD}{AD} = \dfrac{4+5}{5}$

$\Rightarrow \dfrac{AB}{AD} = \dfrac{9}{5} = \dfrac{BC}{DE}$

$\therefore \dfrac{DE}{BC} = \dfrac{5}{9} = 5 : 9$

15. (3)

FE || BC

$\Delta AFE \sim \Delta ABC$

$BC = \dfrac{1}{2}(AB + AC)$

$= \dfrac{1}{2}(19 + 22) = 20.5$ cm

16. (4)

In Δ ADE and Δ ABC,

$\angle ADE = \angle ABC$

$\angle AED = \angle ACB$

$\therefore \Delta AED \sim \Delta ABC$

$\therefore \dfrac{AD}{AB} = \dfrac{DE}{BC}$

$\dfrac{AD}{DB} = 1$

$\Rightarrow \dfrac{DB}{AD} + 1 = 2$

$\Rightarrow \dfrac{DB + AD}{AD} = 2$

$\Rightarrow \dfrac{AB}{AD} = 2 \Rightarrow \dfrac{AD}{AB} = \dfrac{1}{2}$

$\Rightarrow \dfrac{DE}{BC} = \dfrac{1}{2}$

$\therefore \dfrac{\Delta ODE}{\Delta BOC} = \left(\dfrac{1}{2}\right)^2 = \dfrac{1}{4}$

$\therefore \dfrac{\Delta ODE}{\Delta ABC} = \dfrac{1}{12} = 1 : 12$

[$\because 3\,\Delta BOC = \Delta ABC$]

17. (1)

$\Delta ABC \sim \Delta DEF$

$\therefore \dfrac{AB}{DE} = \dfrac{BC}{EF} = \dfrac{AC}{DF}$

$= \dfrac{AB + BC + CA}{DE + EF + FA}$

$\Rightarrow \dfrac{AB}{DE} = \dfrac{30}{18}$

$\Rightarrow \dfrac{AB}{36} = \dfrac{30}{18}$

$\Rightarrow AB = \dfrac{30 \times 36}{18}$

$= 60$ cm.

18. (4)

$\Delta PQR \sim \Delta LMN$

$\therefore \dfrac{PQ}{LM} = \dfrac{QR}{MN}$

$\Rightarrow \dfrac{PQ}{3PQ} = \dfrac{QR}{9}$

$\Rightarrow QR = \dfrac{1}{3} \times 9 = 3$ cm.

19. (3) $\Delta ABC \sim \Delta PQR$

$\therefore \dfrac{AB}{PQ} = \dfrac{BC}{QR} = \dfrac{AC}{PR}$

$= \dfrac{AB + BC + AC}{PQ + QR + PR}$

$\Rightarrow \dfrac{AB}{PQ} = \dfrac{36}{24} \Rightarrow \dfrac{AB}{10} = \dfrac{3}{2}$

$\Rightarrow AB = \dfrac{3}{2} \times 10 = 15$ cm.

20. (3) If the corresponding sides of two triangles be proportional, the triangles are similar.

21. (4) $\Delta ABC \sim \Delta PQR$

$\therefore \dfrac{AB}{PQ} = \dfrac{BC}{QR} = \dfrac{CA}{RP}$

$= \dfrac{AB + BC + CA}{PQ + QR + RP}$

$\Rightarrow \dfrac{AB}{PQ} = \dfrac{60}{36}$

$\Rightarrow \dfrac{AB}{18} = \dfrac{60}{36}$

$\Rightarrow AB = \dfrac{60}{36} \times 18 = 30$ cm.

TYPE-VI

1. (1)

Using Pythagoras theorem,
$QD^2 + QB^2 = QA^2 + QC^2$
$\Rightarrow QD^2 + 16 = 9 + 25$
$\Rightarrow QD^2 = 34 - 16 = 18$
$\Rightarrow QD = \sqrt{18} = 3\sqrt{2}$ cm

2. (4)

Let AB = $3x$ units
BC = $2x$ units
$\Rightarrow PB = \frac{3}{2}x$ units
$CP = \sqrt{PB^2 + BC^2}$
$= \sqrt{\frac{9x^2}{4} + 4x^2}$
$= \sqrt{\frac{25x^2}{4}} = \frac{5x}{2}$ units
$\therefore \sin \angle CPB = \frac{BC}{CP}$
$= \frac{2x}{\frac{5x}{2}} = \frac{4}{5}$
Take AB = $6x$ and BC = $4x \Rightarrow$ BP = $3x \Rightarrow$ CP = $5x$ and
$\sin \angle BPC = \frac{BC}{CP} = \frac{4x}{5x} = \frac{4}{5}$

3. (1)

AB = CD
BC = AD
AC = BD
It will be a rectangle and each angle will be a right angle.

4. (2)

Diameter of circle = Diagonal of rectangle
BC = 12 cm. CD = 5 cm.
$\therefore BD = \sqrt{BC^2 + CD^2}$
$= \sqrt{12^2 + 5^2} = \sqrt{144 + 25}$
$= \sqrt{169} = 13$ cm.
$\therefore$ Radius of circle = BO = $\frac{BD}{2}$
$= \frac{13}{2} = 6.5$ cm.

5. (2)

QC = 16 cm.
$\therefore$ CR = 22 – 16 = 6 cm.
$BC = \sqrt{BQ^2 + QC^2}$
$= \sqrt{2^2 + 16^2}$
$= \sqrt{4 + 256}$
$= \sqrt{260}$ cm.
$AC = \sqrt{CR^2 + AR^2}$
$= \sqrt{6^2 + 8^2} = \sqrt{36 + 64}$
$= \sqrt{100}$
= 10 cm.
BD = DC
BE = EA
$\therefore$ DE || AC and DE = $\frac{1}{2}$ AC = $\frac{10}{2}$ = 5 cm.

TYPE-VII

1. (2)

$\angle ABC = 90°$
$\Rightarrow \angle OBC = 45°$ [$\because \angle ABC = 2\angle OBC$]
$\angle OCB = 60°$
[$\because \Delta BEC$ is equilateral]
$\therefore \angle BOC = 180° - 60° - 45° = 75°$

2. (4)

OE = OF
EF = x units
$\therefore$ From ΔOEF,
$2\ OE^2 = EF^2$
$\Rightarrow \sqrt{2} \times OE = EF = x$
$\Rightarrow OE = \frac{x}{\sqrt{2}}$
BE = diagonal of square EFBC
$= \sqrt{2}\ x$
$\therefore OB = \sqrt{OE^2 + EB^2}$
$= \sqrt{\left(\frac{x}{\sqrt{2}}\right)^2 + \left(\sqrt{2}x\right)^2}$
$= \sqrt{\frac{x^2}{2} + 2x^2}$
$= \sqrt{\frac{x^2 + 4x^2}{2}}$
$= \sqrt{\frac{5x^2}{2}} = \frac{\sqrt{5}x}{\sqrt{2}}$ units

TYPE-VIII

1. (2) If the number of sides of regular polygon be n, then
$\frac{(2n-4)90°}{n} = \frac{360°}{n} \times 3$
$\Rightarrow 2n - 4 = 4 \times 3$
$\Rightarrow 2n = 12 + 4 = 16$
$\therefore n = 8$

2. (1) Let the exterior angle be x, then interior angle will be $4x$.
$\therefore x + 4x = 180°$
[$\because$ Interior angle + Exterior angle = 180°]

$\Rightarrow x = \frac{180}{5} = 36°$

$\therefore$ Interior angle = $4x$

$= 4 \times 36° = 144°$

Interior angle of a polygon

$= \frac{2n-4}{n} \times 90°$

$144° = \frac{2n-4}{n} \times 90°$

$\Rightarrow 144°n = 180°n - 360°$

$\Rightarrow 180°n - 144n = 360°$

$\Rightarrow 36°n = 360°$

$\therefore n = \frac{360°}{36°} = 10$

3. (3) Let the number of sides of polygon be n. Then

$\therefore \frac{(2n-4)}{n} \times 90° - \frac{360}{n} = 150$

$\Rightarrow \frac{(2n-4) \times 3}{n} - \frac{12}{n} = 5$

$\Rightarrow \frac{6n-12-12}{n} = 5$

$\Rightarrow 6n - 24 = 5n$

$\Rightarrow n = 24$

4. (3) If the number of sides of the polygon be n, then

$\left(\frac{2n-4}{n}\right) \times 90° = 144°$

$\Rightarrow \frac{(2n-4)5}{n} = 8$

$\Rightarrow 10n - 20 = 8n$

$\Rightarrow 2n = 20 \Rightarrow n = 10$

5. (2) Sum of the interior angles of a regular polygon of n sides

$= (2n - 4) \times 90°$

$\therefore (2n - 4) \times 90° = 1080°$

$\Rightarrow 2n - 4 = 1080 \div 90 = 12$

$\therefore 2n = 12 + 4 = 16$

$\Rightarrow n = 8$

6. (1) Let the number of sides be $5x$ and $4x$ respectively.

$\therefore \frac{(2 \times 5x - 4)90°}{5x}$

$- \frac{(2 \times 4x - 4) \times 90°}{4x} = 6°$

$\left[\text{Each interior angle} = \left(\frac{2n-4}{n}\right) \times 90°\right]$

$\Rightarrow (10x - 4) \times 360° - (8x - 4) \times 450° = 20x \times 6°$

$\Rightarrow (10x - 4) \times 12 - (8x - 4)15 = 4x$

$\Rightarrow 120x - 48 - 120x + 60 = 4x$

$\Rightarrow 4x = 12 \Rightarrow x = 3$

$\therefore$ Number of sides

= 15 and 12

7. (2) Let the number of sides of regular polygon be n.

$\therefore \left(\frac{2n-4}{n}\right) \times 90° = 2 \times \frac{360}{n}$

$\Rightarrow (2n - 4) = 8$

$\Rightarrow 2n = 12 \Rightarrow n = 6$

8. (3) Let the number of sides be $5x$ and $6x$ respectively.

Then, $\frac{(2 \times 5x - 4) \div 5x}{(2 \times 6x - 4) \div 6x} = \frac{24}{25}$

$\frac{\frac{10x-4}{5x}}{\frac{12x-4}{6x}} = \frac{24}{25}$

$\left[\text{Each interior angle} = \frac{(2n-4)90°}{n}\right]$

$\Rightarrow \frac{5x-2}{5} \times \frac{6}{6x-2} = \frac{24}{25}$

$\Rightarrow \frac{5x-2}{6x-2} = \frac{4}{5}$

$\Rightarrow 25x - 10 = 24x - 8$

$\Rightarrow x = 10 - 8 = 2$

$\therefore$ Number of sides = 10 and 12.

9. (2) Check through options

Each interior angle

$= \left(\frac{2n-4}{n}\right) \times 90°$

If measure of each angle = 105°

then, $\frac{(2n-4) \times 90°}{n} = 105°$

$\Rightarrow (2n - 4) \times 6 = 7n$

$\Rightarrow 12n - 24 = 7n$

$\Rightarrow 5n = 24$

$\Rightarrow n = \frac{24}{5}$ which is impossible.

10. (4) Sum of interior angles

$= (2n - 4) \times 90°$

Sum of exterior angles = 360°

$\therefore (2n - 4) \times 90° = 360° \times 2$

$\Rightarrow 2n - 4 = 2 \times 360° \div 90 = 8$

$\Rightarrow 2n - 4 = 8 \Rightarrow 2n = 12 \Rightarrow n = 6$

11. (3) Each interior angle

$= \frac{(2n-4) \times 90°}{n}$

$\therefore \frac{\frac{(2n-4) \times 90°}{n}}{\frac{(4n-4) \times 90°}{2n}} = \frac{2}{3}$

[$\because$ Ratio of number of sides is 1 : 2]

$\Rightarrow \frac{(2n-4) \times 2}{4n-4} = \frac{2}{3}$

$\Rightarrow \frac{2n-4}{4n-4} = \frac{1}{3}$

$\Rightarrow 6n - 12 = 4n - 4$

$\Rightarrow 6n - 4n = 12 - 4 = 8$

$\Rightarrow 2n = 8 \Rightarrow n = 4$

$\therefore$ No. of sides = 4, 8

12. (3) $\frac{360°}{n-1} - \frac{360°}{n+2} = 6°$

$\Rightarrow 360° \left(\frac{n+2-n+1}{(n-1)(n+2)}\right) = 6°$

$\Rightarrow (n - 1)(n + 2) = 180°$

$n^2 + n - 2 = 180$

$n^2 + n - 182° = 0$

$n^2 + 14n - 13n - 182 = 0$

$n(n + 14) - 13(n + 14) = 0$

$(n + 14)(n - 13) = 0$

$n = 13, -14$ [$\because n \neq -14$]

13. (4) If the number of sides of regular polygon be n, then

$\frac{(2n-4) \times 90°}{n} = 150°$

$\Rightarrow 3(2n - 4) = 5n$

$\Rightarrow 6n - 12 = 5n \Rightarrow n = 12.$

14. (1) If the number of sides of regular polygon be n, then

$(2n - 4) \times 90° = 1440°$

$\Rightarrow 2n - 4 = \frac{1440}{90} = 16$

$\Rightarrow 2n - 4 = 16$

$\Rightarrow 2n = 20$

$\Rightarrow n = 10$

15. (4) Sum of exterior angles of a regular polygon = 360°

But $\frac{360°}{50} = 7.2 \neq$ a whole number.

16. (2) Number of sides of regular polygon = n (let)

Sum of interior angles

$= (2n - 4) \times 90°$

Sum of exterior angles = 360°

$\therefore (2n - 4) \times 90° = 2 \times 360°$

$\Rightarrow 2n - 4 = \frac{2 \times 360°}{90} = 8$

$\Rightarrow 2n - 4 = 8$

$\Rightarrow 2n = 8 + 4 = 12$

$\Rightarrow n = \frac{12}{2} = 6$

17. (3) If the number of sides of regular polygon be n, then

Each interior angle

$= \dfrac{(2n-4)\times 90°}{n}$

and each exterior angle $= \dfrac{360°}{n}$

$\therefore \dfrac{(2n-4)}{n}\times 90° = \dfrac{5\times 360°}{n}$

$\Rightarrow (2n-4) = 5\times 4$

$\Rightarrow 2n-4 = 20$

$\Rightarrow 2n = 20+4 = 24$

$\Rightarrow n = \dfrac{24}{2} = 12.$

18. (1) An interior angle of a regular polygon

$= \dfrac{(2n-4)\times 90°}{n}$

Where n = number of sides

$\therefore \dfrac{(2n-4)90°}{n} = 140$

$\Rightarrow 9(2n-4) = 14n$

$\Rightarrow 18n-36 = 14n$

$\Rightarrow 18n-14n = 36$

$\Rightarrow 4n = 36 \Rightarrow n = \dfrac{36}{4} = 9$

19. (3) Number of sides of regular polygon = n

$\therefore \dfrac{(2n-4)\times 90°}{n} - \dfrac{360°}{n} = 132°$

$\Rightarrow 180n-360-360 = 132n$

$\Rightarrow 180n-132n = 720$

$\Rightarrow 48n = 720$

$\Rightarrow n = \dfrac{720}{48} = 15$

20. (3) Number of sides of regular polygon = n (let)

According to question,

$\dfrac{\text{Exterior angle}}{\text{Interior angle}} = \dfrac{1}{17}$

$\Rightarrow \dfrac{\frac{360}{n}}{\frac{(2n-4)\times 90}{n}} = \dfrac{1}{17}$

$\Rightarrow \dfrac{360}{(2n-4)\times 90} = \dfrac{1}{17}$

$\Rightarrow \dfrac{4}{2n-4} = \dfrac{1}{17}$

$\Rightarrow 2n-4 = 4\times 17$

$\Rightarrow 2n-4 = 68$

$\Rightarrow 2n = 68+4 = 72$

$\Rightarrow n = \dfrac{72}{2} = 36$

21. (3) Number of sides of a regular polygon (n)

$= \dfrac{360}{20} = 18$

$\therefore$ Sum of all interior angles

$= (2n-4)\times 90°$

$= (2\times 18-4)\times 90°$

$= 32\times 90° = 2880°$

22. (2) Let the number of sides of regular polygon be n.

$\therefore$ Sum of all interior angles

$= (2n-4)\times 90°$

$\Rightarrow (2n-4)\times 90° = 1440°$

$\Rightarrow (2n-4) = 1440° \div 90° = 16$

$\Rightarrow 2n-4 = 16$

$\Rightarrow 2n = 16+4 = 20$

$\Rightarrow n = 20\div 2 = 10$

23. (4) Number of sides of polygon = n (let).

According to the question,

$\dfrac{(2n-4)\times 90°}{n} : \dfrac{360°}{n} = \dfrac{3}{1}$

$\Rightarrow \dfrac{(2n-4)\times 90°}{360°} = \dfrac{3}{1}$

$\Rightarrow \dfrac{2n-4}{4} = \dfrac{3}{1}$

$\Rightarrow 2n-4 = 4\times 3 = 12$

$\Rightarrow 2n = 12+4 = 16$

$\Rightarrow n = \dfrac{16}{2} = 8$

24. (2)

Sum of interior angles of a pentagon

$= (2n-4)\times 90°$

$= (2\times 5-4)\times 90° = 540°$

If PQ = QR = RS = ST

$\therefore \angle POQ = \angle QOR = \angle ROS$

$= \angle SOT = \dfrac{180°}{4} = 45°.$

$\therefore$ OP = OQ = OR = OS = OT = radii

$\therefore \angle OPQ = \dfrac{180°-45°}{2} = \dfrac{135°}{2}$

$\therefore \angle PQR + \angle RST$

$= 4\times \dfrac{135°}{2} = 270°.$

25. (4) Let the number of sides of regular polygon be n.

According to the question,

$\dfrac{(2n-4)\times 90°}{n} - \dfrac{360°}{n} = 108$

$\Rightarrow \dfrac{(2n-4)\times 5}{n} - \dfrac{20}{n} = 6$

$\Rightarrow 10n-20-20 = 6n$

$\Rightarrow 10n-6n = 40$

$\Rightarrow 4n = 40 \Rightarrow n = 40\div 4 = 10$

26. (4) Each interior angle of regular polygon of n sides

$= \left(\dfrac{2n-4}{n}\right)\times 90°$

Here, $n = 6$

$\therefore$ Required answer

$= \left(\dfrac{2\times 6-4}{6}\right)\times 90°$

$= \dfrac{8}{6}\times 90° = 120°$

27. (2) Sum of all interior angles of a regular polygon of n sides = $(2n-4)$ right angles

$\therefore 2n-4 = 14$

$\Rightarrow 2n = 14+4 = 18$

$\Rightarrow n = \dfrac{18}{2} = 9$

28. (1) Required interior angle

$= \dfrac{(2n-4)\times 90°}{n}$

$= \dfrac{(2\times 8-4)}{8}\times 90°$

$= \dfrac{12\times 90°}{8} = 135°$

29. (3) Number of diagonals

$= \dfrac{n(n-3)}{2}$

$\Rightarrow 54 = \dfrac{n(n-3)}{2}$

$\Rightarrow n(n-3) = 108 = 12\times 9$

$\Rightarrow n(n-3) = 12(12-3)$

$\Rightarrow n = 12$

30. (4) Each interior angle of n-sided polygon

$= \dfrac{2n-4}{n}$ right angles

According to the question,

$\dfrac{\frac{2\times x-4}{x}}{\frac{2\times 2x-4}{2x}} = \dfrac{3}{4}$

$= \dfrac{2x-4}{x}\times \dfrac{2x}{4x-4} = \dfrac{3}{4}$

$\Rightarrow \dfrac{4x-8}{x-1} = 3$

$\Rightarrow 4x-8 = 3x-3$

$\Rightarrow 4x-3x = 8-3 \Rightarrow x = 5$

$\therefore$ Number of sides of polygons = 5 and 10.

31. (1) Each interior angle of regular polygon = $\left(\frac{2n-4}{n}\right) \times 90°$

where, n = number of sides

$\therefore \left(\frac{2n-4}{n}\right) \times 90° = 170°$

$\Rightarrow \frac{(2n-4)}{n} \times 9 = 17$

$\Rightarrow 18n - 36 = 17n$

$\Rightarrow 18n - 17n = 36$

$\Rightarrow n = 36$

TYPE-IX

1. (2)

Centroid is the point where medians intersect. Diagonals of parallelogram bisect each other.

$OP = \frac{1}{3} \times 9 = 3$ cm

$OQ = \frac{1}{3} \times 9 = 3$cm

$\therefore PQ = 6$cm

2. (2) AD || BC $\Rightarrow$ AD || BQ

Point B is the mid-point of AE.

$\therefore$ Q is the mid-point of DE.

In Δs DQC and BQE,

$\angle DQC = \angle BQE$

$\angle DCQ = \angle QBE$

$\angle CDQ = \angle QEB$

$\therefore$ Both triangles Δ DQC and Δ BQE are similar.

$\therefore \frac{DQ}{QE} = \frac{CQ}{BQ} = 1 : 1$

3. (1)

$\angle SPQ + \angle PQR = 180°$

$\Rightarrow 4\angle PQR + \angle PQR = 180°$

$\Rightarrow 5\angle PQR = 180°$

$\Rightarrow \angle PQR = \frac{180°}{5} = 36°$

$\therefore \angle SRQ = 180° - 36° = 144°$

TYPE-X

1. (4)

ABCD is a cyclic parallelogram.

$\therefore \angle B + \angle D = 180°$

$\Rightarrow 2\angle B = 180°$

$\Rightarrow \angle B = 90°$

2. (2)

$\angle ABC + \angle CDA = 180°$

$\Rightarrow \angle CDA = 180° - 70° = 110°$

$\therefore \angle BCD = 180° - 110° = 70°$

3. (4)

$\angle ABC + \angle CDA = 180°$

$\Rightarrow \angle CDA = 180° - 72° = 108°$

AD || BC

$\angle BCD = \angle ADE = \angle ABC = 72°$

4. (3)

$\angle ABC + \angle ADC = 180°$

$\angle CBE = 50°$

$\therefore \angle ABC = 180° - 50° = 130°$

$\therefore \angle ADC = 180° - 130° = 50°$

5. (1) The angle subtended at the centre by an arc is twice to that of angle subtended at the circumference.

$\therefore \angle CAD = \frac{1}{2} \angle COD = 70°$

$\therefore \angle BAD = 70° + 40° = 110°$

$\therefore \angle BCD = 180° - 110° = 70°$

6. (2)

$\angle ACB = 90°$

(Angle of semi-circle)

$\angle CAB = 30°$

$\therefore \angle CBA = 180° - 90° - 30° = 60°$

Again, $\angle ADC + \angle ABC = 180°$

$\therefore \angle ADC = 180° - 60° = 120°$

7. (1)

$\angle ADC = 70°$

$\angle ABC = 180° - 70° = 110°$

$\Rightarrow \angle PBC = 70°$

$\angle BCD = 180° - 60° = 120°$

$\Rightarrow \angle PCB = 60°$

$\therefore \angle PBC + \angle PCB = 70° + 60° = 130°$

8. (3)

$\angle B + \angle D = 180°$

and $\angle A + \angle C = 180°$

$\Rightarrow \angle BAC = \angle BCA$

$\angle DAC = \angle DCA$

$\therefore \angle DAB = \angle DCB = 90°$

$\angle DAC = \theta$

$\therefore \angle ADE = 90° - \theta = \angle CDE$

$\therefore \angle ABC = 180° - 2(90° - \theta)$

$= 180° - 180° + 2\theta = 2\theta$

9. (2)

$\therefore$ AP . PC = BP. DP. (Theorem)

10. (1)

We know tangents drawn to a circle from same external point are equal $\Rightarrow$ AM = AQ = x (say)

$\therefore$ MB = BN = $6 - x$, QD = DP=$7-x$,

Let NC = PC = Z

Now $7 - x + z = 5$ (Consider side DC)

BC = $6 - x + z = (7 - x + z) - 1$

$= 5 - 1 = 4$

11. (2) The sum of opposite angles of a concyclic quadrilateral is 180°.

12. (1)

In concyclic quadrilateral ABCD,

$\angle ADC + \angle ABC = 180°$

$\Rightarrow 70° + \angle ABC = 180°$

$\therefore \angle ABC = 180° - 70° = 110°$

$\therefore \angle CBE = 180° - 110° = 70°$

BC = BE

$\therefore \angle BCE = \angle BEC = \dfrac{110}{2} = 55°$

$\angle BAD = 95°$

$\therefore \angle BAD + \angle BCD = 180°$

$\Rightarrow \angle BCD = 180° - 95° = 85°$

$\therefore \angle DCE = \angle BCD + \angle BCE$

$= 85° + 55° = 140°$

13. (4)

The sum of opposite angles of a concyclic quadrilateral

= 180°

$\therefore \angle A + \angle C = \angle B + \angle D = 180°$

14. (2)

The sum of opposite angles of a concyclic quadrilateral is 180°.

$\therefore \angle A + C = 180°$

$\Rightarrow 4x + 5y = 180°$ ...(i)

$\angle B + \angle D = 180°$

$\Rightarrow 7x + y = 180°$ ...(ii)

By equation (ii) × 5 – (i),

$$\begin{array}{rcl} 35x + 5y & = & 900° \\ 4x + 5y & = & 180° \\ - \quad - & & - \\ \hline 31x & = & 720 \end{array}$$

$x = \dfrac{720}{31}$

From equation (ii),

$7x + y = 180°$

$\Rightarrow 7 \times \dfrac{720}{31} + y = 180°$

$\Rightarrow y = 180 - \dfrac{5040}{31}$

$= \dfrac{5580 - 5040}{31} = \dfrac{540}{31}$

$\therefore x : y = \dfrac{720}{31} : \dfrac{540}{31} = 4 : 3$

15. (3)

In ΔACD

$\angle DAC = 55°$

$\angle ACD = 90°$

$\angle D = 180° - 55° - 90° = 35°$

$\therefore \angle ABC + \angle ADC = 180°$

$\Rightarrow \angle ABC = 180° - 35° = 145°$

16. (2)

$\angle APB = 64°$

$\angle CBD = 28°$

$\angle CBD = \angle CAD = 28°$

$\angle APD = 180° - 64° = 116°$

$\therefore \angle ADB = 180° - 116° - 28°$

$= 180° - 144° = 36°$

17. (4)

$\angle APB = 110° = \angle CPD$

$\therefore \angle APD = 180° - 110° = 70°$

$= \angle BPC$

$\therefore \angle PCB = 180° - 70° - 30°$

$= 80°$

Angles subtended by same arcs at the circumference are equal.

$\therefore \angle ACB$ or $\angle PCB = \angle ADB$

$= 80°$

18. (4)

Clearly,

AP × BP = PD × PC

$\Rightarrow 8 \times 6 = PD \times 4$

$\Rightarrow PD = \dfrac{8 \times 6}{4} = 12$ cm.

19. (1) The sum of opposite angles of a concyclic quadrilateral is 180°.

$\angle A : \angle B : \angle C = 1 : 3 : 4$

$\therefore\ \angle A : \angle C = 1 : 4$

$\angle A = \frac{1}{5} \times 180° = 36°$

$\angle C = \frac{4}{5} \times 180° = 144°$

$\therefore\ \angle B = 3 \times 36° = 108°$

$\therefore\ \angle D = 180° - 108^{\circ} = 72°$

20. (4) In a concyclic quadrilateral ABCD,

$\angle A + \angle C = 180°$

$\Rightarrow\ 50° + \angle C = 180°$

$\Rightarrow \angle C = 180° - 50° = 130°$

Again,

$\angle B + \angle D = 180°$

$\Rightarrow\ 80° + \angle D = 180°$

$\Rightarrow\ \angle D = 180° - 80° = 100°$

21. (1) Three angles of quadrilateral

$= x^{\circ}, 2x^{\circ}$ and $3x^{\circ}$

$\therefore$ Fourth angle $= x + 2x + 3x$

$= 6x^{\circ}$

$\therefore\ x + 2x + 3x + 6x = 360°$

$\Rightarrow\ 12x = 360°$

$\Rightarrow x = \frac{360}{12} = 30°$

= Smallest angle

22. (1)

The sum of opposite angles of a concyclic quadrilateral is 180°.

$\therefore\ \angle BCD + \angle BAD = 180°$

$\Rightarrow\ 120° + \angle BAD = 180°$

$\Rightarrow\ \angle BAD = 180° - 120° = 60°$

The angle in a semi-circle is a right angle.

$\therefore\ \angle BDA = 90°$

$\therefore$ In ΔABD,

$\therefore\ \angle ABD = 90° - 60° = 30°$

23. (2)

The sum of two sides of a triangle is greater than the third side.

$\therefore$ AB + BC > AC

BC + CD > BD

CD + AD > AC

DA + AB > BD

On adding,

2 (AB + BC + CD + DA) > 2 (AC + BD)

$\Rightarrow$AB+BC + CD + DA > (AC + BD)

24. (2) The sum of the opposite angles of a cyclic quadrilateral is 180°.

For a quadrilateral ABCD,

$\angle A = x^{\circ}; \angle B = 4x^{\circ}; \angle C = 5x^{\circ}$

$\therefore\ x + 5x = 180° \Rightarrow 6x = 180°$

$\Rightarrow\ x = \frac{180°}{6} = 30°$

$\therefore\ \angle B + \angle D = 180°$

$\Rightarrow\ 4 \times 30° + \angle D = 180°$

$\Rightarrow\ \angle D = 180° - 120° = 60°$

25. (2)

The sum of opposite angles of a cyclic quadrilateral is 180°.

$\angle CBX = 82°$

$\therefore\ \angle ABC = 180° - 82° = 98°$

$\therefore\ \angle ADC + \angle ABC = 180°$

$\Rightarrow\ \angle ADC = 180° - 98° = 82°$

$\angle ADB = 47°$

$\therefore\ \angle BDC = 82° - 47° = 35°$

26. (3)

The angle in a semi-circle is right angle.

$\therefore\ \angle ADB = \angle ACB = 90°$

$\angle DBC = 35°$

$\therefore\ \angle CEB = 90° - 35° = 55°$

$\therefore\ \angle CEB = \angle AED = 55°$

(Opposite angles)

TYPE-XI

1. (1)

AB = BC = CD = DA

[ABCD is a rhombus]

$DP = \frac{1}{2}AB = \frac{1}{2}BC = \frac{1}{2}CD$

$= \frac{1}{2}DA$

In Δs APQ and BCQ,

$\angle P = \angle QCB; \angle A = \angle QBC; \angle Q = Q$

$\therefore\ \Delta$ APQ and Δ BCQ are similar.

$\therefore\ \frac{AB + BQ}{BQ} = \frac{AD + DP}{BC}$

$\Rightarrow \frac{AB}{BQ} + 1 = \frac{\frac{3}{2}BC}{BC} = \frac{3}{2}$

$\Rightarrow \frac{AB}{BQ} = \frac{3}{2} - 1 = \frac{1}{2}$

$\Rightarrow \frac{BQ}{AB} = \frac{2}{1}$

$\Rightarrow 2 : 1$

2. (2)

$$\left.\begin{aligned} OB^2 + OC^2 &= BC^2 \\ OC^2 + OD^2 &= CD^2 \\ OD^2 + OA^2 &= AD^2 \\ OA^2 + OB^2 &= AB^2 \end{aligned}\right\}\text{Pythagoras theorem}$$

$\therefore\ 2\ (OB^2 + OA^2 + OD^2 + OC^2)$

$= AB^2 + BC^2 + CD^2 + DA^2$

$\Rightarrow\ 2(AB^2 + CD^2)$

$= AB^2 + BC^2 + CD^2 + DA^2$

$\Rightarrow\ AB^2 + CD^2 = BC^2 + DA^2$

3. (3) $4x + 5x = 180°$

$\Rightarrow\ 9x = 180°$

$\Rightarrow\ x = 20°$

$\therefore\ \angle C = 4x = 80°$

4. (4)

From ΔBOC,

$\cos 60° = \frac{BO}{4}$

$\Rightarrow BO = \frac{1}{2} \times 4$

$= 2$ cm

$\therefore BD = 2 \times 2 = 4$ cm

5. (2) We know that diagonals of a rhombus are perpendicular bisector of each other.

$\therefore$ OA = OC; OB = OD

$\angle AOD = \angle COD = 90°$

$\angle AOB = \angle COB = 90°$

In ΔBDE, OA || DE

$\Rightarrow$ OC || DG

In ΔCFA,

OB || CF

$\Rightarrow$ OD || GC

In quadrilateral DOCG

OC || DG and

$\Rightarrow$ OD || GC

$\therefore$ DOCG is a parallelogram.

$\therefore \angle DGC = \angle DOC$

$\Rightarrow \angle DGC = 90°$

EG $\perp$ GF or ED $\perp$ CF

6. (4)

Clearly,

$\Delta AOD \sim \Delta BOC$

$\therefore \frac{BO}{OC} = \frac{OD}{OA}$

$\Rightarrow \frac{3x-19}{x-3} = \frac{x-5}{3}$

$\Rightarrow 9x - 57 = x^2 - 8x + 15$

$\Rightarrow x^2 - 17x + 72 = 0$

$\Rightarrow x^2 - 8x - 9x + 72 = 0$

$\Rightarrow x(x-8) - 9(x-8) = 0$

$\Rightarrow (x-8)(x-9) = 0$

$\Rightarrow x = 8$ or 9

7. (4)

$\angle A + \angle B + \angle C + \angle D = 360°$

$\Rightarrow \angle A + \angle B + 70° + 130° = 360°$

$\Rightarrow \angle A + \angle B = 360° - 70° - 130° = 160°$

In ΔAOB,

$\angle OAB + \angle OBA + \angle AOB = 180°$

$\Rightarrow \frac{\angle A}{2} + \frac{\angle B}{2} + \angle AOB = 180°$

$\Rightarrow \frac{1}{2}(\angle A + \angle B) + \angle AOB = 180°$

$\Rightarrow \frac{1}{2} \times 160° + \angle AOB = 180°$

$\Rightarrow \angle AOB = 180° - 80° = 100°$

8. (4)

$AO \times BO = OD \times OC$

$\Rightarrow 3(3x - 19) = (x - 5)(x - 3)$

$\Rightarrow 9x - 57 = x^2 - 8x + 15$

$\Rightarrow x^2 - 17x + 72 = 0$

$\Rightarrow x^2 - 9x - 8x + 72 = 0$

$\Rightarrow x(x - 9) - 8(x - 9) = 0$

$\Rightarrow (x - 8)(x - 9) = 0$

$\Rightarrow x = 8$ or 9

9. (2)

In the rhombus PQRS,

PQ = QR = RS = SP

$\angle SPQ = 50°$

$\therefore \angle PSQ = \angle PQS = \frac{180° - 50°}{2}$

$= \frac{130°}{2} = 65°$

$\angle PSR = 180° - 50° = 130°$

$\angle RSQ = 130° - 65° = 65°$

10. (1)

ABCD is a concyclic quadrilateral.

AD || BC

$\therefore \angle DAB + \angle ABC = 180°$

$\Rightarrow \angle DAB = 180° - 75° = 105°$

Sum of the opposite of a concyclic quadrilateral = 180°

$\therefore \angle BAD + \angle BCD = 180°$

$\Rightarrow 105° + \angle BCD = 180°$

$\Rightarrow \angle BCD = 180° - 105° = 75°$

11. (1)

$\angle ABC = 60°$

AB = BC

$\therefore \angle BAC = \angle BCA = 60°$

$\therefore \Delta ABC$ is an equilateral triangle.

12. (2)

$\angle PAB = \angle ABQ$

$\therefore$ PQ || AB

13. (3)

The sum of the opposite angles of a concyclic quadrilateral is 180°.

$\therefore \angle ABC + \angle ADC = 180°$

$\Rightarrow 70° + \angle ADC = 180°$

$\Rightarrow \angle ADC = 180° - 70° = 110°$

$\because$ AD || BC

$\therefore \angle ADC + \angle BCD = 180°$

$\Rightarrow 110° + \angle BCD = 180°$

$\Rightarrow \angle BCD = 180° - 110° = 70°$.

14. (1)

AD || BC

In concyclic quadrilateral ABCD,

$\angle A + \angle C = 180°$

$\Rightarrow 105° + \angle C = 180°$

$\Rightarrow \angle C = 180° - 105° = 75°$

Again,

$\angle A + \angle B = 180°$

$\Rightarrow 105° + \angle B = 180°$

$\Rightarrow \angle B = 180° - 105° = 75°$

$\therefore \angle D = 180° - 75° = 105°$

15. (4)

The line segment joining the mid–points of the diagonals of a trapezium is parallel to each of parallel sides and is equal to half the difference of these sides.

$\therefore$ MN = $\frac{1}{2}$ (AB – CD)

= $\frac{1}{2}$ (8 – 4) cm. = 2 cm.

16. (3)

AE ⊥ BC; DF ⊥ BC

$\therefore \angle DCB = 45°$

In ΔCDF,

$\sin 45° = \frac{DF}{DC}$

$\Rightarrow \frac{1}{\sqrt{2}} = \frac{DF}{10}$

$\Rightarrow DF = \frac{10}{\sqrt{2}} = 5\sqrt{2}$ metre

17. (2)

In an isosceles trapezium,

AB || CD ; AD = BC

AC = BD

The angles of base are equal. i.e.

$\angle A = \angle B$; $\angle C = \angle D$; $\angle A + \angle D = \angle B + \angle C$

$= 180°$

TYPE-XII

1. (2)

OC = 2cm

OA = 4cm

$\therefore AC = \sqrt{4^2 - 2^2} = \sqrt{16 - 4}$

$= \sqrt{12} = 2\sqrt{3}$

$\therefore AB = 4\sqrt{3}$ cm

2. (2) The largest chord of a circle is its diameter.

3. (2)

AC = CB = 4 cm

OC = 3 cm

$\therefore OA = \sqrt{OC^2 + CA^2}$

$= \sqrt{3^2 + 4^2}$

$= \sqrt{9 + 16} = \sqrt{25} = 5$ cm

4. (1)

AO = OB = AB

$\Rightarrow \angle AOB = 60°$

[$\because$ ΔAOB is equilateral]

$\therefore \angle ACB = 30°$

5. (1)

Let OE = x cm

then OF = $(x+1)$ cm

OA = OC = r cm

AE = 4 cm; CF = 3 cm

From ΔOAE,

$OA^2 = AE^2 + OE^2$

$\Rightarrow r^2 = 16 + x^2$

$\Rightarrow x^2 = r^2 - 16$ .....(i)

From ΔOCF,

$(x + 1)^2 = r^2 - 9$ ..... (ii)

By equation (ii) – (i),

$(x + 1)^2 - x^2 = r^2 - 9 - r^2 + 16$

$\Rightarrow 2x + 1 = 7 \Rightarrow x = 3$cm

$\therefore$ From equation (i),

$9 = r^2 - 16 \Rightarrow r^2 = 25$

$\Rightarrow r = 5$ cm

6. (4)

$\angle BAC = 90°$

As, BC is the diameter of the circle.

$\therefore BC = \sqrt{AB^2 + AC^2}$

$= \sqrt{8^2 + 6^2} = \sqrt{64 + 36}$

$= \sqrt{100} = 10$ cm

$\therefore$ Radius of the circle = 5 cm

7. (1)

AB = CD

OP = OQ

From Δ OAP,

$OP = \sqrt{OA^2 - AP^2} = \sqrt{5^2 - 4^2}$

$= \sqrt{25 - 16}$

$= \sqrt{9} = 3$cm.

$\therefore QP = 2 \times OP = 6$ cm.

8. (2)

$OD = \sqrt{15^2 - 12^2}$

$= \sqrt{225 - 144}$

$= \sqrt{81} = 9$

$O'D = \sqrt{13^2 - 12^2}$

$= \sqrt{169 - 144} = \sqrt{25} = 5$

$\therefore OO' = 9 + 5 = 14$ cm

9. (2) $\theta = 72° = 72 \times \frac{\pi}{180}$ radians

$= \frac{2\pi}{5}$ radians

$\therefore \theta = \frac{l}{r}$

$l \rightarrow$ length of arc

$\Rightarrow l = \theta.r = \frac{2\pi}{5} \times 21$

$= \frac{2}{5} \times \frac{22}{7} \times 21$

$= \frac{132}{5} = 26.4$ cm.

10. (2) One and only circle can pass through three non-collinear points.

11. (2)

AB = 24 cm

$\Rightarrow$ AE = EB = 12 cm

$OE = \sqrt{OA^2 - AE^2}$

$= \sqrt{15^2 - 12^2}$

$= \sqrt{225 - 144} = \sqrt{81}$

= 9 cm

$\therefore$ OF = 21 – 9 = 12 cm

Also, $CF = \sqrt{15^2 - 12^2} = 9$ cm

$\therefore$ CD = 2 × 9 = 18 cm

12. (1)

AB = 16 cm

AC = BC = 8 cm

OC = CO′ = 6 cm

$\therefore OA = \sqrt{OC^2 + CA^2}$

$= \sqrt{6^2 + 8^2} = \sqrt{36 + 64}$

$= \sqrt{100} = 10$ cm

13. (2)

AB = 6 cm; CD = 3 cm

PD = 5 cm; PB = ?

PA × PB = PC × PD

$\Rightarrow$ (PB – 6) PB = 2 × 5

$\Rightarrow PB^2 - 6PB - 10 = 0$

$\Rightarrow PB = \frac{6 \pm \sqrt{36 + 40}}{2}$

$= \frac{6 \pm \sqrt{76}}{2}$

$= \frac{6 + 8.7}{2} = 7.35$

14. (1)

$\angle ACB = 65°$

$\angle AOB = 2 \times 65° = 130°$

$\angle OAP = 90°$; $\angle AOP = 65°$

$\therefore \angle APO = 180° - 90° - 65°$

$= 25°$

15. (1)

$OE \perp AB$ and $OF \perp CD$

AE = EB = 5 cm

CF = FD = 12 cm

AO = OC = 13 cm

From Δ AOE,

$OE = \sqrt{13^2 - 5^2} = \sqrt{169 - 25}$

$= \sqrt{144} = 12$ cm

From Δ COF,

$OF = \sqrt{13^2 - 12^2} = \sqrt{25} = 5$ cm

$\therefore$ EF = OE + OF = 17 cm

16. (3)

AB = 10 cm, AE = 5 cm

Let OE = x

CD = 24 cm, DF = 12 cm

OF = 17 – x

OA = OD

$\Rightarrow 5^2 + x^2 = 12^2 + (17 - x)^2$

$\Rightarrow 25 + x^2 = 144 + 289 - 34x + x^2$

$\Rightarrow 34x = 408$

$\Rightarrow x = \frac{408}{34} = 12$

$\therefore OA = \sqrt{5^2 + 12^2} = 13$ cm

17. (3)

$OC = \sqrt{3} - 1$

OA = $\sqrt{3}+1$

AC = $\sqrt{\left(\sqrt{3}+1\right)^2-\left(\sqrt{3}-1\right)^2}$

= $\sqrt{4\sqrt{3}}$ = 2 $\sqrt[4]{3}$

∴ AB = 2AC = $4.\sqrt[4]{3}$ cm

18. (4)

BC = $x \Rightarrow$ CD = 50 – x

$AC^2 = 30^2 - x^2 = 40^2 - (50 - x)^2$

$\Rightarrow 900 - x^2 = 1600 - 2500 + 100x - x^2$

$\Rightarrow 100x = 1800$

$\Rightarrow x = 18$

∴ AC = $\sqrt{30^2-18^2} = \sqrt{48\times 12}$

= 24

∴ AE = 2 × 24 = 48 cm

19. (1)

AE = 2 cm

EB = 6 cm

ED = 3 cm

∴ AE × EB = DE × EC

$\Rightarrow$ EC = $\frac{2\times 6}{3} = 4$ cm

∴ Diameter

= $\sqrt{7^2+4^2} = \sqrt{49+16}$

= $\sqrt{65}$ cm

20. (2)

∴ ∠BCA = $\frac{130°}{2} = 65°$

[∵ ∠APB = 130°]

$\Rightarrow$ ∠BCD = 180° – 65° = 115°

$\Rightarrow$ Ext. ∠BQD = 2 × 115° = 230°

∴ ∠BQD = 360° – 230° = 130°

21. (1)

AC = 4 cm

OA = 5 cm

OC = $\sqrt{5^2-4^2} = 3$ cm

OO′ = 2 × 3 = 6 cm

22. (3)

BC = DO = OA

∠DAB = 90°

∠DOA = 2 × ∠DCA

or 2 ∠BCD = 40°

23. (2)

AE = 15 cm [∵ AB = 30 cm]

OA = 17 cm

∴ OE = $\sqrt{17^2-15^2}$

= $\sqrt{(17+15)(17-15)}$

= $\sqrt{32\times 2}$ = 8 cm

Again, CF = 8 cm

OC = 17 cm

∴ OF = = $\sqrt{17^2-8^2}$

= $\sqrt{(17+8)(17-8)}$

= $\sqrt{25\times 9}$ = 15 cm

∴ Distance between chords

= EF = 15 – 8 = 7 cm

24. (2)

BD = 2 units

AB = $\sqrt{2}$ units

Area of square = 2 square units

Area of four semicircles

$= 4 \times \frac{\pi r^2}{2}$

$= \frac{4\times\pi\times\frac{1}{2}}{2}$

= π sq. units

∴ Required area

= 2 + π – π = 2 sq. units.

25. (4)

O′A = 3 cm

OA = 2 cm

CA = 6 cm

O′D = 3 cm

O′B = 1 cm

BD = $\sqrt{3^2-1} = 2\sqrt{2}$

∴ DE = $4\sqrt{2}$ cm

26. (2)

OO′ = 7 cm

$\Rightarrow r_1 + r_2 = 7$

$\Rightarrow 4 + r_2 = 7$

$\Rightarrow r_2 = 7 - 4 = 3$ cm

27. (2)

[$\because$ BOC is not a straight line]
$\angle AOB = 90°$; OA = OB = r
$\therefore \angle BAO = \angle ABO = 45°$
$\therefore \angle AOC = 110°$; OA = OC = r

$\therefore \angle OAC = \angle OCA = \frac{70}{2} = 35°$

$\therefore \angle BAC = 45° + 35° = 80°$

28. (4)

AB = 14 cm, PB = 12 cm
$\angle APB = 90°$
(angle in the semi circle)

$\therefore AP = \sqrt{14^2 - 12^2}$

$= \sqrt{(14+12)(14-12)}$

$= \sqrt{26 \times 2} = \sqrt{52}$

Let AN = $x \Rightarrow$ NB = $14 - x$
In Δ APN, $PN^2 = AP^2 - AN^2$
$= 52 - x^2$ ...(i)
In ΔPNB, $PN^2 = PB^2 - NB^2 = 12^2 - (14 - x)^2$ ...(ii)
From (i) and (ii)
$52 - x^2 = 144 - (14 - x)^2$
$52 - x^2 = 144 - (196 + x^2 - 28x)$
$\Rightarrow 52 - x^2 = 144 - 196 - x^2 + 28x$
$52 = -52 + 28x$

$\Rightarrow 28x = 104 \Rightarrow x = \frac{104}{28} = \frac{26}{7}$

NB = $14 - x$

$= 14 - \frac{26}{7} = \frac{72}{7} = 10\frac{2}{7}$ cm

29. (4)

Given, $\angle BEC = 130°$
$\Rightarrow \angle DEC = 180° - 130° = 50°$
$\therefore \angle EDC = 180° - 50° - 20°$
$= 110°$
$\therefore \angle BAC = \angle EDC = 110°$
(Angles on the same arc)

30. (4)

OC = 3 cm
OA = 5 cm

$AC = \sqrt{5^2 - 3^2} = 4$

$\therefore$ AB = 2 AC = 8 cm

31. (1)

OC = radius = 10 cm
CE = ED = 6 cm

$\therefore OE = \sqrt{OC^2 - CE^2}$

$= \sqrt{10^2 - 6^2} = \sqrt{100 - 36}$

$= \sqrt{64} = 8$ cm

32. (2)

OA = OB = AB
$\therefore \Delta$OAB is an equilateral triangle.
Hence, $\angle AOB = 60°$

33. (2)

OA = OB = r units
$\angle AOC = 30°$; AC = CB
In Δ AOC,

$\sin AOC = \frac{AC}{OA}$

$\Rightarrow \sin 30° = \frac{AC}{r}$

$\Rightarrow \frac{1}{2} = \frac{AC}{r}$

$\Rightarrow AC = \frac{r}{2}$

$\Rightarrow AB = 2 \times \frac{r}{2} = r$ units

$\therefore$ Required ratio = 1 : 1

Second Method

OA = OB
$\therefore \angle OAB = \angle OBA = 60°$
$\therefore \Delta$OAB is an equilateral triangle.
$\therefore$ OA = OB = AB

34. (3)

In Δ ABD,
AD = BD = AB = radius
In Δ ACB,
AC = CB = AB = radius
$\therefore \angle DBC = 60° + 60° = 120°$

35. (1)

$\angle ABC = 90°$
Δ ABC is a right angled triangle and 'O' is the circumcentre.

36. (2)

Radius of each circle = r units
$\therefore$ AB = BC = CA = $2r$ units
Hence, ABC is an equilateral triangle.

37. (3)

$\angle APB = 90°$

AB = Diameter = hypotenuse of ΔAPB

The angle of a semi-circle is a right angle.

38. (2)

AB = 20 cm.

AM = MB = 10 cm.

OM = $2\sqrt{11}$ cm.

$\therefore$ Radius OA = $\sqrt{OM^2 + AM^2}$

$= \sqrt{(2\sqrt{11})^2 + 10^2}$

$= \sqrt{4 \times 11 + 100} = \sqrt{44 + 100}$

$= \sqrt{144} = 12$ cm.

39. (4)

OA = OB = OC

= Circum – radius

In Δ ABC,

$\angle A = 180° - 70° - 40°$

$= 180° - 110° = 70°$

The angle subtended by an arc at the centre is twice to that at the circumference.

$\therefore \angle BOC = 2 \angle BAC$

$= 2 \times 70 = 140°$

40. (2)

In Δs OAB and OCA,

OC = OA = OB = radii

$2 \angle OAB + \angle AOB = 180°$

$2 \angle OAC + \angle AOC = 180°$

$\therefore \angle AOB + \angle AOC$

$= 360° - 2 (\angle OAB + \angle OAC)$

$= 360° - 2 \times 90° = 180°$

AB = AC

$\therefore \angle AOB = 90°$

$\angle OAB = 45°$

$\therefore \sin OAB = \dfrac{OB}{AB}$

$\Rightarrow \sin 45° = \dfrac{OB}{5\sqrt{2}}$

$\Rightarrow OB = 5\sqrt{2} \,.\, \sin 45°$

$= 5\sqrt{2} \times \dfrac{1}{\sqrt{2}} = 5$ cm.

41. (4)

In Δ ONY, ON = OY = radii

$\angle ONY = 50° = \angle OYN$

$\therefore \angle NOY = 180° - 2 \times 50° = 80°$

In Δ OMY,

OM = OY = radii

$\therefore \angle OMY = \angle OYN = 15°$

$\therefore \angle MOY = 180° - 2 \times 15° = 150°$

$\therefore \angle MON = 150° - 80° = 70°$

42. (1)

Radius of circle = r units

In Δ OCD, $\angle COD = 90°$

$\therefore CD^2 = OC^2 + OD^2$

$\Rightarrow b^2 = r^2 + r^2 = 2r^2$ ...(i)

In Δ OAB,

$OE \perp AB$

$\angle OAB = 60°$

$AE = \dfrac{a}{2}$

$\therefore \cos 60° = \dfrac{AE}{OA}$

$\Rightarrow \dfrac{1}{2} = \dfrac{\frac{a}{2}}{r}$

$\Rightarrow \dfrac{1}{2} = \dfrac{a}{2r} \Rightarrow a = r$ ...(ii)

From equations (i) and (ii),

$b^2 = 2a^2$

$\Rightarrow b = \sqrt{2}a$

43. (4)

$\angle AOD = 100°$

$\therefore \angle ACD = \angle ACP = \dfrac{100}{2} = 50°$

(The angle subtended at the centre is twice to that of angle at the circumference by the same arc)

Again, $\angle BOC = 70°$

$\therefore \angle BAC = \dfrac{70}{2} = 35° = \angle PAC$

$\therefore \angle APC = 180° - 50° - 35° = 95°$

44. (2)

OA = OB = radii

$\angle OAB = \angle OBA = 25°$

$\therefore \angle AOB = 180° - 50° = 130°$

$\therefore \angle BCA = \dfrac{130°}{2} = 65°$

$\therefore \angle EBC = 90° - 65° = 25°$

45. (3)

OQ = OP = OR
(Tangents drawn from the same external point)
$\therefore \angle QPO = \angle PQO = \angle OPR$
$= \angle PRO = 45°$ because $\angle POQ$
$= \angle POR = 90°$
$\therefore \angle QPR = 45° + 45° = 90°$

46. (3)

Clearly, CD = EF = = 4.5 cm.

47. (1)

$\angle BDC = 120°$
$\therefore \angle CDP = 180° - 120° = 60°$
CD || AB
$\therefore \angle ABP = 60° = \angle CDP$

48. (2)

$CO = OD = \frac{r}{2}$ units

AC = r units
In ΔAOC,

$OA = \sqrt{AC^2 - OC^2}$

$= \sqrt{r^2 - \frac{r^2}{4}} = \sqrt{\frac{3r^2}{4}} = \frac{\sqrt{3}r}{2}$

$\therefore AB = 2OA = 2 \times \frac{\sqrt{3}r}{2}$

$= \sqrt{3}r$ units

49. (4)

In ΔPBE,
PB = 5 cm
BE = 1 cm

$PE = \sqrt{PB^2 - BE^2}$

$= \sqrt{25 - 1} = \sqrt{24} = 2\sqrt{6}$ cm

$\therefore PQ = 2PE = 4\sqrt{6}$ cm

50. (2)

OA = OC = radius = 10 cm
AB = 16 cm
CD = 12 cm
In ΔOAE,
$\angle OEA = 90°$
$\therefore AE = EB = 8$ cm

$\therefore OE = \sqrt{OA^2 - AE^2}$

$= \sqrt{10^2 - 8^2} = \sqrt{100 - 64}$

$= \sqrt{36} = 6$ cm

In ΔOFC,
$\angle OFC = 90°$
$\therefore CF = FD = 6$ cm

$\therefore OF = \sqrt{OC^2 - OF^2}$

$= \sqrt{10^2 - 6^2} = \sqrt{100 - 36}$

$= \sqrt{64} = 8$ cm

$\therefore$ Required distance = EF
= OF – OE
= 8 – 6 = 2 cm

51. (3)

By theorem,
CE × ED = AE × EB
$\Rightarrow 3\ DE \times DE = 9 \times 12$

$\Rightarrow DE^2 = \frac{9 \times 12}{3} = 36$

$\Rightarrow DE = \sqrt{36} = 6$ cm.

52. (2)

Angle subtended by an arc at the centre is twice to that subtended at the circumference.
$\therefore \angle ABC = \angle ADC = 130° \div 2 = 65°$

53. (4)

OP × OQ = OS × OR
$\Rightarrow (6 + 8) \times 8 = 7 \times OR$

$\Rightarrow OR = \frac{14 \times 8}{7} = 16$ cm.

$\therefore$ RS = OR – OS
= 16 – 7 = 9 cm.

54. (2)

ABC will be an equilateral triangle whose each side = 12 cm.
$AD \perp BC$
$\therefore$ BD = DC = 6 cm.
$AD \perp BC$

$\therefore$ AD = $\sqrt{AB^2 - BD^2}$

= $\sqrt{12^2 - 6^2}$

= $\sqrt{(12+6)(12-6)}$

= $\sqrt{18 \times 6}$ = 6 $\sqrt{3}$ cm.

55. (3)

AB = 12 cm
AC = BC = 6 cm
OA = 10 cm
From ΔAOC,

$\therefore$ OC = $\sqrt{OA^2 - AC^2}$

= $\sqrt{10^2 - 6^2}$ = $\sqrt{100 - 36}$

= $\sqrt{64}$ = 8 cm

Again, in ΔACO',
AO' = 8 cm

$\therefore$ O'C = $\sqrt{8^2 - 6^2}$

= $\sqrt{64 - 36}$ = $\sqrt{28}$ = 5.3 cm

$\therefore$ OO' = OC + CO'
= 8 + 5.3 = 13.3 cm

56. (2)

PQ = 18 cm
PM = MQ = 9 cm
OP = OB = r cm
MB = 3 cm
From ΔOPM,
$OP^2 = PM^2 + OM^2$
$\Rightarrow r^2 = 9^2 + (r-3)^2$
$\Rightarrow r^2 = 81 + r^2 - 6r + 9$
$\Rightarrow 81 - 6r + 9 = 0$
$\Rightarrow 6r = 90$
$\Rightarrow r = 15$ cm
$\therefore$ AB = 30 cm

57. (2)

OA = OB = OC = OD = radius(r)
$\angle$OAB = 90°; AB = b, CD = a
From ΔOAB,
$OA^2 + OB^2 = AB^2$
$\Rightarrow r^2 + r^2 = b^2 \Rightarrow 2r^2 = b^2$

$\Rightarrow r^2 = \frac{b^2}{2}$

$\Rightarrow r = \frac{b}{\sqrt{2}}$ .....(i)

In ΔOCD,
$\angle$COD = 60° ;
$\therefore \angle$OCD = $\angle$ODC = 60°
$\therefore$ OC = CD
$\Rightarrow r = a$ .....(ii)
From equations (i) and (ii),

$\frac{b}{\sqrt{2}} = a \Rightarrow b = \sqrt{2}\ a$

58. (1)

AB = 10 cm.
$\therefore$ AF = FB = 5 cm.
CD = 24 cm.
$\therefore$ CE = DE = 12 cm.
Let OE = x cm
$\therefore$ OF = $(17 - x)$ cm
From Δ ODE,

OD = $\sqrt{OE^2 + DE^2}$

= $\sqrt{x^2 + 12^2}$ ..... (i)

From Δ OAF,

OA = $\sqrt{OF^2 + AF^2}$

= $\sqrt{(17-x)^2 + 5^2}$ ..... (ii)

$\because$ OA = OD

$\therefore \sqrt{x^2 + 12^2} = \sqrt{(17-x)^2 + 5^2}$

$\Rightarrow x^2 + 144 = 289 - 34x + x^2 + 25$

$\Rightarrow 34x = 289 + 25 - 144 = 170$

$\Rightarrow x = \frac{170}{34} = 5$

$\therefore$ From equation (i),

OD = $\sqrt{x^2 + 12^2}$ = $\sqrt{5^2 + 144}$

= $\sqrt{169}$ = 13 cm.

59. (3)

60. (4)

OA = OB = OC = $\frac{AB}{2}$

$\therefore$ AC = $\sqrt{OA^2 + OC^2}$

= $\sqrt{\left(\frac{AB}{2}\right)^2 + \left(\frac{AB}{2}\right)^2}$

= $\sqrt{\frac{AB^2 + AB^2}{4}}$ = $\sqrt{\frac{AB^2}{2}}$ = $\frac{AB}{\sqrt{2}}$

61. (1)

$\angle$AOB = 180°
$\angle$AOP = 120°
$\therefore \angle$POB = 180° – 120° = 60°
OP = OB = radii

$\therefore \angle$OPB = $\angle$PBO = $\frac{120°}{2}$ = 60°

62. (2)

AB = 8 cm
AM = MB = 4 cm
OA = 5 cm

$\therefore$ OM = $\sqrt{OA^2 - AM^2}$

= $\sqrt{5^2 - 4^2}$

= $\sqrt{25 - 16}$ = $\sqrt{9}$ = 3 cm

63. (2)

$\angle$AOB = 180°
$\angle$ POA = 120°
$\therefore$ $\angle$ POB = 180° – 120° = 60°
In Δ OPB,
OP = OB = radius
$\therefore$ $\angle$OPB = $\angle$PBO = 60°

64. (3)

$\theta = \frac{l}{r}$; $\frac{l_1}{l_2} = 2$; $\frac{r_2}{r_1} = 3$

$\therefore \frac{\theta_1}{\theta_2} = \frac{l_1 r_2}{l_2 r_1} = 2 \times 3 = 6$

$\Rightarrow \frac{30°}{\theta_2} = 6$

$\Rightarrow \theta_2 = \frac{30°}{6} = 5°$

[θ (radian) = $\frac{l}{r}$. Here, $\frac{\theta_1}{\theta_2}$ is a ratio.]

65. (2)

OA = OB = radius
$\therefore$ $\angle$ OAB = $\angle$ OBA = 45°
OC $\perp$ AB

$\therefore$ AC = CB = $\frac{5\sqrt{2}}{2}$ cm.

$\therefore$ cos OAC = $\frac{AC}{OA}$

$\Rightarrow$ OA cos 45° = $\frac{5\sqrt{2}}{2}$

$\Rightarrow \frac{OA}{\sqrt{2}} = \frac{5\sqrt{2}}{2}$

$\Rightarrow$ OA = $\frac{5\sqrt{2} \times \sqrt{2}}{2}$ = 5 cm.

66. (3)

AC = CB
OC = 16 cm.
OA = 20 cm.

$\therefore$ AC = $\sqrt{OA^2 - OC^2}$

= $\sqrt{20^2 - 16^2}$

= $\sqrt{400 - 256}$

= $\sqrt{144}$ = 12 cm.

$\therefore$ AB = 2 AC = 24 cm.

67. (4)

Case I,
When chords lie on both sides of centre.
AB = 40 cm.
CD = 48 cm.
CE = DE = 24 cm.
AF = BF = 20 cm.
OA = OC = 25 cm.
In Δ AOF,

OF = $\sqrt{AO^2 - AF^2}$

= $\sqrt{25^2 - 20^2}$

= $\sqrt{(25+20)(25-20)}$

= $\sqrt{45 \times 5}$ = $\sqrt{5 \times 3 \times 3 \times 5}$

= 15 cm.

In Δ COE,

OE = $\sqrt{OC^2 - CE^2}$

= $\sqrt{25^2 - 24^2}$

= $\sqrt{(25+24)(25-24)}$

= $\sqrt{49}$ = 7 cm.

$\therefore$ Required distance
= EF = OE + OF = (7 + 15) cm
= 22 cm.

Case II

When the chords lie on the same side of centre
AF = 20 cm.
CE = 24 cm.
OC = OA = 25 cm.
In Δ OAF

OF = $\sqrt{OA^2 - AF^2}$

= $\sqrt{25^2 - 20^2}$

= $\sqrt{625 - 400}$

= $\sqrt{225}$ = 15 cm.

In Δ OCE,

OE = $\sqrt{OC^2 - CE^2}$ = $\sqrt{25^2 - 24^2}$

= $\sqrt{(25+24)(25-24)}$

= $\sqrt{49}$ = 7 cm.

$\therefore$ Required distance
= EF = OF – OE = 15 – 7
= 8 cm.

68. (3)

According to the question,
OA = AB = OB
$\therefore$ ΔOAB is an equilateral triangle.
$\therefore$ $\angle AOB = 60°$
$\because$ $180° = \pi$ radian

$\therefore$ $60° = \frac{\pi}{180} \times 60 = \frac{\pi}{3}$ radian

69. (1)

Angle subtended by arc AC at the centre = Reflex angle AOC = 360° – 140° = 220°
$\therefore$ $\angle ABC$ = Angle at the circumference = $\frac{220}{2} = 110°$

70. (2)

PQ is perpendicular bisector of OA.

$\therefore$ OP = OQ = PA = AQ

$\therefore$ OPAQ is a rhombus.

$\therefore$ $2 \angle PAQ$ = Reflex $\angle POQ$
(The angle sutended at the centre by an arc is twice to that at the circumference)

$\Rightarrow 2 \angle PAQ = 360° - \angle POQ$

$\Rightarrow 3 \angle PAQ = 360°$

($\because$ $\angle PAQ = \angle POQ$)

$\Rightarrow \angle PAQ = 120° = \angle POQ = \frac{2\pi}{3}$

Again, radius (r) = $\frac{l}{\theta} = \frac{\frac{2\pi}{3}}{\frac{2\pi}{3}} = 1$

$\therefore$ From Δ OPB

OP = 1 unit

$\angle POB = 60°$

$\therefore$ $\sin 60° = \frac{PB}{OP}$

$\Rightarrow PB = \frac{\sqrt{3}}{2}$

$\therefore$ $PQ = 2 \times \frac{\sqrt{3}}{2} = \sqrt{3}$ unit

71. (2)

OA = radius = 10 cm.
AB = chord = 16 cm.
OC $\perp$ AB
$\therefore$ AC = CB = 8 cm.

$\therefore$ $OC = \sqrt{OA^2 - AC^2}$

$= \sqrt{10^2 - 8^2} = \sqrt{100 - 64}$

$= \sqrt{36} = 6$ cm.

72. (3) The angle at the semi-circle is right angle.

The angle subtended at the centre by an are is double to that at the circumference.

For are $\widehat{ADB}$

$\angle AOB = 180°$

$\therefore$ $\angle ACB = 90°$

73. (2)

OC $\perp$ AB
$\therefore$ AP = PB = 3 cm
PC = 2 cm
If OA = OC = r cm
then, OP = $(r - 2)$ cm.
From Δ OAP,
$OA^2 = AP^2 + OP^2$
$\Rightarrow r^2 = 3^2 + (r-2)^2$
$\Rightarrow r^2 - (r-2)^2 = 9$
$\Rightarrow r^2 - r^2 + 4r - 4 = 9$

$\Rightarrow 4r = 13 \Rightarrow r = \frac{13}{4}$ cm.

$\therefore$ Diameter of circle

$= 2 \times \frac{13}{4} = \frac{13}{2}$ cm = 6.5 cm.

74. (2)

OA = 6 cm.
OO' = 2 cm.
$\therefore$ O'A = OA – OO'
= 6 – 2 = 4 cm.

75. (3)

AB = chord = 16 cm.
OC $\perp$ AB
$\therefore$ AC = CB = 8 cm.
OC = 15 cm.

$\therefore$ $OA = \sqrt{OC^2 + CA^2}$

$= \sqrt{15^2 + 8^2}$

$= \sqrt{225 + 64} = \sqrt{289} = 17$ cm.

76. (2)

$\angle BOC = 120°$

$\therefore\ \angle AOC = 180° - 120° = 60°$

Angle subtended at the centre by arc AC = 60°

$\therefore$ Angle subtended at the circumference by arc AC = $\angle ADC = \frac{60°}{2} = 30°$

77. (1)

$AD \times DB = PD \times DQ$

$\Rightarrow 4 \times 6 = PD \times 3$

$\Rightarrow PD = \frac{4 \times 6}{3} = 8$ cm.

$\therefore PQ = PD + DQ$

$= (8 + 3)$ cm. $= 11$ cm.

78. (3)

Radius of other circle

$= 6 - 2 = 4$ cm.

79. (3)

$\frac{AX}{BX} = \frac{3}{2}$

$\therefore\ AX = \frac{3}{5} \times 10 = 6$ cm.

$BX = \frac{2}{5} \times 10 = 4$ cm.

$\therefore\ AX \times XB = PX^2$

$\Rightarrow PX^2 = 6 \times 4$

$\Rightarrow PX = \sqrt{6 \times 4} = 2\sqrt{6}$

$\therefore\ PQ = 2PX = 4\sqrt{6}$ cm.

80. (3)

In ΔOCD,

OC = OD = CD = radius

$\therefore\ \Delta OCD$ is an equilateral triangle.

$\therefore\ \angle COD = 60°$

$\angle CBD = \frac{1}{2}\angle COD = 30°$

$\angle ACB$ is an angle of semi-circle.

$\therefore\ \angle ACB = 90°$

$\therefore\ \angle BCP = 180° - \angle ACB$

$= 180° - 90° = 90°$

In ΔBCP,

$\angle BCP = 90°$, $\angle CBP = \angle CBD$

$= 30°$

$\therefore\ \angle BCP + \angle CBP + \angle CPB$

$= 180°$

$\Rightarrow 90° + 30° + \angle CPB = 180°$

$\Rightarrow \angle CPB = 60° = \angle APB$

81. (3)

Arc AC subtends $\angle AOC$ at the centre and $\angle ABC$ at the circumference.

Similarly,

$\angle BOD = 2\angle BCD$

$\therefore\ \angle AOC + \angle BOD$

$= 2(\angle ABC + \angle BCD)$

$= 2\ \angle APC = 2 \times 40° = 80°$

82. (2)

OC = 5 cm.

$OC \perp AB$

$\therefore$ AC = CB

OA = 13 cm.

In ΔOAC,

$AC = \sqrt{OA^2 - OC^2}$

$= \sqrt{13^2 - 5^2}$

$= \sqrt{169 - 25}$

$= \sqrt{144} = 12$ cm.

$\therefore$ AB = 2 AC = 2 × 12 = 24 cm.

83. (3)

According to the question,

OC = radius of smaller circle

= 8 cm.

OA = radius of larger circle

= 17 cm.

AB = chord of larger circle

$OC \perp AB$

$\therefore$ AC = CB

From Δ OAC,

$AC = \sqrt{OA^2 - OC^2} = \sqrt{17^2 - 8^2}$

$= \sqrt{(17+8)(17-8)}$

$= \sqrt{25 \times 9}$

$= 5 \times 3 = 15$ cm.

$\therefore$ AB = 2AC = 30 cm.

84. (2)

The angle of a semi–circle is right angle.

$\therefore\ \angle BAC = 90°$

$\therefore\ \angle ACB = 90° - \angle ABC$

$= 90° - 30° = 60°$

85. (1) $\theta = \frac{l}{r}$ where θ is in radian measure.

$\therefore\ \theta_1 = \frac{l_1}{r_1}$; $\theta_2 = \frac{l_2}{r_2}$

$\Rightarrow \dfrac{\theta_1}{\theta_2} = \dfrac{l_1 r_2}{r_1 l_2}$

$\Rightarrow \dfrac{\theta_1}{45°} = \dfrac{5}{3}$ $(\because r_1 = r_2)$

$\Rightarrow \theta_1 = \dfrac{5}{3} \times 45° = 75°$

($\because$ Here ratio is given. Hence, θ is not taken in radian.)

86. (4)

AB = Length of chord = 12 cm.
OC $\perp$ AB
$\therefore$ AC = CB = 6 cm.
OC = 8 cm.
In ΔOAC,

$OA = \sqrt{OC^2 + CA^2}$

$= \sqrt{8^2 + 6^2}$

$= \sqrt{64 + 36} = \sqrt{100} = 10$ cm.

$\therefore$ Diametre of circle = 2 × OA = 2 × 10 = 20 cm.

87. (2)

OA = radius = 5 cm.
OC $\perp$ AB

$\therefore$ AC = CB = $\dfrac{8}{2}$ = 4 cm.

In right angle ΔOAC,

$OC = \sqrt{OA^2 - AC^2} = \sqrt{5^2 - 4^2}$

$= \sqrt{25 - 16} = \sqrt{9} = 3$ cm.

88. (1)

$OO' = r_1 + r_2 = 7$ cm.
r_1 = 4 cm.
$\therefore$ r_2 = (7 – 4) cm. = 3 cm.

89. (4)

In ΔPQR,
$\angle$PQR = 40°; $\angle$QRP = 60°
$\therefore$ $\angle$QPR = 180° – 60° – 40° = 80°
$\therefore$ Angle subtended at the circumference by arc QR = 80°
$\therefore$ Angle subtended at the centre by arc QR = $\angle$QOR = 2$\angle$QPR = 2 × 80° = 160°

90. (1)

OC $\perp$ AB
$\therefore$ AC = CB
OA = 13 cm., OC = 12 cm.
In ΔOAC,

$AC = \sqrt{OA^2 - OC^2}$

$= \sqrt{13^2 - 12^2}$

$= \sqrt{(13+12)(13-12)} = \sqrt{25}$

= 5 cm.

$\therefore$ AB = 2 AC = 10 cm.

91. (1) One and only one circle can pass through three non-collinear points.

92. (2)

Radius of larger circle
= 6 + 3 = 9 cm.

93. (4)

OR $\perp$ PQ

$\therefore$ PR = RQ = $\dfrac{4}{2}$ = 2 cm

OR = 2 cm
In ΔOPR,

$OP = \sqrt{PR^2 + RO^2}$

$= \sqrt{2^2 + 2^2} = \sqrt{4 + 4}$

$= \sqrt{8} = 2\sqrt{2}$ cm

$\therefore$ Diameter

$= 2 \times 2\sqrt{2} = 4\sqrt{2}$ cm

94. (2)

OC $\perp$ AB

$\therefore$ AC = CB = $\dfrac{39}{2}$ = 19.5 cm

OC = 10.4 cm

$\therefore$ Radius of circle = OA

$= \sqrt{OC^2 + CA^2}$

$= \sqrt{(10.4)^2 + (19.5)^2}$

$= \sqrt{108.16 + 380.25}$

$= \sqrt{488.41} = 22.1$ cm

95. (3)

BC = 10 cm
AD $\perp$ BC
$\therefore$ BD = DC = 5 cm
$\angle$BAC = 120°
$\angle$BAD = 60°
$\angle$ABD = 30°
$\therefore$ In ΔABD,

$\tan 30° = \dfrac{AD}{BD}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{AD}{5}$

$\Rightarrow AD = \dfrac{5}{\sqrt{3}}$ cm

TYPE-XIII

1. (1)

BO = OC = 15 cm.
OD = 9 cm.

$\therefore$ BD = $\sqrt{15^2 - 9^2}$

= $\sqrt{24 \times 6}$ = 12 cm

$\therefore$ BC = 2 × 12 = 24 cm.

2. (3)

AC = $\sqrt{AO^2 - OC^2}$

= $\sqrt{5^2 - 3^2}$

= $\sqrt{25 - 9}$

= $\sqrt{16}$ = 4 cm

$\therefore$ AB = 2 × 4 = 8 cm

3. (3)

In ΔPCR and ΔRBP,
PC = PB (radii)
RC = RB
PR is common.
$\therefore$ $\Delta PCR \cong \Delta RBP$ [By SSS]
$\therefore$ $\angle CPR = \angle RPB$
Similarly, $\angle CPQ = \angle QPA$
$\therefore$ $\angle QPR = 90°$
[$\therefore$ $\angle APB = 180°$]

4. (3)

If a line touches a circle and from the point of contact a chord is drawn, the angles which this chord makes with the given line are equal respe ctively to the angles formed in the corresponding alternate segments.

$\therefore$ $\angle ACB = \angle BAT = 75°$
$\angle ABC = 180° - 45° - 75° = 60°$

5. (1)

$\angle OAP = \angle OBP = 90°$
$\angle AOB + \angle APB = 180°$
$\Rightarrow$ $5\angle APB + \angle APB = 180°$
$\Rightarrow$ $6\angle APB = 180°$
$\Rightarrow$ $\angle APB = 30°$

6. (2)

AO is perpendicular to PQ.
OA = OP = OQ.
$\Rightarrow \angle OPA = \angle OAP = \angle OQA$
$= \angle OAQ = 45°$
$\therefore \angle PAQ = 90°$

7. (4)

$OQ \perp PR$
$\therefore$ From ΔOPQ,

PQ = $\sqrt{OP^2 - OQ^2}$

= $\sqrt{\left(\frac{20}{3}\right)^2 - 4^2}$

= $\sqrt{\frac{400}{9} - 16}$

= $\sqrt{\frac{400 - 144}{9}}$

= $\sqrt{\frac{256}{9}} = \frac{16}{3}$ cm

From ΔOQR,

QR = $\sqrt{OR^2 - OQ^2}$

= $\sqrt{5^2 - 4^2}$ = $\sqrt{25 - 16}$

= $\sqrt{9}$ = 3 cm

$\therefore$ PR = PQ + QR

= $\frac{16}{3} + 3$ = $\frac{25}{3}$ cm

8. (2)

OA = OP
$\Rightarrow \angle PAB = \angle OPA = 35°$
$\therefore \angle AOP = 110° \Rightarrow \angle POB = 70°$

$\therefore \angle ABP = \frac{180° - 70°}{2} = \frac{110°}{2}$

= 55°

9. (1)

Length of transverse tangent

= $\sqrt{XY^2 - (r_1 + r_2)^2}$

$\Rightarrow 8 = \sqrt{XY^2 - 9^2}$
$\Rightarrow$ $64 = XY^2 - 81$
$\Rightarrow$ $XY^2 = 64 + 81 = 145$
$\Rightarrow$ XY = $\sqrt{145}$ cm

10. (1)

Transverse common tangent

= $\sqrt{\left(\begin{matrix}\text{Distance between}\\ \text{centres}\end{matrix}\right)^2 - (r_1 + r_2)^2}$

= $\sqrt{10^2 - 6^2}$ = $\sqrt{16 \times 4}$ = 8 cm

11. (3) Transverse common tangent

= $\sqrt{d^2 - (r_1 + r_2)^2}$

= $\sqrt{(24)^2 - (5 + 3)^2}$

= $\sqrt{576 - 64}$ = $\sqrt{512}$

= $16\sqrt{2}$ cm.

12. (4)

$\angle OPS = \angle OQS = 90°$

$\angle PSQ = 20°$;

$\therefore \angle POQ = 160°$

$[\angle PSQ + \angle POQ = 180°]$

$\Rightarrow \angle PTQ = 80°$

PRQT is a concyclic quadrilateral.

$\therefore \angle PRQ = 180° - 80° = 100°$

13. (4)

PT = PQ

Tangents will be equal.

14. (1)

$\angle OBA = 90°$

OA = 5, OB = 4

$\therefore$ AB = $\sqrt{OA^2 - OB^2}$

= $\sqrt{25-16}$ = $\sqrt{9}$ = 3 cm

15. (4)

Let OA = OB = r

OP = $2r$

$\Rightarrow$ AP = PB

$\sin \angle APO = \frac{OA}{OP} = \frac{r}{2r} = \frac{1}{2}$

$\angle$ APO = 30°

$\therefore \angle APB = 60°$

16. (2)

$\angle ODB = 90°$

OD = 8 cm

OB = 13 cm

$\therefore$ BD = $\sqrt{13^2 - 8^2}$

= $\sqrt{169-64}$

= $\sqrt{105}$ cm

AE = 16 cm; $\angle AED = 90°$

AD = $\sqrt{AE^2 + DE^2}$

AD = $\sqrt{256+105} = \sqrt{361}$

= 19 cm

17. (1)

OT is the perpendicular bisector of chord PQ.

Let TR = y

$\therefore$ PR = QR = 4 cm

In right angle ΔORP,

$OP^2 = OR^2 + PR^2$

$\Rightarrow OR^2 = OP^2 - PR^2 = 5^2 - 4^2 = 9$

$\Rightarrow$ OR = 3 cm

In right angled ΔPRT and ΔOPT,

$TP^2 = TR^2 + PR^2$ and $OT^2 = TP^2 + OP^2$

$\Rightarrow OT^2 = TR^2 + PR^2 + OP^2$

$\Rightarrow (y+3)^2 = y^2 + 16 + 25$

$\Rightarrow 6y = 32 \Rightarrow y = \frac{16}{3}$

$\therefore$ TR = $\frac{16}{3}$

$\therefore TP^2 = TR^2 + PR^2 = \left(\frac{16}{3}\right)^2 + 16$

$= \frac{256}{9} + 16 = \frac{400}{9}$

$\therefore$ TP = $\frac{20}{3}$ cm

18. (3) Minimum number of common tangents drawn to two circles when both circles touch each other externally = 3

19. (1)

AB = 5 $\sqrt{3}$ units

OA = 5 units

$\angle OAB = 90°$

$\therefore$ OB = $\sqrt{AB^2 + OA^2}$

= $\sqrt{(5\sqrt{3})^2 + 5^2}$

= $\sqrt{75+25}$

= $\sqrt{100}$ = 10 units

$\therefore$ BC = OB – OC

= 10 – 5 = 5 units

20. (1)

Direct common tangent

$\sqrt{(\text{Distance between two centres})^2 - (r_1 - r_2)^2}$

= $\sqrt{(C_1C_2)^2 - (r_1 - r_2)^2}$

= $\sqrt{(13)^2 - (7-2)^2}$

= $\sqrt{169-25}$ = $\sqrt{144}$ = 12 cm.

21. (4)

OB = 6 cm

OA = 10 cm

$\angle OBA = 90°$

$\therefore AB = \sqrt{OA^2 - OB^2}$

$= \sqrt{10^2 - 6^2} = \sqrt{100 - 36}$

$= \sqrt{64} = 8$ cm

22. (4)

DE || BC

$\therefore \angle DAB = \angle ABC$

$\angle EAC = \angle ACB$

Hence, $\angle ABC$ is equilateral triangle.

$\therefore$ side AB = AC = BC = 17 cm

23. (1)

$\therefore$ Required length of tangent

$= \sqrt{(\text{Distance between centres})^2 - (r_1 - r_2)^2}$

$= \sqrt{(25)^2 - (16 - 9)^2}$

$= \sqrt{625 - 49} = \sqrt{576}$

= 24 cm

24. (1)

$\angle RPT = 50°$

$\angle RPQ = 90°$ (Angle of semi circle)

$\angle TPS = 180°$

$\therefore \angle SPQ = 180° - 50° - 90°$

$= 40°$

25. (2)

$\angle AOB = 110°$

$\angle OAP = 90°$

$\angle OBP = 90°$

$\therefore \angle APB + \angle AOB + \angle OAP + \angle OBP$
$= 360°$

$\Rightarrow \angle APB + 110° + 90° + 90°$
$= 360°$

$\Rightarrow \angle APB = 180° - 110° = 70°$

26. (2)

$r_1 = 25$ cm, $r_2 = 9$ cm

Length of common tangent

$= \sqrt{(\text{distance between centres})^2 - (r_1 - r_2)^2}$

$= \sqrt{(25+9)^2 - (25-9)^2}$

$= \sqrt{(34)^2 - (16)^2}$

$= \sqrt{(34+16)(34-16)}$

$= \sqrt{50 \times 18}$

= 30 cm

27. (3)

In ΔOAB,

OA = OB = radius

$\therefore \angle OAB = \angle OBA$

$\therefore \angle OAB + \angle OBA + \angle AOB$
$= 180°$

$\therefore 2\angle OAB = 180° - 140° = 40°$

$\Rightarrow \angle OAB = \frac{40}{2} = 20°$

$\therefore \angle PAO = 90°$

$\therefore \angle PAB = 90° - 20° = 70°$

28. (4)

OO' = 9 + 4 = 13 cm

$\therefore$ Common tangent

$= \sqrt{(r_1 + r_2)^2 - (r_1 - r_2)^2}$

$= \sqrt{13^2 - (9-4)^2}$

$= \sqrt{13^2 - 5^2} = \sqrt{169 - 25}$

$= \sqrt{144} = 12$ cm

29. (1)

The angle at the circumference of a semi–circle is right angle.

$\therefore \angle ACB = 90°$

$\angle CAB = 34°$

$\therefore \angle CBA = 90° - 34° = 56°$

30. (3)

$\angle PAQ = 48°$

AP = AQ = tangents from the same exterior point.

$\therefore$ In ΔAPQ,

$\angle APQ = \angle AQP$

$\therefore 2\angle APQ = 180° - 48° = 132°$

$\Rightarrow \angle APQ = \frac{132}{2} = 66°$

31. (4) Length of direct common tangent

$\sqrt{(\text{Distance between two centres})^2 - (r_1 - r_2)^2}$

$= \sqrt{13^2 - (8-3)^2}$

$= \sqrt{13^2 - 5^2}$

$= \sqrt{(13+5)(13-5)}$

$= \sqrt{18 \times 8} = 12$ cm.

32. (2)

Secant PB = (4 + x) cm.

$\therefore$ PA. PB = PT^2

$\Rightarrow 4\,(4 + x) = 5^2 = 25$

$\Rightarrow 16 + 4x = 25$

$\Rightarrow 4x = 25 - 16 = 9$

$\Rightarrow x = \dfrac{9}{4}$ cm.

33. (2)

OE $\perp$ AB ; OE $\perp$ CD

OE = OA = OB = 3 cm

OC = OD = 5 cm

$\therefore$ $CE^2 = OC^2 - OE^2$

$\Rightarrow 5^2 - 3^2 = 25 - 9 = 16$

$\Rightarrow$ CE = $\sqrt{16} = 4$ cm

$\therefore$ CD = 2CE = 2 × 4 = 8 cm

34. (3) Common tangent =

$\sqrt{(\text{Distance between centres})^2 - (r_1 - r_2)^2}$

$= \sqrt{(8+4)^2 - (8-4)^2}$

$= \sqrt{12^2 - 4^2}$

$= \sqrt{144 - 16} = \sqrt{128}$

$= 8\sqrt{2}$ cm

35. (4)

AB is a tangent. OB is radius of circle.

OB $\perp$ AB

OB = 6 cm.

OA = 10 cm.

$\therefore$ AB = $\sqrt{OA^2 - OB^2}$

$= \sqrt{10^2 - 6^2} = \sqrt{100 - 36}$

$= \sqrt{64} = 8$ cm.

36. (3)

The tangents drawn from an exterior point to a circle are equal.

$\therefore$ XY = XZ = 15 cm.

$\therefore$ TZ = XZ – TX

= 15 – 9 = 6 cm

Argain, TR = TZ = 6 cm.

37. (4)

In Δ APB and Δ BCQ,

$\angle$ PAB = $\angle$ BCQ = 90°

$\angle$ PBA = $\angle$ QBC

By AA – similarity,

Δ APB ~ Δ BQC

$\therefore \dfrac{AB}{BC} = \dfrac{AP}{QC}$

$\Rightarrow \dfrac{8}{BC} = \dfrac{6}{3}$

$\Rightarrow$ BC = $\dfrac{8 \times 3}{6} = 4$ cm.

$\therefore$ PQ = $\sqrt{AC^2 + (r_1 + r_2)^2}$

$= \sqrt{(8+4)^2 + (6+3)^2}$

$= \sqrt{12^2 + 9^2} = \sqrt{144 + 81}$

$= \sqrt{225} = 15$ cm.

38. (2)

QB = Tangent = 12 cm.

OQ = 13 cm.

$\angle$QBO = 90°

From ΔOQB,

OB = $\sqrt{OQ^2 - QB^2}$

$= \sqrt{13^2 - 12^2} = \sqrt{169 - 144}$

$= \sqrt{25} = 5$ cm.

$\therefore$ AQ = Shortest distance

= OQ – OA = 13 – 5 = 8 cm.

39. (3)

PQ = $\sqrt{AB^2 - (r_1 - r_2)^2}$

$= \sqrt{13^2 - (11-6)^2}$

$= \sqrt{13^2 - 5^2} = \sqrt{169 - 25}$

$= \sqrt{144} = 12$ cm.

40. (2)

AB = AC = tangents drawn from an exterior point

D is mid-point of BC and AD is perpendicular to BC.

$\therefore \angle$BDO = 90°

41. (1)

Length of common transverse tangent =

$\sqrt{(\text{distance between centres})^2 - (r_1 + r_2)^2}$

$= \sqrt{15^2 - (6+3)^2}$

$= \sqrt{225 - 81}$

$= \sqrt{144} = 12$ cm.

42. (1)

Required ratio $= \frac{r_1}{r_2} = 5 : 3$

43. (2)

$PQ = \sqrt{(OO')^2 - (r_2 - r_1)^2}$

$= \sqrt{(13)^2 - (8-3)^2}$

$= \sqrt{169 - 25}$

$= \sqrt{144} = 12$ cm.

44. (2)

OA ⊥ PA ; OB ⊥ PB : PA = PB (tangents from the same external point)

∠APB = 80° : OA = OB = radius

$\therefore \angle APO = \frac{80°}{2} = 40°$

∴ ∠AOP = 90° – 40° = 50°.

45. (4)

$PQ = \sqrt{(AB)^2 - (r_1 - r_2)^2}$

$= \sqrt{(13)^2 - (11-6)^2}$

$= \sqrt{169 - 25} = \sqrt{144} = 12$ cm.

46. (2)

∠APB = 120°

OA = OB = radii

∴ ∠APO = ∠OPB = 60°

∴ From Δ OAP,

$\cos 60° = \frac{AP}{OP}$

$\Rightarrow \frac{1}{2} = \frac{AP}{12} \Rightarrow AP = 6$ cm.

47. (4)

∠OBA = 90°

In ΔOAB,

$OA^2 = OB^2 + AB^2$

$\Rightarrow 5^2 = 3^2 + AB^2$

$\Rightarrow AB^2 = 5^2 - 3^2 = 25 - 9 = 16$

$\Rightarrow AB = \sqrt{16} = 4$ cm.

48. (3)

AB is tangent at point C.

AC = BC

OA = 13 cm.

OC = 12 cm.

∠ACO = 90°

From ΔOAC,

$AC = \sqrt{OA^2 - OC^2}$

$= \sqrt{13^2 - 12^2}$

$= \sqrt{(13+12)(13-12)} = \sqrt{25}$

= 5 cm.

∴ AB = 2AC = 2 × 5 = 10 cm.

49. (2)

∴ ∠BAT = 50°

OA = OB = radii

∠OAT = 90°

∴ ∠OAB = ∠OBA

= 90° – 50° = 40°

∴ ∠AOB = 100°

$\therefore \angle AEB = \frac{100°}{2} = 50°$

ADBE is a cyclic quadrilateral.

∴ ∠ADB = 180° – 50° = 130°

50. (1)

OB = OC = radii

∴ In Δ OBC,

OB = BC = CO

∴ ∠OCB = ∠OBC = ∠BOC = 60°

OC ⊥ DE

∴ ∠BCD = 90° – 60° = 30°

51. (4) No. of common tangents = 3

52. (3) Maximum No. of Common tangents = 4

53. (4) Transverse common tangent

$= \sqrt{d^2 - (r_1 + r_2)^2}$

$= \sqrt{10^2 - (3+3)^2}$

$[r_1 = r_2 = 3$ cm.$]$

$= \sqrt{100 - 36}$

$= \sqrt{64} = 8$ cm.

54. (4)

The angle at the circumference of a semi–circle is a right angle.

$\therefore$ $\angle BAC = 90°$

$\angle ABC = 36°$

$\therefore$ $\angle ACB = 90° - 36° = 54°$

$\angle BCD = 90°$

$\therefore$ $\angle ACD = 90° - 54° = 36°$

$\angle DAC = 90°$

$\therefore$ $\angle ADC = 90° - 36° = 54°$

55. (3)

TR = TS

$\angle SRT = \angle TSR = 65°$

$\therefore$ $\angle STR = 180° - 130° = 50°$

$\therefore$ $\angle PTR = \angle STQ = \dfrac{130°}{2} = 65°$

$\therefore$ $\angle PTS = 65° + 50° = 115°$

56. (3)

OA = OB = radii of circle

$\angle AOB = 72°$;

$\angle OBP = \angle OAP = 90°$

In $\angle OAB$,

$\angle OAB = \angle OBA$

$\therefore$ $2\angle OAB = 180° - 72° = 108°$

$\Rightarrow \angle OAB = \dfrac{108°}{2} = 54°$

$\therefore$ $\angle PBA = \angle PAB = 90° - 54° = 36°$

$\therefore$ $\angle BPA = 180° - 2 \times 36°$

$= 180° - 72° = 108°$

57. (1)

$AB \perp AC$

$\therefore$ $\angle BAC = 90°$

$\therefore$ $BC = \sqrt{AB^2 + AC^2}$

$= \sqrt{8^2 + 6^2} = \sqrt{64 + 36}$

$= \sqrt{100} = 10$ cm.

58. (4)

$\angle ATC = 30°$; $\angle ACT = 48°$

$\therefore$ $\angle CAT = 180° - (30° + 48°)$

$= 180° - 78° = 102°$

$\therefore$ $\angle OCA = 90° - 48°$

$= 42° = \angle OAC$

$\therefore$ $\angle OAB = 180° - 102° - 42°$

$= 36° = \angle OBA$

$\therefore$ $\angle AOB = 180° - 2 \times 36°$

$= 108°$

59. (1)

PA = PB (tangents from an exterior point)

OA = OB = radii

$\angle APO = \angle OPB = 25°$

$\angle PAB = \angle PBA = \dfrac{130}{2} = 65°$

$\angle OAP = 90°$

$\therefore$ $\angle OAB = 90° - 65° = 25°$

60. (2)

Tangents drawn from an external point to a circle are equal.

$\therefore$ TA = TP; TP = TB

$\therefore$ TA = TB

61. (3)

PQ = PR (Tangents from the same exterior point)

$\angle OPQ = \angle OPR = \dfrac{120°}{2} = 60°$

$\therefore$ $OQ \perp PQ$ (Tangent)

$\therefore$ $\angle OQP = 90°$

$\therefore$ $\angle POQ = 90° - 60° = 30°$

62. (3)

OT = 5 cm.

OP = 13 cm.

$\therefore$ $PT = \sqrt{OP^2 - OT^2}$

$= \sqrt{13^2 - 5^2}$

$= \sqrt{169 - 25} = \sqrt{144} = 12$ cm.

63. (2)

Tangent $\Rightarrow$ CAD

$OA \perp CD$

$\Rightarrow$ OAD = 90°

$\angle BAD = \theta$

$\therefore$ $\angle OAB = 90° - \theta = \angle OBA$

64. (1)

OT = 6 cm.
TP = 8 cm.
$\angle OTP = 90°$
In ΔOPT,

$OP = \sqrt{OT^2 + TP^2} = \sqrt{6^2 + 8^2}$

$= \sqrt{36 + 64} = \sqrt{100} = 10$ cm.

65. (3)

$OA \perp AP$
OP = 5 cm.
PA = 4 cm.

$\therefore\ OA = \sqrt{OP^2 - AP^2}$

$= \sqrt{5^2 - 4^2} = \sqrt{25 - 16}$

$= \sqrt{9} = 3$ cm.

TYPE-XIV

1. (4)

$\angle CBE = 50°$
$\angle BAC + \angle BCA = 90°$
$[\because \angle ABC = 90°]$
$\angle ABE = 90° - 50° = 40°$
$\therefore \angle ABE = \angle ACE = 40°$
$\therefore \angle ACE = \angle DEC = 40°$

2. (1)

$\angle ABC = 90°$

AC = Diameter of circle

$\therefore AC = \sqrt{6^2 + 8^2} = \sqrt{36 + 64}$

$= \sqrt{100} = 10$ cm

$\therefore$ Circum-radius = 5 cm

3. (2)

$3^2 + 4^2 = 5^2$ [Pythagorean Triplet]
Δ ABC is a right angled triangle.
$\angle B = 90°$ = angle at the circumference
Since, Diameter of circle = 5 cm
$\therefore$ Circum-radius = 2.5 cm

4. (1)

OA = OB = OC
$\angle BID = \angle ABC$
$\Rightarrow x = y$
$\angle BOD = 2\ \angle BAD$

$\therefore \dfrac{z + x}{y} = \dfrac{3y}{y} = 3$

5. (2) Simply, check through options & find Pythagorean Triplet

$18^2 + 24^2 = 30^2$
$\therefore$ Sides = 18, 24, 30

6. (4)

$AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{15^2 + 20^2} = \sqrt{225 + 400}$

$= \sqrt{625} = 25$ cm.

$\angle ABC = 90°$
As, AC = diameter

$\therefore$ Circum radius (OA) = $\dfrac{25}{2}$

= 12.5 cm.

7. (4)

Circum-radius of equilateral triangle = $\dfrac{2}{3}$ × height

$\therefore 8 = \dfrac{2}{3}$ × height

$\therefore$ Height = $\dfrac{8 \times 3}{2} = 12$ cm.

8. (4)

$PR^2 = PQ^2 + PR^2$
$= 3^2 + 4^2 = 25$

$\therefore PR = \sqrt{25}$

= 5 cm

$r = \dfrac{\text{Area of triangle}}{\text{Semi – perimeter of triangle}}$

$$= \frac{\frac{1}{2} \times 3 \times 4}{\frac{3+4+5}{2}} = \frac{6}{6} = 1\text{cm}$$

[Or, In the above figure, QR = r + 2 + r = 4 ⇒ r = 1

9. (3)

BE = EC = 6 cm, OB = 10 cm, OA = 17 cm

From ΔOBE,

$OE = \sqrt{OB^2 - BE^2}$

$= \sqrt{10^2 - 6^2} = \sqrt{16 \times 4} = 8$ cm

From ΔOAE,

$AE = \sqrt{OA^2 - OE^2}$

$= \sqrt{17^2 - 8^2} = \sqrt{25 \times 9} = 15$ cm

∴ AD = 2 × AE = 2 × 15 = 30 cm

10. (2)

∠PRQ = 90°

PR = 2 + x

PQ = 17

RQ = 9 + x

∴ $PQ^2 = PR^2 + RQ^2$

⇒ $17^2 = (2 + x)^2 + (9 + x)^2$

⇒ $289 = 4 + 4x + x^2 + 81 + 18x + x^2$

⇒ $289 = 2x^2 + 22x + 85$

⇒ $2x^2 + 22x + 85 - 289 = 0$

⇒ $2x^2 + 22x - 204 = 0$

⇒ $x^2 + 11x - 102 = 0$

⇒ $x^2 + 17x - 6x - 102 = 0$

⇒ $x(x + 17) - 6(x + 17) = 0$

⇒ $(x - 6)(x + 17) = 0$

⇒ $x = 6$ as $x \neq -17$

∴ $x = 6$ cm

11. (2)

∠BAC = 85°

∴ ∠BOC = 2 × 85° = 170°

∠BCA = 55°

∴ ∠AOB = 2 × 55° = 110°

∴ ∠AOC = 360° – 170° – 110°

= 360° – 280° = 80°

$\therefore \angle OAC = \angle OCA = \frac{1}{2}(180° - 80°)$

$= \frac{1}{2} \times 100 = 50°$

12. (1)

$\therefore RQ = \sqrt{PR^2 + PQ^2}$

$= \sqrt{6^2 + 8^2} = \sqrt{36 + 64}$

$= \sqrt{100} = 10$ cm

$\therefore$ Circum-radius $= \frac{10}{2}$

= 5 cm

13. (3)

In Δ ABC,

∠ BAC = 60°, ∠ ABC = 60°

The angle subtended by an arc at the centre is twice to that at the circumference by the same arc.

∴ ∠ AOC = 2∠ABC = 120°

14. (3) ∠BAC = 85°

∴ ∠BOC = 2 × 85° = 170°

⇒ ∠OBC = ∠OCB = 5°

∴ ∠OCA = ∠OAC = 75° – 5°

= 70°

15. (1)

BC = Diameter

$\therefore BC = \sqrt{AB^2 + AC^2}$

$= \sqrt{5^2 + 12^2} = \sqrt{25 + 144}$

$= \sqrt{169} = 13$ cm

∴ OB = circum-radius

$= \frac{BC}{2} = \frac{13}{2} = 6.5$ cm

16. (2)

Angle of a semi–circle is a right angle.

∴ ∠PRQ = 90°

In Δ PQR,

∠RPQ + ∠RQP = 90°

⇒ ∠RPQ + 30° = 90°

⇒ ∠RPQ = 90° – 30° = 60°

17. (4)

Point 'O' is the centre of circle.
OD is perpendicular on QR.
QD = DR = 8 cm.
From Δ OQD,

$OD = \sqrt{OQ^2 - QD^2}$

$= \sqrt{17^2 - 8^2}$

$= \sqrt{(17+8)(17-8)}$

$= \sqrt{25 \times 9} = 5 \times 3 = 15$ cm.

From Δ OPD,

$PD = \sqrt{OP^2 - OD^2}$

$= \sqrt{25^2 - 15^2}$

$= \sqrt{(25+15)(25-15)}$

$= \sqrt{40 \times 10} = 20$ cm.

∴ PS = 2PD = 2 × 20 = 40 cm.

18. (4)

$\frac{AB}{AC} = \frac{BD}{DC}$

∠AEC = ∠CBA
∠BCE = ∠BAE
∠AEB = ∠ACB
∴ Ratio will be same.

19. (4)

∠BAC = Angle at circumference = 50°
∠BOC = angle at centre = 100°
OB = OC = radius

$\therefore \angle OBC = \angle OCB = \frac{80°}{2} = 40°$

20. (3)

OA = AB = OB
∠AOB = 60°
∴ ∠ADB = 30°
Angle subtended at the centre by an arc is twice of that subtended at the circumference.
□ADBC is a cyclic quadrilateral.
∴ ∠ADB + ∠ACB = 180°
⇒ 30° + ∠ACB = 180°
⇒ ∠ACB = 180° – 30° = 150°

21. (1)

∠BQP = ∠BAP

$\therefore \angle BQP = \frac{\angle A}{2}$

∠BQR = ∠BCR

$\therefore \angle BQR = \frac{1}{2} \angle C$

∴ ∠BQP + ∠BQR

$= \frac{1}{2} (\angle A + \angle C)$

$\Rightarrow \angle PQR = \frac{1}{2} (180° - \angle B)$

[∵ ∠A + ∠B + ∠C = 180°]

$= 90° - \frac{B}{2}$

22. (2)

In Δ ABC,
∠ BAC = 85°
∠ BCA = 75°
∴ ∠ABC = 180° – 85° – 75°
= 20°
The angle subtended by an arc of a circle at the centre is double the angle subtended by it at any point on the remaining part of the circle.
∴ ∠AOC = ∠ABC = 40°
∴ OA = OC = radii
In ΔOAC,
∠OAC = ∠OCA (The angles at the base of an isosceles triangle are equal)
∠OAC + ∠OCA = 180° – 40°
= 140°

$\therefore \angle OAC = \frac{140°}{2} = 70°$

23. (4)

∠BAC = 85°
∠BCA = 75°
∠ABC = 180° – 85° – 75°
= 20°
Angle subtended by an arc at the centre is twice to that subtended at any point on the circumference.
∴ 2∠ABC = ∠AOC
∴ ∠OAC = 40°
In ΔOAC,
OA = OC = radii
∴ ∠OAC = ∠OCA
∴ 2∠OAC = 180° – 40° = 140°

$\Rightarrow \angle OAC = \frac{140°}{2} = 70°$

24. (1)

In Δ OBC $\because$ OB = OC

$\therefore$ $\angle$OBC = $\angle$OCB

$\therefore$ $\angle$BOC = 180° – 2 $\angle$OBC

In Δ OBD,

$\angle$OBD = $\angle$ OBC = 90° – $\angle$BOD

Angle subtended by an arc at the centre is twice to that subtended at the circumference.

$\therefore$ $\angle BAC = \frac{1}{2}\angle BOC$

$= \frac{1}{2}(180° - 2\angle OBC)$

= 90° – $\angle$ OBC

$\therefore$ $\angle$BAC + $\angle$OBC = 90°

25. (3)

OA = OB = AB

$\therefore$ ΔOAB is an equilateral triangle.

$\therefore$ $\angle$AOB = 60°

$\therefore \angle ACB = \frac{60°}{2} = 30°$

Angle subtended at the centre by an arc is twice to that at the circumference.

26. (2)

AX = AY = tangents from an exterior point

$\angle$AXO = $\angle$AYO = 90°

$\therefore$ AX = XB ; AY = YC

$\therefore$ XY || BC and $= \frac{1}{2}BC$

27. (4)

AB = AC = 5 cm. (We have assumed to reach answer)

AD $\perp$ BC

BD = DC = 3 cm.

$AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{5^2 - 3^2} = \sqrt{25 - 9} = \sqrt{16}$

= 4 cm.

Let, OA = OC = r cm.

OD = $(4 - r)$ cm.

In ΔOCD,

$OC^2 = OD^2 + DC^2$

$\Rightarrow r^2 = (4 - r)^2 + 3^2$

$\Rightarrow r^2 = 16 + r^2 - 8r + 9$

$\Rightarrow 8r = 25 \Rightarrow r = \frac{25}{8} = 3.125$

28. (1)

OE = OF (In–radius)

BF = BD (tangents from external point B)

and EC = DC = 15 cm.

BF = x cm.

AB = $(6 + x)$ cm.

AC = 6 + 15 = 21 cm.

$BC^2 = AB^2 + BC^2$

$\Rightarrow (x + 15)^2 = (6 + x)^2 + (21)^2$

($\because$ BC = BD + CD)

$\Rightarrow x^2 + 30x + 225 = 36 + x^2 + 12x + 441$

$\Rightarrow 30x - 12x = 441 + 36 - 225$

$\Rightarrow 18x = 252$

$\Rightarrow x = \frac{252}{18} = 14 \Rightarrow$ BD = 14 cm.

$\therefore$ Required difference

= CD – BD

= 15 – 14 = 1 cm.

29. (3)

OP = OQ = OR = r (let)

$\angle$CBA = 90°

$\therefore AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{6^2 + 8^2} = \sqrt{36 + 64}$

$= \sqrt{100} = 10$ cm.

Area of Δ ABC = Area of (Δ AOC + Δ BOC + Δ AOB)

$\Rightarrow \frac{1}{2} \times 6 \times 8 = \frac{1}{2} AC \times OQ + \frac{1}{2}$

$BC \times OR + \frac{1}{2} \times AB \times OP$

$\Rightarrow 24 = \frac{1}{2} \times 10 \times r + \frac{1}{2} \times 8 \times r$

$+ \frac{1}{2} \times 6 \times r$

$\Rightarrow 24 = 5r + 4r + 3r$

$\Rightarrow 12r = 24 \Rightarrow r = \frac{24}{12} = 2$ cm.

30. (1)

$AD = \frac{\sqrt{3}}{2} \times$ side

$\therefore OD = \frac{1}{3} \times AD$

$= \frac{1}{3} \times \frac{\sqrt{3}a}{2} = \frac{a}{2\sqrt{3}}$

$OA = \frac{2}{3}$ AD

$= \frac{2}{3} \times \frac{\sqrt{3}}{2} a = \frac{a}{\sqrt{3}}$

In-radius $= \frac{\text{Side}}{2\sqrt{3}} = \frac{a}{2\sqrt{3}}$

Circum-radius $= \frac{\text{Side}}{\sqrt{3}} = \frac{a}{\sqrt{3}}$

$\therefore$ Required ratio

$= \frac{a}{2\sqrt{3}} : \frac{a}{\sqrt{3}} = 1 : 2$

31. (3)

AD = DC = DB

In Δ ABC,

$AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{3^2 + 4^2} = \sqrt{9 + 16}$

$= \sqrt{25} = 5$ cm.

$\therefore AD = \frac{5}{2} = 2.5$ cm.

32. (1)

Point 'O' is equidistant from the vertices of triangle ABC.

$\therefore$ OA = OB = OC

$\therefore \angle OAC = \angle OCA, \angle OBC = \angle OCB; \angle OAB = \angle OBA$

$\therefore$ In ΔABC,

$\angle ABC = 180° - 85° - 75° = 20°$

$\therefore \angle AOC = 2 \angle ABC = 2 \times 20° = 40°$

$\therefore$ In Δ AOC,

$2 \angle OAC + 40° = 180°$

$\Rightarrow 2 \angle OAC = 180° - 40° = 140°$

$\Rightarrow \angle OAC = \frac{140°}{2} = 70°$

33. (4)

Angle subtended at the centre of a circled by an arc is twice to that at the circumference.

$\therefore \angle BOC = 2\angle BAC$

$\Rightarrow \angle BAC = \frac{150}{2} = 75°$

34. (1)

BI = IC = ex–radius

$\therefore$ Angle subtended by arc AC at the centre

$= 2 \times \angle BAC$

$= 2 \times 60° = 120°$

$\therefore \angle BID = \angle DIC = \frac{120°}{2} = 60°$

35. (3)

$\angle POR = 115°$

$\therefore \angle OPR + \angle ORP = 180° - 115° = 65°$

$\therefore 2\angle OPR + 2\angle ORP = 130°$

$\Rightarrow \angle QPR + \angle QRP = 130°$

$\therefore \angle PQR = 180° - 130° = 50°$

TYPE-XV

1. (2) Error = 45°27' – 45° = 27'

We have, 60' = 1°

$\Rightarrow 27' = \frac{27°}{60}$

$\therefore$ Percentage error

$= \frac{\frac{27}{60}}{45} \times 100 = \frac{2700}{60 \times 45} = 1\%$

2. (2)

XP = XR

$\therefore \angle XPR = \angle XRP$

If $\angle PSX = \angle RQX$,

then, PS = RQ

3. (3)

Join CB.

$\angle AOC + \angle BOD$

$= 2\angle ABC + 2\angle BCD$

(Exterior angles of triangle)

$= 2 (\angle ABC + \angle BCD)$

$= 2\angle BPD$

$\therefore \angle BPD = \frac{1}{2}(50° + 40°) = 45°$

4. (3)

PQ || BC

$\therefore \frac{AP}{AB} = \frac{AQ}{AC}$ [By BPT]

$\Rightarrow \frac{AB}{AP} = \frac{AC}{AQ}$

$\Rightarrow \frac{AP + PB}{AP} = \frac{AQ + QC}{AQ}$

$\Rightarrow \frac{PB}{AP} = \frac{QC}{AQ} = \frac{AP}{AQ}$

$\Rightarrow AP^2 = PB.\ AQ = 4 \times 9 = 36$

$\therefore$ AP = 6 units

5. (2)

$AB^2 + AC^2 = BC^2 \Rightarrow \angle BAC = 90°$
$\Rightarrow AB^2 + AC^2 = 2AB^2$
$\Rightarrow AB^2 = AC^2$
$\Rightarrow AB = AC$
$\therefore \angle ABC = \angle ACB = 45°$

6. (3)

$\angle BOC = 2\ \angle BAC$
$\angle AOD = 2\ \angle DCA$
$\therefore \angle BOC + \angle AOD$
$= 2\ (\angle BAC + \angle DCA)$
$= 2\ \angle BPC$ (Exterior angles' sum)
$\therefore 2\angle BPC = 20° + 30° = 50°$
$\Rightarrow \angle BPC = 25°$

7. (2)

$\angle COD = 120°$ [Given]
$\angle BAC = 30°$

$\angle CAD = \frac{1}{2} \times 120° = 60°$

$\therefore \angle BAD = 90°$
$\therefore \angle BCD = 180° - 90° = 90°$

8. (2)

$\Delta ABC \sim \Delta DEF$
$\therefore \angle A = 47° = \angle D$
$\angle B = \angle E = 63°$
$\therefore \angle C = 180° - 47° - 63° = 70°$

9. (1)

In ΔABC,
$\angle A + \angle B + \angle C = 180°$ ... (i)
In ΔOBC,
$\angle OBC + \angle BOC + \angle OCB = 180°$

$\Rightarrow \frac{\angle B}{2} + 110° + \frac{\angle C}{2} = 180°$

$\Rightarrow \frac{\angle B + \angle C}{2} = 180° - 110° = 70°$

$\Rightarrow \angle B + \angle C = 140°$
$\therefore \angle A = 180° - 140° = 40°$

10. (2)

$\angle A = 180° - 60° - 40° = 80°$

$\angle BAD = \frac{80°}{2} = 40°$

$\angle BAE = 180° - 60° - 90° = 30°$
$\therefore \angle DAE = 40° - 30° = 10°$

11. (1)

$\angle ACB = 65°$
$\angle AOB = 2 \times 65° = 130°$
$\angle OAP = 90°, \angle AOP = 65°$
$\therefore \angle APO = 180° - 90° - 65°$
$= 25°$

12. (2)

$\angle A + \angle B + \angle C = 180°$

$\Rightarrow \frac{\angle B}{2} + \frac{\angle C}{2} = 90° - \frac{\angle A}{2}$

In ΔBOC,

$\angle BOC + \frac{\angle B}{2} + \frac{\angle C}{2} = 180°$

$\Rightarrow 102° + 90° - \frac{\angle A}{2} = 180°$

$\Rightarrow \frac{\angle A}{2} = 102° + 90° - 180° = 12°$

$\therefore \angle A = 24°$

13. (3)

$\angle ABC + \angle CBP = 180°$
$\Rightarrow \angle B + 2\ \angle 1 = 180°$
$\Rightarrow 2\angle 1 = 180° - \angle B$

$\Rightarrow \angle 1 = 90° - \frac{1}{2}\ \angle B$

Again, $\angle ACB + \angle QCB = 180°$

$\Rightarrow \angle 2 = 90° - \frac{1}{2}\ \angle C$

In ΔBOC,
$\angle 1 + \angle 2 + \angle BOC = 180°$

$\Rightarrow 90° - \frac{1}{2}\angle B + \angle 90° - \frac{1}{2}$
$\angle C + \angle BOC = 180°$

$\Rightarrow \angle BOC = \frac{1}{2}(\angle B + \angle C)$

$= \frac{1}{2}(180° - \angle A)$

$\Rightarrow \angle BOC = 90° - \frac{1}{2}\ \angle A$

$\Rightarrow 60° = 90° - \frac{1}{2}\ \angle A$

$\therefore \angle A = 60°$

14. (3)

$\angle ABC = 60° \Rightarrow \angle BCA = 80°$
$\angle ABI = \angle IBC = 30°$
$\angle ACI = \angle ICB = 40°$
In ΔBIC,
$\therefore \angle BIC = 180° - 30° - 40° = 110°$

15. (4)

$\angle BAC = 70°$
$\angle ABC + \angle ACB = 110°$ ...(i)
From $\angle BCF$,
$\angle CFB + \angle FBC + \angle FCB = 180°$
$\Rightarrow \angle FBC + \angle FCB = 90°$ ...(ii)
From ΔBCE,
$\angle ECB + \angle EBC = 90°$ ...(iii)
(ii) + (iii) – (i)
$\Rightarrow \angle EBC + \angle FCB$
$= 180° - 110° = 70°$
$\therefore \angle BOC = 180° - 70° = 110°$

16. (3)

$\angle AOC = 130°$

$\Rightarrow \angle ADC = \frac{1}{2} \times 130° = 65°$

$\angle PBC = \angle ADC = 65°$

17. (4)

$\angle BAC = 80°$
$\therefore \angle B + \angle C = 180° - 80° = 100°$

$\frac{\angle B}{2} + \frac{\angle C}{2} = 50°$

$\Rightarrow \angle OBC + \angle OCB = 50°$
$\therefore \angle BOC = 180° - 50°$
$= 130°$

18. (4)

AC= QC
$\therefore \angle QAC = \angle CQA = x$ (Let)
CR = CB
$\therefore \angle CBR = \angle CRB = y$
$\therefore$ From ΔPQR,
$\angle x + \angle y + 40° = 180°$
$\angle x + \angle y = 140°$ .....(i)
Again,
$\angle ACQ + \angle ACB + \angle BCR = 180°$
$\Rightarrow 180° - 2x + \angle ACB + 180° - 2y$
$= 180°$
$\Rightarrow \angle ACB = 2(x + y) - 180°$
$= 2 \times 140 - 180° = 100°$

19. (2)

$\angle APC = 70° = \angle DPB$
$\therefore \angle APD = 180° - 70°$
$= 110° = \angle BPC$
Also, $\angle ADC = \angle ABC = 23°$
$\therefore \angle BCD = 180° - 110° - 23° = 47°$

20. (2) $2x + 3x + 4x = 180°$
$\Rightarrow 9x = 180° \Rightarrow x = 20°$
$\therefore$ Angles of triangle are 40°, 60° and 80°

AB || CD

$\angle DCE = \angle ABC = 60°$
$\therefore \angle ACB + \angle ACD + \angle DCE$
$= 180°$
$\Rightarrow \angle ACD = 180° - 120° = 60°$

21. (4)

$\angle ACB = 180° - 75° - 45°$
$= 60°$
$\angle ACD = 180° - 60° = 120° = x$

$\therefore \frac{x}{3}\%$ of 60°

$= 60 \times \frac{120}{300} = 24°$

22. (4)

Let $\angle ABC = \angle ACB = x$ [$\because AB = AC$]
$\therefore \angle BAC = 180° - 2x$
$\Rightarrow \angle CAD = 180° - 2x$
Also, $\angle BAD = 180°$
$\therefore 180° = (180° - 2x) \times 2$
$\Rightarrow 180° - 2x = 90°$
$\Rightarrow 2x = 90° = \angle BCD$

23. (2) $\angle A + \angle B = 65°$
$\therefore \angle C = 180° - 65° = 115°$
$\angle B + \angle C = 140°$
$\therefore \angle B = 140° - 115° = 25°$

24. (4)

$\angle A = 90°$, $\angle C = 55°$,
$\therefore \angle B = 90° - 55° = 35°$
$\angle ADB = 90°$
$\therefore \angle BAD = 90° - 35° = 55°$

25. (4)

$\angle QOR = 110°$
$\angle OPR = 25°$
$\therefore \angle QPR = 110° \div 2 = 55°$
OR = OP
$\therefore \angle OPR = \angle PRO = 25°$

$\therefore \angle OQR = \angle ORQ = \frac{70}{2} = 35°$

$\therefore \angle PRQ = 25° + 35° = 60°$

26. (3)

$\angle AOE = 150°$, $\angle DAO = 51°$[Given]
$\angle EOB = 180° - 150° = 30°$
OE = OB

$\therefore \angle OEB = \angle OBE = \frac{150}{2} = 75°$

$\therefore \angle CBE = 180° - 75° = 105°$

27. (4)

$\angle ACB = 80°$
$\therefore \angle ACD = 180° - 80° = 100°$
$\angle CAD = \angle CDA$ [CD = AC]

$= \frac{80°}{2} = 40°$

$\angle BAC = 111° - 40° = 71°$
$\angle ABC = 180° - 71° - 80° = 29°$

28. (4)

$\angle A + \angle B = 145°$
$\angle C = 180° - 145° = 35°$
$\angle C + 2\angle B = 180°$
$\Rightarrow 2\angle B = 180° - 35° = 145°$

$\Rightarrow \angle B = \frac{145°}{2}$

$\Rightarrow 72.5° = \angle A$
$\Rightarrow \angle B > \angle C$
$\therefore$ AC > AB

29. (3) $\angle A + \angle B + \angle C = 180°$ ....(i)
$(\angle B - \angle C) - (\angle A - \angle B) = 30° - 15°$
$\Rightarrow 2\angle B - \angle A - \angle C = 15°$ ....(ii)
By adding (i) and (ii),
$3\angle B = 180° + 15° = 195°$
$\Rightarrow \angle B = 65°$
$\angle A - \angle B = 15°$
$\Rightarrow \angle A = 15° + 65° = 80°$
$\angle C = \angle B - 30°$
$= 65° - 30° = 35°$

30. (4)

AE = AH
BE = BF
GC = FC
GD = HD
$\Rightarrow$ AE + BE + GC + GD
= AH + BF + FC + HD
$\Rightarrow$ AB + CD = AD + BC
$\Rightarrow 6 + 3 = AD + 7.5$
$\Rightarrow AD = 9 - 7.5 = 1.5$ cm

31. (3)

$\angle BAD = 30°$
$\angle ABD = 60°$ [$\because \angle ADB = 90°$]

$$\frac{\tan \angle ACB}{\tan \angle DBE} = \frac{\frac{AD}{DC}}{\frac{DE}{BD}}$$

$$= \frac{AD}{DC} \times \frac{BD}{DE} = 6\frac{BD}{DC}$$

$$\therefore 6\frac{BD}{DC} = 6$$

$\Rightarrow$ BD = DC
$\Delta ADB \cong \Delta ADC$
$\Rightarrow \angle ABD = \angle ACD = 60°$
$\therefore \angle ACB = 60°$
Hence, ΔABC is an equilateral triangle

32. (1)

$\angle A = \angle B = \angle C = 60°$

BC = AB = AC = $\sqrt{13}$ cm

BD = 2 cm
In ΔABD,
$AB^2 = BD^2 + AD^2$

$\Rightarrow \left(\sqrt{13}\right)^2 = (2)^2 + AD^2$

$\Rightarrow AD^2 = 13 - 4 = 9$

$\Rightarrow AD = \sqrt{9} = 3$ cm

33. (3) The sum of supplementary angles is 180°.
$\therefore 2x + 3x = 180$

$\Rightarrow 5x = 180 \Rightarrow x = \frac{180}{5} = 36$

$\therefore 2x = 2 \times 36 = 72°$
and, $3x = 3 \times 36 = 108°$

34. (1) Sum of three angles of triangle = 180°
$\angle A = 2x°$
$\angle B = 3x°$
$\angle C = x°$
$\Rightarrow 2x° + 3x° + x° = 180°$
$\Rightarrow 6x° = 180°$

$\Rightarrow x = \frac{180}{6} = 30$

$\therefore \angle A = 2 \times 30° = 60°$
$\angle B = 3x = 3 \times 30 = 90°$
$\angle C = x = 30°$

35. (2)

AB = Height of tree = h metre
AC = Required height
= y metre
BC = CD = Broken part of tree
= $(h - y)$ metre
$\therefore$ In ΔACD,
$AC^2 + AD^2 = CD^2$
$\Rightarrow y^2 + x^2 = (h - y)^2$
$\Rightarrow y^2 + x^2 = h^2 + y^2 - 2hy$
$\Rightarrow x^2 = h^2 - 2hy$
$\Rightarrow 2hy = h^2 - x^2$

$\Rightarrow y = \dfrac{h^2 - x^2}{2h}$ metre

36. (2)

AB = 7 metre CD = 12 metre
$\therefore$ CE = CD – DE
= 12 – 7 = 5 metre
$\therefore$ From ΔAEC,

$AC = \sqrt{AE^2 + EC^2}$

$= \sqrt{12^2 + 5^2} = \sqrt{144 + 25}$

$= \sqrt{169} = 13$ metre

37. (3) Let the required angle be $x°$.
According to the question,
$180 - x = 3(90 - x)$
$\Rightarrow 180 - x = 270 - 3x$
$\Rightarrow 3x - x = 270 - 180$

$\Rightarrow 2x = 90 \Rightarrow x = \dfrac{90}{2} = 45°$

38. (1) Supplementary angles
$= x$ and $180° - x$ (let)
According to the question,
$180° - x - x = 44°$
$\Rightarrow 180° - 2x = 44°$
$\Rightarrow 2x = 180° - 44° = 136°$

$\Rightarrow x = \dfrac{136°}{2} = 68°$

39. (1)

D and E are midpoints of BC and AC respectively.
$\therefore$ DE || BA $\Rightarrow$ DE || BF,
FE || BD
DF is the diagonal of parallelogram BDEF.
$\therefore$ Area of ΔBDF = Area of ΔDEF
Similarly
DE is the diagonal of parallelogram DCEF.
$\therefore$ Area of ΔDCE = Area of ΔDEF
$\therefore \Delta BDF = \Delta DCE = \Delta AFE$
$= \Delta DEF$
$\therefore$ On adding
$4 \times \Delta DEF = \Delta ABC$
Parallelogram BDEF

$= 2 \times \Delta DEF = \dfrac{1}{2} \times \Delta ABC$

Quadrilateral CAFD = $\Delta ABC - \Delta BDF$

$= \Delta ABC - \dfrac{1}{4} \Delta BDF$

$= \dfrac{3}{4} \times \Delta ABC$

$\therefore$ Required ratio

$= \dfrac{1}{2} \times \Delta ABC : \dfrac{3}{4} \Delta ABC = 2 : 3$

40. (1) Angles of ΔABC,
$\because \angle A + \angle B + \angle C = 180°$
A : B : C = 3 : 4 : 5

$\therefore \angle A = \dfrac{3}{12} \times 180° = 45°$

$\angle B = \dfrac{4}{12} \times 180° = 60°$

$\angle C = \dfrac{5}{12} \times 180° = 75°$

41. (1) Let the required angle be $x°$.
According to the question,

$90 - x = \dfrac{1}{4}(180 - x)$

$\Rightarrow 360 - 4x = 180 - x$
$\Rightarrow 4x - x = 360 - 180$
$\Rightarrow 3x = 180 \Rightarrow x = 60°$

42. (2) The opposite angles of a parallelogram are equal.
$2x + 7x + 2x + 7x = 360°$
$\Rightarrow 18x = 360°$
$\Rightarrow x = 20°$
$\therefore$ One angle = $2x$
$= 2 \times 20 = 40°$
Second angle = $7x$
$= 7 \times 20 = 140°$
$\therefore 140 + 40° = 180°$

43. (1) Sum of two supplementary angles = 180°
$\therefore 5y + 62° + 22° + y = 180°$
$\Rightarrow 6y + 84° = 180°$
$\Rightarrow 6y = 180° - 84° = 96°$

$\therefore y = \dfrac{96}{6} = 16°$

44. (2)

Each triangle is equilateral.
$\therefore \angle P + \angle R + \angle T$
$= 2(60 + 60 + 60°)$
$= 2 \times 180° = 360°$

45. (4)

PR + RQ = PQ
Hence, P, Q and R are collinear.
Hence, no circle will pass through these three points.

❑❑❑

TEST YOURSELF

1. PQRS is a rhombus in which $\angle SPQ = 64°$. Equilateral triangles PXQ and QYR are drawn outside the rhombus on sides PQ and QR. Calculate the magnitude of the angle $\angle QXY$.

(1) 26° (2) 28°
(3) 30° (4) 45°

2. ABC is a right angled triangle with a right angle at A. Points D, E are the middle points of AB and AC respectively. Which of the following relations is correct ?

(1) $3(BE^2 + CD^2) = 4\,BC^2$
(2) $4(BE^2 + CD^2) = 5\,BC^2$
(3) $4(BE^2 + CD^2) = 3\,BC^2$
(4) None of these

3. A triangle ABC is inscribed in a circle and the bisectors of the angles A, B and C meet the circumference at P, Q and R respectively. The angles of the triangle PQR respectively are

(1) $90° - \frac{A}{2}, 90° + \frac{A}{2}, 90° + \frac{C}{2}$
(2) $90° + \frac{A}{2}, 90° - \frac{B}{2}, 90° - C$
(3) $90° - \frac{A}{2}, 90° - \frac{B}{2}, 90° - \frac{C}{2}$
(4) None of these

4. PQRS is a cyclic quadrilateral. The bisectors of the angles $\angle P$ and $\angle R$ meet the circle ABCD at A and B respectively. If the radius of the circle be r units, then AB = ?

(1) r (2) $2r$
(3) $\frac{2}{3}r$ (4) $\frac{3}{2}r$

5. Two chords AB and CD of a circle with centre O intersect at point P within the circle.
$\angle AOC + \angle BOD = ?$

(1) $\angle APC$ (2) $2\angle APC$
(3) $\frac{3}{2}\angle APC$ (4) None of these

6. If the ratio of numer of sides of two regular polygons be 2 : 3 and the ratio of their interior angles be 6 : 7, find the number of sides of the two polygons.

(1) 6 and 7 (2) 8 and 9
(3) 6 and 9 (4) 6 and 8

7. In Δ ABC, AB = 6 cms, BC = 10 cms, AC = 8cm and AD $\perp$ BC. Find the value of the ratio of BD : DC.

(1) 3 : 4 (2) 9 : 16
(3) 4 : 5 (4) 16 : 25

8. In Δ ABC, a line parallel to BC intersects AB and AC at D and E. If AE = 3 AD, find the ratio BD : EC.

(1) 1 : 3 (2) 1 : 2
(3) 2 : 3 (4) 3 : 2

9. The angles of a triangle are in the ratio of 1 : 2 : 3. What will be the radian measure of the largest angle of the triangle ?

(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{3}$
(3) $\frac{\pi}{4}$ (4) $\frac{2\pi}{3}$

10. If the internal bisectors of angles $\angle ABC$ and $\angle ACB$ of ΔABC intersect at point O, then $\angle BOC = ?$

(1) $90° - \frac{\angle A}{2}$ (2) $90° + \frac{\angle A}{2}$
(3) $180 - \frac{\angle A}{2}$ (4) $90° - \angle A$

11. In any triangle PQR, PS is the internal bisector of $\angle QPR$ and PT $\perp$ QR then $\angle TPS = ?$

(1) $\angle Q - \angle R$ (2) $\frac{1}{2}(\angle Q + \angle R)$
(3) $\frac{1}{2}(\angle Q - \angle R)$ (4) $\angle Q + \angle R$

12. In any triangle ABC the internal bisector of $\angle ABC$ and the external bisector of other base angle meet at point E. Then $\angle BEC = ?$

(1) $\angle A$ (2) $2\angle A$
(3) $\frac{1}{2}\angle A$ (4) $\frac{1}{2}\angle B$

13. ΔABC is an isosceles triangle in which AB = AC. Side BA is extended to D such that AB = AD. What will be the value of $\angle BCD$?

(1) 90° (2) 60°
(3) 30° (4) 45°

14. In any triangle ABC, AD, BE and CF are medians. What is the relation between the perimeter of triangle and sum of all three medians ?

(1) AB + BC + AC < AD + BE + CF
(2) AB + BC + AC > AD + BE + CF
(3) AB + BC + AC $\leq$ AD + BE + CF
(4) AB + BC + AC $\geq$ AD + BE + CF

15. Two circles whose radii are 10 cm and 8 cm, intersect each other and their common chord is 12 cm long. What is the distance between their centres ?

(1) 11.27 cm (2) 12.29 cm
(3) 12.27 cm (4) 13.29 cm

16. In the following figure, $\angle ABC = 69°$, $\angle ACB = 31°$ then $\angle BDC = ?$

(1) 80° (2) 60°
(3) 65° (4) 75°

17. In the following figure, AB is the diameter of circle and CD is a chord equal to the radius. AC and BD when extended meet at E. $\angle AEB = ?$

(1) 30° (2) 60°
(3) 45° (4) 90°

18. ABC is a right angled triangle in which $\angle C = 90°$. If BC = a, AB = c, CA = b and the length of perpendicular from C to AB be p, then,

$$\frac{1}{a^2} + \frac{1}{b^2} = ?$$

(1) $\frac{1}{p}$ (2) $\frac{2}{p^2}$
(3) $\frac{1}{p^2}$ (4) None of these

19. The centre of a circle of radius 5 cm is 'O'. T is an external point where OT = 13 cm and OT intersects the circle at point E. AB is a tangent at point E. What is the length of AB ?

(1) $\frac{10}{3}$ cm (2) $\frac{20}{3}$ cm

(3) $\frac{40}{3}$ cm (4) $\frac{16}{3}$ cm

SHORT ANSWERS

1. (2)	**2.** (2)	**3.** (3)	**4.** (2)
5. (2)	**6.** (3)	**7.** (2)	**8.** (1)
9. (1)	**10.** (2)	**11.** (3)	**12.** (3)
13. (1)	**14.** (2)	**15.** (4)	**16.** (1)
17. (2)	**18.** (3)	**19.** (2)	

EXPLANATIONS

1. (2)

$\angle SPQ = 64°$

$\angle PQR = 180° - 64° = 116°$

Each angle of equilateral triangle is 60°.

$\therefore \angle XQY = 360° - 116° - 60° - 60° = 124°$

$\therefore \angle QXY = \frac{180°-124°}{2} = \frac{56°}{2} = 28°$

2. (2)

Using Pythagoras theoren.

$BE^2 = AE^2 + AB^2$

$CD^2 = AC^2 + AD^2$

$\therefore BE^2 + CD^2 = AE^2 + AD^2 + AB^2 + AC^2$

$= \left(\frac{AC}{2}\right)^2 + \left(\frac{AB}{2}\right)^2 + AB^2 + AC^2$

$= \frac{AC^2}{4} + \frac{AB^2}{4} + AB^2 + AC^2$

$\Rightarrow 4(BE^2 + CD^2) = 5(AB^2 + AC^2)$
$= 5BC^2$

3. (3)

$\angle BQP = \angle BAP$

$\angle BQP = \frac{\angle A}{2}$

$\angle BQR = \angle BCR$

$\angle BQR = \frac{1}{2}\angle C$

$\therefore \angle PQR = \frac{1}{2}(\angle A + \angle C)$

$= \frac{1}{2}(180° - \angle B) = 90° - \frac{\angle B}{2}$

$\angle APR = \angle ACR$

$\Rightarrow \angle APR = \frac{1}{2}\angle C$

Also, $\angle APR = \angle ABQ$

$\Rightarrow \angle APR = \frac{1}{2}\angle B$

$\therefore \angle APQ + \angle APR = \frac{1}{2}(\angle B + \angle C)$

$\Rightarrow \angle QPR = \frac{1}{2}(180 - \angle A) = 90° - \frac{\angle A}{2}$

Similarly,

$\angle QRP = 90° - \frac{\angle C}{2}$

4. (2)

PQRS is a cyclic quadrilateral.

$\angle P + \angle R = 180°$

$\Rightarrow \frac{1}{2}\angle P + \frac{1}{2}\angle R = 90°$

$\Rightarrow \angle APS + \angle BRS = 90°$ ....(i)

But $\angle BRS$ and $\angle BPS$ are angles in the same segment with chord BS.

$\therefore \angle BRS = \angle BPS$ .....(ii)

$\therefore \angle APS + \angle BPS = 90°$

$\Rightarrow \angle APB = 90°$

$\therefore$ AB is the diameter.

5. (2)

Arc AC subtends $\angle AOC$ at the centre.

$\angle AOC = 2\angle ABC$

Similarly, $\angle BOD = 2\angle BCD$

On adding, $\angle AOC + \angle BOD$

$= 2(\angle ABC + \angle BCD) = 2\angle APC$

[$\because \angle APC$ is the exterior angle]

6. (3) Each interior angle of a regular polygon of n sides

$= \left(\frac{2n-4}{n}\right)$ right angles

Let the number of sides be $2x$ and $3x$ respectively.

$\therefore \frac{\frac{2\times 2x - 4}{2x}}{\frac{2\times 3x - 4}{3x}} = \frac{6}{7}$

$\Rightarrow \frac{(4x-4)3}{2(6x-4)} = \frac{6}{7}$

$\Rightarrow \frac{4x-4}{12x-8} = \frac{2}{7}$

$\Rightarrow \frac{x-1}{3x-2} = \frac{2}{7}$

$\Rightarrow 7x - 7 = 6x - 4$

$\Rightarrow x = 7 - 4 = 3$

$\therefore$ Number of sides = 6 and 9.

7. (2)

$6^2 + 8^2 = 10^2$

$\therefore$ Δ ABC is a right angled triangle.

$\Delta ABC = \frac{1}{2} \times \text{Base} \times \text{Height}$

$\therefore \frac{1}{2} \times AB \times BC = \frac{1}{2} BC \times AD$

$\Rightarrow 6 \times 8 = 10 \times AD$

$\Rightarrow AD = \frac{24}{5}$ cm

Let BD = x cm.

From Δ ABD,

$BD = \sqrt{6^2 - \left(\frac{24}{5}\right)^2}$

$= \sqrt{36 - \frac{576}{25}} = \sqrt{\frac{900-576}{25}}$

$= \sqrt{\frac{324}{25}} = \frac{18}{5}$ cm

$\therefore CD = 10 - \frac{18}{5} = \frac{32}{5}$

$\therefore BD : CD = \frac{18}{5} : \frac{32}{5} = 9 : 16$

8. (1)

In Δ ADE and Δ ABC,

$\angle D = \angle B$; $\angle E = \angle C$

$\angle A = \angle A$

$\therefore$ Both triangles are similar.

$\therefore \frac{AD}{AB} = \frac{AE}{AC}$

$\Rightarrow \frac{AB}{AD} = \frac{AC}{AE}$

$\Rightarrow \frac{AB}{AD} - 1 = \frac{AC}{AE} - 1$

$\Rightarrow \frac{BD}{AD} = \frac{EC}{AE}$

$\Rightarrow \frac{BD}{EC} = \frac{AD}{AE} = \frac{1}{3}$

9. (1) Sum of all angles of a traingle = 180°

$\therefore$ Sum of ratios

$= 1 + 2 + 3 = 6$

$\therefore$ Largest angle $= \frac{3}{6} \times 180°$

$= 90°$

$\because$ 180° = π radian

$\therefore 90° = \frac{\pi}{180} \times 90 = \frac{\pi}{2}$ radian

10. (2)

In ΔBOC,

$\angle 1 + \angle 2 + \angle BOC = 180°$ ...(i)

In ΔABC,

$\angle A + \angle B + \angle C = 180°$

$\Rightarrow \angle A + 2\angle 1 + 2\angle 2 = 180°$

$\Rightarrow \frac{\angle A}{2} + \angle 1 + \angle 2 = 90°$

$\Rightarrow \angle 1 + \angle 2 = 90° - \frac{\angle A}{2}$

From equation (i)

$90° - \frac{\angle A}{2} + \angle BOC = 180°$

$\Rightarrow \angle BOC = 180° - 90° + \frac{\angle A}{2}$

$= 90° + \frac{\angle A}{2}$

11. (3)

PS, is bisector of $\angle$QPR.

$\therefore \angle QPS = \angle SPR$ .....(i)

In ΔPQT,

$\angle PQT + \angle PTQ + \angle QPT = 180°$

$\Rightarrow \angle PQT + 90° + \angle QPT = 180°$

$\Rightarrow \angle PQT + \angle QPT = 90°$

$\Rightarrow \angle PQT = 90° - \angle QPT$

$\Rightarrow \angle Q = 90° - \angle QPT$ .....(ii)

In ΔPTR,

$\angle PRT + \angle TPR + \angle PTR = 180°$

$\Rightarrow \angle PRT + \angle TPR + 90° = 180°$

$\Rightarrow \angle PRT + \angle TPR = 90°$

$\Rightarrow \angle PRT = 90° - \angle TPR$ ....(iii)

By equation (ii) – (iii),

$\angle Q - \angle R = (90° - \angle QPT) - (90° - \angle TPR)$

$\Rightarrow \angle Q - \angle R = \angle TPR - \angle QPT$

$\Rightarrow \angle Q - \angle R = (\angle TPS + \angle SPR) - (\angle QPS - \angle TPS)$

$\Rightarrow \angle Q - \angle R = 2\angle TPS$

$\Rightarrow \angle TPS = \frac{1}{2}(\angle Q - \angle R)$

12. (3)

Exterior $\angle ACD = \angle A + \angle B$

$\Rightarrow \frac{1}{2}\angle ACD = \frac{1}{2}\angle A + \frac{1}{2}\angle B$

$\Rightarrow \angle 2 = \angle 1 + \frac{1}{2}\angle A$ (i)

In ΔBCE,

$\angle ECD = \angle 1 + \angle E$

$\Rightarrow \angle 2 = \angle 1 + \angle E$ (ii)

From equations (i) and (ii),

$\angle 1 + \frac{1}{2}\angle A = \angle 1 + \angle E$

$\Rightarrow \frac{1}{2}\angle A = \angle E$

$\Rightarrow \angle E = \frac{1}{2}\angle A$.

13. (1)

In ΔABC,

AB = AC

$\Rightarrow \angle ACB = \angle ABC$ ..... (i)

Now, AB = AD

$\therefore$ AD = AC

In ΔADC,

AD = AC $\Rightarrow \angle ACD = \angle ADC$ ....(ii)

By equations (i) + (ii),

$\angle ACB + \angle ACD = \angle ABC + \angle ADC$

$\Rightarrow \angle BCD = \angle ABC + \angle BDC$

$\Rightarrow \angle BCD + \angle BCD$

$= \angle ABC + \angle BDC + \angle BCD$

$\Rightarrow 2\angle BCD = 180°$

$\Rightarrow \angle BCD = 90°$

14. (2)

We know that the sum of any two sides of a triangle is greater than twice the median bisecting the third side.

AD is the median on BC.

$\therefore$ AB + AC > 2AD

Similarly,

AB + BC > 2BE

BC + AC > 2CF

On adding

AB + AC + AB + BC + BC + AC > 2AD + 2BE + 2CF

$\Rightarrow$ 2 (AB + BC + AC) > 2 (AD + BE + CF)

$\Rightarrow$ AB+BC+AC > AD + BE + CF

15. (4)

OP = 10 cm, O'P = 8 cm and PQ = 12 cm ; PL = $\frac{1}{2}$ PQ = 6 cm

In right angled Δ OLP,

OL = $\sqrt{OP^2 - LP^2}$

= $\sqrt{10^2 - 6^2}$

= $\sqrt{64}$ = 8 cm

In ΔO'LP,

O' P^2 = O'L^2 + LP^2

$\Rightarrow$ O'L = $\sqrt{O'P^2 - LP^2}$

= $\sqrt{8^2 - 6^2}$ = $\sqrt{28}$ = 5.29 cm

$\therefore$ OO' = OL + LO' = 8 + 5.29 = 13.29 cm

16. (1)

In ΔABC,

$\angle$BAC + $\angle$ABC + $\angle$ACB = 180°

$\Rightarrow$ $\angle$BAC + 69° + 31° = 180°

$\Rightarrow$ $\angle$ BAC = 180° – 100° = 80°

Since angles in the same segment are equal.

$\therefore$ $\angle$BDC = 80°

17. (2)

In Δ OCD,

OC = OD = CD

$\therefore$ Δ OCD is an equilateral triangle.

$\therefore$ $\angle$COD = 60°

Now, $\angle$CBD = $\frac{1}{2}\angle$COD

$\Rightarrow$ $\angle$CBD = 30°

$\angle$ACB is angle of semi-circle.

$\therefore$ $\angle$ACB = 90°

$\Rightarrow$ $\angle$ BCE = 180° – $\angle$ACB = 180° – 90° = 90°

In ΔBCE,

$\angle$BCE = 90°,

$\angle$CBE = $\angle$CBD = 30°

$\therefore$ $\angle$BCE + $\angle$CBE + $\angle$CEB = 180°

$\Rightarrow$ 90° + 30° + $\angle$CEB = 180°

$\Rightarrow$ $\angle$CEB = 180° – 120° = 60°

$\Rightarrow$ $\angle$ AEB = 60°

18. (3)

Area of Δ ABC = $\frac{1}{2}$ × AB × CD = $\frac{1}{2}cp$

Area of Δ ABC = $\frac{1}{2}$ × BC × AC = $\frac{1}{2}ab$

$\therefore$ $\frac{1}{2}cp = \frac{1}{2}ab$

$\Rightarrow$ $cp = ab$ .... (i)

Again, $AB^2 = BC^2 + AC^2$

$\Rightarrow$ $c^2 = a^2 + b^2$

$\Rightarrow$ $\left(\frac{ab}{p}\right)^2 = a^2 + b^2$

[From equation (i)]

$\Rightarrow$ $\frac{a^2b^2}{p^2} = a^2 + b^2$

$\Rightarrow$ $\frac{1}{p^2} = \frac{a^2+b^2}{a^2b^2}$

$= \frac{1}{b^2} + \frac{1}{a^2}$

19. (2)

$\angle$OPT = 90°

In ΔOPT,

$OT^2 = OP^2 + PT^2$

$\Rightarrow$ $13^2 = 5^2 + PT^2$

$\Rightarrow$ $PT^2 = 169 - 25 = 144$

$\Rightarrow$ PT = $\sqrt{144}$ = 12 cm.

Tangents drawn from an external point on a circle are equal.

$\therefore$ AP = AE = x (let)

$\Rightarrow$ AT = PT – AP = (12 – x) cm

OE $\perp$ AB

$\Rightarrow$ $\angle$OEA = 90°

$\Rightarrow$ $\angle$ AET = 90°

$\therefore$ $AT^2 = AE^2 + ET^2$

$\Rightarrow$ $(12-x)^2 = x^2 + (13-5)^2$

$\Rightarrow$ $144 - 24x + x^2 = x^2 + 64$

$\Rightarrow$ $24x = 80$

$\Rightarrow$ $x = \frac{80}{24} = \frac{10}{3}$ cm

Similarly, BE = $\frac{10}{3}$ cm

$\therefore$ AB = AE + BE = $\frac{20}{3}$ cm

20 MENSURATION

PERIMETER & AREA (2-DIMENSIONAL PLANE FIGURE)

The area of any figure is the planar space occupied by it or the amount of surface (space) enclosed within its boundary lines. It is measured by the number of square metres or square centimetres or square inches (or some other units of square measure) that it contains. Hence, its units are accordingly square metre, square centimetre, square inch, square foot, etc.

Perimeter : Perimeter of a geometrical figure is the total length of the sides enclosing the figure or the total length of its boundary.

Triangle : A triangle is a plane figure bounded by three sides.

It includes three angles. It is denoted by the symbol Δ.

General Convention : (*i*) Nomenclature of vertices or sides are usually done in clock-wise manner.

(*ii*) The side opposite to the vertex *A* is '*a*', the side opposite to the vertex *B* is '*b*' and so on.

(*iii*) Angle *A* (or angle *BAC*) is denoted by $\angle A$ (or $\angle ABC$) and is the angle at vertex *A* enclosed by sides *b* and *c*. It is opposite to side *a*. Similarly, we can write $\angle B$ and $\angle C$. The sum of the three interior angles of a triangle is equal to 180°. Thus, $\angle A + \angle B + \angle C = 180°$

Important Formula based on triangles

Rule 1 : Area of a triangle = $\frac{1}{2}$ base × height

(a) $A = \frac{1}{2} bh$.

(b) $b = \frac{2A}{h} = \sqrt{2A\left(\frac{b}{h}\right)}$

(c) $h = \frac{2A}{b} = \sqrt{\left(\frac{2A}{b/h}\right)}$

Rule 2 : $A = \sqrt{S(S-a)(S-b)(S-c)}$

Rule 3 : $P = a + b + c = 2S$

Rule 4 : Right angled triangle : A

$= \frac{1}{2}$ base × perpendicular

Rule 5 : Isosceles triangle : $A = \frac{1}{4} b\sqrt{\left(4a^2 - b^2\right)}$

where a = equal side

Rule 6 : Equilateral triangle : h

$= \frac{\sqrt{3}}{2} a$; $A = \frac{\sqrt{3}}{4} a^2 = 0.433\, a^2$

Rule 7 : Right isosceles triangle A

$= \frac{1}{2} b^2 = \frac{1}{4}$ (hypotenuse)^2

Quadrilateral : It is a plane figure bounded by four sides. It has four angles included in it. The sum of these four angles is 360°.

So, $\angle A + \angle B + \angle C + \angle D = 360°$

Important Formulae based on various quadrilaterals

Rule 8 :

Quadrilateral :

(a) $P = a + b + c + d$

$S = \frac{P}{2} = \frac{a+b+c+d}{2}$

(b) $A = \sqrt{S(S-a)(S-b)(S-c)(S-d)}$

(c) $A = \sqrt{4(d_1 d_2)^2 - \left(b^2 + d^2 - a^2 - c^2\right)}$ where d_1 and d_2 are diagonals.

Rule 9 :

Rectangle : A geometrical figure having opposite sides are equal and parallel. Also the angle between adjacent sides is 90°.

(a) $A = lb,\ l = \frac{A}{b},\ b = \frac{A}{l}$

(b) $P = 2(l + b) = 2b\left(\frac{l}{b} + 1\right) = 2l\left(1 + \frac{b}{l}\right)$

(c) If $\frac{l}{b} = n$, then $A = nb^2 : b = \sqrt{\frac{A}{n}}$ and $l = \sqrt{nA}$

Rule 10 :

Square : A geometrical figure having all sides equal and the angle between adjacent sides is 90°.

(a) $A = a^2 = \frac{(\text{diagonal})^2}{2}$

(b) $P = 4a$

(c) $P = 4\sqrt{A}$

(d) $A = \frac{P^2}{16}$

Rule 11 :

Parallelogram : A geometrical figure having opposite sides are equal and parallel.

$A = lh$

$P = 2(l + b)$

Rule 12 :

Rhombus : A geometrical figure having all sides equal.

$A = \frac{1}{2}(d_1 \times d_2)$

$P = 4l$

Side, $l = \frac{1}{2}\sqrt{d_1^2 + d_2^2}$

Rule 13 :

Trapezium : A geomatrical figure having any pair of sides are parallel and unequal

$A = \frac{1}{2}(a + b)h$

$P = a + b + c + d$

Circle : A circle is the locus of points such that their distance from a fixed point is always equal. The fixed point (O) is called the centre of the circle and the distance (r = OA) between the fixed point (O) and the moving point (A) is called the radius of the circle.

Rule 14:

Circle :

$D = 2r$ $\qquad A = \pi r^2 = \frac{\pi D^2}{4}$

$r = \sqrt{\frac{A}{\pi}}$ $\qquad$ $P = 2\pi r = \pi D$

$A = \frac{p^2}{4\pi}$ $\qquad$ $P = \sqrt{4\pi A}$

Semi Circle :

$A = \frac{\pi r^2}{2}$ $\qquad$ $P = \pi r + 2r = \frac{36}{7} r$

Rule 15 :

Length of arc

$= \left(\frac{\theta°}{360°}\right) \times 2\pi r = \theta$ (in radian) $\times$ r

Rule 16 :

θ (in degree) $= \left(\frac{\theta°}{180°}\right) \pi$ radian

Rule 17:

Area of sector $= \left(\frac{\theta°}{360°}\right) \pi r^2 = \frac{r}{2}$ (Length of arc)

Incircle or Inscribed Circle: It is the circle in side the polygon whose all the sides are tangent to the circle.

For an equilateral triangle of side 'a'. radius of the inscribed circle $= \frac{a}{2\sqrt{3}}$. This is called in-radius.

Circumcircle : It is the circle whose circumference touches all the vertices of the polygon.

Equilateral Triangle: It is a triangle whose all the three sides are equal. It can be proved that its all three angles are also equal, each being 60°.

Rule 18:

For an equilateral triangle :

(a) In-radius $= \frac{a}{2\sqrt{3}}$; Area of incircle $= \frac{\pi}{12} a^2$

(b) Circum radius $= \frac{a}{\sqrt{3}}$;

Area of circum circle $= \frac{\pi}{3} a^2$

Rule 19:

For a rectangular room (or box)

Area of the floor = lb

Area of 4 walls (or faces) = $2h\,(l + b)$

Area of 4 walls and floor = $2h\,(l + b) + lb$

Area of 4 walls, floor and roof = $2[h(l + b) + lb]$

Rule 20:

Area of a regular polygon

$= \frac{1}{2} \times$ (number of sides) $\times$ (radius of inscribed circle)

Rule 21:

Area of a regular hexagon $= \frac{3\sqrt{3}}{2}$ (side)^2

$= 2.598$ (side)^2

Rule 22:

Area of a regular octagon $= 2\left(\sqrt{2} + 1\right)$ (side)^2

$= 4.828$ (side)^2

Regular Polygon	No. of sides	Area (S = side of the polygon)
Triangle (Equilateral)	3	0.433 S^2
Square	4	1.000 S^2
Pentagon	5	1.720 S^2
Hexagon	6	2.598 S^2
Septagon	7	3.634 S^2
Octagon	8	4.828 S^2
Nonagon	9	6.182 S^2
Decagon	10	7.694 S^2

For a regular polygon of n equal sides, its vertex angle θ is given by

$$\theta = \frac{(n-2)\times 180}{n}$$

Rule 23:

Cyclic Quadrilateral: It is a quadrilateral whose vertices lie on the circumference of the circle.

$$A = \sqrt{S(S-a)(S-b)(S-c)(S-d)}$$

where, $S = \frac{a+b+c+d}{2}$

and $\angle A + \angle B + \angle C + \angle D = 2 \times 180°$

or, $\angle A + \angle B + \angle C + \angle D = 360°$

Important rules

Rule 1:

Cost of carpeting the floor

$$= \text{Rate of carpet per metre} \times \frac{\text{Area of the floor}}{\text{Width of carpet}}$$

Rule 2:

Least number of equal square tiles required for flooring

$$= \frac{\text{Length} \times \text{Breadth of the room}}{\text{HCF of length and breadth of the room}}$$

Rule 3:

(a) When a path of width 'w' is constructed around a rectangular garden of length 'L' and breadth 'B'.

Area of the path = 2w [L + B ± 2w]

Sign convention: (+) when path surrounds the garden/park on its outside

Rule 4:

When the paths, each of width 'w' are constructed on the outside as well as inside the garden.

Area of the path = $4w$[L + B]

Rule 5:

When cross paths each of width 'w' is constructed across the field,

Total area of the path = w(L + B – w)

Uncovered area of the field = (L – w) (B – w)

Rule 6:

Area of the path of width w around square of side 'S' on its outside = $4w$ (S + w) ...(A)

Area of the path of width w around square of side 'S' on its inside = $4w$ (S – w) ...(B)

Total area of the path of width w around square of side 'S' both on its outside and inside = 8 Sw ...(C)

Total area of paths each of width w crossing each other at right angle inside square of side 'S' = w(2S –w) ...(D)

Area of remaining portion of square of side 'S' in which two paths each of width w cross at right angle inside it = $(S - w)^2$ ...(E)

Rule 7:

Distance covered by a moving wheel of radius 'r' (or diameter D)

= $2\pi r$ × No. of revolutions = πD × No. of revolutions

Rule 8:

A circular garden of radius 'r' has a path of width 'w' around it. Then Area of the path = πw ($2r \pm w$)

Sign convention: (+) when path is outside the garden (–) when path is inside the garden.

Rule 9:

A circular garden of radius r has paths around it, outside as well as inside, each of width 'w'. Then

Total area of the path = $4\pi\ wr$

Rule 10:

When Length and breadth of a rectangle are changed by x% and y% respectively, the net% change in its area

$$= \left[x + y + \frac{xy}{100}\right]\% = \left(\frac{-x^2}{100}\right)\% \text{ when } x = -y$$

Sign convention: + for increase, – for decrease

Note: Put '0' for no change.

Rule 11:

If there is no change in area, then

$$y = \left(\frac{-100x}{100+x}\right)\% \text{ and } x = \left(\frac{-100y}{100+y}\right)\%$$

Rule 12:

When each of the sides of a triangle or any polygon including square, rectangle etc. or radius of a circle is increased by x%, then

$$\% \text{ change in area} = x\left(2 + \frac{x}{100}\right)\%$$

% change in perimeter = x%

In case of quadrilateral,

% change in diagonal = x%

Sign convention : + for increase, – for decrease.

SURFACE AREAS AND VOLUMES (3-DIMENSOINAL FIGURE)

Every real object occupies some space. It is usually specified by its three dimensions—length, breadth and depth (or height or thickness). The object may be solid or hollow. In case of circular, cylindrical and spherical object, the specifying dimensions change to radius, angle etc. The amount of space occupied by the object is called its **volume**. In case of hollow objects such as tank, bucket, bottle etc, the amount of liquid required to fill it is called its **capacity** or volume of the object. Its unit of measurement is m^3, cm^3, $(\text{inches})^3$ etc. The area of the surfaces (plane/curved) of the object is called its surface area. It can be outer/external surface area or inner/internal surface area. If it is not clearly specified, surface area means outer surface area.

A 2-dimensional figure is a special case or a limiting case of a 3-dimensional object in which its third dimension i.e., depth (or thickness) is negligible in comparison to its other two dimensions i.e., length and breadth.

We illustrate below some important 3-dimensional objects and also write formulae associated with them,

In general we will use l = length, b = breadth, h = height, w = width, r = radius, D = diameter, P = perimeter, A = area, V = volume.

Cuboid

It is made up of 6 rectangular faces. All sides/edges/faces meet at right angle. Pair of opposite faces are equal.

Rule 1:

(a) Volume : V = lbh cubic units

(b) Total Surface Area : A = 2 ($lb + bh + lh$) square units

(c) Face diagonals : AC = BD = GE = FH = $\sqrt{l^2 + h^2}$

(d) DF = CE = AG = BH = $\sqrt{b^2 + h^2}$

(e) AE = DH = BF = CG = $\sqrt{l^2 + b^2}$

(f) Body diagonal or diagonal of the cuboid :

AF = BE = DG = CH = $\sqrt{l^2 + b^2 + h^2}$

Rule 2:

(a) Volume = a^3 cubic units

(b) Total Surface Area = $6a^2$ sq. units

(c) Volume = $\left(\sqrt{\frac{\text{Surface Area}}{6}}\right)^3$ or, $\left[\sqrt{\frac{S}{6}}\right]^3$

(d) Face diagonal = $\sqrt{2}\,a$

(c) Body diagonal or Diagonal of the cube = $\sqrt{3}$ a

Rule 3:

(a) Volume = $\pi r^2 h$ cubic units

(b) Area of the curved surface = $2\pi rh$ sq. units

(c) Area of the base = Area of the top = πr^2 sq. units

(d) Total surface area = $(2\pi rh + 2\pi r^2)$sq. units

= $2\pi r\,(h + r)$ sq. units

Rule 4:

(a) Volume = $\frac{4}{3}\pi r^3$ cu. units

(b) Surface area = $4\pi r^2$ sq. units

(c) $\frac{A^3}{V^2} = 36\pi$

Rule 5:

(a) Volume = $\frac{2}{3}\pi r^3$ cu. units

(b) Area of the curved surface = $2\pi r^2$ sq. units

(c) Total surface Area = $3\pi r^2$ sq. units

Rule 6:

l = slant height, h = height, r = radius

(a) $l = \sqrt{r^2 + h^2}$

(b) $V = \frac{1}{3}\pi r^2 h$ cu. units

(c) Area of the curved surface = πrl

$= \pi r\sqrt{r^2 + h^2}$ sp. units

(d) Area of the base = πr^2 sq. units

(e) Total surface area of the cone = $(\pi rl + \pi r^2) = \pi r(l + r)$ sq. units

Rule 7:

(a) $s = \sqrt{h^2 + (R - r)^2}$

(b) $V = \frac{\pi h}{3}(R^2 + r^2 + Rr)$ cu. units.

(c) Area of the curved or slant surface = $\pi(R + r)\, s$ sq. units

(d) Total surface area of the frustum = $\pi[(R^2 + r^2) + s(R + r)]$ sq. units

Rule 8:

Volume of material of a cylindrical tube,

(a) $V = \pi L(r_\circ^2 - r_i^2)$

(b) $V = \pi L\,(r_\circ + r_i)\,(r_\circ - r)$

(c) $V = \pi L\,(r_\circ + r_t)$

(d) $V = \pi L\,(2r_i + t)t$

(e) $V = \pi L\,(2r_\circ - t)t$

Rule 1:

(a) When rectangular sheet is rolled along its length (L) to form a cylinder of height/length W, then the volume of the cylinder so formed is given by, $V = \frac{WL^2}{4\pi}$

(b) When it is rolled along its width (W). $V = \frac{LW^2}{4\pi}$

Rule 2:

A well of radius r_i is dug to a depth 'h'. The earth dug out is spread uniformly around the well to form an embankment of width 'w'. Then the height of the embankment so formed is given by, $H = \frac{r_i^2 h}{(2r_i + t)t}$

Rule 3:

(a) If the length, breadth and height of a cuboid (or cube) are changed by x%, y% and z% respectively, then the % change in its volume

$$= \left[x + y + z + \frac{xy + yz + zx}{100} + \frac{xyz}{(100)^2}\right]\%$$

Sign convention : (+ve) for increase, (–ve) for decrease

(b) When $x = y = z$ i.e; % change is equal in all the sides, then the % change

$$= \left[3x + \frac{3x^2}{(100)} + \frac{x^3}{(100)^2}\right]\% = \left[\left(1 + \frac{x}{100}\right)^3 - 1\right] \times 100\%$$

Note: This is applicable for sphere, hemisphere, cube, cylinder and cone too.

Rule 4:

Cylinder In case of Cylinder

(a) If x : % change in radius

y : % change in height/length

Then, % change in volume

$$= \left[2x + y + \frac{x^2 + 2xy}{100} + \frac{x^2 y}{(100)^3}\right]\%$$

Note: This can also be obtained from formula (12) by putting $x = z$

(b) When $y = 0$, % change in volume = $\left[2x + \frac{x^2}{100}\right]\%$

(c) When $x = 0$, % change in volume = y%

Note: These are also applicable to cones.

Rule 5:

(Ratio based)

Sphere, Hemisphere, Cube (side : r)

(i) (a) $V \propto r^3$ (b) $A \propto r^2$ (c) $V^2 \propto A^3$

or, $V \propto (A)^{3/2}$

or, $A \propto (V)^{2/3}$

Cylinder $V \propto r^2 h$, $A \propto rh$

(ii) When h : constant :

(a) $V \propto r^2$ (b) $A \propto r$ (c) $V \propto A^2$

(iii) When r : constant :

(a) $V \propto h$ (b) $A \propto h$ (c) $V \propto A$

(iv) When V : constant :

(a) $h \propto \frac{1}{r^2}$ (b) $A \propto (rh)$

$r \propto \frac{1}{\sqrt{h}}$ $A \propto \frac{1}{r}$

$A \propto \frac{1}{h}$

(v) When A : constant :

(a) $r \propto \frac{1}{h}$ (b) $V \propto r$, $v \propto \frac{1}{h}$

Cones

V, A, r, h ratios remain same as for cylinders.

Further,

(vi) $A \propto$ slant height (l)

$l \propto \frac{1}{r}$, $r \propto \frac{1}{l}$

Rule 6:

(a) If a sphere of radius R is melted to form smaller spheres of radius 'r'. No. of smaller spheres formed

$= \left(\frac{R}{r}\right)^3$

(b) If n small spheres of radius 'r' are melted to form a big sphere of radius 'R', then $R = r\sqrt[3]{n}$

PRISM AND PYRAMID

Importance : Question based on Prism & Pyramid are seldom asked, however these questions are very easy to be solved.

Scope of questions : Questions are related to surface area, volume, length of cloth for wrapping/covering, or based on spherical shape.

Way to success : For these shapes formulae and methods for getting areas and volumes are very useful.

Pyramid :

Rule 1. Volume = $\frac{1}{3}$ × (base area) × height

Rule 2. Lateral surface (Triangular) area

= $\frac{1}{2}$ × (Perimeter of base) × (lateral height).

Rule 3. Lateral height = $\sqrt{\left(\frac{a}{2}\right)^2 + h^2}$

Where base of rectangle/square/triangle = a and h is the height.

Tetrahedron : A pyramid with regular triangular base is tetrahedron. It is bounded by four regular triangular faces.

Rule 4. ∴ Area of (all three) lateral faces

$$= \frac{3\sqrt{3}}{4} \times (\text{side})^2$$

Rule 5. Total surface area (of all four faces)

$$= \frac{4\sqrt{3}}{4} \times (\text{side})^2 = \sqrt{3} \times (\text{side})^2$$

Rule 6. Height = $\frac{\sqrt{2}}{\sqrt{3}} \times (\text{side})$

Rule 7. Volume = $\frac{\sqrt{2}}{12} \times (\text{side})^3$

Rule 8.

Prism

base triangle base square rectangle or base hexagon

∴ Volume =(base area) × height

Lateral surface area = (perimeter of base) × slant height.

Total surface area = (Perimeter of base × height) + 2 × area of base

Frustrum :

Rule 9.

Volume = $\frac{1}{3}\pi h\left(R^2 + r^2 + Rr\right)$ or $\frac{1}{3}\pi h\left[(R+r)^2 - Rr\right]$

Rule 10. Lateral height (l) = $\sqrt{h^2 + (R-r)^2}$

Rule 11. Area of lateral surface = $\pi(R + r)l$

Rule 12. Area of total surface

$= \pi\{(R + r)l + R^2 + r^2\}$

Rule 13. Total surface area of bucket

$= \pi\{(R + r)l + r^2\}$

Rule 14. When a figure is made moving a right angle Δ with the hypotenuse around.

$$\text{Volume} = \frac{1}{3}\pi r^2 \times \text{hypotenuse}$$

$$\text{where } r = \frac{\text{base} \times \text{perpendicular}}{\text{hypotenuse}}$$

2D GEOMETRY FORMULAE

SQUARE

s = side Area: $A = s^2$ Perimeter: $P = 4s$

RECTANGLE

l = length, w = width
Area : $A = lw$
Perimeter : $P = 2l + 2w$

TRIANGLE

b = base, h = height

Area : $A = \frac{1}{2}bh$

Perimeter : $P = a + b + c$

EQUILATERAL TRIANGLE

s = side

Height: $h = \frac{\sqrt{3}}{2}s$

Area : $A = \frac{\sqrt{3}}{4}s^2$

PARALLELOGRAM

b = base, h = height, a = side
Area : $A = bh$
Perimeter : $P = 2a + 2b$

TRAPEZIUM

a, b = bases; h = height; c, d = sides

Area: $A = \frac{1}{2}(a + b)h$

Perimeter : $P = a + b + c + d$

CIRCLE

r = radius, d = diameter
Diameter : $d = 2r$
Area: $A = \pi r^2$
Circumference : $C = 2\pi r = \pi d$

SECTOR OF CIRCLE

r = radius, θ = angle in radians

Area : $A = \frac{1}{2}\pi r^2$

Arc Length : $s = \theta r$

ELLIPSE

a = semimajor axis
b = semiminor axis
Area : $A = \pi ab$
Circumference :

$$C \approx \pi\left(3(a+b) - \sqrt{(a+3b)(b+3a)}\right)$$

ANNULUS

r = inner radius, R = outer radius

Average Radius : $\rho = \frac{1}{2}(r + R)$

Width : $w = R - r$
Area : $A = \pi(R^2 - r^2)$ or $A = 2\,p\pi\rho w$

REGULAR POLYGON

s = side length, n = number of sides

Circumradius: $R = \frac{1}{2} s \cos\left(\frac{\pi}{n}\right)$

Area : $A = \frac{1}{4} n s^2 \cot\left(\frac{\pi}{n}\right)$

or $A = \frac{1}{2} n R^2 \sin\left(\frac{2\pi}{n}\right)$

3D GEOMETRY FORMULAE

CUBE

s = side

Volume: $V = s^3$

Surface Area: $S = 6s^2$

RECTANGULAR SOLID

l = length, w = width,

h = height

Volume : $V = lwh$

Surface Area :

$S = 2lw + 2lh + 2wh$

SPHERE

r = radius

Volume: $V = \frac{4}{3} \pi r^3$

Surface Area : $S = 4\pi r^2$

RIGHT CIRCULAR CYLINDER

r = radius, h = height

Volume: $V = \pi r^2 h$

Surface Area:

$S = 2\pi rh + 2\pi r^2$

TORUS

r = tube radius,

R = torus radius

Volume: $V = 2\pi^2 r^2 R$

Surface Area : $S = 4\pi^2 rR$

PYRAMID

A = area of base, h = height

Volume: $V = \frac{1}{3} Ah$

RIGHT CIRCULAR CONE

r = radius, h = height

Volume: $V = \frac{1}{3} \pi r^2 h$

Surface Area :

$S = \pi r\sqrt{r^2 + h^2} + \pi r^2$

FRUSTUM OF A CONE

r = top radius,

R = base radius,

h = height,

s = slant height

Volume: $V = \frac{\pi}{3}\left(r^2 + rR + R^2\right)h$

Surface Area : $S = \pi s(R + r) + \pi r^2 + \pi R^2$

SQUARE PYRAMID

s = side, h = height

Volume : $V = \frac{1}{3} s^2 h$

Surface Area : $S = s(s + \sqrt{s^2 + 4h^2})$

REGULAR TETRAHEDRON

s = side

Volume : $V = \frac{1}{12}\sqrt{2s^3}$

Surface Area: $S = \sqrt{3s^2}$

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE -I

1. If the length of the diagonal AC of a square ABCD is 5.2 cm, then the area of the square is :

(1) 15.12 sq.cm
(2) 13.52 sq.cm
(3) 12.62 sq.cm
(4) 10.00 sq.cm.

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The length of the diagonal of a square is 'a' cm. Which of the following represents the area of the square (in sq. cm.) ?

(1) 2a (2) $\frac{a}{\sqrt{2}}$
(3) $a^2/2$ (4) $a^2/4$

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. The diagonal of a square is $4\sqrt{2}$ cm. The diagonal of another square whose area is double that of the first square is :

(1) $8\sqrt{2}$ cm (2) 16 cm
(3) $\sqrt{32}$ cm (4) 8 cm

(SSC CGL Prelim Exam. 24.02.2002 & 13.11.2005 (IInd Sitting)

4. The diagonal of a square A is $(a+b)$. The diagonal of a square whose area is twice the area of square A, is

(1) $2(a+b)$ (2) $2(a+b)^2$
(3) $\sqrt{2}(a+b)$ (4) $\sqrt{2}(a-b)$

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

5. The difference of the areas of two squares drawn on two line segments of different lengths is 32 sq.cm. Find the length of the greater line segment if one is longer than the other by 2 cm.

(1) 7 cm (2) 9 cm
(3) 11 cm (4) 16 cm

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

6. If the diagonals of two squares are in the ratio of 2 : 5, their area will be in the ratio of

(1) $\sqrt{2} : \sqrt{5}$ (2) 2 : 5
(3) 4 : 25 (4) 4 : 5

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

7. The perimeter of five squares are 24 cm, 32 cm, 40 cm, 76 cm and 80 cm respectively. The perimeter of another square equal in area to sum of the areas of these squares is :

(1) 31 cm (2) 62 cm
(3) 124 cm (4) 961 cm

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

8. The ratio of the area of a square to that of the square drawn on its diagonal is :

(1) 1 : 1 (2) 1 : 2
(3) 1 : 3 (4) 1 : 4

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

9. From four corners of a square sheet of side 4 cm, four pieces, each in the shape of arc of a circle with radius 2 cm, are cut out. The area of the remaining portion is :

(1) $(8-\pi)$ sq.cm.
(2) $(16-4\pi)$ sq.cm.
(3) $(16-8\pi)$ sq.cm.
(4) $(4-2\pi)$sq.cm.

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

10. The length of diagonal of a square is $15\sqrt{2}$ cm. Its area is

(1) 112.5 cm^2 (2) 450 cm^2
(3) $\frac{225\sqrt{2}}{2}$ cm^2 (4) 225 cm^2

11. A kite in the shape of a square with a diagonal 32 cm attached to an equilateral triangle of the base 8 cm. Approximately how much paper has been used to make it? (Use $\sqrt{3}$ = 1.732)

(1) 539.712 cm^2
(2) 538.721 cm^2
(3) 540.712 cm^2
(4) 539.217 cm^2

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

12. The breadth of a rectangular hall is three-fourth of its length. If the area of the floor is 768 sq. m., then the difference between the length and breadth of the hall is:

(1) 8 metres (2) 12 metres
(3) 24 metres (4) 32 metres

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

13. The length of a plot is five times its breadth. A playground measuring 245 square metres occupies half of the total area of the plot. What is the length of the plot?

(1) $35\sqrt{2}$ metres (2) $175\sqrt{2}$ metres
(3) 490 metres (4) $5\sqrt{2}$ metres

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

14. The length of a rectangular garden is 12 metres and its breadth is 5 metres. Find the length of the diagonal of a square garden having the same area as that of the rectangular garden :

(1) $2\sqrt{30}$ m (2) $\sqrt{13}$ m
(3) 13 m (4) $8\sqrt{15}$ m

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

15. A circular wire of diameter 42 cm is folded in the shape of a rectangle whose sides are in the ratio 6 : 5 . Find the area enclosed by the rectangle. (Take $\pi = \frac{22}{7}$)

(1) 540 cm^2 (2) 1080 cm^2
(3) 2160 cm^2 (4) 4320 cm^2

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting)

16. A took 15 sec. to cross a rectangular field diagonally walking at the rate of 52 m/min. and B took the same time to cross the same field along its sides walking at the rate of 68 m/min. The area of the field is :

(1) 30 m^2 (2) 40 m^2
(3) 50 m^2 (4) 60 m^2

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

17. The difference between the length and breadth of a rectangle is 23 m. If its perimeter is 206 m, then its area is

(1) 1520 m^2 (2) 2420 m^2
(3) 2480 m^2 (4) 2520 m^2

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

18. There is a rectangular tank of length 180 m and breadth 120 m in a circular field. If the area of the land portion of the field is 40000 m^2, what is the radius of the field ? (Take $\pi = \frac{22}{7}$)

(1) 130 m (2) 135 m
(3) 140 m (4) 145 m

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

19. The length of a rectangular hall is 5m more than its breadth. The area of the hall is 750m^2. The length of the hall is :

(1) 15 m (2) 22.5 m
(3) 25 m (4) 30 m

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

20. If the length and breadth of a rectangle are in the ratio 3 : 2 and its perimeter is 20 cm, then the area of the rectangle (in cm^2) is :

(1) 24 (2) 48
(3) 72 (4) 96

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

21. A path of uniform width runs round the inside of a rectangular field 38 m long and 32 m wide. If the path occupies 600m^2, then the width of the path is

(1) 30 m (2) 5 m
(3) 18.75 m (4) 10 m

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

22. The length and breadth of a rectangle are increased by 20% and 25% respectively. The increase in the area of the resulting rectangle will be :

(1) 60% (2) 50%
(3) 40% (4) 30%

(SSC CHSL DEO & LDC Exam. 27.11.2010)

23. The length of a room floor exceeds its breadth by 20 m. The area of the floor remains unaltered when the length is decreased by 10 m but the breadth is increased by 5 m. The area of the floor (in square metres) is :

(1) 280 (2) 325
(3) 300 (4) 420

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

24. A street of width 10 metres surrounds from outside a rectangular garden whose measurement is 200 m × 180 m. The area of the path (in square metres) is

(1) 8000 (2) 7000
(3) 7500 (4) 8200

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

25. In measuring the sides of a rectangle, there is an excess of 5% on one side and 2% deficit on the other. Then the error percent in the area is

(1) 3·3% (2) 3·0%
(3) 2·9% (4) 2·7%

(SSC Multi-Tasking (Non-Technical) Staff Exam. 22.02.2011)

26. A lawn is in the form of a rectangle having its breadth and length in the ratio 3 : 4. The area of the lawn is $\frac{1}{12}$ hectare. The breadth of the lawn is

(1) 25 metres (2) 50 metres
(3) 75 metres (4) 100 metres

(SSC Graduate Level Tier-II Exam. 29.09.2013

27. The area of a rectangle is thrice that of a square. The length of the rectangle is 20 cm and the breadth of the rectangle is $\frac{3}{2}$ times that of the side of the square. The side of the square, (in cm) is

(1) 10 (2) 20
(3) 30 (4) 60

(SSC Graduate Level Tier-II Exam. 29.09.2013

28. The length and breadth of a rectangular field are in the ratio 7 : 4. A path 4 m wide running all around outside has an area of 416 m^2 . The breadth (in m) of the field is

(1) 28 (2) 14
(3) 15 (4) 16

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

29. ABC is a triangle with base AB. D is a point on AB such that AB = 5 and DB = 3. What is the ratio of the area of ΔADC to the area of ΔABC ?

(1) 3/2 (2) 2/3
(3) 3/5 (4) 2/5

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

30. If the area of a triangle is 1176 cm^2 and base : corresponding altitude is 3 : 4, then the altitude of the triangle is :

(1) 42 cm (2) 52 cm
(3) 54 cm (4) 56 cm

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

31. The base of a triangle is 15 cm and height is 12 cm. The height of another triangle of double the area having the base 20 cm is :

(1) 9 cm (2) 18 cm
(3) 8 cm (4) 12.5 cm

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

32. The sides of a triangle are 3 cm, 4 cm and 5 cm. The area (in cm^2) of the triangle formed by joining the mid points of this triangle is :

(1) 6 (2) 3
(3) $\frac{3}{2}$ (4) $\frac{3}{4}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

33. If D and E are the mid-points of the side AB and AC respectively of the ΔABC in the figure given here, the shaded region of the triangle is what per cent of the whole triangular region?

(1) 50% (2) 25%
(3) 75% (4) 60%

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

34. The ratio of base of two triangles is $x : y$ and that of their areas is $a : b$. Then the ratio of their corresponding altitudes will be:

(1) $\frac{a}{x} : \frac{b}{y}$ (2) $ax : by$
(3) $ay : bx$ (4) $\frac{x}{a} : \frac{b}{y}$

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

35. The diagonal of a right angle isosceles triangle is 5 cm. Its area will be
(1) 5 sq.cm (2) 6.25 sq.cm
(3) 6.50 sq.cm (4) 12.5 sq.cm
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

36. In an isosceles triangle, the measure of each of equal sides is 10 cm and the angle between them is 45°. the area of the triangle is
(1) 25 cm^2 (2) $\frac{25}{2}\sqrt{2}$ cm^2
(3) $25\sqrt{2}$ cm^2 (4) $25\sqrt{3}$ cm^2
(SSC CPO S.I. Exam. 03.09.2006)

37. From a point in the interior of an equilateral triangle, the length of the perpendiculars to the three sides are 6 cm, 8 cm and 10 cm respectively. The area of the triangle is
(1) 48 cm^2 (2) $16\sqrt{3}$ cm^2
(3) $192\sqrt{3}$ cm^2 (4) 192 cm^2
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

38. The area of two equilateral triangles are in the ratio 25 : 36. Their altitudes will be in the ratio :
(1) 36 : 25 (2)25 : 36
(3) 5 : 6 (4) $\sqrt{5}:\sqrt{6}$
(SSC CPO S.I. Exam. 16.12.2007)

39. ABC is an equilateral triangle of side 2 cm. With A, B, C as centre and radius 1 cm three arcs are drawn. The area of the region within the triangle bounded by the three arcs is
(1) $\left(3\sqrt{3}-\frac{\pi}{2}\right)$ cm^2
(2) $\left(\sqrt{3}-\frac{3\pi}{2}\right)$ cm^2
(3) $\left(\sqrt{3}-\frac{\pi}{2}\right)$ cm^2
(4) $\left(\frac{\pi}{2}-\sqrt{3}\right)$ cm^2
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

40. The area of a right-angled isosceles triangle having hypotenuse $16\sqrt{2}$ cm is
(1) 144 cm^2 (2) 128 cm^2
(3) 112 cm^2 (4) 110 cm^2
(SSC (South Zone) Investigator Exam. 12.09.2010)

41. The sides of a triangle are in the ratio 2 : 3 : 4. The perimeter of the triangle is 18 cm. The area (in cm^2) of the triangle is
(1) 9 (2) 36
(3) $\sqrt{42}$ (4) $3\sqrt{15}$
(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

42. If the numerical value of the perimeter of an equilateral triangle is $\sqrt{3}$ times the area of it, then the length of each side of the triangle is
(1) 2 units (2) 3 units
(3) 4 units (4) 6 units
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

43. Each side of an equilateral triangle is 6 cm. Find its area.
(1) $9\sqrt{3}$ sq.cm. (2) $6\sqrt{3}$ sq.cm.
(3) $4\sqrt{3}$ sq.cm. (4) $8\sqrt{3}$ sq.cm.
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

44. If a triangle with base 8 cm has the same area as a circle with radius 8 cm, then the corresponding altitude (in cm) of the triangle is
(1) 12π (2) 20π
(3) 16π (4) 32π
(SSC Data Entry Operator Exam. 02.08.2009)

45. The measures (in cm) of sides of a right angled triangle are given by consecutive integers. Its area (in cm^2) is
(1) 9 (2) 8
(3) 5 (4) 6
(SSC Data Entry Operator Exam. 02.08.2009)

46. The area of an equilateral triangle is $4\sqrt{3}$ cm^2. The length of each side of the triangle is :
(1) 3 cm (2) $2\sqrt{2}$ cm
(3) $2\sqrt{3}$ cm (4) 4 cm
(SSC CHSL DEO & LDC Exam. 27.11.2010)

47. The length of three medians of a triangle are 9 cm, 12 cm and 15 cm. The area (in sq. cm) of the triangle is
(1) 24 (2) 72
(3) 48 (4) 144
(SSC Graduate Level Tier-II Exam.16.09.2012)

48. The area of the triangle formed by the straight line $3x + 2y = 6$ and the co-ordinate axes is
(1) 3 square units
(2) 6 square units
(3) 4 square units
(4) 8 square units
(SSC Graduate Level Tier-II Exam.16.09.2012)

49. The ratio of length of each equal side and the third side of an isosceles triangle is 3 : 4. If the area of the triangle is $18\sqrt{5}$ square units, the third side is
(1) 16 units (2) 5 $\sqrt{10}$ units
(3) 8 $\sqrt{2}$ units (4) 12 units
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

50. The ratio of sides of a triangle is 3 : 4 : 5. If area of the triangle is 72 square unit, then the length of the smallest side is :
(1) $4\sqrt{3}$ unit (2) $5\sqrt{3}$ unit
(3) $6\sqrt{3}$ unit (4) $3\sqrt{3}$ unit
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

51. If the length of each side of an equilateral triangle is increased by 2 unit, the area is found to be increased by $3 + \sqrt{3}$ square unit. The length of each side of the triangle is
(1) $\sqrt{3}$ unit (2) 3 unit
(3) $3\sqrt{3}$ unit (4) $1 + 3\sqrt{3}$ unit
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

52. What is the area of the triangle whose sides are 9cm, 10cm and 11cm?
(1) 30 cm^2 (2) 60cm^2
(3) 30 $\sqrt{2}$ cm^2 (4) 60 $\sqrt{2}$ cm^2
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

53. The area of an isosceles triangle is 4 square unit. If the length of the third side is 2 unit, the length of each equal side is
(1) 4 units (2) 2 $\sqrt{3}$ units
(3) $\sqrt{17}$ units (4) 3 $\sqrt{2}$ units
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

54. The ratio of sides of a triangle is 3:4:5 and area of the triangle is 72 square unit. Then the area of an equilateral triangle whose perimeter is same as that of the previous triangle is

(1) $32\sqrt{3}$ square units

(2) $48\sqrt{3}$ square units

(3) 96 square units

(4) $60\sqrt{3}$ square units

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

55. A right angled isosceles triangle is inscribed in a semi-circle of radius 7 cm. The area enclosed by the semi-circle but exterior to the triangle is

(1) 14 cm^2 (2) 28 cm^2

(3) 44 cm^2 (4) 68 cm^2

(SSC Delhi Police S.I. Exam. 19.08.2012)

56. What is the area of a triangle having perimeter 32cm, one side 11cm and difference of other two sides 5cm?

(1) $8\sqrt{30}$ cm^2 (2) $5\sqrt{35}$ cm^2

(3) $6\sqrt{30}$ cm^2 (4) $8\sqrt{2}$ cm^2

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

57. The area (in sq. unit) of the triangle formed in the first quadrant by the line $3x + 4y = 12$ is

(1) 8 (2) 12

(3) 6 (4) 4

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

58. The height of an equilateral triangle is 15 cm. The area of the triangle is

(1) $50\sqrt{3}$ sq. cm.

(2) $70\sqrt{3}$ sq. cm.

(3) $75\sqrt{3}$ sq. cm.

(4) $150\sqrt{3}$ sq. cm.

(SSC Graduate Level Tier-I Exam. 19.05.2013)

59. The area of an equilateral triangle is $9\sqrt{3}$ m^2. The length (in m) of the median is

(1) $2\sqrt{3}$ (2) $3\sqrt{3}$

(3) $3\sqrt{2}$ (4) $2\sqrt{2}$

(SSC Graduate Level Tier-II Exam. 29.09.2013

60. The sides of a triangle are 16 cm, 12 cm and 20 cm. Find the area.

(1) 64 cm^2 (2) 112 cm^2

(3) 96 cm^2 (4) 81 cm^2

(SSC CHSL DEO & LDC Exam. 20.10.2013)

61. 360 sq. cm and 250 sq. cm are the area of two similar triangles. If the length of one of the sides of the first triangle be 8 cm, then the length of the corresponding side of the second triangle is

(1) $6\frac{1}{5}$ cm (2) $6\frac{1}{3}$ cm

(3) $6\frac{2}{3}$ cm (4) 6 cm

(SSC CHSL DEO & LDC Exam. 20.10.2013)

62. The perimeter of an isosceles triangle is 544 cm and each of the equal sides is $\frac{5}{6}$ times the base. What is the area (in cm^2) of the triangle ?

(1) 38172 (2) 18372

(3) 31872 (4) 13872

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

63. The altitude drawn to the base of an isosceles triangle is 8 cm and its perimeter is 64 cm. The area (in cm^2) of the triangle is

(1) 240 (2) 180

(3) 360 (4) 120

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

64. The perimeter of a rhombus is 40 m and its height is 5 m. Its area is :

(1) 60 m^2 (2) 50 m^2

(3) 45 m^2 (4) 55m^2

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

65. The area of a field in the shape of a trapezium measures 1440 m^2. The perpendicular distance between its parallel sides is 24 m. If the ratio of the parallel sides is 5 : 3, the length of the longer parallel side is :

(1) 75 m (2) 45 m

(3) 120 m (4) 60 m

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

66. The area of a rhombus is 150 cm^2. The length of one of its diagonals is 10 cm. The length of the other diagonal is :

(1) 25 cm (2) 30 cm

(3) 35 cm (4) 40 cm

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

67. The perimeter of a rhombus is 100 cm. If one of its diagonals is 14 cm, then the area of the rhombus is

(1) 144 cm^2 (2) 225 cm^2

(3) 336 cm^2 (4) 400 cm^2

(SSC Data Entry Operator Exam. 31.08.2008)

68. If the measure of one side and one diagonal of a rhombus are 10 cm and 16 cm respectively, then its area (in cm^2) is :

(1) 60 (2) 64

(3) 96 (4) 100

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

69. The ratio of the length of the parallel sides of a trapezium is 3:2. The shortest distance between them is 15 cm. If the area of the trapezium is 450 cm^2, the sum of the length of the parallel sides is

(1) 15 cm (2) 36 cm

(3) 42 cm (4) 60 cm

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

70. A parallelogram has sides 15 cm and 7 cm long. The length of one of the diagonals is 20 cm. The area of the parallelogram is

(1) 42 cm^2 (2) 60 cm^2

(3) 84 cm^2 (4) 96 cm^2

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

71. Sides of a parallelogram are in the ratio 5 : 4. Its area is 1000 sq. units. Altitude on the greater side is 20 units. Altitude on the smaller side is

(1) 30 units (2) 25 units

(3) 10 units (4) 15 units

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

72. The perimeter of a rhombus is 40 cm and the measure of an angle is 60°, then the area of it is :

(1) 100 $\sqrt{3}$ cm^2 (2) 50 $\sqrt{3}$ cm^2

(3) 160 $\sqrt{3}$ cm^2 (4) 100 cm^2

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

73. The parallel sides of a trapezium are in a ratio 2 : 3 and their shortest distance is 12 cm. If the area of the trapezium is 480 sq. cm., the longer of the parallel sides is of length :
(1) 56 cm (2) 36 cm
(3) 42 cm (4) 48 cm
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

74. If the sum of the length, breadth and height of a rectangular parallelopiped is 24 cm and the length of its diagonal is 15 cm, then its total surface area is
(1) 256 cm^2 (2) 265 cm^2
(3) 315 cm^2 (4) 351 cm^2
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

75. The perimeter of a non-square rhombus is 20 cm. One of its diagonal is 8 cm. The area of the rhombus is
(1) 28 sq cm (2) 20 sq cm
(3) 22 sq cm (4) 24 sq cm
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

76. The perimeter of a rhombus is 100 cm and one of its diagonals is 40 cm. Its area (in cm^2) is
(1) 1200 (2) 1000
(3) 600 (4) 500
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

77. In • ABC, D and E are the points of sides AB and BC respectively such that DE || AC and AD : DB = 3 : 2. The ratio of area of trapezium ACED to that of Δ BED is
(1) 4 : 15 (2) 15 : 4
(3) 4 : 21 (4) 21 : 4
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

78. ABCD is a trapezium in which AB||DC and AB = 2 CD. The diagonals AC and BD meet at O. The ratio of area of triangles AOB and COD is
(1) 1 : 1 (2) $1:\sqrt{2}$
(3) 4 : 1 (4) 1 : 4
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

79. The length of each side of a rhombus is equal to the length of the side of a square whose diagonal is $40\sqrt{2}$ cm. If the length of the diagonals of the rhombus are in the ratio 3 : 4, then its area (in cm^2) is
(1) 1550 (2) 1600
(3) 1535 (4) 1536
(SSC CHSL DEO & LDC Exam. 10.11.2013 (IInd Sitting)

80. The area of a regular hexagon of side $2\sqrt{3}$ cm is :
(1) $18\sqrt{3}$ cm^2 (2) $12\sqrt{3}$ cm^2
(3) $36\sqrt{3}$ cm^2 (4) $27\sqrt{3}$ cm^2
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

81. Each side of a regular hexagon is 1 cm. The area of the hexagon is
(1) $\frac{3\sqrt{3}}{2}cm^2$ (2) $\frac{3\sqrt{3}}{4}cm^2$
(3) $4\sqrt{3}cm^2$ (4) $3\sqrt{2}cm^2$
(SSC CPO S.I. Exam. 05.09.2004)

82. An equilateral triangle of side 6 cm has its corners cut off to form a regular hexagon. Area (in cm^2) of this regular hexagon will be
(1) $3\sqrt{3}$ (2) $3\sqrt{6}$
(3) $6\sqrt{3}$ (4) $\frac{5\sqrt{3}}{2}$
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

83. The ratio of the area of a regular hexagon and an equilateral triangle having same perimeter is
(1) 2: 3 (2) 6: 1
(3) 3: 2 (4) 1: 6
(SSC MTS (Non-Technical Exam. 20.02.2011) & (SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

84. The area of a sector of a circle of radius 5 cm, formed by an arc of length 3.5 cm is :
(1) 8.5 cm^2 (2) 8.75 cm^2
(3) 7.75 cm^2 (4) 7.50 cm^2
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

85. The area (in sq. cm.) of the largest circle that can be drawn inside a square of side 28 cm, is :
(1) 17248 (2) 784
(3) 8624 (4) 616
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

86. If the circumference of a circle increases from 4π to 8π, what change occurs in its area?
(1) It doubles (2) It triples
(3) It quadruples (4) It is halved
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

87. The area of the ring between two concentric circles, whose circumference are 88 cm and 132 cm, is :
(1) 780 cm^2 (2) 770 cm^2
(3) 715 cm^2 (4) 660 cm^2
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

88. Three circles of radius 3.5 cm each are placed in such a way that each touches the other two. The area of the portion enclosed by the circles is
(1) 1.975 cm^2 (2) 1.967 cm^2
(3) 19.67 cm^2 (4) 21.21 cm^2
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

89. The area of a circular garden is 2464 sq.m. How much distance will have to be covered if you like to cross the garden along its diameter ? (Use $\pi = \frac{22}{7}$)
(1) 56 m (2) 48 m
(3) 28 m (4) 24 m
(SSC CPO S.I. Exam. 07.09.2003)

90. Four equal circles each of radius 'a' units touch one another. The area enclosed between them ($\pi = \frac{22}{7}$), in square units, is
(1) $3a^2$ (2) $\frac{6a^2}{7}$
(3) $\frac{41a^2}{7}$ (4) $\frac{a^2}{7}$
(SSC CPO S.I. Exam. 07.09.2003)

91. Three coins of the same size (radius 1 cm) are placed on a table such that each of them touches the other two. The area enclosed by the coins is
(1) $\left(\frac{\pi}{2} - \sqrt{3}\right)cm^2$
(2) $\left(\sqrt{3} - \frac{\pi}{2}\right)cm^2$
(3) $\left(2\sqrt{3} - \frac{\pi}{2}\right)cm^2$
(4) $\left(3\sqrt{3} - \frac{\pi}{2}\right)cm^2$
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

92. The area of the largest triangle, that can be inscribed in a semicircle of radius r cm, is
(1) $2r$ cm^2 (2) r^2 cm^2
(3) $2r^2$ cm^2 (4) $\frac{1}{2}r^2$ cm^2
(SSC CPO S.I. Exam. 05.09.2004)

93. The area of circle whose radius is 6 cm is trisected by two concentric circles. The radius of the smallest circle is
(1) $2\sqrt{3}$ cm (2) $2\sqrt{6}$ cm
(3) 2 cm (4) 3 cm
(SSC CPO S.I. Exam. 03.09.2006)

94. The area of the shaded region in the figure given below is

(1) $\frac{a^2}{2}\left(\frac{\pi}{2}-1\right)$ sq. units
(2) $a^2(\pi - 1)$ sq. units
(3) $a^2\left(\frac{\pi}{2}-1\right)$ sq. units
(4) $\frac{a^2}{2}(\pi - 1)$ sq. units
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

95. The area of a circle is increased by 22 cm its radius is increased by 1 cm. The original radius of the circle is
(1) 6 cm (2) 3.2 cm
(3) 3 cm (4) 3.5 cm
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

96. The radius of circle A is twice that of circle B and the radius of circle B is twice that of circle C. Their area will be in the ratio
(1) 16 : 4 : 1 (2) 4 : 2 : 1
(3) 1 : 2 : 4 (4) 1 : 4 : 16
(SSC CPO S.I. Exam. 06.09.2009)

97. The circumference of a circle is 11 cm and the angle of a sector of the circle is 60°. The area of the sector is (use $\pi = \frac{22}{7}$)
(1) $1\frac{29}{48}$ cm^2 (2) $2\frac{29}{48}$ cm^2
(3) $1\frac{27}{48}$ cm^2 (4) $2\frac{27}{48}$ cm^2
(SSC Data Entry Operator Exam. 31.08.2008)

98. A 7 m wide road runs outside around a circular park, whose circumference is 176 m. The area of the road is :
[use $\pi = \frac{22}{7}$]
(1) 1386 m^2 (2) 1472 m^2
(3) 1512 m^2 (4) 1760 m^2
(SSC CHSL DEO & LDC Exam. 27.11.2010)

99. The four equal circles of radius 4 cm drawn on the four corners of a square touch each other externally. Then the area of the portion between the square and the four sectors is
(1) 9 (π – 4) sq. cm.
(2) 16 (π – 4) sq. cm.
(3) 9 (4 – π) sq. cm.
(4) 16 (4 – π) sq.cm.
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

100. If the four equal circles of radius 3 cm touch each other externally, then the area of the region bounded by the four circles is
(1) 4(9 – π) sq.cm
(2) 9(4 – π) sq.cm
(3) 5(6 – π) sq.cm
(4) 6(5 – π) sq.cm
(SSCCHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

101. The area of a circle is increased by 22 cm^2 when its radius is increased by 1 cm. The original radius of the circle is
(1) 3 cm (2) 5 cm
(3) 7 cm (4) 9 cm
(SSC Graduate Level Tier-II Exam.16.09.2012)

102. The radii of two circles are 5cm and 12cm. The area of a third circle is equal to the sum of the area of the two circles. The radius of the third circle is :
(1) 13 cm (2) 21 cm
(3) 30 cm (4) 17 cm
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

103. The perimeter of a semicircular path is 36 m. Find the area of this semicircular path.
(1) 42sq.m (2) 54 sq. m
(3) 63 sq.m (4) 77 sq. m
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

104. The ratio between the area of two circles is 4 : 7. What will be the ratio of their radii?
(1) 2 : $\sqrt{7}$ (2) 4 : 7
(3) 16 : 49 (4) 4 : $\sqrt{7}$
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

105. Three circles of radius a, b, c touch each other externally. The area of the triangle formed by joining their centre is
(1) $\sqrt{(a+b+c)abc}$
(2) $(a+b+c)\sqrt{ab+bc+ca}$
(3) $ab + bc + ca$
(4) None of the above
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

106. The area of a circle is proportional to the square of its radius. A small circle of radius 3 cm is drawn within a larger circle of radius 5 cm. Find the ratio of the area of the annular zone to the area of the larger circle. (Area of the annular zone is the difference between the area of the larger circle and that of the smaller circle).
(1) 9 : 16 (2) 9 : 25
(3) 16 : 25 (4) 16 : 27
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

107. The diameter of two circles are the side of a square and the diagonal of the square. The ratio of the area of the smaller circle and the larger circle is
(1) 1 : 2 (2) 1 : 4
(3) $\sqrt{2}$: $\sqrt{3}$ (4) 1 : $\sqrt{2}$
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

108. Three circles of equal radius 'a' cm touch each other. The area of the shaded region is :

(1) $\left(\frac{\sqrt{3}+\pi}{2}\right)a^2$sq.cm

(2) $\left(\frac{6\sqrt{3}-\pi}{2}\right)a^2$sq.cm

(3) $\left(\sqrt{3}-\pi\right)a^2$sq.cm

(4) $\left(\frac{2\sqrt{3}-\pi}{2}\right)a^2$sq.cm

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

109. The radii of two circles are 10 cm and 24 cm. The radius of a circle whose area is the sum of the area of these two circles is

(1) 36 cm (2) 17 cm
(3) 34 cm (4) 26 cm

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

110. The area of the greatest circle inscribed inside a square of side 21 cm is (Take $\pi = \frac{22}{7}$)

(1) 344.5 cm^2 (2) 364.5 cm^2
(3) 346.5 cm^2 (4) 366.5 cm^2

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

111. The area of the greatest circle, which can be inscribed in a square whose perimeter is 120 cm, is :

(1) $\frac{22}{7}\times(15)^2$ cm^2

(2) $\frac{22}{7}\times\left(\frac{7}{2}\right)^2$ cm^2

(3) $\frac{22}{7}\times\left(\frac{15}{2}\right)^2$ cm^2

(4) $\frac{22}{7}\times\left(\frac{9}{2}\right)^2$ cm^2

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

112. The area of the incircle of an equilateral triangle of side 42 cm is $\left(\text{Take } \pi = \frac{22}{7}\right)$:

(1) 231 cm^2 (2) 462cm^2
(3) $22\sqrt{3}$ cm^2 (4) 924 cm^2

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

113. The ratio of the area of the in-circle and the circum-circle of a square is

(1) 1 : 2 (2) $\sqrt{2}$: 1
(3) 1 : $\sqrt{2}$ (4) 2: 1

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting, Delhi Zone)

114. The area of an equilateral triangle inscribed in a circle is $4\sqrt{3}$ cm^2. The area of the circle is

(1) $\frac{16}{3}\pi cm^2$ (2) $\frac{22}{3}\pi cm^2$
(3) $\frac{28}{3}\pi cm^2$ (4) $\frac{32}{3}\pi cm^2$

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (IInd Sitting) & (SSC SAS Exam. 26.06.2010 (Paper-I)

115. The area of the largest circle, that can be drawn inside a rectangle with sides 18 cm. by 14 cm, is

(1) 49 cm^2 (2) 154 cm^2
(3) 378 cm^2 (4) 1078 cm^2

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

116. A circle is inscribed in an equilateral triangle of side 8 cm. The area of the portion between the triangle and the circle is

(1) 11 cm^2 (2) 10.95 cm^2
(3) 10 cm^2 (4) 10.50 cm^2

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

117. If the difference between areas of the circumcircle and the incircle of an equilateral triangle is 44 cm^2, then the area of the triangle is $\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) 28 cm^2 (2) $7\sqrt{3}$ cm^2
(3) $14\sqrt{3}$ cm^2 (4) 21 cm^2

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

118. If the area of a circle inscribed in a square is 9π cm^2, then the area of the square is

(1) 24 cm^2 (2) 30 cm^2
(3) 36 cm^2 (4) 81 cm^2

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

119. The sides of a triangle are 6 cm, 8 cm and 10 cm. The area of the greatest square that can be inscribed in it, is

(1) 18 cm^2 (2) 15 cm^2
(3) $\frac{2304}{49}cm^2$ (4) $\frac{576}{50}cm^2$

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

120. The length of a side of an equilateral triangle is 8 cm. The area of the region lying between the circumference and the incircle of the triangle is (Use $\pi = \frac{22}{7}$)

(1) $50\frac{1}{7}$ cm^2 (2) $50\frac{2}{7}cm^2$
(3) $75\frac{1}{7}$ cm^2 (4) $75\frac{2}{7}$ cm^2

(SSC CPO S.I. Exam. 09.11.2008)

121. The length of each side of an equilateral triangle is $14\sqrt{3}$ cm. The area of the incircle (in cm^2), is

(1) 450 (2) 308
(3) 154 (4) 77

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 Paper-I)

122. The area of a circle inscribed in a square of area 2 m^2 is

(1) $\frac{\pi}{4}m^2$ (2) $\frac{\pi}{2}m^2$
(3) πm^2 (4) $2\pi m^2$

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

123. Length of the perpendiculars from a point in the interior of an equilateral triangle on its sides are 3 cm, 4 cm and 5 cm. Area of the triangle is

(1) 48 $\sqrt{3}$ cm^2 (2) 54 $\sqrt{3}$ cm^2
(3) 72 $\sqrt{3}$ cm^2 (4) 80 $\sqrt{3}$ cm^2

(SSC Data Entry Operator Exam. 02.08.2009)

124. The ratio of the areas of the circumcircle and the incircle of an equilateral triangle is
(1) 2 : 1 (2) 4 : 1
(3) 8 : 1 (4) 3 : 2
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

125. Area of the incircle of an equilateral triangle with side 6 cm is
(1) $\frac{\pi}{2}$ sq. cm. (2) $\sqrt{3}\,\pi$ sq. cm.
(3) 6π sq. cm. (4) 3π sq. cm.
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

126. The area of the square inscribed in a circle of radius 8 cm is
(1) 256 sq. cm (2) 250 sq. cm
(3) 128 sq. cm (4) 125 sq. cm
(SSC Graduate Level Tier-II Exam.16.09.2012)

127. A circle is inscribed in an equilateral triangle and a square is inscribed in that circle. The ratio of the areas of the triangle and the square is
(1) $\sqrt{3}$: 4 (2) $\sqrt{3}$: 8
(3) $3\sqrt{3}$: 2 (4) $3\sqrt{3}$: 1
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

128. The ratio of the area of an equilateral triangle and that of its circumcircle is
(1) $2\sqrt{3} : 2\pi$ (2) $4 : \pi$
(3) $3\sqrt{3} : 4\pi$ (4) $7\sqrt{2} : 2\pi$
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

129. Between a square of perimeter 44 cm and a circle of circumference 44 cm, which figure has larger area and by how much?
(1) Square, 33cm^2
(2) Circle, 33 cm^2
(3) Both have equal area.
(4) Square, 495 cm^2
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

130. The perimeter of a square and a circular field are the same. If the area of the circular field is 3850 sq metres,what is the area (in m^2) of the square?
(1) 4225 (2) 3025
(3) 2500 (4) 2025
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

131. The areas of a square and a rectangle are equal. The length of the rectangle is greater than the length of any side of the square by 5 cm and the breadth is less by 3 cm. Find the perimeter of the rectangle.
(1) 17 cm (2) 26 cm
(3) 30 cm (4) 34 cm
(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting))

132. If a wire is bent into the shape of a square, the area of the square is 81 sq. cm. When the wire is bent into a semicircular shape, the area of the semicircle (taking $\pi = \frac{22}{7}$) is :
(1) 154 cm^2 (2) 77 cm^2
(3) 44 cm^2 (4) 22 cm^2
(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CGL Tier-I Exam. 26.06.2011 (IInd Sitting)

133. The perimeter of a rectangle is 160 metre and the difference of two sides is 48 metre. Find the side of a square whose area is equal to the area of this rectangle.
(1) 32 m (2) 8 m
(3) 4 m (4) 16 m
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

134. If the area of a triangle with base 12 cm is equal to the area of a square with side 12 cm, the altitude of the triangle will be
(1) 12 cm (2) 24 cm
(3) 18 cm (4) 36 cm
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

135. The area (in m^2) of the square which has the same perimeter as a rectangle whose length is 48 m and is 3 times its breadth, is :
(1) 1000 (2) 1024
(3) 1600 (4) 1042
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

136. A square and an equilateral triangle are drawn on the same base. The ratio of their area is
(1) 2 : 1 (2) 1 : 1
(3) $\sqrt{3}$: 4 (4) 4 : $\sqrt{3}$
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

137. A wire, when bent in the form of a square, encloses a region having area 121 cm^2. If the same wire is bent into the form of a circle, then the area of the circle is $\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) 144 cm^2 (2) 180 cm^2
(3) 154 cm^2 (4) 176 cm^2
(SSC CGL Prelim Exam. 27.07.2008 (Ist Sitting) & (SSC HSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

138. A copper wire is bent in the form of an equilateral triangle and has area $121\sqrt{3}$ cm^2. If the same wire is bent into the form of a circle, the area (in cm^2) enclosed by the wire is (Take $\pi = \frac{22}{7}$)
(1) 364.5 (2) 693.5
(3) 346.5 (4) 639.5
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

139. A copper wire is bent in the shape of a square of area 81cm^2. If the same wire is bent in the form of a semicircle, the radius (in cm) of the semicircle is (Take $\pi = \frac{22}{7}$)
(1) 16 (2) 14
(3) 10 (4) 7
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

140. At each corner of a triangular field of sides 26 m, 28 m and 30 m, a cow is tethered by a rope of length 7 m. The area (in m^2) ungrazed by the cows is
(1) 336 (2) 259
(3) 154 (4) 77
(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

141. An equilateral triangle is drawn on the diagonal of a square. The ratio of the area of the triangle to that of the square is
(1) $\sqrt{3} : 2$ (2) $\sqrt{2} : \sqrt{3}$
(3) $2 : \sqrt{3}$ (4) $1 : \sqrt{2}$
(FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

142. A cow is tied on the corner of a rectangular field of size 30 m ×20 m by a 14m long rope. The area of the region, that she can graze, is (use $\pi = \frac{22}{7}$) :
(1) 350 m^2 (2) 196 m^2
(3) 154 m^2 (4) 22 m^2
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

143. A circle and a square have equal areas. The ratio of a side of the square and the radius of the circle is

(1) $1 : \sqrt{\pi}$ (2) $\sqrt{\pi} : 1$
(3) $1 : \pi$ (4) $\pi : 1$

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

144. If the perimeters of a rectangle and a square are equal and the ratio of two adjacent sides of the rectangle is 1 : 2 then the ratio of area of the rectangle and that of the square is

(1) 1 : 1 (2) 1 : 2
(3) 2 : 3 (4) 8 : 9

(SSC Graduate Level Tier-I Exam. 21.04.2013)

145. The perimeter of a triangle and an equilateral triangle are same. Also, one of the sides of the rectangle is equal to the side of the triangle. The ratio of the area of the rectangle and the triangle is

(1) $\sqrt{3} : 1$ (2) $1 : \sqrt{3}$
(3) $2 : \sqrt{3}$ (4) $4 : \sqrt{3}$

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

146. The radius of a circle is a side of a square. The ratio of the area of the circle and the square is

(1) $1 : \pi$ (2) $\pi : 1$
(3) $\pi : 2$ (4) $2 : \pi$

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

147. If the length of a rectangle is increased by 25% and the width is decreased by 20%, then the area of the rectangle :

(1) increases by 5%
(2) decreases by 5%
(3) remains unchanged
(4) increases by 10%

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

148. The length of a rectangle is decreased by 10% and its breadth is increased by 10%. By what per cent is its area changed ?

(1) 0% (2) 1%
(3) 5% (4) 100%

(SSC CGL Prelim Exam. 08.02.2004 (Ist Sitting) & (SSC CGL Tier-I Exam. 16.05.2010 (Ist Sitting)

149. The percentage increase in the area of a rectangle, if each of its sides is increased by 20%, is :

(1) 40% (2) 42%
(3) 44% (4) 46%

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

150. If the circumference of a circle is reduced by 50%, its area will be reduced by

(1) 12.5% (2) 25%
(3) 50% (4) 75%

(SSC CPO S.I. Exam. 05.09.2004)

151. If the side of a square is increased by 25%, then its area is increased by :

(1) 25% (2) 55%
(3) 40.5% (4) 56.25%

(SSC CPO S.I. Exam. 26.05.2005)

152. If the radius of a circle is increased by 50%, its area is increased by :

(1) 125% (2) 100%
(3) 75% (4) 50%

(SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting) & (SSC CGL Tier-I Exam. 26.06.2010 (IInd Sitting)

153. If the length of a rectangle is increased by 20% and its breadth is decreased by 20%, then its area

(1) increases by 4%
(2) decreases by 4%
(3) decreases by 1%
(4) remains unchanged

(SSC CPO S.I. Exam. 03.09.2006)

154. If each side of a rectangle is increased by 50%, its area will be increased by

(1) 50% (2) 125%
(3) 100% (4) 250%

(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting) & (SSC HSL DEO & LDC Exam. 28.11.2010)

155. If the altitude of a triangle is increased by 10% while its area remains same, its corresponding base will have to be decreased by

(1) 10 % (2) 9 %
(3) $9\frac{1}{11}\%$ (4) $11\frac{1}{9}\%$

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (IInd Sitting) & (SSC MTS Exam. 17.03.2013, Kolkata Region)

156. If the circumference of a circle is increased by 50% then the area will be increased by

(1) 50% (2) 75%
(3) 100% (4) 125%

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

157. The length and breadth of a rectangle are increased by 12% and 15% respectively. Its area will be increased by :

(1) $27\frac{1}{5}\%$ (2) $28\frac{4}{5}\%$
(3) 27% (4) 28%

(SSC CPO S.I. Exam. 16.12.2007)

158. Each side of a rectangular field is diminished by 40%. By how much per cent is the area of the field diminished ?

(1) 32% (2) 64%
(3) 25% (4) 16%

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

159. The length of rectangle is increased by 60%. By what percent would the breadth to be decreased to maintain the same area ?

(1) $37\frac{1}{2}\%$ (2) 60%
(3) 75% (4) 120%

(SSC CPO S.I. Exam. 06.09.2009) & (SSC MTS Exam. 17.03.2013, Kolkata Region)

160. If each side of a square is increased by 10%. its area will be increased by

(1) 10% (2) 21%
(3) 44% (4) 100%

(SSC CGL Tier-I Exam. 16.05.2010 (IInd Sitting) & (SSC SAS Exam. 26.06.2010 (Paper-I)

161. If the length of a rectangular plot of land is increased by 5% and the breadth is decreased by 10%, how much will its area increase or decrease ?

(1) 6.5% increase
(2) 5.5% decrease
(3) 5.5% increase
(4) 6.5% decrease

(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

162. The radius of a circle is increased by 1%. How much does the area of the circle increase ?

(1) 1% (2) 1.1%
(3) 2 % (4) 2.01%

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

163. In measuring the sides of a rectangle, there is an excess of 5% on one side and 2% deficit on the other. Then the error percent in the area is

(1) 3·3% (2) 3·0%
(3) 2·9% (4) 2·7%

(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

164. The length and breadth of a square are increased by 30% and 20% respectively. The area of the rectangle so formed exceeds the area of the square by

(1) 46% (2) 66%
(3) 42% (4) 56%

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

165. If each edge of a cube is increased by 40%, the percentage increase in its surface area is

(1) 40% (2) 60%
(3) 80% (4) 96%

(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

166. If the diameter of a circle is increased by 8%, then its area is increased by :

(1) 16.64% (2) 6.64%
(3) 16% (4) 16.46%

(SSC Multi-Tasking Staff Exam. 10.03.2013)

167. One side of a square is increased by 30%. To maintain the same area, the other side will have to be decreased by

(1) $23\frac{1}{13}\%$ (2) $76\frac{12}{13}\%$
(3) 30% (4) 15%

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting))

168. The length and breadth of a rectangle are doubled. Percentage increase in area is

(1) 150% (2) 200%
(3) 300% (4) 400%

(SSC CHSL DEO & LDC Exam. 20.10.2013)

169. ABC is an equilateral triangle. P and Q are two points on $\overline{AB}$ and $\overline{AC}$ respectively such that $\overline{PQ} \parallel \overline{BC}$. If $\overline{PQ}$ = 5 cm, then area of ΔAPQ is :

(1) $\frac{25}{4}$ sq. cm (2) $\frac{25}{\sqrt{3}}$ sq. cm
(3) $\frac{25\sqrt{3}}{4}$ sq. cm (4) $25\sqrt{3}$ sq. cm

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

170. If area of an equilateral triangle is a and height b, then value of $\frac{b^2}{a}$ is:

(1) 3 (2) $\frac{1}{3}$
(3) $\sqrt{3}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

171. ABC is an isosceles right angled triangle with ∠B = 90°. On the sides AC and AB, two equilateral triangles ACD and ABE have been constructed. The ratio of area of ΔABE and ΔACD is

(1) 1 : 3 (2) 2 : 3
(3) 1 : 2 (4) 1 : $\sqrt{2}$

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

172. Two triangles ABC and DEF are similar to each other in which AB = 10 cm, DE = 8 cm. Then the ratio of the area of triangles ABC and DEF is

(1) 4 : 5 (2) 25 : 16
(3) 64 : 125 (4) 4 : 7

(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

173. If ΔABC is similar to ΔDEF such that BC = 3 cm, EF = 4 cm and area of ΔABC = 54 cm^2, then the area of ΔDEF is :

(1) 66 cm^2 (2) 78 cm^2
(3) 96 cm^2 (4) 54 cm^2

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

174. The area of two similar triangles ABC and DEF are 20 cm^2 and 45 cm^2 respectively. If AB = 5 cm, then DE is equal to :

(1) 6.5 cm (2) 7.5 cm
(3) 8.5 cm (4) 5.5 cm

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

175. ABCD is a parallelogram. BC is produced to Q such that BC = CQ. Then

(1) area (Δ BCP) = area (Δ DPQ)
(2) area (Δ BCP) > area (Δ DPQ)
(3) area (Δ BCP) < area (Δ DPQ)
(4) area (Δ BCP) + area (Δ DPQ) = area (ΔBCD)

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

176. The ratio of the length of the parallel sides of a trapezium is 3:2. The shortest distance between them is 15 cm. If the area of the trapezium is 450 cm^2, the sum of the length of the parallel sides is

(1) 15 cm (2) 36 cm
(3) 42 cm (4) 60 cm

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

177. C_1 and C_2 are two concentric circles with centre at O. Their radii are 12 cm. and 3 cm. respectively. B and C are the point of contact of two tangents drawn to C_2 from a point A lying on the circle C_1. Then, the area of the quadrilateral ABOC is

(1) $\frac{9\sqrt{15}}{2}$ sq. cm.
(2) $12\sqrt{15}$ sq. cm.
(3) $9\sqrt{15}$ sq. cm.
(4) $6\sqrt{15}$ sq. cm.

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

178. From a point P which is at a distance of 13 cm from centre O of a circle of radius 5 cm, in the same plane, a pair of tangents PQ and PR are drawn to the circle. Area of quadrilateral PQOR is

(1) 65 cm^2 (2) 60 cm^2
(3) 30 cm^2 (4) 90 cm^2

(SSC Graduate Level Tier-I Exam. 21.04.2013)

179. In Δ ABC, O is the centroid and AD, BE, CF are three medians and the area of Δ AOE = 15 cm^2, then area of quadrilateral BDOF is

(1) 20 cm^2 (2) 30 cm^2
(3) 40 cm^2 (4) 25 cm^2

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

180. A straight line parallel to the base BC of the triangle ABC intersects AB and AC at the points D and E respectively. If the area of the ΔABE be 36 sq.cm, then the area of the ΔACD is

(1) 18 sq.cm (2) 36 sq.cm
(3) 18 cm (4) 36 cm

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

181. If in a Δ ABC, the medians CD and BE intersect each other at 0, then the ratio of the areas of Δ ODE and Δ ABC is

(1) 1 : 6 (2) 6 : 1
(3) 1 : 12 (4) 12 : 1

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

182. Three circles of radii 4 cm, 6 cm and 8 cm touch each other pairwise externally. The area of the triangle formed, by the line-segments joining-the centres of the three circles is

(1) $144\sqrt{13}$ sq. cm

(2) $12\sqrt{105}$ sq. cm

(3) $6\sqrt{6}$ sq. cm

(4) $24\sqrt{6}$ sq. cm

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

183. Two circles with centre A and B and radius 2 units touch each other externally at 'C'. A third circle with centre 'C' and radius '2' units meets other two at D and E. Then the area of the quadrilateral ABDE is

(1) $2\sqrt{2}$ sq. units

(2) $3\sqrt{3}$ sq. units

(3) $3\sqrt{2}$ sq. units

(4) $2\sqrt{3}$ sq. units

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

184. ABC is a right angled triangle, B being the right angle. Mid-points of BC and AC are respectively B′ and A′. The ratio of the area of the quadrilateral AA′ B′B to the area of the triangle ABC is

(1) 1 : 2 (2) 2 : 3

(3) 3 : 4

(4) None of the above

(SSC Graduate Level Tier-I Exam. 21.04.2013)

185. Two triangles ABC and PQR are congruent. If the area of Δ ABC is 60 sq. cm, then area of Δ PQR will be

(1) 60 sq.cm (2) 30 sq.cm

(3) 15 sq.cm (4) 120 sq.cm

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

186. In ΔPQR, the line drawn from the vertex P intersects QR at a point S. If QR = 4.5 cm and SR = 1.5 cm then the ratios of the area of triangle PQS and triangle PSR is

(1) 4 : 1 (2) 3 : 1

(3) 3 : 2 (4) 2 : 1

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

187. The difference between the radii of the bigger circle and smaller circle is 14 cm and the difference between their areas is 1056 cm^2. Radius of the smaller circle is

(1) 7 cm (2) 5 cm

(3) 9 cm (4) 3 cm

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

188. ABCD is parallelogram. P and Q are the mid-points of sides BC and CD respectively. If the area of Δ ABC is 12 cm^2, then the area of Δ APQ is

(1) 12 cm^2 (2) 8 cm^2

(3) 9 cm^2 (4) 10 cm^2

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

189. ABC is a right angled triangle. B being the right angle. Mid-points of BC and AC are respectiveely B′ and A′. Area of ΔA′B′C′ is

(1) $\frac{1}{2}$ × area of ΔABC

(2) $\frac{2}{3}$ × area of ΔABC

(3) $\frac{1}{4}$ × area of ΔABC

(4) $\frac{1}{8}$ × area of ΔABC

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

190. A wire of length 44 cm is first bent to form a circle and then rebent to form a square. The difference of the two enclosed areas is

(1) 44 cm^2 (2) 33 cm^2

(3) 55 cm^2 (4) 66 cm^2

(SSC CGL Tier-I Exam. 19.10.2014)

191. A parallelogram has sides 60 m and 40m and one of its diagonals is 80 m long. Its area is

(1) $500\sqrt{15}$ m^2

(2) $600\sqrt{15}$ m^2

(3) $400\sqrt{15}$ m^2

(4) $450\sqrt{15}$ m^2

(SSC CGL Tier-I Exam. 26.10.2014)

192. ∠ACB is an angle in the semicircle of diameter AB = 5 and AC : BC = 3 : 4. The area of the triangle ABC is

(1) $6\sqrt{2}$ sq. cm (2) 4 sq. cm

(3) 12 sq. cm (4) 6 sq. cm

(SSC CGL Tier-I Exam. 26.10.2014)

193. If the lengths of the sides AB, BC and CA of a triangle ABC are 10 cm, 8 cm and 6 cm respectively and if M is the mid - point of BC and MN || AB to cut AC at N, then the area of the trapezium ABMN is equal to

(1) 18 sq. cm. (2) 20 sq. cm.

(3) 12 sq. cm. (4) 16 sq. cm.

194. ABCD is a trapezium with AD and BC parallel sides. E is a point on BC. The ratio of the area of ABCD to that of AED is

(1) $\frac{\overline{AD}}{\overline{BC}}$ (2) $\frac{\overline{BE}}{\overline{EC}}$

(3) $\frac{\overline{AD}+\overline{BE}}{\overline{AD}+\overline{CE}}$ (4) $\frac{\overline{AD}+\overline{BC}}{\overline{AD}}$

(SSC CGL Tier-II Exam. 21.09.2014)

195. In an equilateral triangle of side 24 cm, a circle is inscribed touching its sides. The area of the remaining portion of the triangle is

$\left(\sqrt{3}=1.732\right)$

(1) 98.55 sq cm (2) 100 sq cm

(3) 101 sq cm (4) 95 sq cm

(SSC CGL Tier-II Exam. 21.0.2014)

196. Perimeter of a rhombus is 2p unit and sum of length of diagonals is *m* unit, then area of the rhombus is

(1) $\frac{1}{4}m^2p$ sq unit

(2) $\frac{1}{4}mp^2$ sq unit

(3) $\frac{1}{4}\left(m^2-p^2\right)$ sq unit

(4) $\frac{1}{4}\left(p^2-m^2\right)$ sq unit

(SSC CGL Tier-II Exam. 21.09.2014)

197. Two sides of a plot measuring 32 m and 24 m and the angle between them is a perfect right angle. The other two sides measure 25 m each and the other three angles are not right angles. The area of the plot in m^2 is

(1) 768 (2) 534

(3) 696.5 (4) 684

(SSC CGL Tier-II Exam. 21.09.2014)

198. a and b are two sides adjacent to the right angle of a right-angled triangle and p is the perpendicular drawn to the hypotenuse from the opposite vertex. Then p^2 is equal to

(1) $a^2 + b^2$ (2) $\frac{1}{a^2} + \frac{1}{b^2}$

(3) $\frac{a^2b^2}{a^2+b^2}$ (4) $a^2 - b^2$

(SSC CGL Tier-II Exam. 21.09.2014)

199. A is the centre of circle whose radius is 8 and B is the centre of a circle whose diameter is 8. If these two circles touch externally, then the area of the circle with diameter AB is

(1) 36 π (2) 64 π

(3) 144 π (4) 256 π

(SSC CGL Tier-II Exam. 21.09.2014)

200. The length of a rectangle is increased by 10% and breadth decreased by 10%. The area of the new rectangle is

(1) neither increased nor decreased

(2) increased by 1%

(3) decreased by 2%

(4) decreased by 1%

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

201. If the numerical values of the height and the area of an equilateral triangle be same, then the length of each side of the triangle is

(1) 2 units (2) 4 units

(3) 5 units (4) 8 units

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

202. If the length of a side of the square is equal to that of the diameter of a circle, then the ratio of the area of the square and that of the circle is

$\left(\pi = \frac{22}{7}\right)$

(1) 14 : 11 (2) 7 : 11

(3) 11 : 14 (4) 11 : 7

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

203. The median of an equilateral triangle is $6\sqrt{3}$ cm. The area (in cm^2) of the triangle is

(1) 72 (2) 108

(3) $72\sqrt{3}$ (4) $36\sqrt{3}$

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

204. If the numerical value of the circumference and area of a circle is same, then the area is

(1) 6 π sq. unit (2) 4 π sq. unit

(3) 8 π sq. unit (4) 12 π sq. unit

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

205. The area of an equilateral triangle is 48 sq. cm. The length of the side is

(1) $\sqrt{8} \times 4$ cm (2) $4\sqrt{3}$ cm

(3) 8 cm (4) 16 cm

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

206. Area of regular hexagon with side 'a' is

(1) $\frac{3\sqrt{3}}{4}a^2$ sq. unit

(2) $\frac{12}{2\sqrt{3}}a^2$ sq. unit

(3) $\frac{9}{2\sqrt{3}}a^2$ sq. unit

(4) $\frac{6}{\sqrt{2}}a^2$ sq. unit

(SSC CHSL DEO & LDC Exam. 9.11.2014)

207. The external fencing of a circular path around a circular plot of land is 33 m more than its interior fencing. The width of the path around the plot is

(1) 5.52 m (2) 5.25 m

(3) 2.55 m (4) 2.25 m

(SSC CHSL DEO & LDC Exam. 9.11.2014)

208. In Δ ABC, D and E are two points on the sides AB and AC respectively so that DE || BC and $\frac{AD}{BD} = \frac{2}{3}$. Then

$\frac{\text{the area of trapezium DECB}}{\text{the area of } \Delta ABC}$ is equal to

(1) $\frac{5}{9}$ (2) $\frac{21}{25}$

(3) $1\frac{4}{5}$ (4) $5\frac{1}{4}$

(SSC CHSL DEO & LDC Exam. 9.11.2014)

209. The sides of a rhombus are 10 cm each and a diagonal measures 16 cm. Area of the rhombus is

(1) 96 sq.cm (2) 160 sq.cm

(3) 100 sq. cm (4) 40 sq.cm

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

210. The perimeter of a triangle is 54 m and its sides are in the ratio of 5 : 6 : 7. The area of the triangle is

(1) 18 m^2 (2) $54\sqrt{6}$ m^2

(3) $27\sqrt{2}$ m^2 (4) 25 m^2

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

211. The lengths of two parallel sides of a trapezium are 6 cm and 8 cm. If the height of the trapezium be 4 cm, then its area is

(1) 28 cm (2) 28 sq.cm

(3) 30 sq.cm (4) 30 cm

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

212. If a and b are the lengths of the sides of a right triangle whose hypotenuse is 10 and whose area is 20, then the value of $(a+b)^2$ is

(1) 140 (2) 180

(3) 120 (4) 160

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

213. A wire is bent into the form of a circle, whose area is 154 cm^2. If the same wire is bent into the form of an equilateral triangle, the approximate area of the equilateral triangle is

(1) 93.14 cm^2 (2) 90.14 cm^2

(3) 83.14 cm^2 (4) 39.14 cm^2

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

214. If the ratio of the altitudes of two triangles be 3 : 4 and the ratio of their corresponding areas be 4 : 3, then the ratio of their corresponding lengths of bases is

(1) 1 : 1 (2) 16 : 9

(3) 1 : 2 (4) 2 : 1

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

215. Let A be the area of a square whose each side is 10 cm. Let B be the area of a square whose diagonals are 14 cm each. Then (A – B) is equal to

(1) 0 (2) 1

(3) 2 (4) 4

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

216. Two sides of a parallelogram are 20 cm and 25 cm. If the altitude corresponding to the side of length 25 cm is 10 cm, then the altitude corresponding to the other pair of sides is

(1) 10.5 cm (2) 12 cm
(3) 12.5 cm (4) 10 cm

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

217. If the sides of an equilateral triangle be increased by 1 m its area is increased by $\sqrt{3}$ sq. metre. The length of any of its sides is

(1) 2 metre (2) $\frac{5}{2}$ metre
(3) $\frac{3}{2}$ metre (4) $\sqrt{3}$ metre

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

218. The in-radius of a triangle is 6 cm, and the sum of the lengths of its sides is 50 cm. The area of the triangle (in square cm.) is

(1) 150 (2) 50
(3) 300 (4) 56

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

219. One of the angles of a right-angled triangle is 15°, and the hypotenuse is 1 metre. The area of the triangle (in square cm.) is

(1) 1220 (2) 1200
(3) 1250 (4) 1215

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

220. If for an isosceles triangle the length of each equal side is 'a' units and that of the third side is 'b' units, then its area will be

(1) $\frac{a}{4}\sqrt{4b^2 - a^2}$ square units
(2) $\frac{a}{2}\sqrt{2a^2 - b^2}$ square units
(3) $\frac{b}{4}\sqrt{4a^2 - b^2}$ square units
(4) $\frac{b}{2}\sqrt{a^2 - 2b^2}$ square units

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

221. The outer and inner diameter of a circular path be 728 metre and 700 metre respectively. The breadth of the path is

(1) 7 metre (2) 28 metre
(3) 14 metre (4) 20 metre

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

222. The area of the parallelogram whose length is 30 cm, width is 20 cm and one diagonal is 40 cm is

(1) 200 $\sqrt{15}$ cm^2
(2) 100 $\sqrt{15}$ cm^2
(3) 300 $\sqrt{15}$ cm^2
(4) 150 $\sqrt{15}$ cm^2

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

223. On increasing each side of a square by 50%, the ratio of the area of new square formed and the given square will be

(1) 9 : 5 (2) 9 : 3.5
(3) 9 : 7 (4) 9 : 4

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

224. The area of a circle is 324 π square cm. The length of its longest chord (in cm.) is

(1) 36 (2) 28
(3) 38 (4) 32

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

225. The area of a rhombus is 256 square cm. and one of its diagonals is twice the other in length. Then length of its larger diagonal is

(1) 32 cm (2) 16 cm
(3) 48 cm (4) 24 cm

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

226. If the side of a square is $\frac{1}{2}(x + 1)$ units and its diagonal is $\frac{3 - x}{\sqrt{2}}$ units, then the length of the side of the square would be

(1) $\frac{4}{3}$ units (2) $\frac{1}{2}$ unit
(3) 1 unit (4) 2 units

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

227. The circumference of a triangle is 24 cm and the circumference of its in-circle is 44 cm. Then the area of the triangle is (taking $\pi = \frac{22}{7}$)

(1) 56 square cm.
(2) 84 square cm.
(3) 48 square cm.
(4) 68 square cm.

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

228. If the length of each of two equal sides of an isosceles triangle is 10 cm. and the adjacent angle is 45°, then the area of the triangle is

(1) 20 $\sqrt{2}$ square cm.
(2) 12 $\sqrt{2}$ square cm.
(3) 25 $\sqrt{2}$ square cm.
(4) 15 $\sqrt{2}$ square cm.

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

229. The length of the diagonal of a rectangle with sides 4 m and 3 m would be

(1) 12 m (2) 7 m
(3) 5 m (4) 14 m

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

230. In a right angled triangle ΔPQR, PR is the hypotenuse of length 20 cm, $\angle PRQ = 30°$, the area of the triangle is

(1) 50 $\sqrt{3}$ cm^2 (2) 100 $\sqrt{3}$ cm^2
(3) 25 $\sqrt{3}$ cm^2 (4) $\frac{100}{\sqrt{3}}$ cm^2

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

231. The perimeter of an equilateral triangle is equal to the circumference of a circle. The ratio of their areas is

$\left(\text{Use } \pi = \frac{22}{7}\right)$

(1) 22 : 21$\sqrt{3}$ (2) 21 : 22$\sqrt{3}$
(3) 21 : 22$\sqrt{2}$ (4) 22 : 21$\sqrt{2}$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

232. From any point inside an equilateral triangle, the lengths of perpendiculars on the sides are 'a' cm, 'b' cm and 'c' cms. Its area (in cm^2) is

(1) $\frac{\sqrt{2}}{3}(a+b+c)$

(2) $\frac{\sqrt{3}}{3}(a+b+c)^2$

(3) $\frac{\sqrt{3}}{3}(a+b+c)$

(4) $\frac{\sqrt{2}}{3}(a+b+c)^2$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

233. The areas of a circle and a square are same. The ratio of the side of the square to the radius of the circle is

(1) $2\pi : 1$ (2) $1 : \sqrt{\pi}$

(3) $\sqrt{\pi} : 1$ (4) $1 : \pi$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

234. ABCD is a square inscribed in a circle of radius r. Then the total area (in square units) of the portions of the circle lying outside the square is

(1) $\pi(r^2 - 4)$ (2) $2\pi(r^2 - 1)$

(3) $\pi^2 r(r - 7)$ (4) $r^2(\pi - 2)$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

235. The lengths of the two parallel sides of a trapezium are 28 cm and 40 cm. If the length of each of its other two sides be 12 cm, then the area (in cm^2) of the trapezium is

(1) $312\sqrt{5}$ (2) $408\sqrt{3}$

(3) $204\sqrt{3}$ (4) $504\sqrt{3}$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

236. The perimeter of a sheet of paper in the shape of a quadrant of a circle is 75 cm. Its area would be $\left(\pi = \frac{22}{7}\right)$

(1) 100 cm^2 (2) 346.5 cm^2

(3) 693 cm^2 (4) 512.25 cm^2

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

237. The diagonal of a quadrilateral shaped field is 24m and the perpendiculars dropped on it from the remaining opposite vertices are 8m and 13m. The area of the field is

(1) 252 m^2 (2) 156 m^2

(3) 96 m^2 (4) 1152 m^2

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

238. Two isosceles triangles have equal vertical angles and their areas are in the ratio 9:16. Then the ratio of their corresponding heights is-

(1) 4.5 : 8 (2) 4 : 3

(3) 8 : 4.5 (4) 3 : 4

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

239. In ΔABC, a line through A cuts the side BC at D such that BD : DC = 4 : 5. If the area of ΔABD = 60 cm^2, then the area of ΔADC is

(1) 90 cm^2 (2) 50 cm^2

(3) 60 cm^2 (4) 75 cm^2

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

240. If the area of a circle is A, radius of the circle is r and circumference of it is C, then

(1) $\frac{A}{r} = C$ (2) $rC = 2A$

(3) $\frac{C}{A} = \frac{r}{2}$ (4) $AC = \frac{r^2}{4}$

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

241. In a rhombus ABCD, $\angle A = 60°$ and AB = 12 cm. Then the diagonal BD is

(1) 10 cm (2) $2\sqrt{3}$ cm

(3) 6 cm (4) 12 cm

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

242. If two medians BE and CF of a triangle ABC, intersect each other at G and if BG = CG, $\angle BGC = 60°$ and BC = 8 cm then area of the triangle ABC is

(1) $96\sqrt{3}$ cm^2 (2) $64\sqrt{3}$ cm^2

(3) $48\sqrt{3}$ cm^2 (4) 48 cm^2

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

243. Two circles touch each other externally. The sum of their areas is 130 π sq cm and the distance between their centres is 14 cm. The radius of the smaller circle is

(1) 2 cm (2) 4 cm

(3) 5 cm (4) 3 cm

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

244. Let C_1 and C_2 be the inscribed and circumscribed circles of a triangle with sides 3cm, 4cm and 5cm then $\frac{\text{area of } C_1}{\text{area of } C_2}$ is

(1) $\frac{9}{25}$ (2) $\frac{4}{25}$

(3) $\frac{9}{16}$ (4) $\frac{16}{25}$

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

245. If the altitude of an equilateral triangle is $12\sqrt{3}$ cm, then its area would be :

(1) 12 cm^2 (2) 144 $\sqrt{3}$ cm^2

(3) 72 cm^2 (4) 36 $\sqrt{3}$ cm^2

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

246. Given that : $\Delta ABC \sim \Delta PQR$, If $\frac{\text{area } (\Delta PQR)}{\text{area } (\Delta ABC)} = \frac{256}{441}$ and PR = 12 cm, then AC is equal to

(1) 15.75 cm (2) 16 cm

(3) $12\sqrt{2}$ cm (4) 15.5 cm

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

247. ABCD is a cyclic quadrilateral. Diagonals AC and BD meets at P. If $\angle APB = 110°$ and $\angle CBD = 30°$, then $\angle ADB$ measures

(1) 55° (2) 30°

(3) 70° (4) 80°

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

248. A circular swimming pool is surrounded by a concrete wall 4m wide. If the area of the concrete wall surrounding the pool is $\frac{11}{25}$ that of the pool, then the radius (in m) of the pool is :

(1) 8 (2) 16

(3) 30 (4) 20

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

249. Δ ABC is similar to Δ DEF. The ratio of their perimeters is 4 : 1. The ratio of their areas is
(1) 4 : 1 (2) 16 : 1
(3) 8 : 1 (4) $8\sqrt{2}$: 1
(SSC CGL Tier-I Re-Exam, 30.08.2015)

250. The amount of rice produced in a square field of side 50 m is 750 kg. The amount of rice produced in a similar square field of side 100 m will be
(1) 2000 kg (2) 3000 kg
(3) 3500 kg (4) 1500 kg
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

251. The time required for a boy to travel along the external and internal boundaries of a circular path are in the ratio 20 : 19. If the width of the path be 5 metres, the internal diameter is :
(1) 195 metres (2) 192 metres
(3) 180 metres (4) 190 metres
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

252. In triangle ABC, DE || BC where D is a point on AB and E is a point on AC. DE divides the area of Δ ABC into two equal parts. Then DB : AB is equal to
(1) $\sqrt{2} : \left(\sqrt{2}+1\right)$
(2) $\sqrt{2} : \left(\sqrt{2}-1\right)$
(3) $\left(\sqrt{2}-1\right) : \sqrt{2}$
(4) $\left(\sqrt{2}+1\right) : \sqrt{2}$
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

253. The centroid of a Δ ABC is G. The area of Δ ABC is 60 cm^2. The area of ΔGBC is
(1) 10 cm^2 (2) 30 cm^2
(3) 40 cm^2 (4) 20 cm^2
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

254. In trapezium ABCD, AB || CD and AB = 2CD. Its diagonals intersect at O. If the area of ΔAOB = 84 cm^2, then the area of ΔCOD is equal to
(1) 72 cm^2 (2) 21 cm^2
(3) 42 cm^2 (4) 26 cm^2
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

255. Given that the ratio of altitudes of two triangles is 4 : 5, ratio of their areas is 3 : 2. The ratio of their corresponding bases is
(1) 8 : 15 (2) 15 : 8
(3) 5 : 8 (4) 8 : 5
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

256. The area of an isosceles trapezium is 176 cm^2 and the height is $\frac{2}{11}$th of the sum of its parallel sides. If the ratio of the length of the parallel sides is 4 : 7, then the length of a diagonal (in cm) is
(1) 28 (2) $\sqrt{137}$
(3) $2\sqrt{137}$ (4) 24
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

257. The area of a circle whose radius is the diagonal of a square whose area is 4 sq. units is :
(1) 16π sq. units (2) 4π sq. units
(3) 6π sq. units (4) 8π sq. units
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

258. A rectangular carpet has an area of 120 m^2 and a perimeter of 46 metre. The length of its diagonal is :
(1) 23 metre (2) 13 metre
(3) 17 metre (4) 21 metre
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

259. A plate on square base made of brass is of length x cm and width 1 mm. The plate weighs 4725 gm. If 1 cubic cm of brass weighs 8.4 gram, then the value of x is :
(1) 75 (2) 76
(3) 72 (4) 74
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

260. The length of two parallel sides of a trapezium are 15 cm and 20 cm. If its area is 175 sq.cm, then its height is :
(1) 15 cm (2) 10 cm
(3) 20 cm (4) 25 cm
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

261. ABCD is a square. Draw a triangle QBC on side BC considering BC as base and draw a triangle PAC on AC as its base such that ΔQBC ~ ΔPAC. Then, $\frac{\text{Area of } \Delta QBC}{\text{Area of } \Delta PAC}$ is equal to :
(1) $\frac{1}{2}$ (2) $\frac{2}{1}$
(3) $\frac{1}{3}$ (4) $\frac{2}{3}$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

262. The hypotenuse of a right–angled triangle is 39 cm and the difference of other two sides is 21 cm. Then, the area of the triangle is
(1) 270 sq. cm (2) 450 sq. cm
(3) 540 sq. cm (4) 180 sq. cm
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

263. The ratio between the length and the breadth of a rectangular park is 3 : 2. If a man cycling along the boundary of the park at the speed of 12 km/hour completes one round in 8 minutes, then the area of the park is
(1) 153650 sq.metre
(2) 135600 sq.metre
(3) 153600 sq.metre
(4) 156300 sq.metre
(SSC CGL Tier-II Online Exam.01.12.2016)

264. A rectangular park 60 metre long and 40 metre wide has two concrete crossroads running in the middle of the park and rest of the park has been used as a lawn. If the area of the lawn is 2109 metre^2 then the width of the road is
(1) 3 metre (2) 5 metre
(3) 6 metre (4) 2 metre
(SSC CGL Tier-II Online Exam.01.12.2016)

265. A square and a regular hexagon are drawn such that all the vertices of the square and the hexagon are on a circle of radius r cm. The ratio of area of the square and the hexagon is
(1) 3 : 4 (2) 4 : $3\sqrt{3}$
(3) $\sqrt{2} : \sqrt{3}$ (4) 1 : $\sqrt{2}$
(SSC CGL Tier-II Online Exam.01.12.2016)

266. ΔABC is similar to ΔDEF. If the area of ΔABC is 9 sq.cm. and the area of ΔDEF is 16 sq.cm. and BC = 2.1 cm, then the length of EF will be
(1) 5.6 cm. (2) 2.8 cm.
(3) 3.7 cm. (4) 1.4 cm.
(SSC CGL Tier-II Online Exam.01.12.2016)

267. If D and E are the mid-points of AB and AC respectively of ΔABC, then the ratio of the areas of Δ ADE and ☐ BCED is

(1) 1 : 2 (2) 1 : 4
(3) 2 : 3 (4) 1 : 3

(SSC CGL Tier-II Online Exam.01.12.2016)

268. What is the area of dark (coloured) sector for the figure given below?

(1) 8.38 (2) 25.28
(3) 16.76 (4) 18.56

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

269. If two medians BE and CF of a triangle ABC, intersect each other at G and if BG = CG, angle BGC = 120°, BC = 10 cm, then area of the triangle ABC is :

(1) $50\sqrt{3}$ cm² (2) 60 cm²
(3) 25 cm² (4) $25\sqrt{3}$ cm²

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

270. A room 16m 5cm long and 15 m broad is to be fitted with equal square tiles. How many number of largest possible tiles are required so that they exactly fit?

(1) 10400 (2) 10700
(3) 10800 (4) 9800

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

271. Three equal circles of unit radius touch one another. Then the area of the circle circumscribing the three circles is

(1) $6\pi\left(2+\sqrt{3}\right)^2$

(2) $\frac{\pi}{6}\left(2+\sqrt{3}\right)^2$

(3) $\frac{\pi}{3}\left(2+\sqrt{3}\right)^2$

(4) $3\pi\left(2+\sqrt{3}\right)^2$

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

272. Area of the circle inscribed in a square of diagonal $6\sqrt{2}$ cm. (in sq. cm.) is

(1) 9π (2) 6π
(3) 3π (4) $9\sqrt{2}\pi$

(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

273. The diagonals of two squares are in the ratio 5 : 2. The ratio of their area is

(1) 5 : 6 (2) 25 : 4
(3) 5 : 4 (4) 125 : 8

(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

274. In Δ ABC and Δ PQR, ∠ B = ∠ Q, ∠C = ∠R. M is the mid-point of side QR. If AB : PQ = 7 : 4, then

$\frac{\text{area}(\Delta ABC)}{\text{area}(\Delta PMR)}$ is :

(1) $\frac{35}{8}$ (2) $\frac{49}{16}$

(3) $\frac{49}{8}$ (4) $\frac{35}{16}$

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

275. The diagonals of two squares are in the ratio of 3 : 7. What is the ratio of their areas?

(1) 3 : 7 (2) 9 : 49
(3) 4 : 7 (4) 7 : 3

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

276. A string of length 24 cm is bent first into a square and then into a right–angled triangle by keeping one side of the square fixed as its base. Then the area of triangle equals to :

(1) 24 cm² (2) 60 cm²
(3) 40 cm² (4) 28 cm²

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

277. ABCD is a square. Draw an equilateral triangle PBC on side BC considering BC is a base and an equilateral triangle QAC on diagonal AC considering AC is a base. Find the value of

$\frac{\text{Area of } \Delta PBC}{\text{Area of } \Delta QAC}$.

(1) $\frac{1}{2}$ (2) 1

(3) $\frac{1}{3}$ (4) $\frac{1}{4}$

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

278. If D, E and F are the mid–points of the sides of an equilateral triangle ABC, then the ratio of the area of triangle DEF and DCF is :

(1) 1.1 : 1 (2) 1 : 1.1
(3) 0.9 : 1 (4) 1 : 1

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

279. The area of a rectangle is 60 cm² and its perimeter is 34 cm, then the length of the diagonal is

(1) 17 cm (2) 11 cm
(3) 15 cm (4) 13 cm

(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

280. The centroid of a triangle ΔABC is G. If the area of Δ ABC = 72 sq. units , then the area of Δ BGC is

(1) 16 sq. units (2) 24 sq. units
(3) 36 sq. units (4) 48 sq. units

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

281. In a trapezium ABCD, AB || CD, AB < CD, CD = 6 cm and distance between the parallel sides is 4 cm. If the area of ABCD is 16 cm², then AB is

(1) 1 cm (2) 2 cm
(3) 3 cm (4) 8 cm

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

282. In a triangle ABC, AB = 8 cm, AC = 10 cm and ∠B = 90°, then the area of ΔABC is

(1) 49 sq.cm (2) 36 sq.cm
(3) 25 sq.cm (4) 24 sq.cm

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

283. In figure, DE || BC. If DE = 3 cm, BC = 6 cm and area of ΔADE = 15 sq. cm, then the area of ΔABC is

(1) 75 sq. cm. (2) 45 sq. cm.
(3) 30 sq. cm. (4) 60 sq. cm.
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

284. ΔABC is a right angled triangle, the radius of its circumcircle is 3 cm and the length of its altitude drawn from the opposite vertex to the hypotenuse is 2 cm. Then the area of the triangle is
(1) 12 sq. cm. (2) 3 sq. cm.
(3) 6 sq. cm. (4) 5 sq. cm.
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

285. The lengths of the diagonals of a rhombus are 8 cm and 6 cm. The area of rhombus is :
(1) 96 cm^2 (2) 60 cm^2
(3) 48 cm^2 (4) 24 cm^2
(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

286. Two adjacent sides of a parallelogram are 21 cms and 20 cms. The diagonal joining the end points of these two sides is 29 cms. The area of the parallelogram (in sq. cms) is
(1) 240 (2) 120
(3) 210 (4) 420
(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

287. Δ ABC is an equilateral triangle and D and E are midpoints of AB and BC respectively. Then the area of Δ ABC : the area of the trapezium ADEC is
(1) 5 : 3 (2) 4 : 1
(3) 8 : 5 (4) 4 : 3
(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

288. The perimeters of a square and a rectangle are equal . If their area be 'A' m^2 and 'B' m^2 respectively, then correct statement is
(1) A < B (2) A ≤ B
(3) A > B (4) A ≥ B
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

289. A rectangle with one side of length 4 cm. is inscribed in a circle of diameter 5 cm. Find, the area of the rectangle.
(1) 21 $cm.^2$ (2) 12 $cm.^2$
(3) 4 $cm.^2$ (4) 3 $cm.^2$
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

290. A rectangle with one side 4 cm is inscribed in a circle of radius 2.5 cm. The area of the rectangle is :
(1) 8 cm^2 (2) 12 cm^2
(3) 16 cm^2 (4) 20 cm^2
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

291. If O is the centroid and AD, BE and CF are the three medians of ΔABC with an area of 96 cm^2 then the area of ΔBOD in cm^2 is
(1) 8 (2) 12
(3) 16 (4) 24
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

292. ΔABC is similar to ΔDEF. If the ratio of similar sides is $k : 1$, the ratio of their areas is
(1) $k^2 : 1$ (2) $2k : 1$
(3) $\frac{k^2}{2} : 1$ (4) $2k^2 : 1$
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

293. The height of an equilateral triangle is 18 cm. Its area is
(1) $36\sqrt{3}$ square metre
(2) $108\sqrt{3}$ square cm.
(3) 108 square cm.
(4) $96\sqrt{3}$ square metre
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

294. The length and breadth of a rectangular piece of a land are in a ratio 5 : 3. The owner spent Rs. 6000 for surrounding it from all sides at Rs. 7.50 per metre. The difference between its length and breadth is
(1) 50 metre (2) 100 metre
(3) 150 metre (4) 250 metre
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

295. The ratio between the area of a square and that of a circle, when the length of a side of the square is equal to that of the diameter of the circle, is

$\left(\text{Take}, \pi = \frac{22}{7}\right)$

(1) 14 : 11 (2) 28 : 11
(3) 7 : 22 (4) 22 : 7
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

296. A piece of wire 132 cm. long is bent successively in the shape of an equilateral triangle, a square and a circle. Then area will be longest in shape of
(1) Circle
(2) Equilateral triangle
(3) Square
(4) Equal in all the shapes
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

297. Let ΔABC and ΔABD be on the same base AB and between the same parallels AB and CD. Then the relation between areas of triangles ABC and ABD will be
(1) $\Delta ABD = \frac{1}{3}\Delta ABC$
(2) $\Delta ABD = \frac{1}{2}\Delta ABC$
(3) $\Delta ABC = \frac{1}{2}\Delta ABD$
(4) ΔABC = ΔABD
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

298. The perimeter of a rhombus is 240 metre and the distance between any two parallel sides is 20 metre. The area of the rhombus in square metre is
(1) 600 square metre
(2) 1200 square metre
(3) 2400 square metre
(4) 4800 square metre
(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (Ist Sitting)

299. The area of the largest triangle that can be inscribed in a semicircle of radius 6 m is
(1) 36 m^2 (2) 72 m^2
(3) 18 m^2 (4) 12 m^2
(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (Ist Sitting)

300. A circle and a square have same area. The ratio of the side of the square to the radius of the circle will be:
(1) $\sqrt{\pi} : 1$ (2) $1 : \sqrt{\pi}$
(3) $\pi^2 : 1$ (4) $1 : \pi$
(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

301. Point O is the centre of a circle of radius 5 cm. At a distance of 13 cm from O, a point P is taken. From this point, two tangents PQ and PR are drawn to the circle. Then , the area of quadrilateral PQOR is
(1) 60 $cm.^2$ (2) 32.5 $cm.^2$
(3) 65 $cm.^2$ (4) 30 $cm.^2$
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

302. The length of a median of an equilateral triangle is $12\sqrt{3}$ cms. Then the area of the triangle is :
(1) 144 sq. cm.
(2) $288\sqrt{3}$ sq. cm.
(3) $144\sqrt{3}$ sq. cm.
(4) 288 sq. cm.
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

303. Two circles touch externally. The sum of their areas is 130π sq. cm. and the distance between their centres is 14 cm. The radius of the bigger circle is $\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) 22 cm. (2) 11 cm.
(3) 33 cm. (4) 44 cm.
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

304. In an equilateral triangle of side 24 cm., a circle is inscribed touching its sides. The area of the remaining portion of the triangle is approximately equal to
$\left(\text{assuming } \pi = \frac{22}{7} \& \sqrt{3} = 1.732\right)$
(1) 36.6 cm^2 (2) 54.2 cm^2
(3) 72.8 cm^2 (4) 98.5 cm^2
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

305. The inradius of triangle is 4 cm and its area is 34 sq. cm. the perimeter of the triangle is :
(1) 8.5 cm (2) 17 cm
(3) 34 cm (4) 20 cm
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

306. The area of a triangle ABC is 10.8 cm^2. If CP = PB and 2AQ = QB, then the area of the triangle APQ is
(1) 3.6 cm^2 (2) 0.9 cm^2
(3) 2.7 cm^2 (4) 1.8 cm^2
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

307. If a circle of radius 12 cm is divided into two equal parts by one concentric circle, then radius of inner circle is :
(1) 6 cm (2) 4 cm
(3) $6\sqrt{2}$ cm (4) $4\sqrt{2}$ cm
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

308. In ΔABC, the medians AD and BE meet at G. The ratio of the areas of ΔBDG and the quadrilateral GDCE is :
(1) 1 : 2 (2) 1 : 3
(3) 2 : 3 (4) 3 : 4
(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

309. O is the centre of the circle and ∠AOB = 150°, and the shaded portion is x part of the circular region, then x = ?

(1) $\frac{1}{12}$ (2) $\frac{1}{9}$
(3) $\frac{1}{6}$ (4) $\frac{1}{4}$
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

310. The area of the circle with radius y is w. The difference between the areas of the bigger circle (with radius y) and that of the smaller circle (with radius x) is w'. So $\frac{x}{y}$ is equal to
(1) $\sqrt{1-\frac{w'}{w}}$ (2) $\sqrt{1+\frac{w'}{w}}$
(3) $\sqrt{1+\frac{w}{w'}}$ (4) $\sqrt{1-\frac{w}{w'}}$
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

311. D, E and F are the mid points of the sides BC, CA and AB respectively of a ΔABC. Then the ratio of the areas of ΔDEF and ΔABC is
(1) $\frac{1}{2}$ (2) $\frac{1}{4}$
(3) $\frac{1}{8}$ (4) $\frac{1}{16}$
(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

312. An arc AB of a circle subtends an angle x radians at the centre of the circle. Given that the area of the secctor AOB is equal to the square of the length of the arc AB, then the value of x is :
(1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{2}$
(3) $\frac{1}{\sqrt{3}}$ (4) $\frac{1}{3}$
(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

313. The radii of two concentric circles are 68 cm and 22 cm. The area of the closed figure bounded by the boundaries of the circles is
(1) 4140π sq. cm. (2) 4110π sq. cm.
(3) 4080π sq. cm. (4) 4050π sq. cm.
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

314. In a trapezium ABCD, AB and DC are parallel sides and ∠ADC = 90°. If AB = 15 cm, CD = 40 cm and diagonal AC = 41 cm. then the area of the trapezium ABCD is
(1) 245 $cm.^2$ (2) 240 $cm.^2$
(3) 247.5 $cm.^2$ (4) 250 $cm.^2$
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

315. The area of a rhombus having one side 10 cm and one diagonal 12 cm is
(1) 48 $cm.^2$ (2) 96 $cm.^2$
(3) 144 $cm.^2$ (4) 192 $cm.^2$
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

316. The cost of levelling a circular field at 50 paise per square metre is Rs. 7700. The cost (in Rs.) of putting up a fence all round it at Rs. 1.20 per metre is $\left(\text{Use } \pi = \frac{22}{7}\right)$
(1) Rs. 132 (2) Rs. 264
(3) Rs. 528 (4) Rs. 1056
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

317. The sum of the length and breadth of a rectangle is 6 cm. A square is constructed such that one of its sides is equal to a diagonal of the rectangle. If the ratio of areas of the square and rectangle is 5 : 2, the area of the square in cm^2 is
(1) 20 (2) 10
(3) $4\sqrt{5}$ (4) $10\sqrt{2}$
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

318. The length of a side of an equilateral triangle is 8 cm. The area of the region lying between the circum circle and the incircle of the triangle is
$\left(\text{Use : } \pi = \frac{22}{7}\right)$
(1) $50\frac{1}{7}$ cm^2 (2) $50\frac{2}{7}$ cm^2
(3) $75\frac{1}{7}$ cm^2 (4) $75\frac{2}{7}$ cm^2
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

319. Two equal circles intersect so that their centres, and the points at which they intersect form a square of side 1 cm. The area (in sq.cm) of the portion that is common to the circles is

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{2}-1$

(3) $\frac{\pi}{5}$ (4) $\left(\sqrt{2}-1\right)$

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

320. D and E are points on the sides AB and AC respectively of ΔABC such that DE is parallel to BC and AD : DB = 4 : 5, CD and BE intersect each other at F. Then find the ratio of the areas of ΔDEF and ΔCBF.

(1) 16 : 25 (2) 16 : 81
(3) 81 : 16 (4) 4 : 9

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

331. Diagonals of a Trapezium ABCD with AB || CD intersect each other at the point O. If AB = 2CD, then the ratio of the areas of ΔAOB and ΔCOD is

(1) 4 : 1 (2) 1 : 16
(3) 1 : 4 (4) 16 : 1

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–II

1. The perimeter of two squares are 24 cm and 32 cm. The perimeter (in cm) of a third square equal in area to the sum of the areas of these squares is :

(1) 45 (2) 40
(3) 32 (4) 48

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. The perimeter of two squares are 40 cm and 32 cm. The perimeter of a third square whose area is the difference of the area of the two squares is

(1) 24 cm (2) 42 cm
(3) 40 cm (4) 20 cm

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

3. If the ratio of areas of two squares is 225 : 256, then the ratio of their perimeter is :

(1) 225 : 256 (2) 256 : 225
(3) 15 : 16 (4) 16 : 15

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

4. The perimeter of two squares are 40 cm and 24 cm. The perimeter of a third square , whose area is equal to the difference of the area of these squares, is

(1) 34 cm (2) 32 cm
(3) 38 cm (4) 30 cm

(SSC CPO S.I. Exam. 09.11.2008)

5. The length and breadth of a rectangular field are in the ratio of 3 : 2. If the perimeter of the field is 80m, its breadth (in metres) is :

(1) 18 (2) 16
(3) 10 (4) 24

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

6. The sides of a rectangular plot are in the ratio 5:4 and its area is equal to 500 sq.m. The perimeter of the plot is :

(1) 80m. (2) 100m.
(3) 90m. (4) 95m.

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

7. The perimeter of the top of a rectangular table is 28m., whereas its area is $48m^2$. What is the length of its diagonal?

(1) 5m. (2) 10m.
(3) 12m. (4) 12.5 m.

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

8. If the length and the perimeter of a rectangle are in the ratio 5 : 16, then its length and breadth will be in the ratio

(1) 5 : 11 (2) 5 : 8
(3) 5 : 4 (4) 5 : 3

(SSC CPO S.I. Exam. 09.11.2008)

9. The length and perimeter of a rectangle are in the ratio 5:18. Then length and breadth will be in the ratio

(1) 4 : 3 (2) 3 : 5
(3) 5 : 4 (4) 4 : 7

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

10. If the area of a rectangle be $(x^2 + 7x + 10)$ sq. cm, then one of the possible perimeter of it is

(1) $(4x + 14)$ cm (2) $(2x + 14)$ cm
(3) $(x + 14)$ cm (4) $(2x + 7)$ cm

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

11. The perimeter of a rectangular plot is 48 m and area is 108 m^2. The dimensions of the plot are

(1) 36 m and 3 m
(2) 12 m and 9 m
(3) 27 m and 4 m
(4) 18 m and 6 m

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

12. The sides of a triangle are in the ratio $\frac{1}{2}:\frac{1}{3}:\frac{1}{4}$. If the perimeter of the triangle is 52 cm, the length of the smallest side is :

(1) 24 cm (2) 10 cm
(3) 12 cm (4) 9 cm

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

13. The area of an equilateral triangle is 400 $\sqrt{3}$ sq.m. Its perimeter is :

(1) 120 m (2) 150 m
(3) 90 m (4) 135 m

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

14. From a point in the interior of an equilateral triangle, the perpendicular distance of the sides are $\sqrt{3}$ cm, $2\sqrt{3}$ cm and $5\sqrt{3}$ cm. The perimeter (in cm) of the triangle is

(1) 64 (2) 32
(3) 48 (4) 24

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

15. The perimeter of a triangle is 30 cm and its area is 30 cm^2. If the largest side measures 13 cm, what is the length of the smallest side of the triangle ?

(1) 3 cm (2) 4 cm
(3) 5 cm (4) 6 cm

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

16. The area of a triangle is 216 cm^2 and its sides are in the ratio 3 : 4 : 5. The perimeter of the triangle is :

(1) 6 cm (2) 12 cm
(3) 36 cm (4) 72 cm

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

17. In a triangular field having sides 30m, 72m and 78m, the length of the altitude to the side measuring 72m is :

(1) 25 m (2) 28 m
(3) 30 m (4) 35 m

(SSC CPO S.I. Exam. 16.12.2007)

18. If the perimeter of a right-angled isosceles triangle is $\left(4\sqrt{2}+4\right)$ cm, the length of the hypotenuse is :

(1) 4 cm (2) 6 cm
(3) 8 cm (4) 10 cm

(SSC CPO S.I. Exam. 16.12.2007)

19. Through each vertex of a triangle, a line parallel to the opposite side is drawn. The ratio of the perimeter of the new triangle, thus formed, with that of the original triangle is
(1) 3 : 2 (2) 4 : 1
(3) 2 : 1 (4) 2 : 3
(SSC CPO S.I. Exam. 09.11.2008)

20. The sides of a triangle are in the ratio $\frac{1}{3}:\frac{1}{4}:\frac{1}{5}$ and its perimeter is 94cm. The length of the smallest side of the triangle is:
(1) 18 cm (2) 22.5 cm
(3) 24 cm (4) 27 cm
(SSC CHSL DEO & LDC Exam. 27.11.2010)

21. The length of two sides of an isosceles triangle are 15 and 22 respectively. What are the possible values of perimeter ?
(1) 52 or 59 (2) 52 or 60
(3) 15 or 37 (4) 37 or 29
(SSC CISF Constable (GD) Exam. 05.06.2011)

22. If the perimeter of a right-angled triangle is 56 cm and area of the triangle is 84 sq. cm, then the length of the hypotenuse is (in cm)
(1) 25 (2) 50
(3) 7 (4) 24
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

23. If the length of each median of an equilateral triangle is $6\sqrt{3}$ cm, the perimeter of the triangle is
(1) 24 cm (2) 32 cm
(3) 36 cm (4) 42 cm
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

24. The area of an equilateral triangle is $4\sqrt{3}$ sq. cm. Its perimeter is
(1) 12 cm (2) 6 cm
(3) 8 cm (4) $3\sqrt{3}$ cm
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

25. The sides of a triangle are in the ratio $\frac{1}{4}:\frac{1}{6}:\frac{1}{8}$ and its perimeter is 91 cm. The difference of the length of longest side and that of shortest side is
(1) 19 cm (2) 20 cm
(3) 28 cm (4) 21 cm
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

26. The diagonals of a rhombus are 32 cm and 24 cm respectively. The perimeter of the rhombus is:
(1) 80 cm (2) 72 cm
(3) 68 cm (4) 64 cm
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

27. The diagonals of a rhombus are 24 cm and 10 cm. The perimeter of the rhombus (in cm) is :
(1) 68 (2) 65
(3) 54 (4) 52
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

28. The perimeter of a rhombus is 40 cm. If one of the diagonals be 12cm long, what is the length of the other diagonal ?
(1) 12 cm (2) $\sqrt{136}$ cm
(3) 16 cm (4) $\sqrt{44}$ cm
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

29. The perimeter of a rhombus is 40 cm. If the length of one of its diagonals be 12 cm, the length of the other diagonal is
(1) 14 cm (2) 15 cm
(3) 16 cm (4) 12 cm
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

30. The sides of a quadrilateral are in the ratio 3 : 4 : 5 : 6 and its perimeter is 72 cm. The length of its greatest side (in cm) is
(1) 24 (2) 27
(3) 30 (4) 36
(SSC (South Zone) Investigator Exam. 12.09.2010)

31. The area of a rhombus is 216 cm^2 and the length of its one diagonal is 24 cm. The perimeter (in cm) of the rhombus is
(1) 52 (2) 60
(3) 120 (4) 100
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

32. The area of a circle is 38.5 sq. cm. Its circumference (in cm) is $\left(\text{use } \pi = \frac{22}{7}\right)$:
(1) 22 (2) 24
(3) 26 (4) 32
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

33. The diameter of a toy wheel is 14 cm. What is the distance travelled by it in 15 revolutions?
(1) 880 cm (2) 660 cm
(3) 600 cm (4) 560 cm
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

34. A can go round a circular path 8 times in 40 minutes. If the diameter of the circle is increased to 10 times the original diameter, the time required by A to go round the new path once travelling at the same speed as before is :
(1) 25 min (2) 20 min
(3) 50 min (4) 100 min
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

35. Diameter of a wheel is 3 cm. The wheel revolves 28 times in a minute. To cover 5.280 km distance, the wheel will take (Take $\pi = \frac{22}{7}$) :
(1) 10 minutes (2) 20 minutes
(3) 30 minutes (4) 40 minutes
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

36. Find the diameter of a wheel that makes 113 revolutions to go 2 km 26 decameters. (Take $\pi = \frac{22}{7}$)
(1) $4\frac{4}{13}$ m (2) $6\frac{4}{11}$ m
(3) $12\frac{4}{11}$ m (4) $12\frac{8}{11}$ m
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

37. The radius of a circular wheel is 1.75 m. The number of revolutions that it will make in travelling 11 km., is
(1) 1000 (2) 10,000
(3) 100 (4) 10
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003) (Second Sitting)

38. A circular wire of radius 42 cm is bent in the form of a rectangle whose sides are in the ratio of 6 : 5. The smaller side of the rectangle is $\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) 60 cm (2) 30 cm
(3) 25 cm (4) 36 cm
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

39. The number of revolutions, a wheel of diameter 40 cm makes in travelling a distance of 176 m, is $\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) 140 (2) 150
(3) 160 (4) 166

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

40. If the difference between the circumference and diameter of a circle is 30 cm, then the radius of the circle must be

(1) 6 cm (2) 7 cm
(3) 5 cm (4) 8 cm

(SSC CPO S.I. Exam. 03.09.2006)

41. If the perimeter of a semicircular field is 144m, then the diameter of the field is $\left(\text{take } \pi = \frac{22}{7}\right)$

(1) 55m (2) 30m
(3) 28m (4) 56m

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

42. The perimeter (in metres) of a semicircle is numerically equal to its area (in square metres). The length of its diameter is $\left(\text{take } \pi = \frac{22}{7}\right)$

(1) $3\frac{6}{11}$ metres (2) $5\frac{6}{11}$ metres
(3) $6\frac{6}{11}$ metres (4) $6\frac{2}{11}$ metres

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

43. The ratio of the numbers giving the measure of the circumference and the area of a circle of radius 3 cm is

(1) 1 : 3 (2) 2 : 3
(3) 2 : 9 (4) 3 : 2

(SSC CPO S.I. Exam. 09.11.2008)

44. The ratio of the radii of two wheels is 3 : 4. The ratio of their circumference is

(1) 4 : 3 (2) 3 : 4
(3) 2 : 3 (4) 3 : 2

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

45. The length (in cm) of a chord of a circle of radius 13 cm at a distance of 12 cm from its centre is

(1) 5 (2) 8
(3) 10 (4) 12

(SSC (South Zone) Investigator Exam. 12.09.2010)

46. The diameter of a wheel is 98 cm. The number of revolutions in which it will have to cover a distance of 1540 m is

(1) 500 (2) 600
(3) 700 (4) 800

(SSC CGL Tier-1 Exam.19.06.2011 (First Sitting)

47. The wheel of a motor car makes 1000 revolutions in moving 440 m. The diameter (in metre) of the wheel is

(1) 0.44 (2) 0.14
(3) 0.24 (4) 0.34

(SSC CGL Tier-1 Exam.19.06.2011 (Second Sitting)

48. A bicycle wheel makes 5000 revolutions in moving 11km.Then the radius of the wheel (in cm) is (Take $\pi = \frac{22}{7}$)

(1) 70 (2) 35
(3) 17.5 (4) 140

(SSC CGL Tier-1 Exam.26.06.2011 (First & Second Sitting)

49. Three circles of diameter 10 cm each, are bound together by a rubber band, as shown in the figure.

The length of the rubber band, (in cm) if it is stretched as shown, is

(1) 30 (2) 30 + 10π
(3) 10π (4) 60 + 20π

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

50. If a chord of length 16 cm is at a distance of 15 cm from the centre of the circle, then the length of the chord of the same circle which is at a distance of 8 cm from the centre is equal to

(1) 10 cm (2) 20 cm
(3) 30 cm (4) 40 cm

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

51. A semicircular shaped window has diameter of 63 cm. Its perimeter equals $\left(\pi = \frac{22}{7}\right)$

(1) 126 cm (2) 162 cm
(3) 198 cm (4) 251 cm

(SSC CISF Constable (GD) Exam. 05.06.2011)

52. A gear 12 cm in diameter is turning a gear 18 cm in diameter. When the smaller gear has 42 revolutions, how many has the larger one made ?

(1) 28 (2) 20
(3) 15 (4) 24

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

53. The perimeter of a semi-circular area is 18cm, then the radius is : (using $\pi = \frac{22}{7}$)

(1) $5\frac{1}{3}$ cm (2) $3\frac{1}{2}$ cm
(3) 6 cm (4) 4 cm

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

54. A circular road runs around a circular ground. If the difference between the circumference of the outer circle and the inner circle is 66 metres, the width of the road is: (Take $\pi = \frac{22}{7}$)

(1) 10.5 metres (2) 7 metres
(3) 5.25 metres (4) 21 metres

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

55. A person observed that he required 30 seconds less time to cross a circular ground along its diameter than to cover it once along the boundary. If his speed was 30 m/minute, then the radius of the circular ground is (Take $\pi = \frac{22}{7}$) :

(1) 5.5 m (2) 7.5 m
(3) 10.5 m (4) 3.5 m

(SSC Graduate Level Tier-I Exam. 21.04.2013)

56. The difference of perimeter and diameter of a circle is X unit. The diameter of the circle is

(1) $\frac{X}{\pi - 1}$ unit (2) $\frac{X}{\pi + 1}$ unit

(3) $\frac{X}{\pi}$ unit (4) $\left(\frac{X}{\pi} - 1\right)$ unit

(SSC Graduate Level Tier-I Exam. 19.05.2013)

57. The circumference of a circle is 100 cm. The side of a square inscribed in the circle is

(1) $\frac{100\sqrt{2}}{\pi}$ cm (2) $\frac{50\sqrt{2}}{\pi}$ cm

(3) $\frac{100}{\pi}$ cm (4) $50\sqrt{2}$ cm

(SSC CPO S.I. Exam. 12.01.2003 & 09.11.2008)

58. A path of uniform width surrounds a circular park. The difference of internal and external circumference of this circular path is 132 metres. Its width is :

(Take $\pi = \frac{22}{7}$)

(1) 22m (2) 20 m
(3) 21m (4) 24m

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

59. The ratio of the outer and the inner perimeter of a circular path is 23 : 22. If the path is 5 metres wide, the diameter of the inner circle is :

(1) 110 m (2) 55 m
(3) 220 m (4) 230 m

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

60. The radius of the incircle of a triangle is 2 cm. If the area of the triangle is 6 cm^2, then its perimeter is

(1) 2 cm (2) 3 cm
(3) 6 cm (4) 9 cm

(SSC CPO (SI, ASI & Intelligence Officer) Exam.28.08.2011 (Paper-I)

61. The area of the circumcircle of an equilateral triangle is 3π sq. cm. The perimeter of the triangle is

(1) $3\sqrt{3}$ cm (2) 9 cm
(3) 18 cm (4) 3 cm

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

62. A wire when bent in the form of a square encloses an area of 484 sq. cm. What will be the enclosed area when the same wire is bent into the form of a circle?

(Take $\pi = \frac{22}{7}$)

(1) 462 sq.cm (2) 539 sq.cm
(3) 616 sq.cm (4) 693 sq.cm

(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting, Delhi Zone)

63. Four equal sized maximum circular plates are cut off from a square paper sheet of area 784 sq.cm. The circumference of each plate is (Take $\pi = \frac{22}{7}$)

(1) 22 cm (2) 44 cm
(3) 66 cm (4) 88 cm

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

64. If the area of a circle and a square are equal, then the ratio of their perimeter is

(1) 1 : 1 (2) 2 : π

(3) π : 2 (4) $\sqrt{\pi}$: 2

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

65. A copper wire is bent in the form of square with an area of 121 cm^2. If the same wire is bent in the form of a circle, the radius (in cm) of the circle is (Take $\pi = \frac{22}{7}$)

(1) 7 (2) 10
(3) 11 (4) 14

(SSC CGL Tier-1 Exam.19.06.2011 (Second Sitting)

66. If the perimeter of a square and a rectangle are the same, then the area P and Q enclosed by them would satisfy the condition

(1) P < Q (2) P $\leq$ Q
(3) P > Q (4) P = Q

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

67. A circle and a rectangle have the same perimeter. The sides of the rectangle are 18 cm and 26 cm. The area of the circle is

$\left[\text{Take } \pi = \frac{22}{7}\right]$

(1) 125 cm^2 (2) 230 cm^2
(3) 550 cm^2 (4) 616 cm^2

(SSC Graduate Level Tier-II Exam.16.09.2012)

68. If the sides of an equilateral triangle are increased by 20%, 30% and 50% respectively to form a new triangle, the increase in the perimeter of the equilateral triangle is

(1) 25% (2) $33\frac{1}{3}$%

(3) 75% (4) 100%

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

69. A horse is tied to a post by a rope. If the horse moves along a circular path always keeping the rope stretched and describes 88 metres when it has traced out 72° at the centre, the length of the rope is

$\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) 70 m (2) 75 m
(3) 80 m (4) 65 m

(SSC Graduate Level Tier-I Exam. 21.04.2013)

70. Three circles of radii 3.5 cm, 4.5 cm and 5.5 cm touch each other externally. Then the perimeter of the triangle formed by joining the centres of the circles, in cm, is

(1) 27
(2) $\pi[(3.5)^2 + (4.5)^2 + (5.5)^2]$
(3) 27π
(4) 13.5

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

71. ABCD is a parallelogram in which diagonals AC and BD intersect at O. If E, F, G and H are the mid points of AO, DO, CO and BO respectively, then the ratio of the perimeter of the quadrilateral EFGH to the perimeter of parallelogram ABCD is

(1) 1 : 4 (2) 2 : 3
(3) 1 : 2 (4) 1 : 3

(SSC CGL Tier-I Exam. 19.10.2014)

72. A circular wire of diameter 112 cm is cut and bent in the form of a rectangle whose sides are in the ratio of 9 : 7. The smaller side of the rectangle is

(1) 77 cm (2) 97 cm
(3) 67 cm (4) 87 cm

(SSC CGL Tier-I Exam. 26.10.2014)

73. If the perimeter of an equilateral triangle be 18 cm, then the length of each median is

(1) $3\sqrt{2}$ cm (2) $2\sqrt{3}$ cm
(3) $3\sqrt{3}$ cm (4) $2\sqrt{2}$ cm

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

74. Two equal maximum sized circular plates are cut off from a circular paper sheet of circumference 352 cm. Then the circumference of each circular plate is

(1) 176 cm (2) 150 cm
(3) 165 cm (4) 180 cm

(SSC CHSL DEO & LDC Exam. 16.11.2014)

75. If diagonals of a rhombus are 24 cm and 32 cm, then perimeter of that rhombus is

(1) 80 cm (2) 84 cm
(3) 76 cm (4) 72 cm

(SSC CHSL DEO & LDC Exam. 16.11.2014)

76. The inradius of an equilateral triangle is $\sqrt{3}$ cm, then the perimeter of that triangle is

(1) 18 cm (2) 15 cm
(3) 12 cm (4) 6 cm

(SSC CHSL DEO & LDC Exam. 16.11.2014)

77. Length of a side of a square inscribed in a circle is $a\sqrt{2}$ units. The circumference of the circle is

(1) $2\pi a$ units (2) πa units
(3) $4\pi a$ units (4) $\frac{2a}{\pi}$ units

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

78. The perimeter and length of a rectangle are 40 m and 12 m respectively. Its breadth will be

(1) 10 m (2) 8 m
(3) 6 m (4) 3 m

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

79. The difference between the circumference and diameter of a circle is 150 m. The radius of that circle is (Take $\pi = \frac{22}{7}$)

(1) 25 metre (2) 35 metre
(3) 30 metre (4) 40 metre

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

80. PQRS is a square with side 10 cm. A, B, C and D are mid–points of PQ, QR, RS and SP respectively. Then the perimeter of the square ABCD so formed is

(1) $10\sqrt{2}$ cm (2) $20\sqrt{2}$ cm
(3) $25\sqrt{2}$ cm (4) $15\sqrt{2}$ cm

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

81. A piece of wire when bent to form a circle will have a radius of 84 cm. If the wire is bent to form a square, the length of a side of the square is

(1) 152 cm (2) 132 cm
(3) 168 cm (4) 225 cm

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

82. The perimeters of two similar triangles are 30 cm and 20 cm respectively. If one side of the first triangle is 9 cm. Determine the corresponding side of the second triangle.

(1) 13.5 cm (2) 6 cm
(3) 15 cm (4) 5 cm

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

83. The sides of a triangle having area 7776 sq. cm are in the ratio 3 : 4 : 5. The perimeter of the triangle is

(1) 432 cm (2) 400 cm
(3) 412 cm (4) 424 cm

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

84. The diameter of each wheel of a car is 70 cm. If each wheel rotates 400 times per minute, then the speed of the car (in km/hr) is $\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) 0.528 (2) 528
(3) 52.8 (4) 5.28

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

85. Quadrilateral ABCD is circumscribed about a circle. If the lengths of AB, BC and CD are 7 cm, 8.5 cm, and 9.2 cm respectively, then the length (in cm) of DA is

(1) 7.7 (2) 16.2
(3) 10.7 (4) 7.2

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

86. The perimeter of a rhombus is 60 cm and one of its diagonal is 24 cm. The area of the rhombus is

(1) 108 sq. cm. (2) 216 sq. cm.
(3) 432 sq. cm. (4) 206 sq. cm.

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

87. The ratio of circumference and diameter of a circle is 22 : 7. If the circumference be $1\frac{4}{7}$ m, then the radius of the circle is :

(1) $\frac{1}{3}$ m (2) $\frac{1}{2}$ m
(3) $\frac{1}{4}$ m (4) 1 m

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

88. Four circles of equal radii are described about the four corners of a square so that each touches two of the other circles. If each side of the square is 140 cm then area of the space enclosed between the circumference of the circle is $\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) 4200 cm^2 (2) 2100 cm^2
(3) 7000 cm^2 (4) 2800 cm^2

(SSC CGL Tier-II Online Exam.01.12.2016)

89. The perimeter of a triangle is 67 cm. The first side is twice the length of the second side. The third side is 11 cm more than the second side. Find the length of the shortest side of the triangle.

(1) 12 cm. (2) 14 cm.
(3) 17 cm. (4) 25 cm.

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

90. The radius of a wheel is 25 cm. How many rounds it will take to complete 11 km.

(1) 5000 (2) 6000
(3) 7000 (4) 4000

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

91. If the perimeter of circle A is equal

to perimeter of semi circle B, what is the ratio of their areas ?

(1) $(\pi+2)^2 : 2\pi^2$

(2) $2\pi^2 : (\pi+2)^2$

(3) $(\pi+2)^2 : 4\pi^2$

(4) $4\pi^2 : (\pi+2)^2$

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

92. PS is a diameter of a circle of radius 6 cm. In the diameter PS, Q and R are two points such that PQ, QR and RS are all equal. Semicircles are drawn on PQ and QS as diameter (as shown in the figure). The perimeter of shaded portion is :

(1) $15\frac{6}{7}$ cm (2) $75\frac{3}{7}$ cm

(3) $37\frac{5}{7}$ cm (4) $18\frac{6}{7}$ cm

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

93. The perimeter of a certain isosceles right triangle is $10+10\sqrt{2}$ cm. What is the length of the hypotenuse of the triangle ?

(1) 5 cm (2) 10 cm

(3) $5\sqrt{2}$ cm (4) $10\sqrt{2}$ cm

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

94. The radius of wheel moving on a road, is $8\frac{3}{4}$ cm. How many rounds it will take to complete 55 metre distance.

(1) 10 (2) 11

(3) 100 (4) 55

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

95. The sides of a triangle are in the ratio $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$ and its perimeter is 104 cm. The length of the longest side (in cm) is

(1) 52 (2) 48

(3) 32 (4) 26

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

96. In an isosceles triangle, the length of each equal side is twice the length of the third side. The ratio of areas of the isosceles triangle and an equilateral triangle with same perimeter is

(1) $30\sqrt{5} : 100$ (2) $32\sqrt{5} : 100$

(3) $36\sqrt{5} : 100$ (4) $42\sqrt{5} : 100$

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

97. The radius of the incircle of an equilateral ΔABC of side $2\sqrt{3}$ units is x cm. The value of x is :

(1) $\frac{1}{3}$ (2) $\frac{1}{2}$

(3) 1 (4) $\sqrt{3}$

(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (Ist Sitting)

98. The four sides of a quadrilateral are in the ratio of 2 : 3 : 4 : 5 and its perimeter is 280 metre. The length of the longest side is :

(1) 100 metre (2) 150 metre

(3) 175 metre (4) 180 metre

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting

99. If x is the area, y is the circumference and z is the diameter of circle then the value of $\frac{x}{yz}$ is

(1) 4 : 1 (2) 1 : 4

(3) 1 : 2 (4) 2 : 1

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

100. The lengths of diagonals of a rhombus are 24 cm and 10 cm the perimeter of the rhombus (in cm.) is :

(1) 52 (2) 56

(3) 68 (4) 72

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IIIrd Sitting)

101. The length of the base of an isosceles triangle is $2x - 2y + 4z$, and its perimeter is $4x - 2y + 6z$. Then the length of each of the equal sides is

(1) $x + y$ (2) $x + y + z$

(3) $2(x + y)$ (4) $x + z$

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

102. Which of the following ratios can be the ratio of the sides of a right angled triangle?

(1) 9 : 6 : 3 (2) 13 : 12 : 5

(3) 7 : 6 : 5 (4) 5 : 3 : 2

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

103. A square playground measures 1127.6164 sq. cm. If a man walks $2\frac{9}{20}$ m a minute, the time taken by him to walk one round around it is approximately.

(1) 50.82 minutes

(2) 54.82 minutes

(3) 54.62 minutes

(4) 50.62 minutes

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–III

1. How many tiles, each 4 decimetre square, will be required to cover the floor of a room 8 m long and 6 m broad ?

(1) 200 (2) 260

(3) 280 (4) 300

(SSC Graduate Level Tier-II Exam. 29.09.2013

2. The floor of a corridor is 100m long and 3 m wide. Cost of covering the floor with carpet 50 cm wide at the rate of ₹ 15 per m is

(1) ₹ 4500 (2) ₹ 9000

(3) ₹ 7500 (4) ₹ 1900

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

3. Three sides of a triangular field are of length 15 m, 20 m and 25 m long respectively. Find the cost of sowing seeds in the field at the rate of 5 rupees per sq.m.

(1) ₹300 (2) ₹600

(3) ₹750 (4) ₹150

(SSC Graduate Level Tier-I Exam. 21.04.2013)

4. The radius of a circular wheel is 1.75 m. The number of revolutions it will make in travelling 11 km is :

$\left(\text{use } \pi = \frac{22}{7}\right)$

(1) 800 (2) 900

(3) 1000 (4) 1200

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

5. The radius of a wheel is 21 cm. How many revolutions will it make in travelling 924 metres ?

$\left(\text{use } \pi = \frac{22}{7}\right)$

(1) 7 (2) 11

(3) 200 (4) 700

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

6. A playground is in the shape of a rectangle. A sum of ₹1,000 was spent to make the ground usable at the rate of 25 paise per sq. m. The breadth of the ground is 50 m. If the length of the ground is increased by 20 m, what will be the expenditure (in rupees) at the same rate per sq. m. ?

(1) 1,250 (2) 1,000
(3) 1,500 (4) 2,250

(SSC Graduate Level Tier-II Exam.16.09.2012)

7. If each edge of a square be doubled, then the increase percentage in its area is

(1) 200% (2) 250%
(3) 280% (4) 300%

(SSC CHSL DEO & LDC Exam. 16.11.2014)

8. If radius of a circle is increased by 5%, then the increase in its area is

(1) 10.25 % (2) 10 %
(3) 5.75 % (4) 5 %

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

9. The height of a triangle is increased by 10%. To retain the original area of the triangle, its corresponding base must be decreased by

(1) 10% (2) $9\frac{1}{7}\%$
(3) $9\frac{1}{8}\%$ (4) $9\frac{1}{11}\%$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

10. The percentage increase in the area of a rectangle, if each of its sides is increased by 20% is equal to

(1) 32% (2) 34%
(3) 42% (4) 44%

(SSC CGL Tier-I Re-Exam, 30.08.2015)

11. If the radius of a circle is decreased by 10%, then the area of the circle is decreased by

(1) 89% (2) 18%
(3) 19% (4) 25%

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

12. The outer circumference of a circular race-track is 528 metre. The track is everywhere 14 metre wide. Cost of levelling the track at the rate of Rs. 10 per sq. metre is :

(1) Rs. 77660 (2) Rs. 66760
(3) Rs. 76760 (4) Rs. 67760

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

13. If the area of a square is increased by 44%, retaining its shape as a square, each of its sides increases by :

(1) 19% (2) 21%
(3) 22% (4) 20%

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

14. What will be the percentage increase in the area of a square when each of the its sides is increased by 10%?

(1) 20 (2) 11
(3) 121 (4) 21

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

15. If the length and breadth of a rectangle are increased by 10% and 8% respectively, then the area of the rectangle increases by :

(1) $18\frac{7}{5}\%$ (2) $18\frac{4}{5}\%$
(3) 18% (4) $18\frac{1}{5}\%$

(SSC CGL Tier-I (CBE) Exam. 27.10.2016 (Ist Sitting)

TYPE–IV

1. The edges of a rectangular box are in the ratio 1 : 2 : 3 and its surface area is 88 cm^2. The volume of the box is

(1) 24 cm^3 (2) 48 cm^3
(3) 64 cm^3 (4) 120 cm^3

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

2. A right triangle with sides 3 cm, 4 cm and 5 cm is rotated about the side 3 cm to form a cone, The volume of the cone so formed is

(1) $16\pi cm^3$ (2) $12\pi cm^3$
(3) $15\pi cm^3$ (4) $20\pi cm^3$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

3. If the length of each side of a regular tetrahedron is 12 cm, then the volume of the tetrahedron is

(1) $144\sqrt{2}$ cu. cm.
(2) $72\sqrt{2}$ cu. cm.
(3) $8\sqrt{2}$ cu. cm.
(4) $12\sqrt{2}$ cu. cm.

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

4. Two right circular cylinders of equal volume have their heights in the ratio 1 : 2. The ratio of their radii is :

(1) $\sqrt{2}:1$ (2) 2 : 1
(3) 1 : 2 (4) 1 : 4

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

5. The volume of a right circular cylinder whose height is 40cm, and circumference of its base is 66 cm, is :

(1) 55440 cm^3 (2) 3465 cm^3
(3) 7720 cm^3 (4) 13860 cm^3

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

6. The base radii of two cylinders are in the ratio 2 : 3 and their heights are in the ratio 5 : 3. The ratio of their volumes is :

(1) 27 : 20 (2) 20 : 27
(3) 9 : 4 (4) 4 : 9

(SSC CGL Prelim Exam. 24.02.2002 & 13.11.2005 (Ist Sitting)

7. The curved surface area of a cylindrical pillar is 264 m^2 and its volume is 924 m^3. $\left(\text{Taking } \pi = \frac{22}{7}\right)$. Find the ratio of its diameter to its height.

(1) 7 : 6 (2) 6 : 7
(3) 3 : 7 (4) 7 : 3

(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting) & CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting, East Zone)

8. A hollow cylindrical tube 20 cm long, is made of iron and its external and internal diameters are 8 cm and 6 cm respectively. The volume of iron used in making the tube is ($p = \frac{22}{7}$)

(1) 1760 cu.cm. (2) 880 cu.cm.
(3) 440 cu.cm. (4) 220 cu.cm.

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

9. A hollow iron pipe is 21 cm long and its exterior diameter is 8 cm. If the thickness of the pipe is 1 cm and iron weighs 8 g/cm^3, then the weight of the pipe is $\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) 3.696 kg (2) 3.6 kg
(3) 36 kg (4) 36.9 kg

(SSC CGL Prelim Exam. 08.02.2004 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 04.12.2011)

10. The volume of a right circular cylinder, 14 cm in height, is equal to that of a cube whose edge is 11 cm. Taking $\pi = \frac{22}{7}$ the radius of the base of the cylinder is

(1) 5.2 cm. (2) 5.5 cm.
(3) 11.0 cm. (4) 22.0 cm.

(SSC CPO S.I. Exam. 05.09.2004)

11. If the volume of a right circular cylinder is $9\pi h\ m^3$, where h is its height (in metres) then the diameter of the base of the cylinder is equal to

(1) 3 m (2) 6 m
(3) 9 m (4) 12 m

(SSC CPO S.I. Exam. 05.09.2004)

12. A right circular cylinder of height 16 cm is covered by a rectangular tin foil of size 16 cm × 22 cm. The volume of the cylinder is

(1) 352 cm^3 (2) 308 cm^3
(3) 616 cm^3 (4) 176 cm^3

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

13. The volume of the metal of a cylindrical pipe is 748 cm^3. The length of the pipe is 14cm and its external radius is 9 cm. Its thickness is $\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) 1 cm (2) 5.2 cm
(3) 2.3 cm (4) 3.7 cm

(SSC CGL Prelim Ex am. 27.07.2008 (First Sitting)

14. Two iron sheets each of diameter 6 cm are immersed in the water contained in a cylindrical vessel of radius 6 cm. The level of the water in the vessel will be raised by

(1) 1 cm (2) 2 cm
(3) 3 cm (4) 6 cm

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

15. The radii of the base of two cylinders A and B are in the ratio 3 : 2 and their height in the ratio n : 1. If the volume of cylinder A is 3 times that of cylinder B, the value of n is

(1) $\frac{4}{3}$ (2) $\frac{2}{3}$
(3) $\frac{3}{4}$ (4) $\frac{3}{2}$

(SSC CPO S.I. Exam. 09.11.2008)

16. Water is being pumped out through a circular pipe whose internal diameter is 7cm. If the flow of water is 12 cm per second, how many litres of water is being pumped out in one hour ?

(1) 1663.2 (2) 1500
(3) 1747.6 (4) 2000

(SSC CPO S.I. Exam. 06.09.2009)

17. The lateral surface area of a cylinder is 1056 cm^2 and its height is 16cm. Find its volume.

(1) 4545 cm^3 (2) 4455 cm^3
(3) 5445 cm^3 (4) 5544 cm^3

(SSC CPO S.I. Exam. 06.09.2009)

18. A cylinder has 'r' as the radius of the base and 'h' as the height. The radius of base of another cylinder, having double the volume but the same height as that of the first cylinder must be equal to

(1) $\frac{r}{\sqrt{2}}$ (2) $2r$
(3) $r\sqrt{2}$ (4) $\sqrt{2r}$

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

19. The diameter of two cylinders, whose volumes are equal, are in the ratio 3 : 2. Their heights will be in the ratio .

(1) 4 : 9 (2) 5 : 6
(3) 5 : 8 (4) 8 : 9

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

20. From a solid cylinder of height 10 cm and radius of the base 6 cm, a cone of same height and same base is removed. The volume of the remaining solid is :

(1) 240 π cu.cm (2) 5280 cu.cm
(3) 620 π cu.cm (4) 360 π cu.cm

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

21. From a solid cylinder whose height is 12 cm and diameter 10cm, a conical cavity of same height and same diameter of the base is hollowed out. The volume of the remaining solid is approximately $\left(\pi = \frac{22}{7}\right)$

(1) 942.86 cm^3 (2) 314.29 cm^3
(3) 628.57 cm^3 (4) 450.76 cm^3

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

22. The radius of a cylinder is 10 cm and height is 4 cm. The number of centimetres that may be added either to the radius or to the height to get the same increase in the volume of the cylinder is

(1) 5 cm (2) 4 cm
(3) 25 cm (4) 16 cm

(SSC Graduate Level Tier-II Exam.16.09.2012)

23. The radii of the base of a cylinder and a cone are in the ratio $\sqrt{3} : \sqrt{2}$ and their heights are in the ratio $\sqrt{2} : \sqrt{3}$. Their volumes are in the ratio of

(1) $\sqrt{3} : \sqrt{2}$ (2) $3\sqrt{3} : \sqrt{2}$
(3) $\sqrt{3} : 2\sqrt{2}$ (4) $\sqrt{2} : \sqrt{6}$

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

24. The curved surface area and the total surface area of a cylinder are in the ratio 1 : 2. If the total surface area of the right cylinder is 616 cm^2, then its volume is :

(1) 1232 cm^3 (2) 1848 cm^3
(3) 1632 cm^3 (4) 1078 cm^3

(SSC Graduate Level Tier-I Exam. 21.04.2013)

25. The perimeter of the base of a right circular cylinder is 'a' unit. If the volume of the cylinder is V cubic unit, then the height of the cylinder is

(1) $\frac{4a^2V}{\pi}$ unit (2) $\frac{4\pi a^2}{V}$ unit
(3) $\frac{\pi a^2 V}{4}$ unit (4) $\frac{4\pi V}{a^2}$ unit

(SSC Graduate Level Tier-I Exam. 19.05.2013)

26. What is the height of a cylinder that has the same volume and radius as a sphere of diameter 12 cm ?

(1) 7 cm (2) 10 cm
(3) 9 cm (4) 8 cm

(SSC CHSL DEO & LDC Exam. 20.10.2013)

27. If diagonal of a cube is $\sqrt{12}$ cm, then its volume in cubic cm is :

(1) 8 (2) 12
(3) 24 (4) $\sqrt[3]{2}$

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

28. If the volume of two cubes are in the ratio 27:1, the ratio of their edge is :

(1) 3 : 1 (2) 27:1
(3) 1:3 (4) 1:27

(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting) & (SSC S.O. Commercial Audit Exam. 16.11.2003)

29. The edges of a cuboid are in the ratio 1 : 2 : 3 and its surface area is 88cm². The volume of the cuboid is :

(1) 120 cm³ (2) 64 cm³
(3) 48 cm³ (4) 24 cm³

(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 28.10.2012)

30. What is the volume of a cube (in cubic cm) whose diagonal measures $4\sqrt{3}$ cm?

(1) 16 (2) 27
(3) 64 (4) 8

(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & (SSC CPO S.I. Exam. 03.09.2006)

31. A cuboidal water tank has 216 litres of water. Its depth is $\frac{1}{3}$ of its length and breadth is $\frac{1}{2}$ of $\frac{1}{3}$ of the difference of length and breadth. The length of the tank is

(1) 72 dm (2) 18 dm
(3) 6 dm (4) 2 dm

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

32. A wooden box measures 20 cm by 12 cm by 10 cm. Thickness of wood is 1 cm. Volume of wood to make the box (in cubic cm) is

(1) 960 (2) 519
(3) 2400 (4) 1120

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

33. The area of three adjacent faces of a cuboid are x, y, z square units respectively. If the volume of the cuboid be y cubic units, then the correct relation between v, x, y, z is

(1) $v^2 = xyz$ (2) $v^3 = xyz$
(3) $v^2 = x^3y^3z^3$ (4) $v^3 = x^2y^2z^2$

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

34. Water flows into a tank which is 200m long and 150m wide, through a pipe of cross-section 0.3m × 0.2m at 20 km/hour. Then the time (in hours) for the water level in the tank to reach 8m is

(1) 50 (2) 120
(3) 150 (4) 200

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

35. A rectangular sheet of metal is 40cm by 15cm. Equal squares of side 4cm are cut off at the corners and the remainder is folded up to form an open rectangular box. The volume of the box is

(1) 896 cm³ (2) 986 cm³
(3) 600 cm³ (4) 916 cm³

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

36. The areas of three consecutive faces of a cuboid are 12 cm², 20 cm² and 15 cm², then the volume (in cm³) of the cuboid is

(1) 3600 (2) 100
(3) 80 (4) 60

(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

37. Surface areas of three adjacent faces of a cuboid are p, q, r. Its volume is

(1) $\sqrt{pq^2 + qr^2 + rp^2}$

(2) $\left(\sqrt{pq} + \sqrt{qr} + \sqrt{rp}\right)\left(p^2 + q^2 + r^2\right)$

(3) $\left(\sqrt{\left(p^2 + q^2 + r^2\right)(p + q + r)}\right)$

(4) $\sqrt{pqr}$

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

38. A godown is 15 m long and 12 m broad. The sum of the area of the floor and the ceiling is equal to the sum of areas of the four walls. The volume (in m³) of the godown is:

(1) 900 (2) 1200
(3) 1800 (4) 720

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

39. If the total surface area of a cube is 96 cm², its volume is

(1) 56 cm³ (2) 16 cm³
(3) 64 cm³ (4) 36 cm³

(SSC CHSL DEO & LDC Exam. 20.10.2013)

40. The ratio of the volume of two cones is 2 : 3 and the ratio of radii of their base is 1 : 2. The ratio of their height is

(1) 3 : 8 (2) 8 : 3
(3) 4 : 3 (4) 3 : 4

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CPO S.I. Exam. 03.09.2006) & (SSC CHSL DEO & LDC Exam. 10.11.2013)

41. If the height of a given cone be doubled and radius of the base remains the same, the ratio of the volume of the given cone to that of the second cone will be

(1) 2 : 1 (2) 1 : 8
(3) 1 : 2 (4) 8 : 1

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

42. If the radius of the base of a cone be doubled and height is left unchanged, then ratio of the volume of new cone to that of the original cone will be :

(1) 1 : 4 (2) 2 : 1
(3) 1 : 2 (4) 4 : 1

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

43. Each of the measure of the radius of base of a cone and that of a sphere is 8 cm. Also, the volume of these two solids are equal. The slant height of the cone is

(1) $8\sqrt{17}$ cm (2) $4\sqrt{17}$ cm
(3) $34\sqrt{2}$ cm (4) 34 cm.

(SSC CPO S.I. Exam. 05.09.2004)

44. A cone of height 15 cm and basediameter 30 cm is carved out of a wooden sphere of radius 15 cm. The percentage of wasted wood is :

(1) 75% (2) 50%
(3) 40% (4) 25%

(SSC CPO S.I. Exam. 26.05.2005)

45. In a right circular cone, the radius of its base is 7 cm and its height 24 cm. A cross-section is made through the midpoint of the height parallel to the base. The volume of the upper portion is

(1) 169 cm^3 (2) 154 cm^3
(3) 1078 cm^3 (4) 800 cm^3

(SSC Section Officer (Commercial Audit) Exam.26.11.2006 (Second Sitting)

46. If the area of the base of a cone is 770 cm^2 and the area of the curved surface is 814 cm^2, then its volume (in cm^3) is :

(1) $213\sqrt{5}$ (2) $392\sqrt{5}$
(3) $550\sqrt{5}$ (4) $616\sqrt{5}$

(SSC CPO S.I. Exam. 16.12.2007)

47. Volume of two cones are in the ratio 1 : 4 and their diameters are in the ratio 4 : 5. The ratio of their height is

(1) 1 : 5 (2) 5 : 4
(3) 5 : 16 (4) 25 : 64

(SSC CPO S.I. Exam. 06.09.2009)

48. The height of the cone is 30 cm. A small cone is cut off at the top by a plane parallel to its base. If its volume is $\frac{1}{27}$ of the volume of the cone, at what height, above the base, is the section made?

(1) 6 cm (2) 8 cm
(3) 10 cm (4) 20 cm

(SSC Data Entry Operator Exam. 31.08.2008)

49. The radius of the base and height of a right circular cone are in the ratio 5 : 12. If the volume of the cone is $314\frac{2}{7}$ cm^3, the slant height (in cm) of the cone will be

(1) 12 (2) 13
(3) 15 (4) 17

(SSC Data Entry Operator Exam. 02.08.2009)

50. Two solid right cones of equal height and of radii r_1 and r_2 are melted and made to form a solid sphere of radius R. Then the height of the cone is

(1) $\frac{4R^2}{r_1^2 + r_2^2}$ (2) $\frac{4R}{r_1 + r_2}$
(3) $\frac{4R^3}{r_1^2 + r_2^2}$ (4) $\frac{R^2}{r_1^2 + r_2^2}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

51. The ratio of radii of two cone is 3 : 4 and the ratio of their height is 4 : 3. Then the ratio of their volume will be

(1) 3 : 4 (2) 4 : 3
(3) 9 : 16 (4) 16 : 9

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

52. If a right circular cone is separated into solids of volumes V_1, V_2, V_3 by two planes parallel to the base, which also trisect the altitude, then $V_1 : V_2 : V_3$ is

(1) 1: 2 : 3 (2) 1: 4 : 6
(3) 1: 6 : 9 (4) 1: 7 : 19

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

53. If the radii of the circular ends of a truncated conical bucket which is 45cm high be 28 cm and 7 cm, then the capacity of the bucket in cubic centimetre is $\left(use\ \pi = \frac{22}{7}\right)$

(1) 48510 (2) 45810
(3) 48150 (4) 48051

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

54. The ratio of height and the diameter of a right circular cone is 3 : 2 and its volume is 1078 cc, then (taking $\pi = \frac{22}{7}$) its height is :

(1) 7 cm (2) 14 cm
(3) 21 cm (4) 28 cm

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

55. The radius of the base of a right circular cone is doubled keeping its height fixed. The volume of the cone will be :

(1) three times of the previous volume
(2) four times of the previous volume
(3) $\sqrt{2}$ times of the previous volume
(4) double of the previous volume

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

56. The heights of two cones are in the ratio 1 : 3 and the diameters of their base are in the ratio 3 : 5. The ratio of their volume is

(1) 3 : 25 (2) 4 : 25
(3) 6 : 25 (4) 7 : 25

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

57. The base of a right circular cone has the same radius a as that of a sphere. Both the sphere and the cone have the same volume. Height of the cone is

(1) $3a$ (2) $4a$
(3) $\frac{7}{4}a$ (4) $\frac{7}{3}a$

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

58. The circumference of the base of a 16cm height solid cone is 33cm. What is the volume of the cone in cm^3 ?

(1) 1028 (2) 616
(3) 462 (4) 828

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

59. The perimeter of the base of a right circular cone is 8 cm. If the height of the cone is 21 cm, then its volume is:

(1) 108 π cm^3 (2) $\frac{112}{\pi}$ cm^3
(3) 112 π cm^3 (4) $\frac{108}{\pi}$ cm^3

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

60. If the volume of two right circular cones are in the ratio 4 : 1 and their diameter are in the ratio 5 : 4, then the ratio of their height is :

(1) 25 :16 (2) 25 : 64
(3) 64 : 25 (4) 16 : 25

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

61. The volume of a conical tent is 1232 cu. m and the area of its base is 154 sq. m. Find the length of the canvas required to build the tent, if the canvas is 2m in width.

$\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) 270 m (2) 272 m
(3) 276 m (4) 275 m

(SSC Graduate Level Tier-II Exam. 29.09.2013)

62. If the ratio of the diameters of two right circular cones of equal height be 3 : 4, then the ratio of their volume will be
(1) 3 : 4 (2) 9 : 16
(3) 16 : 9 (4) 27 : 64
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

63. A hollow spherical metallic ball has an external diameter 6 cm and is $\frac{1}{2}$ cm thick. The volume of the ball (in cm^3) is $\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) $41\frac{2}{3}$ (2) $37\frac{2}{3}$
(3) $47\frac{2}{3}$ (4) $40\frac{2}{3}$
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

64. The sum of radii of two spheres is 10 cm and the sum of their volume is 880 cm^3. What will be the product of their radii ?
(1) 21 (2) $26\frac{1}{3}$
(3) $33\frac{1}{3}$ (4) 70
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

65. If the radius of a sphere is doubled, its volume becomes
(1) double (2) four times
(3) six times (4) eight times
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

66. The radii of two spheres are in the ratio 3 : 2. Their volume will be in the ratio :
(1) 9 : 4 (2) 3 : 2
(3) 8 : 27 (4) 27 : 8
(SSC CPO S.I. Exam. 16.12.2007)

67. The total surface area of a solid hemisphere is 108π cm^2. The volume of the hemisphere is
(1) 72π cm^3 (2) 144π cm^3
(3) $108\sqrt{6}$ cm^3 (4) $54\sqrt{6}$ cm^3
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

68. The largest sphere is carved out of a cube of side 7 cm. The volume of the sphere (in cm^3) will be
(1) 718.66 (2) 543.72
(3) 481.34 (4) 179.67
(SSC CPO S.I. Exam. 06.09.2009)

69. The surface areas of two spheres are in the ratio 4 : 9. Their volumes will be in the ratio
(1) 2 : 3 (2) 4 :9
(3) 8 : 27 (4) 64 : 729
(SSC Data Entry Operator Exam. 31.08.2008) & (SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting) & (SSC GL Tier-II Exam. 29.09.2013)

70. A sphere and a hemisphere have the same volume. The ratio of their radii is
(1) 1 : 2 (2) 1 : 8
(3) 1 : $\sqrt{2}$ (4) 1 : $\sqrt[3]{2}$
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

71. A solid sphere of 6 cm diameter is melted and recast into 8 solid spheres of equal volume. The radius (in cm) of each small sphere is
(1) 1.5 (2) 3
(3) 2 (4) 2.5
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

72. The total surface area of a sphere is 8π square unit. The volume of the sphere is
(1) $\frac{8\sqrt{2}}{3}\pi$ cubic unit
(2) $\frac{8}{3}\pi$ cubic unit
(3) $8\sqrt{3}\pi$ cubic unit
(4) $\frac{8\sqrt{3}}{5}\pi$ cubic unit
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

73. Area of the base of a pyramid is 57 sq.cm. and height is 10 cm, then its volume (in cm^3), is
(1) 570 (2) 390
(3) 190 (4) 590
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

74. There is a pyramid on a base which is a regular hexagon of side 2a cm. If every slant edge of this pyramid is of length $\frac{5a}{2}$ cm, then the volume of this pyramid is
(1) $3a^3$ cm^3 (2) $3\sqrt{2}\,a^3$ cm^3
(3) $3\sqrt{3}\,a^3$ cm^3 (4) $6a^3$ cm^3
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

75. The base of a right pyramid is a square of side 40 cm long. If the volume of the pyramid is 8000 cm^3, then its height is :
(1) 5 cm (2) 10 cm
(3) 15 cm (4) 20 cm
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

76. The base of a right prism is a trapezium. The length of the parallel sides are 8 cm and 14 cm and the distance between the parallel sides is 8 cm. If the volume of the prism is 1056 cm^3, then the height of the prism is
(1) 44 cm (2) 16.5 cm
(3) 12 cm (4) 10.56 cm
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

77. The height of a right prism with a square base is 15 cm. If the area of the total surface of the prism is 608 sq. cm, its volume is
(1) 910 cm^3 (2) 920 cm^3
(3) 960 cm^3 (4) 980 cm^3
(SSC Graduate Level Tier-II Exam.16.09.2012)

78. The base of a right prism is an equilateral triangle of side 8 cm and height of the prism is 10 cm. Then the volume of the prism is
(1) $320\sqrt{3}$ cubic cm
(2) $160\sqrt{3}$ cubic cm
(3) $150\sqrt{3}$ cubic cm
(4) $300\sqrt{3}$ cubic cm
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

79. The base of right prism is a triangle whose perimeter is 28 cm and the inradius of the triangle is 4 cm. If the volume of the prism is 366 cc, then its height is
(1) 6 cm (2) 8 cm
(3) 4 cm (4) None of these
(SSC CHSL DEO & LDC Exam. 20.10.2013)

80. If the base of a right pyramid is triangle of sides 5 cm, 12 cm, 13 cm and its volume is 330 cm^3, then its height (in cm) will be
(1) 33 (2) 32
(3) 11 (4) 22
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

81. The diameter of the moon is assumed to be one fourth of the diameter of the earth. Then the ratio of the volume of the earth to that of the moon is

(1) 64 : 1 (2) 1 : 64
(3) 60 : 7 (4) 7 : 60

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

82. A conical vessel whose internal radius is 12 cm and height 50 cm is full of liquid. The contents are emptied into a cylindrical vessel with radius (internal) 10 cm. The height to which the liquid rises in the cylindrical vessel is :

(1) 25cm (2) 20cm
(3) 24cm (4) 22cm

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

83. The volume of a right circular cylinder is equal to the volume of that right circular cone whose height is 108 cm and diameter of base is 30 cm. If the height of the cylinder is 9 cm, the diameter of its base is

(1) 30 cm (2) 60 cm
(3) 50 cm (4) 40 cm

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

84. The total surface area of a cube and a sphere are equal. What will be the ratio between their volume ?

(1) $\pi : 6$ (2) $\sqrt{\pi} : \sqrt{6}$
(3) $\sqrt{6} : \sqrt{\pi}$ (4) $6 : \pi$

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005) & (SSC HSGL Data Entry & LDC Exam. 28.11.2010 (Ist Sitting) & (SSC MTS (Non-Technical Staff Exam. 20.02.2011)

85. A rectangular paper sheet of dimensions 22 cm × 12 cm is folded in the form of a cylinder along its length. What will be the volume of this cylinder ? (Take $\pi = \frac{22}{7}$)

(1) 460 cm^3 (2) 462 cm^3
(3) 624 cm^3 (4) 400 cm^3

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

86. The ratio of the volume of a cube to that of a sphere, which will fit exactly inside the cube, is

(1) $\pi : 6$ (2) $6 : \pi$
(3) $3 : \pi$ (4) $\pi : 3$

(SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting) & (SSC CGL Prelim Exam. 27.07.2008 (Ist Sitting)

87. The volume of a sphere and a right circular cylinder having the same radius are equal , The ratio of the diameter of the sphere to the height of the cylinder is

(1) 3 : 2 (2) 2 : 3
(3) 1 : 2 (4) 2 : 1

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

88. The size of a rectangular piece of paper is 100 cm × 44 cm. A cylinder is formed by rolling the paper along its length. The volume of the cylinder is (Use $\pi = \frac{22}{7}$)

(1) 4400 cm^3 (2) 15400 cm^3
(3) 35000 cm^3 (4) 144 cm^3

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

89. A cone, a hemisphere and a cylinder stand on equal bases and have the same height. The ratio of their respective volume is

(1) 1 : 2 : 3 (2) 2 : 1 : 3
(3) 1 : 3 : 2 (4) 3 : 1 : 2

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (Delhi Zone) & (FCI Asst. Grade-III Exam. 25.02.2012 (Paper-I, North Zone, Ist Sitting)

90. The height of a cylinder and that of a cone are in the ratio 2 : 3 and the radii of their bases in the ratio 3 : 4. The ratio of their volume will be

(1) 1 : 9 (2) 2 : 9
(3) 9 : 8 (4) 3 : 8

(SSC CPO S.I. Exam. 09.11.2008)

91. Water is flowing at the rate of 5 km/h through a pipe of diameter 14 cm into a rectangular tank which is 50 m long, 44m wide. The time taken (in hours) for the rise in the level of water in the tank to be 7 cm is

(1) 2 (2) $1\frac{1}{2}$
(3) 3 (4) $2\frac{1}{2}$

(SSC CPO S.I. Exam. 06.09.2009 & (SSC CGL Tier-1 Exam. 19.06.2011 (IInd Sitting)

92. The total surface area of a solid right circular cylinder is twice that of a solid sphere. If they have the same radii, the ratio of the volume of the cylinder to that of the sphere is given by

(1) 9 : 4 (2) 2 : 1
(3) 3 : 1 (4) 4 : 9

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

93. In a cylindrical vessel of diameter 24 cm filled up with sufficient quantity of water, a solid spherical ball of radius 6 cm is completely immersed. Then the increase in height of water level is :

(1) 1.5 cm (2) 2 cm
(3) 3 cm (4) 4.2 cm

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

94. A solid wooden toy is in the shape of a right circular cone mounted on a hemisphere. If the radius of the hemisphere is 4.2 cm and the total height of the toy is 10.2 cm, find the volume of the wooden toy (nearly).

(1) 104 cm^3 (2) 162 cm^3
(3) 427 cm^3 (4) 266 cm^3

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

95. The respective height and volume of a hemisphere and a right circular cylinder are equal, then the ratio of their radii is

(1) $\sqrt{2} : \sqrt{3}$ (2) $\sqrt{3} : 1$
(3) $\sqrt{3} : \sqrt{2}$ (4) $2 : \sqrt{3}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

96. The ratio of the volume of a cube and of a solid sphere is 363 : 49. The ratio of an edge of the cube and the radius of the sphere is (taking $\pi = \frac{22}{7}$)

(1) 7 : 11 (2) 22 : 7
(3) 11 : 7 (4) 7: 22

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

97. From a right circular cylinder of radius 10 cm and height 21 cm, a right circular cone of same base-radius is removed. If the volume of the remaining portion is 4400 cm^3, then the height of the removed cone (taking $\pi = \frac{22}{7}$) is :

(1) 15 cm (2) 18 cm
(3) 21 cm (4) 24 cm

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

98. If a solid cone of volume 27π cm^3 is kept inside a hollow cylinder whose radius and height are that of the cone, then the volume of water needed to fill the empty space is

(1) 3π cm^3 (2) 18π cm^3
(3) 54π cm^3 (4) 81π cm^3

(SSC Graduate Level Tier-II Exam.16.09.2012)

99. A cylindrical can whose base is horizontal and is of internal radius 3.5 cm contains sufficient water so that when a solid sphere is placed inside, water just covers the sphere. The sphere fits in the can exactly. The depth of water in the can before the sphere was put, is

(1) $\frac{35}{3}$ cm (2) $\frac{17}{3}$ cm
(3) $\frac{7}{3}$ cm (4) $\frac{14}{3}$ cm

(SSC Graduate Level Tier-II Exam.16.09.2012)

100. If A denotes the volume of a right circular cylinder of same height as its diameter and B is the volume of a sphere of same radius, then $\frac{A}{B}$ is :

(1) $\frac{4}{3}$ (2) $\frac{3}{2}$
(3) $\frac{2}{3}$ (4) $\frac{3}{4}$

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

101. The base of a right circular cone has the same radius a as that of a sphere. Both the sphere and the cone have the same volume. Height of the cone is

(1) $3a$ (2) $4a$
(3) $\frac{7}{4}a$ (4) $\frac{7}{3}a$

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

102. The radii of the base of a cylinder and a cone are in the ratio $\sqrt{3}:\sqrt{2}$ and their heights are in the ratio $\sqrt{2}:\sqrt{3}$. Their volume are in the ratio of

(1) $\sqrt{3}:\sqrt{2}$ (2) $3\sqrt{3}:\sqrt{2}$
(3) $\sqrt{3}:2\sqrt{2}$ (4) $\sqrt{2}:\sqrt{6}$

(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

103. A semicircular sheet of metal of diameter 28 cm is bent into an open conical cup. The capacity of the cup (taking $\pi = \frac{22}{7}$) is

(1) 624.26 cm^3 (2) 622.38 cm^3
(3) 622.56 cm^3 (4) 623.20 cm^3

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

104. A conical flask is full of water. The flask has base radius r and height h. This water is poured into a cylindrical flask of base radius m. The height of water in the cylindrical flask is

(1) $\frac{m}{2h}$ (2) $\frac{h}{2}m^2$
(3) $\frac{2h}{m}$ (4) $\frac{h}{3m^2}$

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

105. The volume of a cylinder and a cone are in the ratio 3 : 1. Find their diameters and then compare them when their heights are equal.

(1) Diameter of cylinder = 2 times of diameter of cone
(2) Diameter of cylinder = Diameter of cone
(3) Diameter of cylinder > Diameter of cone
(4) Diameter of cylinder < Diameter of cone

(SSC CHSL DEO & LDC Exam. 20.10.2013)

106. A cone of height 7 cm and base radius 1 cm is carved from a cuboidal block of wood 10 cm × 5cm × 2 cm. [Assuming $\pi = \frac{22}{7}$]

The percentage wood wasted in the process is :

(1) $92\frac{2}{3}\%$ (2) $46\frac{1}{3}\%$
(3) $53\frac{2}{3}\%$ (4) $7\frac{1}{3}\%$

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

107. If the radius of a cylinder is decreased by 50% and the height is increased by 50% to form a new cylinder, the volume will be decreased by

(1) 0% (2) 25%
(3) 62.5% (4) 75%

(SSC CPO S.I. Exam. 07.09.2003)

108. Each of the height and base-radius of a cone is increased by 100%. The percentage increase in the volume of the cone is

(1) 700% (2) 400%
(3) 300% (4) 100%

(SSC CPO S.I. Exam. 07.09.2003)

109. If both the radius and height of a right circular cone are increased by 20%, its volume will be increased by

(1) 20% (2) 40%
(3) 60% (4) 72.8%

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

110. If the height of a right circular cone is increased by 200% and the radius of the base is reduced by 50%, the volume of the cone

(1) increases by 25%
(2) increases by 50%
(3) remains unaltered
(4) decreases by 25%

(SSC CPO S.I. Exam. 03.09.2006)

111. If the height and the radius of the base of a cone are each increased by 100%, then the volume of the cone becomes

(1) double that of the original
(2) three times that of the original
(3) six times that of the original
(4) eight times that of the original

(SSC CPO S.I. Exam. 03.09.2006)

112. If the radius of a right circular cylinder is decreased by 50% and its height is increased by 60%, its volume will be decreased by

(1) 10% (2) 60%
(3) 40% (4) 20%

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

113. The length, breadth and height of a cuboid are in the ratio 1 : 2 : 3. If they are increased by 100%, 200% and 200% respectively, then compared to the original volume the increase in the volume of the cuboid will be

(1) 5 times (2) 18 times
(3) 12 times (4) 17 times

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

114. Each of the radius of the base and the height of a right circular cylinder is increased by 10%. The volume of the cylinder is increased by
(1) 3.31% (2) 14.5%
(3) 33.1% (4) 19.5%
(SSC CPO S.I. Exam. 09.11.2008) & (SSC SAS Exam. 26.06.2010 (Paper-I)

115. If the height of a cone is increased by 100% then its volume is increased by :
(1) 100% (2) 200%
(3) 300% (4) 400%
(SSC CHSL DEO & LDC Exam. 27.11.2010)

116. A hemispherical cup of radius 4 cm is filled to the brim with coffee. The coffee is then poured into a vertical cone of radius 8 cm and height 16 cm. The percentage of the volume of the cone that remains empty is :
(1) 87.5% (2) 80.5%
(3) 81.6% (4) 88.2%
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

117. The volume (in m^3) of rain water that can be collected from 1.5 hectares of ground in a rainfall of 5 cm is
(1) 75 (2) 750
(3) 7500 (4) 75000
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

118. Each edge of a regular tetrahedron is 3 cm, then its volume is
(1) $\frac{9\sqrt{2}}{4}$ c.c. (2) $27\sqrt{3}$ c.c.
(3) $\frac{4\sqrt{2}}{9}$ c.c. (4) $9\sqrt{3}$ c.c.
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

119. The perimeter of the triangular base of a right prism is 15 cm and radius of the incircle of the triangular base is 3 cm. If the volume of the prism be 270 cm^3, then the height of the prism is
(1) 6 cm (2) 7·5 cm
(3) 10 cm (4) 12 cm
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

120. A prism has as the base a right-angled triangle whose sides adjacent to the right angles are 10 cm and 12 cm long. The height of the prism is 20 cm. The density of the material of the prism is 6 gm/cubic cm. The weight of the prism is
(1) 6.4 kg (2) 7.2 kg
(3) 3.4 kg (4) 4.8 kg
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

121. A copper rod of 1 cm diameter and 8 cm length is drawn into a wire of uniform diameter and 18 m length. The radius (in cm) of the wire is
(1) $\frac{1}{15}$ (2) $\frac{1}{30}$
(3) $\frac{2}{15}$ (4) 15
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

122. A well 20 m in diameter is dug 14 m deep and the earth taken out is spread all around it to a width of 5 m to form an embankment. The height of the embankment is :
(1) 10 m (2) 11 m
(3) 11.2 m (4) 11.5 m
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

123. Two solid cylinders of radii 4 cm and 5cm and length 6 cm and 4 cm respectively are recast into cylindrical disc of thickness1 cm. The radius of the disc is
(1) 7 cm (2) 14 cm
(3) 21 cm (4) 28 cm
(SSC CPO S.I. Exam. 06.09.2009)

124. A metallic hemisphere is melted and recast in the shape of a cone with the same base radius (R) as that of the hemisphere. If H is the height of the cone, then :
(1) H = 2R (2) $H = \frac{2}{3}R$
(3) $H = \sqrt{3R}$ (4) B = 3R
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

125. Three solid metallic spheres of diameter 6 cm, 8 cm and 10 cm are melted and recast into a new solid sphere. The diameter of the new sphere is :
(1) 4 cm (2) 6 cm
(3) 8 cm (4) 12 cm
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

126. Three solid metallic balls of radii 3 cm, 4 cm and 5 cm are melted and moulded into a single solid ball. The radius of the new ball is :
(1) 2 cm (2) 3 cm
(3) 4 cm (4) 6 cm
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

127. Three solid spheres of a metal whose radii are 1 cm, 6 cm and 8 cm are melted to form an other solid sphere. The radius of this new sphere is
(1) 10.5 cm (2) 9.5 cm
(3) 10 cm (4) 9 cm
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

128. A sphere of radius 2 cm is put into water contained in a cylinder of base-radius 4 cm. If the sphere is completely immersed in the water, the water level in the cylinder rises by
(1) $\frac{1}{3}$ cm (2) $\frac{1}{2}$ cm
(3) $\frac{2}{3}$ cm (4) 2 cm
(SSC CPO S.I. Exam. 07.09.2003)

129. 12 spheres of the same size are made by melting a solid cylinder of 16 cm diameter and 2 cm height. The diameter of each sphere is :
(1) 2 cm (2) 4 cm
(3) 3 cm (4) $\sqrt{3}$ cm
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

130. By melting a solid lead sphere of diameter 12 cm, three small spheres are made whose diameters are in the ratio 3 : 4 : 5. The radius (in cm) of the smallest sphere is
(1) 3 (2) 6
(3) 1.5 (4) 4
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

131. A solid metallic sphere of radius 3 decimetres is melted to form a circular sheet of 1 milimetre thickness. The diameter of the sheet so formed is
(1) 26 metres (2) 24 metres
(3) 12 metres (4) 6 metres
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

132. A copper wire of length 36 m and diameter 2 mm is melted to form a sphere. The radius of the sphere (in cm) is
(1) 2.5 (2) 3
(3) 3.5 (4) 4
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

133. A child reshapes a cone made up of clay of height 24cm and radius 6cm into a sphere. The radius (in cm) of the sphere is
(1) 6 (2) 12
(3) 24 (4) 48
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

134. A solid metallic spherical ball of diameter 6 cm is melted and recasted into a cone with diameter of the base as 12 cm. The height of the cone is
(1) 6 cm (2) 2 cm
(3) 4 cm (4) 3 cm
(SSC CPO S.I. Exam. 12.01.2003)

135. The diameter of the iron ball used for the shot-put game is 14 cm. It is melted and then a solid cylinder of height $2\frac{1}{3}$ cm is made. What will be the diameter of the base of the cylinder ?
(1) 14 cm (2) 28 cm
(3) $\frac{14}{3}$ cm (4) $\frac{28}{3}$ cm
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

136. The radius of the base and height of a metallic solid cylinder are *r* cm and 6 cm respectively. It is melted and recast into a solid cone of the same radius of base, The height of the cone is :
(1) 54 cm (2) 27 cm
(3) 18 cm (4) 9 cm
(SSC CPO S.I. Exam. 16.12.2007)

137. A solid metallic cone is melted and recast into a solid cylinder of the same base as that of the cone. If the height of the cylinder is 7cm, the height of the cone was
(1) 20 cm (2) 21 cm
(3) 28 cm (4) 24 cm
(SSC Data Entry Operator Exam. 02.08.2009)

138. A solid spherical copper ball, whose diameter is 14 cm, is melted and converted into a wire having diameter equal to 14 cm. The length of the wire is
(1) 27 cm (2) $\frac{16}{3}$ cm
(3) 15 cm (4) $\frac{28}{3}$ cm
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

139. A solid sphere is melted and recast into a right circular cone with a base radius equal to the radius of sphere. What is the ratio of the height and radius of the cone so formed?
(1) 4:3 (2) 2:3
(3) 3 : 4 (4) 4 :1
(SSC Constable (GD) Exam. 12.05.2013)

140. A sphere of diameter 6 cm is dropped in a right circular cylindrical vessel partly filled with water. The diameter of the cylindrical vessel is 12 cm. If the sphere is just completely submerged in water, then the rise of water level in the cylindrical vessel is
(1) 2 cm (2) 1 cm
(3) 3 cm (4) 4 cm
(SSC Graduate Level Tier-I Exam. 19.05.2013)

141. A copper sphere of diameter 18 cm is drawn into a wire of diameter 4 mm. The length of the wire, in metre, is :
(1) 2.43 (2) 243
(3) 2430 (4) 24.3
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

142. A rectangular block of metal has dimensions 21 cm, 77 cm and 24 cm. The block has been melted into a sphere. The radius of the sphere is
$\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) 21 cm (2) 7 cm
(3) 14 cm (4) 28 cm
(SSC Graduate Level Tier-II Exam. 29.09.2013

143. The radius of cross-section of a solid cylindrical rod of iron is 50 cm. The cylinder is melted down and formed into 6 solid spherical balls of the same radius as that of the cylinder. The length of the rod (in metres) is
(1) 0.8 (2) 2
(3) 3 (4) 4
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

144. Two right circular cones of equal height of radii of base 3 cm and 4 cm are melted together and made to a solid sphere of radius 5 cm. The height of a cone is
(1) 10 cm (2) 20 cm
(3) 30 cm (4) 40 cm
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

145. A tank 40 m long, 30 m broad and 12 m deep is dug in a field 1000 m long and 30 m wide. By how much will the level of the field rise if the earth dug out of the tank is evenly spread over the field ?
(1) 2 metre (2) 1.2 metre
(3) 0.5 metre (4) 5 metre
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

146. A right pyramid 6 m hight has a square base of which the diagonal is $\sqrt{1152}$ m. Volume of the pyramid is
(1) 144 m^3 (2) 288 m^3
(3) 576 m^3 (4) 1152 m^3
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

147. If the ratio of volumes of two cones is 2 : 3 and the ratio of the radii of their bases is 1 : 2, then the ratio of their heights will be
(1) 8 : 3 (2) 3 : 8
(3) 4 : 3 (4) 3 : 4
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

148. Two cubes have their volumes in the ratio 27 : 64. The ratio of their surface areas is
(1) 9 : 25 (2) 16 : 25
(3) 9 : 16 (4) 4 : 9
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

149. The radius of the base and the height of a right circular cone are doubled. The volume of the cone will be
(1) 8 times of the previous volume
(2) three times of the previous volume
(3) $3\sqrt{2}$ times of the previous volume
(4) 6 times of the previous volume
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

150. The ratio of weights of two spheres of different materials is 8 : 17 and the ratio of weights per 1 cc of materials of each is 289 : 64. The ratio of radii of the two spheres is
(1) 8 : 17 (2) 4 : 17
(3) 17 : 4 (4) 17 : 8
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

151. Three cubes of sides 6 cm, 8 cm and 1 cm are melted to form a new cube. The surface area of the new cube is
(1) 486 cm^2 (2) 496 cm^2
(3) 586 cm^2 (4) 658 cm^2
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

152. A sphere is cut into two hemispheres. One of them is used as bowl. It takes 8 bowlfuls of this to fill a conical vessel of height 12 cm and radius 6 cm. The radius of the sphere (in centimetre) will be
(1) 3 (2) 2
(3) 4 (4) 6
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

153. The volumes of a right circular cylinder and a sphere are equal. The radius of the cylinder and the diameter of the sphere are equal. The ratio of height and radius of the cylinder is
(1) 3 : 1 (2) 1 : 3
(3) 6 : 1 (4) 1 : 6
(SSC CGL Tier-I Exam. 19.10.2014)

154. Some bricks are arranged in an area measuring 20 cu. m. If the length, breadth and height of each brick is 25 cm, 12.5 cm and 8 cm respectively, then in that pile the number of bricks are (suppose there is no gap in between two bricks)
(1) 6,000 (2) 8,000
(3) 4,000 (4) 10,000
(SSC CGL Tier-I Exam. 26.10.2014)

155. The height of a cone is 30 cm. A small cone is cut off at the top by a plane parallel to the base. If its volume be $\frac{1}{27}$th of the volume of the given cone, at what height above the base is the section made ?
(1) 19 cm (2) 20 cm
(3) 12 cm (4) 15 cm
(SSC CGL Tier-II Exam. 21.09.2014)

156. The height of the right pyramid whose area of the base is 30 m^2 and volume is 500 m^3, is
(1) 50 m (2) 60 m
(3) 40 m (4) 20 m
(SSC CGL Tier-II Exam. 21.09.2014)

157. The base of a right prism is an equilateral triangle. If the lateral surface area and volume is 120 cm^2, $40\sqrt{3}$ cm^3 respectively then the side of base of the prism is
(1) 4 cm (2) 5 cm
(3) 7 cm (4) 40 cm
(SSC CGL Tier-II Exam. 21.09.2014)

158. A ball of lead 4 cm in diameter is covered with gold. If the volume of the gold and lead are equal, then the thickness of gold [given $\sqrt[3]{2} = 1.259$] is approximately
(1) 5.038 cm (2) 5.190 cm
(3) 1.038 cm (4) 0.518 cm
(SSC CGL Tier-II Exam. 21.09.2014)

159. A large solid sphere is melted and moulded to form identical right circular cones with base radius and height same as the radius of the sphere. One of these cones is melted and moulded to form a smaller solid sphere. Then the ratio of the surface area of the smaller to the surface area of the larger sphere is
(1) $1 : 3^{\frac{4}{3}}$ (2) $1 : 2^{\frac{3}{2}}$
(3) $1 : 3^{\frac{2}{3}}$ (4) $1 : 2^{\frac{4}{3}}$
(SSC CGL Tier-II Exam. 21.09.2014)

160. A conical cup is filled with ice-cream. The ice-cream forms a hemispherical shape on its open top. The height of the hemispherical part is 7 cm. The radius of the hemispherical part equals the height of the cone. Then the volume of the ice-cream is $\left[\pi = \frac{22}{7}\right]$
(1) 1078 cubic cm
(2) 1708 cubic cm
(3) 7108 cubic cm
(4) 7180 cubic cm
(SSC CGL Tier-II Exam. 21.09.2014)

161. A hollow sphere of internal and external diameters 6 cm and 10 cm respectively is melted into a right circular cone of diameter 8 cm. The height of the cone is
(1) 22.5 cm (2) 23.5 cm
(3) 24.5 cm (4) 25.5 cm
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

162. Each edge of a regular tetrahedron is 4 cm. Its volume (in cubic cm) is
(1) $\frac{16\sqrt{3}}{3}$ (2) $16\sqrt{3}$
(3) $\frac{16\sqrt{2}}{3}$ (4) $16\sqrt{2}$
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

163. A flask in the shape of a right circular cone of height 24 cm is filled with water. The water is poured in right circular cylindrical flask whose radius is $\frac{1}{3}$ rd of radius of the base of the circular cone. Then the height of the water in the cylindrical flask is
(1) 32 cm (2) 24 cm
(3) 48 cm (4) 72 cm
(SSC CHSL DEO & LDC Exam. 9.11.2014)

164. The whole surface of a cube is 150 sq.cm. Then the volume of the cube is
(1) 125 cm^3 (2) 216 cm^3
(3) 343 cm^3 (4) 512 cm^3
(SSC CHSL DEO & LDC Exam. 16.11.2014)

165. A solid metallic spherical ball of diameter 6 cm is melted and recast into a cone with diameter of the base as 12 cm. The height of the cone is
(1) 2 cm (2) 3 cm
(3) 4 cm (4) 6 cm
(SSC CHSL DEO & LDC Exam. 16.11.2014)

166. A hemispherical bowl of internal radius 15 cm contains a liquid. The liquid is to be filled into cylindrical shaped bottles of diameter 5 cm and height 6 cm. The number of bottles required to empty the bowl is
(1) 30 (2) 40
(3) 50 (4) 60
(SSC CHSL DEO & LDC Exam. 16.11.2014)

167. If V_1, V_2 and V_3 be the volumes of a right circular cone, a sphere and a right circular cylinder having the same radius and same height, then
(1) $V_1 = \frac{V_2}{2} = \frac{V_3}{3}$
(2) $\frac{V_1}{2} = \frac{V_2}{3} = V_3$
(3) $\frac{V_1}{3} = \frac{V_2}{2} = V_3$
(4) $\frac{V_1}{3} = V_2 = \frac{V_3}{2}$
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

168. If the radius of a shphere be doubled, then the percentage increase in volume is
(1) 500% (2) 700%
(3) 600% (4) 800%
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

169. If 64 buckets of water are removed from a cubical shaped water tank completely filled with water, $\frac{1}{3}$ of the tank remains filled with water. The length of each side of the tank is 1.2 m. Assuming that all buckets are of the same measure, then the volume (in litres) of water contained by each bucket is

(1) 12 (2) 16
(3) 15 (4) 18

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

170. A wooden box of dimensions 8 metre × 7 metre × 6 metre is to carry rectangular boxes of dimensions 8 cm × 7 cm × 6 cm. The maximum number of boxes that can be carried in 1 wooden box is

(1) 7500000 (2) 9800000
(3) 1200000 (4) 1000000

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

171. Two circular cylinders of equal volume have their heights in the ratio 1 : 2. Ratio of their radii is (Take $\pi = \frac{22}{7}$)

(1) 1 : 4 (2) 1 : $\sqrt{2}$
(3) $\sqrt{2}$: 1 (4) 1 : 2

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

172. A rectangular piece of paper of dimensions 22 cm by 12 cm is rolled along its length to form a cylinder. The volume (in cu.cm.) of the cylinder so formed is (use $\pi = \frac{22}{7}$)

(1) 562 (2) 412
(3) 462 (4) 362

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

173. A sphere is placed inside a right circular cylinder so as to touch the top, base and the lateral surface of the cylinder. If the radius of the sphere is R, the volume of the cylinder is

(1) $2\pi R^3$ (2) $4\pi R^3$
(3) $8\pi R^3$ (4) $\frac{8}{3}\pi R^3$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

174. The base of a right pyramid is an equilateral triangle of side 4 cm each. Each slant edge is 5 cm long. The volume of the pyramid is

(1) $\frac{4\sqrt{8}}{3}$ cm^3 (2) $\frac{4\sqrt{60}}{3}$ cm^3
(3) $\frac{4\sqrt{59}}{3}$ cm^3 (4) $\frac{4\sqrt{61}}{3}$ cm^3

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

175. If the radius of the base of a cone be 7 cm and its curved surface area be 550 sq. cm, then the volume of the cone is

(1) 1232 cu. cm (2) 1024 cu. cm
(3) 1132 cu. cm (4) 1324 cu. cm

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

176. A hemisphere of iron is melted and recast in the shape of a right circular cylinder of diameter 18 cm and height 162 cm. The radius of the hemisphere is

(1) 27 cm (2) 9 cm
(3) 6 cm (4) 12 cm

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

177. An iron sphere of radius 27 cm is melted to form a wire of length 729 cm. The radius of wire is

(1) 6 cm (2) 9 cm
(3) 18 cm (3) 36 cm

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

178. A right circular cylinder is circumscribed about a hemisphere so that they share the same base. The ratio of the volumes of cylinder and hemisphere is

(1) 4 : 3 (2) 3 : 1
(3) 3 : 4 (4) 3 : 2

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

179. The ratio of volumes of two cubes is 8 : 125. The ratio of their surface areas is

(1) 4 : 25 (2) 2 : 75
(3) 2 : 15 (4) 4 : 15

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

180. A spherical ball of radius 1 cm is dropped into a conical vessel of radius 3 cm and slant height 6 cm. The volume of water (in cm^3), that can just immerse the ball, is

(1) $\frac{5\pi}{3}$ (2) $\frac{\pi}{3}$
(3) 3π (4) $\frac{4\pi}{3}$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

181. Assume that a drop of water is spherical and its diameter is one-tenth of a cm. A conical glass has a height equal to the diameter of its rim. If 32000 drops of water fill the glass completely, then the height of the glass (in cm.) is

(1) 3 (2) 1
(3) 4 (4) 2

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

182. If the height of a cylinder is 4 times its circumference, the volume of the cylinder in terms of its circumference *c*, is

(1) $\frac{2c^3}{\pi}$ (2) $4\pi c^3$
(3) $\frac{c^3}{\pi}$ (4) $2\pi c^3$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

183. Base of a right pyramid is a square whose area is 324 sq metre. If the volume of the pyramid is 1296 cu.metre, then the area (in sq. metre) of the slant surface is

(1) 432 (2) 540
(3) 1080 (4) 360

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

184. If the surface areas of two spheres are in the ratio 9 : 16, the ratio of their volumes is

(1) 16 : 9 (2) 27 : 64
(3) 64 : 27 (4) 9 : 16

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

185. The volume of a right circular cone is equal to the volume of a right circular cylinder. The height and the radius of the cylinder are 9 cm and 20 cm respectively. If the height of the cone is 108 cm, then its radius, (in cm) is

(1) 12 (2) 14
(3) 20 (4) 10

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

186. A right circular cone and a right circular cylinder have the same base and their heights are in the ratio 2 : 3. The ratio of their volumes will be

(1) 1 : 9 (2) 4 : 9
(3) 5 : 9 (4) 2 : 9

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

187. A cone, a cylinder and a hemisphere stand on equal bases and have equal heights. The ratio of their volumes is

(1) 2 : 3 : 1 (2) 2 : 1 : 3
(3) 1 : 3 : 2 (4) 1 : 2 : 3

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

188. The diameters of the internal and external surfaces of a hollow spherical shell are 6 cm and 10 cm respectively. If it is melted and a solid cylinder of length $\frac{8}{3}$ cm is made, then the diameter (in cm) of the cylinder is

(1) 10 (2) 14
(3) 16 (4) 7

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

189. The volume of a metallic cylindrical pipe is 748 cm^3. Its length is 14 cm and external radius is 9 cm. Its thickness is

(Use $\pi = \frac{22}{7}$)

(1) 1 cm (2) 7 cm
(3) 17 cm (4) 11 cm

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

190. A cylindrical vessel of diameter 24 cm contains some water. If two spheres of radii 6 cm each are lowered into the water until they are completely immersed, then the water level (in cm) in the vessel will rise by

(1) 12 (2) 6
(3) 4 (4) 9

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

191. The perimeter of one face of a cube is 20 cm. Its volume will be

(1) 625 cm^3 (2) 100 cm^3
(3) 125 cm^3 (4) 400 cm^3

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

192. If the volume of a sphere is numerically equal to its surface area then its diameter is

(1) 6 cm (2) 4 cm
(3) 2 cm (4) 3 cm

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

193. A conical iron piece having diameter 28 cm and height 30cm is totally immersed into the water of a cylindrical vessel, resulting in the rise of water level by 6.4 cm. The diameter, in cm, of the vessel is :

(1) 3.5 (2) $\frac{35}{2}$
(3) 32 (4) 35

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

194. A solid right prism made of iron has cross section of a triangle of sides 5cm, 10cm, 13cm and of height 10 cm. If one cubic cm of iron weights 7g, then the weight of the prism is (approximately)

(1) 1570.8 gram
(2) 1371.32 gram
(3) 1470.8 gram
(4) 1100.68 gram

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

195. A right circular cone of height 20 cm and base radius 15 cm is melted and cast into smaller cones of equal sizes of height 5 cm and base radius 1.5 cm. The number of cones cast are

(1) 300 (2) 150
(3) 400 (4) 100

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

196. A right prism has a triangular base whose sides are 13 cm, 20 cm and 21 cm. If the altitude of the prism is 9 cm, then its volume is

(1) 1314 cm^3 (2) 1134 cm^3
(3) 1413 cm^3 (4) 1143 cm^3

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

197. The portion of a ditch 48m long, 16.5 m wide and 4 m deep that can be filled with stones and earth available during excavation of a tunnel, cylindrical in shape, of diameter 4 m and length 56 m is

$\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) $\frac{1}{4}$ Part (2) $\frac{1}{2}$ Part
(3) $\frac{2}{9}$ Part (4) $\frac{1}{9}$ Part

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

198. If a hemisphere is melted and four spheres of equal volume are made, the radius of each sphere will be equal to

(1) $\frac{1}{4}$ th of the radius of the hemisphere
(2) radius of the hemisphere
(3) $\frac{1}{2}$ of the radius of the hemisphere
(4) $\frac{1}{6}$ th of the radius of the hemisphere

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

199. A cylinder with base radius 8 cm and height 2 cm is melted to form a cone of height 6 cm. The radius of the cone will be

(1) 6 cm (2) 8 cm
(3) 4 cm (4) 5 cm

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

200. A plane divides a right circular cone into two parts of equal volume. If the plane is parallel to the base, then the ratio, in which the height of the cone is divided, is

(1) $1 : \sqrt[3]{2}$ (2) $1 : \sqrt{2}$
(3) $1 : \sqrt[3]{2} + 1$ (4) $1 : \sqrt[3]{2} - 1$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

201. The radii of two solid iron spheres are 1 cm and 6 cm respectively. A hollow sphere is made by melting the two spheres. If the external radius of the hollow sphere is 9 cm, then its thickness (in cm) is

(1) 2 (2) 1.5
(3) 0.5 (4) 1

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

202. The base of a right prism is a trapezium whose lengths of two parallel sides are 10 cm and 6 cm and distance between them is 5 cm. If the height of the prism is 8 cm, its volume is

(1) 320 cm^3 (2) 300.5 cm^3
(3) 310 cm^3 (4) 300 cm^3

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

203. The radius of a hemispherical bowl is 6 cm. The capacity of the bowl is

(Take $\pi = \frac{22}{7}$)

(1) 345.53 cm^3 (2) 452 cm^3
(3) 495.51 cm^3 (4) 452.57 cm^3

204. Length of each edge of a regular tetrahedron is 1 cm. Its volume is :

(1) $\frac{\sqrt{3}}{12}$ cu. cm.

(2) $\frac{1}{4}\sqrt{3}$ cu. cm.

(3) $\frac{\sqrt{2}}{6}$ cu. cm.

(4) $\frac{1}{12}\sqrt{2}$ cu. cm.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

205. The volume of a right circular cone which is obtained from a wooden cube of edge 4.2 dm wasting minimum amount of word is :

(1) 19404 cu. dm
(2) 194.04 cu. dm
(3) 19.404 cu. dm
(4) 1940.4 cu. dm

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

206. Base of a right prism is a rectangle, the ratio of whose length and breadth is 3 : 2. If the height of the prism is 12 cm and total surface area is 288 sq. cm., the volume of the prism is :

(1) 291 cm^3 (2) 288 cm^3
(3) 290 cm^3 (4) 286 cm^3

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

207. A right triangle with sides 9 cm, 12 cm and 15 cm is rotated about the side of 9 cm to form a cone. The volume of the cone so formed is :

(1) 327 π cm^3 (2) 330 π cm^3
(3) 334 π cm^3 (4) 324 π cm^3

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

208. Volume of a right circular cylinder of height 21 cm and base radius 5 cm is :

(1) 1255 cm^3 (2) 1050 cm^3
(3) 1175 cm^3 (4) 1650 cm^3

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

209. The volume of the largest right circular cone that can be cut out of a cube of edge 7 cm ?

$\left(\text{Use } \pi = \frac{22}{7}\right)$

(1) 121 cm^3 (2) 89.8 cm^3
(3) 13.6 cm^3 (4) 147.68 cm^3

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

210. By melting two solid metallic spheres of radii 1 cm and 6 cm, a hollow sphere of thickness 1 cm is made. The external radius of the hollow sphere will be

(1) 9 cm (2) 6 cm
(3) 7 cm (4) 8 cm

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

211. Height of a prism–shaped part of a machine is 8 cm and its base is an isosceles triangle, whose each of the equal sides is 5 cm and remaining side is 6 cm. The volume of the part is

(1) 96 cu. cm (2) 120 cu. cm
(3) 86 cu. cm (4) 90 cu. cm

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

212. A cuboidal shaped water tank, 2.1 m long and 1.5 m broad is half filled with water. If 630 litres more water is poured into that tank, the water level will rise

(1) 0.15 cm (2) 0.20 metre
(3) 0.18 cm (4) 2 cm

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

213. A solid sphere of radius 9 cm is melted to form a sphere of radius 6 cm and a right circular cylinder of same radius. The height of the cylinder so formed is

(1) 19 cm (2) 21 cm
(3) 23 cm (4) 25 cm

(SSC CGL Tier-I (CBE) Exam.10.09.2016)

214. A hollow cylindrical tube 20 cm. long is made of iron and its external and internal diameters are 8 cm. and 6 cm. respectively. The volume (in cubic cm.) of iron used in making the tube is

$\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) 1760 (2) 440
(3) 220 (4) 880

(SSC CGL Tier-II Online Exam.01.12.2016)

215. If the areas of three adjacent faces of a rectangular box which meet in a corner are 12 cm^2, 15 cm^2 and 20 cm^2 respectively, then the volume of the box is

(1) 3600 cm^3 (2) 300 cm^3
(3) 60 cm^3 (4) 180 cm^3

(SSC CGL Tier-II Online Exam.01.12.2016)

216. A cylindrical pencil of diameter 1.2 cm has one of its ends sharpened into a conical shape of height 1.4 cm. The volume of the material removed is

(1) 1.056 cm^3 (2) 4.224 cm^3
(3) 10.56 cm^3 (4) 42.24 cm^3

(SSC CGL Tier-II Online Exam.01.12.2016)

217. A hemispherical bowl of internal radius 9 cm, contains a liquid. This liquid is to be filled into small cylindrical bottles of diameter 3 cm and height 4 cm. Then the number of bottles necessary to empty the bowl is

(1) 18 (2) 45
(3) 27 (4) 54

(SSC CGL Tier-II Online Exam.01.12.2016)

218. A rectangular water tank is 80 metre × 40 metre. Water flows into it through a pipe of 40 sq.cm at the opening at a speed of 10 km/hr. The water level will rise in the tank in half an hour by

(1) $\frac{3}{2}$ cm. (2) $\frac{4}{9}$ cm.

(3) $\frac{5}{9}$ cm. (4) $\frac{5}{8}$ cm.

(SSC CGL Tier-II Online Exam.01.12.2016)

219. A solid cylinder has the total surface area 231 square cm. If its curved surface area is $\frac{2}{3}$ of the total surface area, then the volume of the cylinder is
(1) 154 cu. cm. (2) 308 cu. cm.
(3) 269.5 cu. cm (4) 370 cu. cm
(SSC CGL Tier-II Online Exam.01.12.2016)

220. A right circular cylinder having diameter 21 cm and height 38 cm is full of ice cream. The ice cream is to be filled in cones of height 12 cm and diameter 7 cm having a hemispherical shape on the top. The number of such cones to be filled with ice cream is
(1) 54 (2) 44
(3) 36 (4) 24
(SSC CGL Tier-II Online Exam.01.12.2016)

221. THe sides of a rectangle with dimension 7 cm × 11 cm are joined to form a cylinder with height 11 cm. What is the volume of this cylinder?
(1) 85.75 cm^3 (2) 86.92 cm^3
(3) 54.25 cm^3 (4) 42.875 cm^3
(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

222. A spherical aquarium can accommodate 11 fishes, and each fish requires 1.54 cu. metre of water. What is the volume of the aquarium ?
(1) 11.14 cu. metre
(2) 16.94 cu. metre
(3) 10.25 cu. metre
(4) 17.84 cu. metre
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

223. The volume of a right rectangular pyramid is 220 m^3. What is the height of the pyramid, if the area of its base is 55 m^2 ?
(1) 8 metre (2) 13.5 metre
(3) 12 metre (4) 9 metre
(SSC CPO Exam. 06.06.2016) (Ist Sitting)

224. The radius of a wire is decreased to one third. If volume remains the same, length will increase by :
(1) 6 times (2) 1 time
(3) 3 times (4) 9 times
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

225. A prism with a right triangular base is 25 cm high. If the shorter sides of the triangle are in the ratio of 1 : 2 and the volume of the prism is 100 cm^3, what is the length of the longest side of the triangle?
(1) $\sqrt{5}$ cm (2) $2\sqrt{5}$ cm
(3) $5\sqrt{2}$ cm (4) 5 cm
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

226. The ratio of the volume of a cube to that of a sphere which will fit inside the cube is
(1) 4 : π (2) 4 : 3π
(3) 6 : π (4) 2 : π
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

227. On a rainy day, 60 cm of rain is recorded in a region. What is the volume of water collected in an open and empty rectangular water tank that measures 12 m (length) ×10 m (width) and 50 cm (depth)?
(1) 120 m^3 (2) 72 m^3
(3) 60 m^3 (4) 48 m^3
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

228. How many hemispherical balls can be made from a cylinder 56 cm high and 12 cm diameter, when every ball being 0.75 cm in radius?
(1) 1792 (2) 3584
(3) 4824 (4) 7168
(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

229. The number of coins of radius 0.75 cm and thickness 0.2cm required to be melted to make a right circular cylinder of height 8 cm and base radius 3 cm is :
(1) 500 (2) 600
(3) 460 (4) 640
(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

230. A sphere of radius 5 cm is melted to form a cone with base of same radius. The height (in cm) of the cone is
(1) 5 (2) 10
(3) 20 (4) 22
(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

231. The diameters of two cylinders are in the ratio 3:2 and their volumes are equal. The ratio of their heights is
(1) 2 : 3 (2) 3 : 2
(3) 9 : 4 (4) 4 : 9
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

232. A cylindrical container of 32 cm height and 18 cm radius is filled with sand. Now all this sand is used to form a conical heap of sand. If the height of the conical heap is 24 cm, what is the radius of its base ?
(1) 12 cm (2) 24 cm
(3) 36 cm (4) 48 cm
(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

233. A cylindrical vessel of radius 4 cm. contains water. A solid sphere of radius 3 cm. is dipped into the water until it is completely immersed. The water level in the vessel will rise by
(1) 3.5 cm. (2) 2.25 cm.
(3) 2 cm. (4) 3.8 cm.
(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

234. A hollow hemispherical bowl is made of silver with its outer radius 8 cm and inner radius 4 cm respectively. The bowl is melted to form a solid right circular cone of radius 8 cm. The height of the cone formed is
(1) 7 cm. (2) 9 cm.
(3) 12 cm. (4) 14 cm.
(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

235. If the sum of radius and height of a solid cylinder is 20 cm and its total surface area is 880 $cm.^2$ then its volume is
(1) 1760 $cm.^3$ (2) 8800 $cm.^3$
(3) 2002 $cm.^3$ (4) 4804 $cm.^3$
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

236. A solid sphere and a solid hemisphere have the same total surface area. The ratio of their volumes is $\left(\text{Take}, \pi = \frac{22}{7}\right)$
(1) $3\sqrt{3}$:4 (2) 4 : $3\sqrt{3}$
(3) 3 : $4\sqrt{3}$ (4) 1 : $12\sqrt{3}$
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

237. The base of a right prism is a trapezium whose lengths of parallel sides are 25 cm. and 11 cm. and the perpendicular distance between the parallel sides is 16 cm. If the height of the prism is 10 cm., then the volume of the prism is
(1) 1440 cu. cm.
(2) 1540 cu. cm.
(3) 2880 cu. cm.
(4) 960 cu. cm.
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

238. The external and the internal radii of a hollow right circular cylinder of height 15 cm. are 6.75 cm. and 5.25 cm. respectively. If it is melted to form a solid cylinder of height half of the original cylinder, then the radius of the solid cylinder is
(1) 6 cm. (2) 6.5 cm.
(3) 7 cm. (4) 7.25 cm.
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

239. If a cone is divided into two parts by drawing a plane through the midpoints of its axis, then the ratio of the volume of the two parts of the cone is
(1) 1 : 2 (2) 1 : 4
(3) 1 : 7 (4) 1 : 8
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

240. A right circular cylinder is partially filled with water. Two iron spherical balls are completely immersed in the water so that the height of the water in the cylinder rises by 4 cm. If the radius of one ball is half of the other and the diameter of the cylinder is 18 cm., then the radii of the spherical balls are
(1) 6 cm. and 12 cm.
(2) 4 cm. and 8 cm.
(3) 3 cm. and 6 cm.
(4) 2 cm. and 4 cm.
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

241. The radii of two cylinders are in the ratio of 3 : 2 and their heights are in the ratio 3 : 7. The ratio of their volumes is :
(1) 4 : 7 (2) 7 : 4
(3) 28 : 27 (4) 27 : 28
(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

242. If the volumes of two right circular cones are in the ratio 1 : 4 and their diameters of bases are in the ratio 4 : 5, then their heights will be in the ratio :
(1) 1 : 5 (2) 4 : 25
(3) 16 : 25 (4) 25 : 64
(SSC CGL Tier-I (CBE) Exam. 30.08.2016 (IIIrd Sitting)

243. The volume of metallic cylindrical (hollow) pipe of uniform thickness is 748 c.c. Its length is 14 cm and its external radius is 9 cm. The thickness of the pipe is
(1) 0.5 cm (2) 1.5 cm
(3) 1 cm (4) 2 cm
(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (Ist Sitting)

244. The diagonal of a cube is $\sqrt{192}$ cm. Its volume (in cm^3) will be
(1) 216 (2) 432
(3) 512 (4) 624
(SSC CGL Tier-I (CBE) Exam. 02.09.2016 (IInd Sitting)

245. The radius of the base of a right circular cone is 6 cm and its slant height is 10 cm. Then its volume is $\left(\text{Use } \pi = \frac{22}{7}\right)$
(1) 301.71 $cm.^3$
(2) 310.71 $cm.^3$
(3) 301.17 $cm.^3$
(4) 310.17 $cm.^3$
(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IIIrd Sitting)

246. Three solid spheres have their radii r_1, r_2 and r_3. The spheres are melted to form a solid sphere of bigger radius. Then the radius of the new sphere is :
(1) $(r_1 + r_2 + r_3)$
(2) $\left(r_1^2 + r_2^2 + r_3^2\right)^{\frac{1}{2}}$
(3) $\left(r_1^3 + r_2^3 + r_3^3\right)^{\frac{1}{3}}$
(4) $\left(r_1^4 + r_2^4 + r_3^4\right)^{\frac{1}{4}}$
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

247. The ratio of the weights of two spheres is 8 : 27 and the ratio of weights per 1 cc of materials of two is 8 : 1. The ratio of the radii of the spheres is
(1) 2 : 3 (2) 1 : 3
(3) 3 : 1 (4) 3 : 2
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

248. A spherical lead ball of radius 6 cm is melted and small lead balls of radius 3 mm are made. The total number of possible small lead balls is :
(1) 4250 (2) 4000
(3) 8005 (4) 8000
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

249. The heights of a cone and a cylinder are equal. The radii of their bases are in the ratio 2 : 1. The ratio of their volumes is :
(1) 4 : 3 (2) 3 : 4
(3) 2 : 1 (4) 1 : 2
(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IIIrd Sitting)

250. The base area of a right pyramid is 57 sq. units and height is 10 units. Then the volume of the pyramid is
(1) 190 cubic units
(2) 380 cubic units
(3) 540 cubic units
(4) 570 cubic units
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

251. The radius of a sphere and right circular cylinder is '*r*' units. Their volumes are equal. The ratio of the height and radius of the cylinder is :
(1) 3 : 1 (2) 2 : 1
(3) 3 : 2 (4) 4 : 3
(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IIIrd Sitting)

252. The radius of cross section of a solid right circular cylindrical rod is 3.2 dm. The rod is melted and 44 equal solid cubes of side 8 cm are formed. The length of the rod is :
$\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) 56 cm. (2) 7 cm.
(3) 5.6 cm. (4) 0.7 cm.
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IIIrd Sitting)

253. A cylindrical vessel of height 5 cm and radius 4 cm is completely filled with sand. When this sand is poured out it forms a right circular cone of radius 6 cm. What will be the height of this cone?
(Take ? = $\frac{22}{7}$)
(1) 6.67 cm (2) 2.22 cm
(3) 3.33 cm (4) 1.67 cm
(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

254. The radii of two cylinders are in the ratio 2 : 3 and their heights are in the ratio 5 : 3. The ratio of their volumes is
(1) 27 : 20 (2) 20 : 27
(3) 4 : 9 (4) 9 : 4
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

255. Three cubes of iron whose edges are 6 cm, 8 cm and 10 cm respectively are melted and formed into a single cube. The edge of the new cube formed is
(1) 12 cm. (2) 14 cm.
(3) 16 cm. (4) 18 cm.
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

256. The radius of a sphere is 6 cm. It is melted and drawn into a wire of radius 0.2 cm. The length of the wire is

(1) 81 metre (2) 80 metre
(3) 75 metre (4) 72 metre

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

257. The radius of a wire is decreased to one-third. If volume remains the same, length will increase by

(1) 1.5 times (2) 3 times
(3) 6 times (4) 9 times

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

258. From each of the four corners of a rectangular sheet of dimensions 25 cm × 20 cm, a square of side 2 cm is cut off and a box is made. The volume of the box is

(1) 828 cm.^{3} (2) 672 cm.^{3}
(3) 500 cm.^{3} (4) 1000 cm.^{3}

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

259. A solid sphere of radius 3 cm is melted to form a hollow right circular cylindrical tube of length 4 cm and external radius 5 cm. The thickness of the tube is

(1) 1 cm. (2) 9 cm.
(3) 0.6 cm. (4) 1.5 cm.

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

260. Three small lead spheres of radii 3 cm, 4 cm and 5 cm respectively, are melted into a single sphere. The diameter of the new sphere is

(1) 6 cm (2) 7 cm
(3) 8 cm (4) 12 cm

(SSC Multi-Tasking Staff Exam. 30.04.2017)

261. The height of a right circular cylinder is three times the radius of the base. If the height were four times the radius, the volume would be 1078 cubic centimetre more than it was previously. Find the radius of the base.

(1) 6 cm (2) 5 cm
(3) 7.5 cm (4) 7 cm

(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE–V

1. A cistern 6 m long and 4 m wide, contains water up to a depth of 1 m 25 cm. The total area of the wet surface is

(1) 55 m^2 (2) 53.5 m^2
(3) 50 m^2 (4) 49 m^2.

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

2. If the height of a cylinder is increased by 15 per cent and the radius of its base is decreased by 10 per cent then by what percent will its curved surface area change?

(1) 3.5 per cent decrease
(2) 3.5 per cent increase
(3) 5 per cent increase
(4) 5 per cent decrease

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

3. The radii of the base of two cylinders are in the ratio 3 : 5 and their heights in the ratio 2 : 3. The ratio of their curved surface will be :

(1) 2 : 5 (2) 2 : 3
(3) 3 : 5 (4) 5 : 3

(SSC CPO S.I. Exam. 16.12.2007)

4. Water flows through a cylindrical pipe, whose radius is 7 cm, at 5 metre per second. The time, it takes to fill an empty water tank, with height 1.54 metres and area of the base (3 × 5) square metres, is $\left(\text{take } \pi = \frac{22}{7}\right)$

(1) 6 minutes (2) 5 minutes
(3) 10 minutes (4) 9 minutes

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

5. A solid cylinder has total surface area of 462 sq.cm. Its curved surface area is $\frac{1}{3}$rd of the total surface area. Then the radius of the cylinder is

(1) 7 cm (2) 3.5 cm
(3) 9 cm (4) 11 cm

(SSC (CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

6. The diameter of a cylinder is 7 cm and its height is 16 cm. Using the value of $\pi = \frac{22}{7}$, the lateral surface area of the cylinder is

(1) 352 cm.^{2} (2) 350 cm.^{2}
(3) 355 cm.^{2} (4) 348 cm.^{2}

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

7. The height of a solid right circular cylinder is 6 metres and three times the sum of the area of its two end faces is twice the area of its curved surface. The radius of its base (in metre) is

(1) 4 (2) 2
(3) 8 (4) 10

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

8. The height of a circular cylinder is increased six times and the base area is decreased to one-ninth of its value. The factor by which the lateral surface of the cylinder increases is

(1) 2 (2) $\frac{1}{2}$
(3) $\frac{2}{3}$ (4) $\frac{3}{2}$

(SSC Graduate Level Tier-II Exam.16.09.2012)

9. The radius and height of a cylinder are in the ratio. 5 : 7 and its volume is 550 cm^3. Calculate its curved surface area in sq. cm.

(1) 110 (2) 444
(3) 220 (4) 616

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

10. The area of the curved surface and the area of the base of a right circular cylinder are a square cm and b square cm respectively. The height of the cylinder is

(1) $\frac{2a}{\sqrt{\pi b}}$ cm (2) $\frac{a\sqrt{b}}{2\sqrt{\pi}}$ cm
(3) $\frac{a}{2\sqrt{\pi b}}$ cm (4) $\frac{a\sqrt{\pi}}{2\sqrt{b}}$ cm

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

11. Find the length of the largest rod that can be placed in a room 16m long, 12m broad and $10\frac{2}{3}$ m. high.

(1) 23 m. (2) 68 m.
(3) $22\frac{2}{3}$ m. (4) $22\frac{1}{3}$ m.

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

12. If the volume of two cubes are in the ratio 27 : 64, then the ratio of their total surface area is :
(1) 27 : 64 (2) 3 : 4
(3) 9 : 16 (4) 3 : 8
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

13. Find the length of the longest rod that can be placed in a hall of 10 m length, 6 m breadth and 4 m height.
(1) $2\sqrt{38}$ m (2) $4\sqrt{38}$ m
(3) $2\sqrt{19}$ m (4) 19 m
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

14. The volume of a cuboid is twice the volume of a cube. If the dimensions of the cuboid are 9 cm, 8 cm and 6 cm, the total surface area of the cube is :
(1) 72 cm^2 (2) 216 cm^2
(3) 432 cm^2 (4) 108 cm^2
(SSC CGL Prelim Exam. 24.02.2002 & 13.11.2005 (IInd Sitting)

15. The length, breadth and height of a room is 5m, 4m and 3m respectively. Find the length of the largest bamboo that can be kept inside the room.
(1) 5 m (2) 60 m
(3) 7 m (4) $5\sqrt{2}$ m
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

16. The length of the longest rod that can be placed in a room which is 12 m long, 9 m broad and 8 m high is
(1) 27 m (2) 19 m
(3) 17 m (4) 13 m
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003) & (SSC CPO S.I. Exam. 06.09.2009) & (SSC CISF Constable (GD) Exam. 05.06.2011)

17. A cube of edge 5 cm is cut into cubes each of edge of 1 cm. The ratio of the total surface area of one of the small cubes to that of the large cube is equal to :
(1) 1 : 125 (2) 1 : 5
(3) 1 : 625 (4) 1 : 25
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

18. The perimeter of the floor of a room is 18 m. What is the area of the walls of the room, if the height of the room is 3 m ?
(1) 21 m^2 (2) 42 m^2
(3) 54 m^2 (4) 108 m^2
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

19. The length (in metres) of the longest rod that can be put in a room of dimensions 10 m × 10 m × 5 m is
(1) $15\sqrt{3}$ (2) 15
(3) $10\sqrt{2}$ (4) $5\sqrt{3}$
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

20. The floor of a room is of size 4 m × 3 m and its height is 3 m. The walls and ceiling of the room require painting. The area to be painted is
(1) 66 m^2 (2) 54 m^2
(3) 43 m^2 (4) 33 m^2
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

21. If the sum of three dimensions and the total surface area of a rectangular box are 12 cm and 94 cm^2 respectively, then the maximum length of a stick that can be placed inside the box is
(1) $5\sqrt{2}$ cm (2) 5 cm
(3) 6 cm (4) $2\sqrt{5}$ cm
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011(Paper-I)

22. If the length of the diagonal of a cube is $8\sqrt{3}$ cm, then its surface area is
(1) 192 cm^2 (2) 512 cm^2
(3) 768 cm^2 (4) 384 cm^2
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

23. The area of the four walls of a room is 660 m^2 and its length is twice its breadth. If the height of the room is 11 m, then area of its floor (in m^2) is
(1) 120 (2) 150
(3) 200 (4) 330
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

24. The maximum length of a pencil that can be kept in a rectangular box of dimensions 8cm × 6cm × 2cm is
(1) $2\sqrt{13}$ cm (2) $2\sqrt{14}$ cm
(3) $2\sqrt{26}$ cm (4) $10\sqrt{2}$ cm
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

25. The volume of a cubical box is 3.375 cubic metres. The length of edge of the box is
(1) 75 cm (2) 1.5 m
(3) 1.125 m (4) 2.5 m
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

26. Diagonal of a cube is $6\sqrt{3}$ cm. Ratio of its total surface area and volume (numerically) is
(1) 2 : 1 (2) 1 : 6
(3) 1 : 1 (4) 1 : 2
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

27. The length of the largest possible rod that can be placed in a cubical room is $35\sqrt{3}$ m. The surface area of the largest possible sphere that fit within the cubical room (assuming $\pi = \frac{22}{7}$) (in square m) is
(1) 3,500 (2) 3,850
(3) 2,450 (4) 4,250
(SSC Multi-Tasking Staff Exam. 10.03.2013)

28. The volume of air in a room is 204 m^3. The height of the room is 6 m. What is the floor area of the room ?
(1) 32 m^2 (2) 46 m^2
(3) 44 m^2 (4) 34 m^2
(SSC CHSL DEO & LDC Exam. 20.10.2013)

29. The slant height of a conical mountain is 2.5 km and the area of its base is 1.54 km^2. Taking $\pi = \frac{22}{7}$, the height of the mountain is :
(1) 2.2 km (2) 2.4 km
(3) 3 km (4) 3.11 km
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

30. The base of a conical tent is 19.2 metres in diameter and the height of its vertex is 2.8 metres. The area of the canvas required to put up such a tent (in square metres) (taking $\pi = \frac{22}{7}$) is nearly.
(1) 3017.1 (2) 3170
(3) 301.7 (4) 30.17
(SSC CGL Prelim Exam. 24.02.2002 & 27.07.2008 (Second Sitting)

31. If S denotes the area of the curved surface of a right circular cone of height h and semivertical angle α then S equals

(1) $\pi h^2 \tan^2 \alpha$

(2) $\frac{1}{3}\pi h^2 \tan^2 \alpha$

(3) $\pi h^2 \sec \alpha \tan \alpha$

(4) $\frac{1}{3}\pi h^2 \sec \alpha \tan \alpha$

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

32. The height and the radius of the base of a right circular cone are 12 cm and 6cm respectively. The radius of the circular cross-section of the cone cut by a plane parallel to its base at a distance of 3 cm from the base is

(1) 4 cm (2) 5.5 cm
(3) 4.5 cm (4) 3.5 cm

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

33. The radius of base and slant height of a cone are in the ratio 4 : 7. If its curved surface area is 792 cm^2, then the radius (in cm) of its base is [Use π = 22/7]

(1) 8 (2) 12
(3) 14 (4) 16

(SSC (South Zone) Investigator Exam. 12.09.2010)

34. A semi-circular sheet of metal of diameter 28 cm is bent into an open conical cup. The depth of the cup is approximately

(1) 11 cm (2) 12 cm
(3) 13 cm (4) 14 cm

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

35. The radius and the height of a cone are in the ratio 4 : 3. The ratio of the curved surface area and total surface area of the cone is

(1) 5 : 9 (2) 3 : 7
(3) 5 : 4 (4) 16 : 9

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

36. A right angled sector of radius r cm is rolled up into a cone in such a way that the two binding radii are joined together. Then the curved surface area of the cone is

(1) πr^2 cm^2 (2) $4\pi r^2$ cm^2

(3) $\frac{\pi r^2}{4}$ cm^2 (4) $2\pi r^2$ cm^2

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

37. The radius of the base of a conical tent is 16 metre. If $427\frac{3}{7}$ sq. metre canvas is required to construct the tent, then the slant height of the tent is : $\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) 17 metre (2) 15 metre
(3) 19 metre (4) 8.5 metre

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

38. The volume of a right circular cone is 1232 cm^3 and its vertical height is 24 cm. Its curved surface area is

(1) 154 cm^2 (2) 550 cm^2
(3) 604 cm^2 (4) 704 cm^2

(SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting) & (SSC Graduate Level Tier-II Exam.16.09.2012 & 29.09.2013)

39. If h, c, v are respectively the height, curved surface area and volume of a right circular cone, then the value of $3\pi vh^3 - c^2h^2 + 9v^2$ is

(1) 2 (2) –1
(3) 1 (4) 0

(SSC Graduate Level Tier-II Exam. 29.09.2013)

40. If the radius of a sphere is increased by 2 cm. its surface area increased by 352 cm^2. The radius of sphere before change is : $\left(\text{use } \pi = \frac{22}{7}\right)$

(1) 3 cm (2) 4 cm
(3) 5 cm (4) 6 cm

(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC CPO S.I. Exam.12.01.2003)

41. Spheres A and B have their radii 40 cm and 10 cm respectively. Ratio of surface area of A to the surface area of B is :

(1) 1 : 16 (2) 4 : 1
(3) 1 : 4 (4) 16 : 1

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

42. The volume of a sphere is $\frac{88}{21} \times (14)^3$ cm^3. The curved surface of the sphere is (Take p $= \frac{22}{7}$)

(1) 2424 cm^2 (2) 2446 cm^2
(3) 2484 cm^2 (4) 2464 cm^2

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

43. The surface area of a sphere is $64\pi cm^2$. Its diameter is equal to

(1) 16 cm (2) 8 cm
(3) 4 cm (4) 2 cm

(SSC CPO S.I. Exam. 07.09.2003)

44. The diameter of two hollow spheres made from the same metal sheet are 21 cm and 17.5 cm respectively. The ratio of the area of metal sheets required for making the two spheres is

(1) 6 : 5 (2) 36 : 25
(3) 3 : 2 (4) 18 : 25

(SSC CPO S.I. Exam. 05.09.2004)

45. When the circumference of a toy ballon is increased from 20 cm to 25 cm, its radius (in cm) is increased by :

(1) 5 (2) $\frac{5}{\pi}$

(3) $\frac{5}{2\pi}$ (4) $\frac{\pi}{5}$

(SSC CPO S.I. Exam. 26.05.2005)

46. If the volume and surface area of a sphere are numerically the same, then its radius is :

(1) 1 unit (2) 2 units
(3) 3 units (4) 4 units

(SSC CPO S.I. Exam. 26.05.2005)

47. The ratio of the surface area of a sphere and the curved surface area of the cylinder circumscribing the sphere is

(1) 1 : 2 (2) 1 : 1
(3) 2 : 1 (4) 2 : 3

(SSC CPO S.I. Exam. 03.09.2006)

48. The total surface area of a metallic hemisphere is 1848 cm^2. The hemisphere is melted to form a solid right circular cone. If the radius of the base of the cone is the same as the radius of the hemisphere, its height is

(1) 42 cm (2) 26 cm
(3) 28 cm (4) 30 cm

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

49. If the radii of two spheres are in the ratio 1 : 4, then their surface area are in the ratio :

(1) 1 : 2 (2) 1 : 4
(3) 1 : 8 (4) 1 : 16

(SSC CPO S.I. Exam. 16.12.2007)

50. A solid metallic sphere of radius 8 cm is melted to form 64 equal small solid spheres. The ratio of the surface area of this sphere to that of a small sphere is

(1) 4 : 1 (2) 1 : 16
(3) 16 : 1 (4) 1 : 4

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

51. If S_1 and S_2 be the surface area of a sphere and the curved surface area of the circumscribed cylinder respectively, then S_1 is equal to

(1) $\frac{3}{4}$ S_2 (2) $\frac{1}{2}$ S_2
(3) $\frac{2}{3}$ S_2 (4) S_2

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

52. The volume of two spheres are in the ratio 8 : 27. The ratio of their surface area is :

(1) 4 : 9 (2) 2 : 3
(3) 4 : 5 (4) 5 : 6

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

53. The volume of a solid hemisphere is 19404 cm^3. Its total surface area is

(1) 4158 cm^2 (2) 2858 cm^2
(3) 1738 cm^2 (4) 2038 cm^2

(SSC Graduate Level Tier-II Exam.16.09.2012)

54. A sphere and a hemisphere have the same volume. The ratio of their curved surface area is :

(1) $2^{-\frac{3}{2}} : 1$ (2) $2^{\frac{2}{3}} : 1$
(3) $4^{-\frac{2}{3}} : 1$ (4) $2^{\frac{1}{3}} : 1$

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

55. If the radius of a sphere be doubled, the area of its surface will become

(1) Double
(2) Three times
(3) Four times
(4) None of the mentioned

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

56. A solid hemisphere is of radius 11 cm. The curved surface area in sq. cm is

(1) 1140.85 (2) 1386.00
(3) 760.57 (4) 860.57

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

57. If the total surface area of a hemisphere is 27π square cm, then the radius of the base of the hemisphere is

(1) $9\sqrt{3}$ cm (2) 3 cm
(3) $3\sqrt{3}$ cm (4) 9 cm

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

58. The base of a solid right prism is a triangle whose sides are 9 cm, 12 cm and 15 cm. The height of the prism is 5 cm. Then, the total surface area of the prism is

(1) 180 cm^2 (2) 234 cm^2
(3) 288 cm^2 (4) 270 cm^2

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

59. The base of a right prism is an equilateral triangle of area 173 cm^2 and the volume of the prism is 10380 cm^3. The area of the lateral surface of the prism is (use $\sqrt{3}$ = 1.73)

(1) 1200 cm^2 (2) 2400 cm^2
(3) 3600 cm^2 (4) 4380 cm^2

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

60. The base of a right pyramid is a square of side 16 cm long. If its height be 15 cm, then the area of the lateral surface in square centimetre is :

(1) 136 (2) 544
(3) 800 (4) 1280

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

61. If the slant height of a right pyramid with square base is 4 metre and the total slant surface of the pyramid is 12 square metre, then the ratio of total slant surface and area of the base is :

(1) 16 : 3 (2) 24 : 5
(3) 32 : 9 (4) 12 : 3

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

62. The base of a right pyramid is an equilateral triangle of side $10\sqrt{3}$ cm. If the total surface area of the pyramid is $270\sqrt{3}$ sq. cm, its height is

(1) $12\sqrt{3}$ cm (2) 10 cm
(3) $10\sqrt{3}$ cm (4) 12 cm

(SSC CHSL DEO & LDC Exam. 20.10.2013)

63. A right prism stands on a base 6 cm equilateral triangle and its volume is $81\sqrt{3}$ cm^3. The height (in cm) of the prism is

(1) 9 (2) 10
(3) 12 (4) 15

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

64. A right pyramid stands on a square base of diagonal $10\sqrt{2}$ cm. If the height of the pyramid is 12 cm, the area (in cm^2) of its slant surface is

(1) 520 (2) 420
(3) 360 (4) 260

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

65. If the altitude of a right prism is 10 cm and its base is an equilateral triangle of side 12 cm, then its total surface area (in cm^2) is

(1) $(5 + 3\sqrt{3})$ (2) $36\sqrt{3}$
(3) 360 (4) $72(5+\sqrt{3})$

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

66. A right pyramid stands on a base 16 cm square and its height is 15 cm. The area (in cm^2) of its slant surface is

(1) 514 (2) 544
(3) 344 (4) 444

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

67. The base of a right prism is a right-angled triangle whose sides are 5 cm, 12 cm and 13 cm. If the area of the total surface of the prism is 360 cm^2, then its height (in cm) is

(1) 10 (2) 12
(3) 9 (4) 11

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

68. A hemisphere and a cone have equal base. If their heights are also equal, the ratio of their curved surface will be :

(1) $1 : \sqrt{2}$ (2) $\sqrt{2} : 1$
(3) 1 : 2 (4) 2 : 1

(SSC CGL Prelim Exam. 24.02.2002 & 13.11.2005 (Ist Sitting) & (SSC CGL Tier-I Exam. 26.06.2011 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting) (Delhi Zone)

69. A right circular cylinder just encloses a sphere of radius *r*. The ratio of the surface area of the sphere and the curved surface area of the cylinder is
(1) 2 : 1 (2) 1 : 2
(3) 1 : 3 (4) 1 : 1
(SSC SAS Exam. 26.06.2010 (Paper-1)

70. A sphere and a cylinder have equal volume and equal radius. The ratio of the curved surface area of the cylinder to that of the sphere is
(1) 4 : 3 (2) 2 : 3
(3) 3 : 2 (4) 3 : 4
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011) & (SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

71. A circus tent is cylindrical up to a height of 3 m and conical above it. If its diameter is 105m and the slant height of the conical part is 63 m, then the total area of the canvas required to make the tent is $\left(\text{take } \pi = \frac{22}{7}\right)$
(1) 11385 m^2 (2) 10395 m^2
(3) 9900 m^2 (4) 990 m^2
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

72. A right circular cylinder and a cone have equal base radius and equal height. If their curved surfaces are in the ratio 8 : 5, then the radius of the base to the height are in the ratio :
(1) 2 : 3 (2) 4 : 3
(3) 3 : 4 (4) 3 : 2
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

73. The base of a cone and a cylinder have the same radius 6 cm. They have also the same height 8 cm. The ratio of the curved surface of the cylinder to that of the cone is
(1) 8 : 5 (2) 8 : 3
(3) 4 : 3 (4) 5 : 3
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

74. A solid right circular cylinder and a solid hemisphere stand on equal bases and have the same height. The ratio of their whole surface area is:
(1) 3 : 2 (2) 3 : 4
(3) 4 : 3 (4) 2 : 3
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

75. A square of side 3 cm is cut off from each corner of a rectangular sheet of length 24 cm and breadth 18 cm and the remaining sheet is folded to form an open rectangular box. The surface area of the box is
(1) 468 cm^2 (2) 396 cm^2
(3) 612 cm^2 (4) 423 cm^2
(SSC CHSL DEO & LDC Exam. 20.10.2013)

76. Three solid iron cubes of edges 4 cm, 5 cm and 6 cm are melted together to make a new cube. 62 cm^3 of the melted material is lost due to improper handling. The area (in cm^2) of the whole surface of the newly formed cube is
(1) 294 (2) 343
(3) 125 (4) 216
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

77. If each edge of a cube is increased by 50%, the percentage increase in its surface area is
(1) 150% (2) 75%
(3) 100% (4) 125%
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013) & (SSC GL Tier-II Exam. 29.09.2013)

78. The length of each edge of a regular tetrahedron is 12 cm. The area (in sq. cm) of the total surface of the tetrahedron is
(1) $288\sqrt{3}$ (2) $144\sqrt{2}$
(3) $108\sqrt{3}$ (4) $144\sqrt{3}$
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

79. A toy is in the form of a cone mounted on a hemisphere. The radius of the hemisphere and that of the cone is 3 cm and height of the cone is 4 cm. The total surface area of the toy (taking $\pi = \frac{22}{7}$) is
(1) 75.43 sq. cm.
(2) 103.71 sq. cm.
(3) 85.35 sq. cm.
(4) 120.71 sq. cm.
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

80. Area of the floor of a cubical room is 48 sq.m. The length of the longest rod that can be kept in that room is
(1) 9 metre (2) 12 metre
(3) 18 metre (4) 6 metre
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

81. A sphere and a hemisphere have the same radius. Then the ratio of their respective total surface areas is
(1) 2 : 1 (2) 1 : 2
(3) 4 : 3 (4) 3 : 4
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

82. If the surface area of a sphere is 346.5 cm^2, then its radius $\left[\text{taking } \pi = \frac{22}{7}\right]$ is
(1) 7 cm (2) 3.25 cm
(3) 5.25 cm (4) 9 cm
(SSC CGL Tier-II Exam. 21.09.2014)

83. The base of a prism is a right angled triangle with two sides 5 cm and 12 cm. The height of the prism is 10 cm. The total surface area of the prism is
(1) 360 sq cm (2) 300 sq cm
(3) 330 sq cm (4) 325 sq cm
(SSC CGL Tier-II Exam. 21.09.2014)

84. The ratio of the length and breadth of a rectangular parallelopiped is 5 : 3 and its height is 6 cm. If the total surface area of the parallelopiped be 558 sq. cm, then its length in dm is
(1) 9 (2) 1.5
(3) 10 (4) 15
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

85. Deepali makes a model of a cylindrical kaleidoscope for her science project. She uses a chart paper to make it. If the length of the kaleidoscope is 25 cm and radius 3-5 cm, the area of the paper she used, in square cm, is $\left(\pi = \frac{22}{7}\right)$
(1) 1100 (2) 550
(3) 500 (4) 450
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

86. If the sum of the dimensions of a rectangular parallelopiped is 24 cm and the length of the diagonal is 15 cm, then the total surface area of it is
(1) 420 cm^2 (2) 275 cm^2
(3) 351 cm^2 (4) 378 cm^2
(SSC CHSL DEO & LDC Exam. 9.11.2014)

87. The length, breadth and height of a cuboid are in the ratio 3 : 4 : 6 and its volume is 576 cm^3. The whole surface of the cuboid is

(1) 216 cm^2 (2) 324 cm^2
(3) 432 cm^2 (4) 460 cm^2

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

88. The radius of a right circular cone is 3 cm and its height is 4 cm. The total surface area of the cone is

(1) 48.4 sq.cm (2) 64.4 sq.cm
(3) 96.4 sq.cm (4) 75.4 sq.cm

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

89. There are two cones. The curved surface area of one is twice that of the other. The slant height of the latter is twice that of the former. The ratio of their radii is

(1) 4 : 1 (2) 4 : 3
(3) 3 : 4 (4) 1 : 4

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

90. From a solid right circular cylinder of length 4 cm and diameter 6 cm, a conical cavity of the same height and base is hollowed out. The whole surface of the remaining solid (in square cm.) is

(1) 48 π (2) 15 π
(3) 63 π (4) 24 π

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

91. The length, breadth and height of a wooden box with a lid are 10 cm, 9 cm and 7 cm, respectively. The total inner surface of the closed box is 262 cm^2. The thickness of the wood (in cm.) is

(1) 2 (2) 3
(3) $\frac{23}{3}$ (4) 1

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

92. The total surface area of a regular triangular pyramid with each edge of length 1 cm is

(1) $4\sqrt{3}$ cm^2 (2) $\frac{4}{3}\sqrt{3}$ cm^2
(3) $\sqrt{3}$ cm^2 (4) 4 cm^2

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

93. The number of paving stones each measuring 2.5m × 2m required to pave a rectangular courtyard 30m long and 17.5 m wide, is

(1) 80 (2) 33
(3) 99 (4) 105

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

94. The length of canvas, 75 cm wide required to build a conical tent of height 14m and the floor area 346.5 m^2 is

(1) 665 m (2) 860 m
(3) 490 m (4) 770 m

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

95. 5 persons will live in a tent. If each person requires 16m^2 of floor area and 100m^3 space for air then the height of the cone of smallest size to accommodate these persons would be

(1) 16 metre (2) 10.25 metre
(3) 20 metre (4) 18.75 metre

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

96. The paint in a certain container is sufficient to paint an area equal to 9.375 m^2. How many bricks measuring 22.5 cm by 10 cm by 7.5 cm can be painted out of this container?

(1) 200 (2) 1000
(3) 10 (4) 100

(SSC CGL Tier-I Re-Exam, 30.08.2015)

97. The ratio between the length and the breadth of a rectangular park is 3 : 2. If a man cycling along the boundary of the park at the speed of 12 kmph completes one round in 8 minutes, then the area of the park is equal to

(1) 152600 m^2 (2) 153500 m^2
(3) 153600 m^2 (4) 153800 m^2

(SSC CGL Tier-I Re-Exam, 30.08.2015)

98. The base of a right pyramid is a square of side 10 cm. If the height of the pyramid is 12 cm, then its total surface area is

(1) 400 cm^2 (2) 460 cm^2
(3) 260 cm^2 (4) 360 cm^2

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

99. There is a wooden sphere of radius $6\sqrt{3}$ cm. The surface area of the largest possible cube cut out from the sphere will be

(1) 864 cm^2 (2) 464 $\sqrt{3}$ cm^2
(3) 462 cm^2 (4) 646 $\sqrt{3}$ cm^2

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

100. A hemisphere and a cone have equal bases. If their heights are also equal, then the ratio of their curved surfaces will be

(1) 1 : 2 (2) 2 : 1
(3) 1 : $\sqrt{2}$ (4) $\sqrt{2}$: 1

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

101. The radius of base and curved surface area of a right cylinder is 'r' units and $4\pi rh$ square units respectively. The height of the cylinder is :

(1) $\frac{h}{2}$ units (2) h units
(3) $2h$ units (4) $4h$ units

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

102. A hemispherical bowl has 3.5 cm radius. It is to be painted inside as well as outside. The cost of painting it at the rate of Rs. 5 per 10 sq. cm will be:

(1) Rs. 77 (2) Rs. 100
(3) Rs. 175 (4) Rs. 50

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

103. The total surface area of a right circular cylinder with radius of the base 7 cm and height 20 cm, is:

(1) 900 cm^2 (2) 140 cm^2
(3) 1000 cm^2 (4) 1188 cm^2

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

104. If the radius of a sphere is increased by 2 cm, then its surface area increases by 352 cm^2. The radius of the sphere initially was :

$\left(\text{use } \pi = \frac{22}{7}\right)$

(1) 4 cm (2) 5 cm
(3) 3 cm (4) 6 cm

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

105. The diameter of a 120 cm long roller is 84 cm. It takes 500 complete revolutions of the roller to level a ground. The cost of levelling the ground at Rs. 1.50 per sq. m. is :

(1) Rs. 6000 (2) Rs. 3762
(3) Rs. 2376 (4) Rs. 5750

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

106. A hemispherical bowl has internal radius of 6 cm. The internal surface area would be : (Take $\pi = 3.14$)

(1) 225 cm^2 (2) 400 cm^2
(3) 289.75 cm^2 (4) 226.08 cm^2

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

107. The surface area of a sphere is 616 cm^2. The volume of the sphere would be :

(1) $1437\frac{1}{3}$ cm^2 (2) 2100 cm^2
(3) 2500 cm^2 (4) $1225\frac{3}{5}$ cm^2

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

108. Thousand solid metallic spheres of diameter 6 cm each are melted and recast into a new solid sphere. The diameter of the new sphere (in cm) is

(1) 30 (2) 90
(3) 45 (4) 60

(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

109. The lateral surface area of frustum of a right circular cone, if the area of its base is 16π cm^2 and the diameter of circular upper surface is 4 cm and slant height is 6 cm, will be

(1) 30π cm^2 (2) 48π cm^2
(3) 36π cm^2 (4) 60π cm^2

(SSC CGL Tier-II Online Exam.01.12.2016)

110. The diameter of a sphere is twice the diameter of another sphere. The surface area of the first sphere is equal to the volume of the second sphere. The magnitude of the radius of the first sphere is

(1) 12 (2) 24
(3) 16 (4) 48

(SSC CGL Tier-II Online Exam.01.12.2016)

111. The area of the largest sphere (in cm^2) that can be drawn inside a square of side 18 cm is

(1) 972π (2) 1166π
(3) 36π (4) 288π

(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

112. The total surface area of a right pyramid on a square base of side 10 cm with height 12 cm is :

(1) 260 square cm
(2) 360 square cm
(3) 330 square cm
(4) 300 square cm

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

113. The base of a right prism, whose height is 2 cm, is a square. If the total surface area of the prism is 10 cm^2, then its volume is :

(1) 3 cm^3 (2) 1 cm^3
(3) 2 cm^3 (4) 4 cm^3

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

114. Let ABCDEF be a prism whose base is a right angled triangle, where sides adjacent to 90° are 9 cm and 12 cm. If the cost of painting the prism is Rs. 151.20, at the rate of 20 paise per sq cm then the height of the prism is :

(1) 17 cm (2) 18 cm
(3) 15 cm (4) 16 cm

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

115. A right circular cylindrical tunnel of diameter 5m and length 10m is to be constructed from a sheet of iron. The area of iron sheet required will be :

(1) 52π (2) 50π
(3) 51π (4) 49π

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

116. If h, C, V are respectively the height, the curved surface and the volume of a cone, then

$3\pi Vh^3 - C^2h^2 + 9V^2 = ?$

(1) 0 (2) 3
(3) $\frac{1}{2}$ (4) 11

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

117. The length of the two parallel sides of a trapezium are 16m and 20m respectively. If its height is 10m, its area in square metre is

(1) 360 (2) 260
(3) 240 (4) 180

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

118. Three medians AD, BE and CF of ΔABC intersect at G. The area of ΔABC is 36 sq. cm. Then the area of ΔCGE is

(1) 12 sq. cm. (2) 6 sq. cm.
(3) 9 sq. cm. (4) 18 sq. cm.

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

119. The diagonal of a cuboid of length 5 cm, width 4 cm and height 3 cm is

(1) $5\sqrt{2}$ cm. (2) $2\sqrt{5}$ cm.
(3) 12 cm. (4) 10 cm.

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

120. A well of diameter 3m is dug 14m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 4m to form an embankment. Find the height of the embankment.

(1) 4.25m (2) 2.25m
(3) 1.125m (4) 1.75m

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

121. The diameter of a sphere is twice the diameter of another sphere. The curved surface area of the first and the volume of the second are numerically equal. The numerical value of the radius of the first sphere is

(1) 3 (2) 24
(3) 8 (4) 16

(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

122. A sphere has the same curved surface area as a cone of vertical height 40 cm and radius 30 cm. The radius of the sphere is

(1) $5\sqrt{5}$ cm (2) $5\sqrt{3}$ cm
(3) $5\sqrt{15}$ cm (4) $5\sqrt{10}$ cm

(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

123. The whole surface area of a pyramid whose base is a regular polygon is 340 cm.^{2} and area of its base is 100 cm^2. Area of each lateral face is 30 cm^2. Then the number of lateral faces is
(1) 8 (2) 9
(3) 7 (4) 10
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

124. A right circular conical structure stands on a circular base of 21 metre diameter and is 14 metre in height. The total cost of colour washing for its curved surface at Rs. 6 per square metre is $\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) Rs. 4365 (2) Rs. 4465
(3) Rs. 3465 (4) Rs. 3365
(SSC CGL Tier-I (CBE) Exam. 10.09.2016 (IInd Sitting)

125. If curved surface area of a cylinder is 1386 sq cm and height is 21 cm, what will be its radius? $\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) 21 cm. (2) 5.25 cm.
(3) 10.5 cm. (4) 15.75 cm.
(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

126. The height and the total surface area of a right circular cylinder are 4 cm and 8π sq.cm. respectively. The radius of the base of cylinder is
(1) $\left(2\sqrt{2}-2\right)$ cm.
(2) $\left(2-\sqrt{2}\right)$ cm.
(3) 2 cm.
(4) $\sqrt{2}$ cm.
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

127. The radius of a cylindrical milk container is half its height and surface area of the inner part is 616 sq. cm. The amount of milk that the container can hold, approximately, is
$\left[\text{Use : } \sqrt{5} = 2.23 \text{ and } \pi = \frac{22}{7}\right]$
(1) 1.42 litres (2) 1.53 litres
(3) 1.71 litres (4) 1.82 litres
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

128. A solid brass sphere of radius 2.1 dm is converted into a right circular cylindrical rod of length 7 cm. The ratio of total surface areas of the rod to the sphere is
(1) 3 : 1 (2) 1 : 3
(3) 7 : 3 (4) 3 : 7
(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

TYPE–VI

1. The circumference of the base of a circular cylinder is 6π cm. The height of the cylinder is equal to the diameter of the base. How many litres of water can it hold?
(1) 54 π cc (2) 36 π cc
(3) 0.054 π cc (4) 0.54 π cc
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. The diameter of the base of a cylindrical drum is 35 dm. and the height is 24 dm. It is full of kerosene. How many tins each of size 25 cm × 22 cm × 35 cm can be filled with kerosene from the drum?
(Use $\pi = \frac{22}{7}$)
(1) 1200 (2) 1020
(3) 600 (4) 120
(SSC CPO S.I. Exam. 07.09.2003)

3. Marbles of diameter 1.4 cm are dropped into a cylindrical beaker containing some water and are fully submerged. The dia meter of the beaker is 7 cm. Find how many marbles have been dropped in it if the water rises by 5.6 cm ?
(1) 50 (2) 150
(3) 250 (4) 350
(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

4. A right cylindrical vessel is full with water. How many right cones having the same diameter and height as that of the right cylinder will be needed to store that water ? (Take $\pi = \frac{22}{7}$).
(1) 4 (2) 2
(3) 3 (4) 5
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

5. How many cubes, each of edge 3 cm, can be cut from a cube of edge 15 cm?
(1) 25 (2) 27
(3) 125 (4) 144
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

6. A cuboidal block of 6 cm × 9 cm × 12 cm is cut up into exact number of equal cubes. The least possible number of cubes will be
(1) 6 (2) 9
(3) 24 (4) 30
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

7. A soap cake is of size 8 cm × 5 cm × 4 cm. The number of such soap cakes that can be packed in a box measuring 56 cm × 35 cm × 28 cm is :
(1) 49 (2) 196
(3) 243 (4) 343
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

8. The cost of carpeting a room is ₹ 120. If the width had been 4 metres less, the cost of the Carpet would have been ₹ 20 less. The width of the room is :
(1) 24 m (2) 20 m
(3) 25 m (4) 18.5 m
(SSC CPO S.I. Exam. 26.05.2005)

9. A hall 25 metres long and 15 metres broad is surrounded by a verandah of uniform width of 3.5 metres. The cost of flooring the verandah, at ₹ 27.50 per square metre is
(1) ₹ 9149.50 (2) ₹ 8146.50
(3) ₹ 9047.50 (4) ₹ 4186.50
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

10. A cube of edge 6 cm is painted on all sides and then cut into unit cubes. The number of unit cubes with no sides painted is
(1) 0 (2) 64
(3) 186 (4) 108
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

11. The height of a conical tank is 60 cm and the diameter of its base is 64cm. The cost of painting it from outside at the rate of ₹ 35 per sq. m. is :
(1) ₹ 52.00 approx.
(2) ₹ 39.20 approx.
(3) ₹ 35.20 approx.
(4) ₹ 23.94 approx.
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

12. Some solid metallic right circular cones, each with radius of the base 3 cm and height 4 cm, are melted to form a solid sphere of radius 6 cm. The number of right circular cones is
(1) 12 (2) 24
(3) 48 (4) 6
(SSC CPO S.I. Exam. 03.09.2006)

13. The diameter of a circular wheel is 7 m. How many revolutions will it make in travelling 22 km ?
(1) 100 (2) 400
(3) 500 (4) 1000
(SSC Graduate Level Tier-II Exam. 29.09.2013)

14. A spherical lead ball of radius 10cm is melted and small lead balls of radius 5mm are made. The total number of possible small lead balls is (Take $\pi = \frac{22}{7}$)
(1) 8000 (2) 400
(3) 800 (4) 125
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

15. The total number of spherical bullets, each of diameter 5 decimeter, that can be made by utilizing the maximum of a rectangular block of lead with 11 metre length, 10 metre breadth and 5 metre width is (assume that $\pi > 3$)
(1) equal to 8800
(2) less than 8800
(3) equal to 8400
(4) greater than 9000
(SSC Graduate Level Tier-II Exam. 29.09.2013)

16. A solid metallic cone of height 10 cm, radius of base 20 cm is melted to make spherical balls each of 4 cm diameter. How many such balls can be made ?
(1) 25 (2) 75
(3) 50 (4) 125
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

17. A cylindrical rod of iron whose height is eight times its radius is melted and cast into spherical balls each of half the radius of the cylinder. The number of such spherical balls is
(1) 12 (2) 16
(3) 24 (4) 48
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

18. The number of spherical bullets that can be made out of a solid cube of lead whose edge measures 44 cm, each bullet being of 4 cm diameter, is (take $\pi = \frac{22}{7}$)
(1) 2541 (2) 2451
(3) 2514 (4) 2415
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

19. The radius of a metallic cylinder is 3 cm and its height is 5 cm. It is melted and moulded into small cones, each of height 1 cm and base radius 1 mm. The number of such cones formed, is
(1) 450 (2) 1350
(3) 8500 (4) 13500
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

20. If a metallic cone of radius 30 cm and height 45 cm is melted and recast into metallic spheres of radius 5 cm, find the number of spheres.
(1) 81 (2) 41
(3) 80 (4) 40
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

21. Water flows at the rate of 10 metres per minute from a cylindrical pipe 5 mm in diameter. How long it take to fill up a conical vessel whose diameter at the base is 30 cm and depth 24 cm ?
(1) 28 minutes 48 seconds
(2) 51 minutes 12 seconds
(3) 51 minutes 24 seconds
(4) 28 minutes 36 seconds
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

22. A metallic sphere of radius 10.5 cm is melted and then recast into small cones each of radius 3.5 cm and height 3 cm. The number of cones thus formed is
(1) 140 (2) 132
(3) 112 (4) 126
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

23. The radius of the base of a Conical tent is 12 m. The tent is 9 m high. Find the cost of canvas required to make the tent, if one square metre of canvas costs ₹ 120
(Take $\pi = 3.14$)
(1) ₹ 67, 830 (2) ₹ 67, 800
(3) ₹ 67, 820 (4) ₹ 67, 824
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

24. If the radius of a cylinder is decreased by 50 % and the height is increased by 50 %, then the change in volume is
(1) 52.5 % (2) 67.5 %
(3) 57.5 % (4) 62.5 %
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

25. The base of a triangle is increased by 10%. To keep the area unchanged the height of the triangle is to be decreased by
(1) $9\frac{1}{11}\%$ (2) $11\frac{1}{9}\%$
(3) 11% (4) 9%
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

26. If the area of the base of a cone is increased by 100%, then the volume increases by
(1) 200% (2)182%
(3) 141% (4) 100%
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

27. The percentage increase in the surface area of a cube when each side is doubled is
(1) 50% (2) 200%
(3) 150% (4) 300%
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

28. Each side of a cube is decreased by 25%. Find the ratio of the volumes of the original cube and the resulting cube.
(1) 8 : 1 (2) 27 : 64
(3) 64 : 1 (4) 64 : 27
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

29. If water is freezed to become ice, its volume is increased by 10%, then if the ice is melted to water again, its volume will be decreased by :
(1) 9% (2) $9\frac{1}{11}\%$
(3) 8% (4) $9\frac{1}{2}\%$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

30. If the radius of a right circular cylinder open at both the ends, is decreased by 25% and the height of the cylinder is increased by 25%. Then the curved surface area of the cylinder thus formed
(1) remains unaltered
(2) is increased by 25%
(3) is increased by 6.25%
(4) is decreased by 6.25%
(SSC CGL Tier-II Online Exam.01.12.2016)

31. The amount of concrete required to build a concrete cylindrical pillar whose base has a perimeter 8.8 metre and curved surface area 17.6 square metre, is

$\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) 8.325 m^3 (2) 9.725 m^3
(3) 10.5 m^3 (4) 12.32 m^3

(SSC CGL Tier-II Online Exam.01.12.2016)

32. A big cube is formed by arranging the 160 coloured and 56 non-coloured similar cubes in such a way that the exposure of the coloured cubes to the outside is minimum. The percentage of exposed area that is coloured is

(1) 25.9% (2) 44.44%
(3) 35% (4) 46%

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

33. If the radius of the base, and the height of a right circular cone are increased by 20%, what is the approximate percentage increase in volume ?

(1) 60 (2) 68.8
(3) 72.8 (4) 75

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

34. Which of the the following statements is not correct?

(1) For a given radius and height, a right circular cone has the lesser volume among a right circular cone and a right circular cylinder.
(2) If side of a cube is increased by 10%, the volume will increase by 33.1%.
(3) If the radius of a sphere is increased by 20%, the surface area will increase by 40%.
(4) Cutting a sphere into 2 parts does not change the total volume.

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

35. There is a 4% increase in volume when a liquid freezes to its solid state. The percentage decrease when solid melts to liquid again, is

(1) $3\frac{3}{13}\%$ (2) 4%
(3) $4\frac{1}{13}\%$ (4) $3\frac{11}{13}\%$

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

36. An inverted conical shaped vessel is filled with water to its brim. The height of the vessel is 8 cm and radius of the open end is 5 cm. When a few solid spherical metallic balls each of radius $\frac{1}{2}$ cm are dropped in the vessel, 25% water is overflowed. The number of balls is :

(1) 100 (2) 400
(3) 200 (4) 150

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IInd Sitting)

37. The radius and the height of a cone are each increased by 20%. Then the volume of the cone increases by

(1) 20% (2) 20.5%
(3) 62% (4) 72.8%

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

TYPE - VII

1. If the arcs of square length in two circles subtend angles of 60° and 75° at their centres, the ratio of their radii is

(1) 3 : 4 (2) 4 : 5
(3) 5 : 4 (4) 3 : 5

(SSC Graduate Level Tier-I Exam. 21.04.2013)

2. The length of the perpendiculars drawn from any point in the interior of an equilateral triangle to the respective sides are p_1, p_2 and p_3. The length of each side of the triangle is

(1) $\frac{2}{\sqrt{3}}(p_1 + p_2 + p_3)$

(2) $\frac{1}{3}(p_1 + p_2 + p_3)$

(3) $\frac{1}{\sqrt{3}}(p_1 + p_2 + p_3)$

(4) $\frac{4}{\sqrt{3}}(p_1 + p_2 + p_3)$

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

3. The sides of a triangle are in the ratio 3 : 4 : 5. The measure of the largest angle of the triangle is

(1) 60° (2) 90°
(3) 120° (4) 150°

(SSC CPO S.I. Exam. 05.09.2004)

4. From a point within an equilateral triangle, perpendiculars drawn to the three sides, are 6 cm, 7 cm and 8 cm respectively. the length of the side of the triangle is :

(1) 7 cm (2) 10.5 cm
(3) $14\sqrt{3}$ cm (4) $\frac{14\sqrt{3}}{3}$ cm

(SSC CPO S.I. Exam. 26.05.2005)

5. The base and altitude of a right angled triangle are 12 cm and 5 cm respectively. The perpendicular distance of its hypotenuse from the opposite vertex is

(1) $4\frac{4}{13}$ cm (2) $4\frac{8}{13}$ cm
(3) 5 cm (4) 7 cm

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

6. One acute angle of a right angled triangle is double the other. If the length of its hypotenuse is 10 cm, then its area is

(1) $\frac{25}{2}\sqrt{3}$ cm^2 (2) 25 cm^2
(3) $25\sqrt{3}$ cm^2 (4) $\frac{75}{2}$ cm^2

(SSC CPO S.I. Exam. 09.11.2008)

7. In an equilateral triangle ABC of side 10cm, the side BC is trisected at D. Then the length (in cm) of AD is

(1) $3\sqrt{7}$ (2) $7\sqrt{3}$
(3) $\frac{10\sqrt{7}}{3}$ (4) $\frac{7\sqrt{10}}{3}$

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

8. The perimeter of a triangle is 40cm and its area is 60 cm^2. If the largest side measures 17cm, then the length (in cm) of the smallest side of the triangle is

(1) 4 (2) 6
(3) 8 (4) 15

(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

9. The ratio of the area of two isosceles triangles having the same vertical angle (i.e. angle between equal sides) is 1 : 4. The ratio of their heights is

(1) 1 : 4 (2) 2 : 5
(3) 1 : 2 (4) 3 : 4

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

10. The length of one side of a rhombus is 6.5 cm and its altitude is 10 cm. If the length of its diagonal be 26 cm, the length of the other diagonal will be :

(1) 5 cm (2) 10 cm
(3) 6.5 cm (4) 26 cm

(SSC CPO S.I. Exam. 26.05.2005)

11. The measure of each of two opposite angles of a rhombus is 60° and the measure of one of its sides is 10cm. The length of its smaller diagonal is :

(1) 10 cm (2) $10\sqrt{3}$ cm
(3) $10\sqrt{2}$ cm (4) $\frac{5}{2}\sqrt{2}$ cm

(SSC CPO S.I. Exam. 16.12.2007)

12. Two adjacent sides of a parallelogram are of length 15 cm and 18 cm. If the distance between two smaller sides is 12 cm, then the distance between two bigger sides is

(1) 8 cm (2) 10 cm
(3) 12 cm (4) 15 cm

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

13. A parallelogram ABCD has sides AB = 24 cm and AD = 16 cm. The distance between the sides AB and DC is 10 cm. Find the distance between the sides AD and BC.

(1) 16 cm. (2) 18 cm.
(3) 15 cm. (4) 26 cm.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

14. The adjacent sides of a parallelogram are 36 cm and 27 cm in length. If the distance between the shorter sides is 12 cm, then the distance between the longer sides is

(1) 10 cm (2) 12 cm
(3) 16 cm (4) 9 cm

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

15. If the diagonals of a rhombus are 8 and 6, then the square of its size is

(1) 25 (2) 55
(3) 64 (4) 36

(SSC Graduate Level Tier-II Exam.16.09.2012)

16. One of the four angles of a rhombus is 60°. If the length of each side of the rhombus is 8 cm, then the length of the longer diagonal is

(1) $8\sqrt{3}$ cm (2) 8 cm
(3) $4\sqrt{3}$ cm (4) $\frac{8}{\sqrt{3}}$ cm

(SSC Graduate Level Tier-I Exam. 21.04.2013)

17. The diagonals of a rhombus are 12 cm and 16 cm respectively. The length of one side is

(1) 8 cm (2) 6 cm
(3) 10 cm (4) 12 cm

(SSC Graduate Level Tier-II Exam. 29.09.2013

18. Each interior angle of a regular polygon is 18° more than eight times an exterior angle. The number of sides of the polygon is

(1) 10 (2) 15
(3) 20 (4) 25

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

19. An exterior angle of a regular polygon is 72°. The sum of all the interior angles is

(1) 360° (2) 480°
(3) 520° (4) 540°

(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

20. A cylindrical tank of diameter 35 cm is full of water. If 11 litres of water is drawn off, the water level in the tank will drop by :

$\left(\text{use } \pi = \frac{22}{7}\right)$

(1) $10\frac{1}{2}$cm. (2) $12\frac{6}{7}$cm.
(3) 14 cm. (4) $11\frac{3}{7}$cm.

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

21. A right circular cylinder is formed by rolling a rectangular paper 12 cm long and 3 cm wide along its length. The radius of the base of the cylinder will be

(1) $\frac{3}{2\pi}$cm (2) $\frac{6}{\pi}$ *cm*
(3) $\frac{9}{2\pi}$cm (4) 2π cm

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

22. The diameter of the base of a right circular cone is 4 cm and its height $2\sqrt{3}$ cm. The slant height of the cone is

(1) 5 cm (2) 4 cm
(3) $2\sqrt{3}$ cm (4) 3 cm

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

23. A sector is formed by opening out a cone of base radius 8 cm and height 6 cm. Then the radius of the sector is (in cm)

(1) 4 (2) 8
(3) 10 (4) 6

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

24. A right circular cone is 3.6 cm high and radius of its base is 1.6 cm. It is melted and recast into a right circular cone with radius of its base as 1.2 cm. Then the height of the cone (in cm) is

(1) 3.6 (2) 4.8
(3) 6.4 (4) 7.2

(SSC Graduate Level Tier-II Exam. 29.09.2013)

25. A copper sphere of radius 3 cm is beaten and drawn into a wire of diameter 0.2 cm. The length of the wire is :

(1) 9 m (2) 12 m
(3) 18 m (4) 36 m

(SSC CPO S.I. Exam. 26.05.2005)

26. If surface area and volume of a sphere are S and V respectively, then value of $\frac{S^3}{V^2}$ is

(1) 36 units (2) 9 units
(3) 18 units (4) 27 units

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

27. Assume that a drop of water is spherical and its diameter is one-tenth of a cm. A conical glass has a height equal to the diameter of its rim. If 32,000 drops of water fill the glass completely, then the height of the glass (in cm) is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC Graduate Level Tier-II Exam. 29.09.2013

28. A cistern of capacity 8000 litres measures externally 3.3 m by 2.6 m by 1.1 m and its walls are 5 cm thick. The thickness of the bottom is :
(1) 1 m (2) 1.1 m
(3) 1 dm (4) 90 cm
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

29. A cone is cut at mid point of its height by a frustum parallel to its base. The ratio between the two parts of cone would be
(1) 1 : 1 (2) 1 : 8
(3) 1 : 4 (4) 1 : 7
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

30. The area of a circle of radius 5 is numerically what percent of its circum ference?
(1) 200% (2) 225%
(3) 240% (4) 250%
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

31. If the circumference and area of a circle are numerically equal, then the diameter is equal to :
(1) area of the circle
(2) $\frac{\pi}{2}$
(3) 2π (4) 4
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

32. A chord of length 30 cm is at a distance of 8 cm from the centre of a circle. The radius of the circle is:
(1) 17 cm (2) 23 cm
(3) 21 cm (4) 19 cm
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

33. The circum-radius of an equilateral triangle is 8 cm. The in-radius of the triangle is
(1) 3.25 cm (2) 3.50 cm
(3) 4 cm (4) 4.25 cm
(SSC CPO S.I. Exam. 07.09.2003)

34. A circle is inscribed in a square. An equilateral triangle of side $4\sqrt{3}$ cm is inscribed in that circle. The length of the diagonal of the square (in centimetres) is
(1) $4\sqrt{2}$ (2) 8
(3) $8\sqrt{2}$ (4) 16
(SSC CPO S.I. Exam. 05.09.2004)

35. The height of an equilateral triangle is $4\sqrt{3}$ cm. The ratio of the area of its circumcircle to that of its in-circle is
(1) 2 : 1 (2) 4 : 1
(3) 4 : 3 (4) 3 : 2
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

36. A circle is inscribed in a square whose length of the diagonal is $12\sqrt{2}$ cm. An equilateral triangle is inscribed in that circle. The length of the side of the triangle is
(1) $4\sqrt{3}$ cm (2) $8\sqrt{3}$ cm
(3) $6\sqrt{3}$ cm (4) $11\sqrt{3}$ cm
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

37. The radius of the incircle of a triangle whose sides are 9 cm, 12 cm and 15 cm is
(1) 9 cm (2) 13 cm
(3) 3 cm (4) 6 cm
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

38. The ratio of inradius and circumradius of a square is :
(1) $1 : \sqrt{2}$ (2) $\sqrt{2} : \sqrt{3}$
(3) 1 : 3 (4) 1 : 2
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

39. The perimeter of a rectangle and a square are 160 m each. The area of the rectangle is less than that of the square by 100 sq m. The length of the rectangle is
(1) 30 m (2) 60 m
(3) 40 m (4) 50 m
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

40. The volume of a right circular cylinder and that of a sphere are equal and their radii are also equal. If the height of the cylinder be h and the diameter of the sphere d, then which of the following relation is correct ?
(1) $h = d$ (2) $2h = d$
(3) $2h = 3d$ (4) $3h = 2d$
(SSC CPO S.I. Exam. 09.11.2008)

41. A solid cone of height 9 cm with diameter of its base 18 cm is cut out from a wooden solid sphere of radius 9 cm. The percentage of wood wasted is :
(1) 25% (2) 30%
(3) 50% (4) 75%
(FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

42. Two circles with centres A and B and radius 2 units touch each other externally at 'C'. A third circle with centre 'C' and radius '2' units meets other two at D and E. Then the area of the quadrilateral ABDE is
(1) $2\sqrt{2}$ sq. units
(2) $3\sqrt{3}$ sq. units
(3) $3\sqrt{2}$ sq. units
(4) $2\sqrt{3}$ sq. units
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

43. Two cubes of sides 6 cm each are kept side by side to form a rectangular parallelopiped. The area (in sq. cm) of the whole surface of the rectangular parallelopiped is
(1) 432 (2) 360
(3) 396 (4) 340
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

44. The diameter of a copper sphere is 1 8 cm. The sphere is melted and is drawn into a long wire of uniform circular cross-section. If the length of the wire is 108 m, the diameter of the wire is
(1) 1 cm (2) 0.9cm
(3) 0.3 cm (4) 0.6 cm
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

45. A river 3 m deep and 40 m wide is flowing at the rate of 2 km per hour. How much water (in litres) will fall into the sea in a minute?
(1) 4,00,000 (2) 40,00,000
(3) 40,000 (4) 4,000
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

46. Water is flowing at the rate of 3 km/hr through a circular pipe of 20 cm internal diameter into a circular cistern of diameter 10m and depth 2m. In how much time will the cistern be filled ?

(1) 1 hour
(2) 1 hour 40 minutes
(3) 1 hour 20 minutes
(4) 2 hours 40 minutes

(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

47. The rain water from a roof 22 m × 20 m drains into a cylindrical vessel having a diameter of 2 m and height 3.5 m. If the vessel is just full, then the rainfall (in cm) is :

(1) 2 (2) 2.5
(3) 3 (4) 4.5

(SSC CHSL DEO & LDC Exam. 27.11.2010)

48. 2 cm of rain has fallen on a square km of land. Assuming that 50% of the raindrops could have been collected and contained in a pool having a 100 m × 10 m base, by what level would the water level in the pool have increased ?

(1) 1 km (2) 10 m
(3) 10 cm (4) 1 m

(SSC Graduate Level Tier-II Exam.16.09.2012)

49. A parallelopiped whose sides are in ratio 2 : 4 : 8 have the same volume as a cube. The ratio of their surface area is :

(1) 7 : 5 (2) 4 : 3
(3) 8 : 5 (4) 7 : 6

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

50. If two adjacent sides of a rectangular parallelopiped are 1 cm and 2 cm and the total surface area of the parallelopiped is 22 square cm, then the diagonal of the parallelopiped is

(1) $\sqrt{10}$ cm (2) $2\sqrt{3}$ cm
(3) $\sqrt{14}$ cm (4) 4cm

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

51. What part of a ditch, 48 metres long, 16.5 metres broad and 4 metres deep can be filled by the earth got by digging a cylindrical tunnel of diameter 4 metres and length 56 metres ? (Use $\pi = \frac{22}{7}$)

(1) $\frac{1}{9}$ (2) $\frac{2}{9}$
(3) $\frac{7}{9}$ (4) $\frac{8}{9}$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

52. The perimeters of a circle, a square and an equilateral triangle are same and their areas are C, S and T respectively. Which of the following statement is true ?

(1) C = S = T (2) C > S > T
(3) C < S < T (4) S < C < T

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

53. The base of a right prism is a quadrilateral ABCD. Given that AB = 9 cm, BC = 14 cm, CD = 13 cm, DA = 12 cm and ∠DAB = 90°. If the volume of the prism be 2070 cm^3, then the area of the lateral surface is

(1) 720 cm^2 (2) 810 cm^2
(3) 1260 cm^2 (4) 2070 cm^2

(SSC CGL Tier-I Exam. 19.10.2014)

54. An elephant of length 4 m is at one corner of a rectangular cage of size (16 m × 30 m) and faces towards the diagonally opposite corner. If the elephant starts moving towards the diagonally opposite corner it takes 15 seconds to reach this corner. Find the speed of the elephant.

(1) 1 m/sec (2) 2 m/sec
(3) 1.87 m/sec (4) 1.5 m/sec

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

55. A horse takes $2\frac{1}{2}$ seconds to complete a round around a circular field. If the speed of the horse was 66 m/sec, then the radius of the field is,

[Given $\pi = \frac{22}{7}$]

(1) 25.62 m (2) 26.52 m
(3) 25.26 m (4) 26.25 m

(SSC CHSL DEO & LDC Exam. 9.11.2014)

56. The diameter of the front wheel of an engine is $2x$ cm and that of rear wheel is $2y$ cm. To cover the same distance, find the number of times the rear wheel will revolve when the front wheel revolves 'n' times.

(1) $\frac{n}{xy}$ times (2) $\frac{yn}{x}$ times
(3) $\frac{nx}{y}$ times (4) $\frac{xy}{n}$ times

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

57. A bicycle wheel has a diameter (including the tyre) of 56 cm. The number of times the wheel will rotate to cover a distance of 2.2 km is (Assume $\pi = \frac{22}{7}$)

(1) 625 (2) 1250
(3) 1875 (4) 2500

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

58. If one diagonal of a rhombus of side 13 cm is 10 cm, then the other diagonal is

(1) 24 cm (2) 20 cm
(3) 16 cm (4) 28 cm

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

59. A brick 2" thick is placed against a wheel to act for a stop. The horizontal distance of the face of the brick from the point where the wheel touches the ground is 6". The radius of the wheel in inches is

(1) 10 (2) 5
(3) 12 (4) 6

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

60. A solid has 12 vertices and 30 edges. How many faces does it have?

(1) 22 (2) 24
(3) 26 (4) 20

(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

SHORT ANSWERS

TYPE-I

1. (2)	**2.** (3)	**3.** (4)	**4.** (3)
5. (2)	**6.** (3)	**7.** (3)	**8.** (2)
9. (2)	**10.** (4)	**11.** (1)	**12.** (1)
13. (1)	**14.** (1)	**15.** (2)	**16.** (4)
17. (4)	**18.** (3)	**19.** (4)	**20.** (1)
21. (2)	**22.** (2)	**23.** (3)	**24.** (1)
25. (3)	**26.** (1)	**27.** (1)	**28.** (4)
29. (4)	**30.** (4)	**31.** (2)	**32.** (3)
33. (3)	**34.** (3)	**35.** (2)	**36.** (3)
37. (3)	**38.** (3)	**39.** (3)	**40.** (2)
41. (4)	**42.** (3)	**43.** (1)	**44.** (3)
45. (4)	**46.** (4)	**47.** (2)	**48.** (1)
49. (4)	**50.** (3)	**51.** (1)	**52.** (3)
53. (3)	**54.** (2)	**55.** (2)	**56.** (1)
57. (3)	**58.** (3)	**59.** (2)	**60.** (3)
61. (3)	**62.** (4)	**63.** (4)	**64.** (2)
65. (1)	**66.** (2)	**67.** (3)	**68.** (3)
69. (4)	**70.** (3)	**71.** (2)	**72.** (2)
73. (4)	**74.** (4)	**75.** (4)	**76.** (3)
77. (4)	**78.** (1)	**79.** (4)	**80.** (1)
81. (1)	**82.** (3)	**83.** (3)	**84.** (2)
85. (4)	**86.** (3)	**87.** (2)	**88.** (2)
89. (1)	**90.** (2)	**91.** (2)	**92.** (2)
93. (1)	**94.** (3)	**95.** (3)	**96.** (1)
97. (1)	**98.** (1)	**99.** (4)	**100.** (2)
101. (1)	**102.** (1)	**103.** (4)	**104.** (1)
105. (1)	**106.** (3)	**107.** (1)	**108.** (4)
109. (4)	**110.** (3)	**111.** (1)	**112.** (2)
113. (1)	**114.** (1)	**115.** (2)	**116.** (2)
117. (3)	**118.** (3)	**119.** (4)	**120.** (2)
121. (3)	**122.** (2)	**123.** (1)	**124.** (2)
125. (4)	**126.** (3)	**127.** (3)	**128.** (3)
129. (2)	**130.** (2)	**131.** (4)	**132.** (2)
133. (1)	**134.** (2)	**135.** (2)	**136.** (4)
137. (3)	**138.** (3)	**139.** (4)	**140.** (2)
141. (3)	**142.** (3)	**143.** (2)	**144.** (4)
145. (3)	**146.** (2)	**147.** (3)	**148.** (2)
149. (3)	**150.** (4)	**151.** (4)	**152.** (1)
153. (2)	**154.** (2)	**155.** (3)	**156.** (4)
157. (2)	**158.** (2)	**159.** (1)	**160.** (2)
161. (2)	**162.** (4)	**163.** (3)	**164.** (4)
165. (4)	**166.** (1)	**167.** (1)	**168.** (3)
169. (3)	**170.** (3)	**171.** (3)	**172.** (2)
173. (3)	**174.** (2)	**175.** (1)	**176.** (4)
177. (1)	**178.** (2)	**179.** (2)	**180.** (2)
181. (3)	**182.** (4)	**183.** (2)	**184.** (3)
185. (1)	**186.** (4)	**187.** (2)	**188.** (3)
189. (3)	**190.** (2)	**191.** (2)	**192.** (4)
193. (1)	**194.** (4)	**195.** (1)	**196.** (3)
197. (4)	**198.** (3)	**199.** (1)	**200.** (4)
201. (1)	**202.** (1)	**203.** (4)	**204.** (2)
205. (*)	**206.** (3)	**207.** (2)	**208.** (2)
209. (1)	**210.** (2)	**211.** (2)	**212.** (2)
213. (1)	**214.** (2)	**215.** (3)	**216.** (3)
217. (3)	**218.** (1)	**219.** (3)	**220.** (3)
221. (3)	**222.** (4)	**223.** (4)	**224.** (1)
225. (1)	**226.** (3)	**227.** (2)	**228.** (3)
229. (3)	**230.** (1)	**231.** (1)	**232.** (2)
233. (3)	**234.** (4)	**235.** (3)	**236.** (2)
237. (1)	**238.** (4)	**239.** (4)	**240.** (2)
241. (4)	**242.** (3)	**243.** (4)	**244.** (2)
245. (2)	**246.** (1)	**247.** (4)	**248.** (4)
249. (2)	**250.** (2)	**251.** (4)	**252.** (3)
253. (4)	**254.** (2)	**255.** (2)	**256.** (3)
257. (4)	**258.** (3)	**259.** (1)	**260.** (2)
261. (1)	**262.** (1)	**263.** (3)	**264.** (1)
265. (2)	**266.** (2)	**267.** (4)	**268.** (3)
269. (4)	**270.** (2)	**271.** (3)	**272.** (1)
273. (2)	**274.** (3)	**275.** (2)	**276.** (1)
277. (1)	**278.** (4)	**279.** (4)	**280.** (2)
281. (2)	**282.** (4)	**283.** (4)	**284.** (3)
285. (4)	**286.** (4)	**287.** (4)	**288.** (3)
289. (2)	**290.** (2)	**291.** (3)	**292.** (1)
293. (2)	**294.** (2)	**295.** (1)	**296.** (1)
297. (4)	**298.** (2)	**299.** (1)	**300.** (1)
301. (1)	**302.** (3)	**303.** (2)	**304.** (4)
305. (2)	**306.** (4)	**307.** (3)	**308.** (1)
309. (3)	**310.** (1)	**311.** (2)	**312.** (2)
313. (1)	**314.** (3)	**315.** (2)	**316.** (3)
317. (1)	**318.** (2)	**319.** (2)	**320.** (3)
321. (1)			

TYPE-II

1. (2)	**2.** (1)	**3.** (3)	**4.** (2)
5. (2)	**6.** (3)	**7.** (2)	**8.** (4)
9. (3)	**10.** (1)	**11.** (4)	**12.** (3)
13. (1)	**14.** (3)	**15.** (3)	**16.** (4)
17. (3)	**18.** (1)	**19.** (3)	**20.** (3)
21. (1)	**22.** (1)	**23.** (3)	**24.** (1)
25. (4)	**26.** (1)	**27.** (4)	**28.** (3)
29. (3)	**30.** (1)	**31.** (2)	**32.** (1)
33. (2)	**34.** (3)	**35.** (2)	**36.** (2)
37. (1)	**38.** (1)	**39.** (1)	**40.** (2)
41. (4)	**42.** (3)	**43.** (2)	**44.** (2)
45. (3)	**46.** (1)	**47.** (2)	**48.** (2)
49. (2)	**50.** (3)	**51.** (2)	**52.** (1)
53. (2)	**54.** (1)	**55.** (4)	**56.** (1)
57. (2)	**58.** (3)	**59.** (3)	**60.** (3)
61. (2)	**62.** (3)	**63.** (2)	**64.** (4)
65. (1)	**66.** (3)	**67.** (4)	**68.** (2)
69. (1)	**70.** (1)	**71.** (3)	**72.** (1)
73. (3)	**74.** (1)	**75.** (1)	**76.** (1)
77. (1)	**78.** (2)	**79.** (2)	**80.** (2)
81. (2)	**82.** (2)	**83.** (1)	**84.** (3)
85. (1)	**86.** (2)	**87.** (3)	**88.** (1)
89. (2)	**90.** (3)	**91.** (3)	**92.** (4)
93. (2)	**94.** (3)	**95.** (2)	**96.** (3)
97. (3)	**98.** (1)	**99.** (2)	**100.** (1)
101. (4)	**102.** (2)	**103.** (2)	

TYPE-III

1. (4)	**2.** (2)	**3.** (3)	**4.** (3)
5. (4)	**6.** (1)	**7.** (4)	**8.** (1)
9. (4)	**10.** (4)	**11.** (3)	**12.** (4)
13. (4)	**14.** (4)	**15.** (2)	

TYPE-IV

1. (2)	**2.** (1)	**3.** (1)	**4.** (1)
5. (4)	**6.** (2)	**7.** (4)	**8.** (3)
9. (1)	**10.** (2)	**11.** (2)	**12.** (3)
13. (1)	**14.** (2)	**15.** (1)	**16.** (1)
17. (4)	**18.** (3)	**19.** (1)	**20.** (1)
21. (3)	**22.** (1)	**23.** (2)	**24.** (4)

25. (4)	**26.** (4)	**27.** (1)	**28.** (1)
29. (3)	**30.** (3)	**31.** (2)	**32.** (1)
33. (1)	**34.** (4)	**35.** (1)	**36.** (4)
37. (4)	**38.** (2)	**39.** (3)	**40.** (2)
41. (3)	**42.** (4)	**43.** (1)	**44.** (1)
45. (2)	**46.** (4)	**47.** (4)	**48.** (4)
49. (2)	**50.** (3)	**51.** (1)	**52.** (4)
53. (1)	**54.** (3)	**55.** (2)	**56.** (1)
57. (2)	**58.** (3)	**59.** (2)	**60.** (3)
61. (4)	**62.** (2)	**63.** (3)	**64.** (2)
65. (4)	**66.** (4)	**67.** (2)	**68.** (4)
69. (3)	**70.** (4)	**71.** (1)	**72.** (1)
73. (3)	**74.** (3)	**75.** (3)	**76.** (3)
77. (3)	**78.** (2)	**79.** (4)	**80.** (1)
81. (1)	**82.** (3)	**83.** (2)	**84.** (2)
85. (2)	**86.** (2)	**87.** (1)	**88.** (3)
89. (1)	**90.** (3)	**91.** (1)	**92.** (1)
93. (2)	**94.** (4)	**95.** (3)	**96.** (2)
97. (3)	**98.** (3)	**99.** (3)	**100.** (2)
101. (2)	**102.** (2)	**103.** (2)	**104.** (4)
105. (2)	**106.** (1)	**107.** (3)	**108.** (1)
109. (4)	**110.** (4)	**111.** (4)	**112.** (2)
113. (4)	**114.** (3)	**115.** (1)	**116.** (1)
117. (2)	**118.** (1)	**119.** (4)	**120.** (2)
121. (2)	**122.** (3)	**123.** (2)	**124.** (1)
125. (4)	**126.** (4)	**127.** (4)	**128.** (3)
129. (2)	**130.** (1)	**131.** (3)	**132.** (2)
133. (1)	**134.** (4)	**135.** (2)	**136.** (3)
137. (2)	**138.** (4)	**139.** (4)	**140.** (2)
141. (2)	**142.** (1)	**143.** (4)	**144.** (2)
145. (3)	**146.** (4)	**147.** (1)	**148.** (3)
149. (1)	**150.** (1)	**151.** (1)	**152.** (1)
153. (4)	**154.** (2)	**155.** (2)	**156.** (1)
157. (1)	**158.** (4)	**159.** (4)	**160.** (1)
161. (3)	**162.** (3)	**163.** (4)	**164.** (1)
165. (2)	**166.** (4)	**167.** (*)	**168.** (2)
169. (4)	**170.** (4)	**171.** (3)	**172.** (3)
173. (1)	**174.** (*)	**175.** (1)	**176.** (1)
177. (1)	**178.** (4)	**179.** (1)	**180.** (1)
181. (3)	**182.** (3)	**183.** (2)	**184.** (2)
185. (4)	**186.** (4)	**187.** (3)	**188.** (2)
189. (1)	**190.** (3)	**191.** (3)	**192.** (1)

193. (4)	**194.** (1)	**195.** (3)	**196.** (2)
197. (3)	**198.** (3)	**199.** (2)	**200.** (4)
201. (4)	**202.** (1)	**203.** (4)	**204.** (4)
205. (3)	**206.** (2)	**207.** (4)	**208.** (4)
209. (2)	**210.** (1)	**211.** (1)	**212.** (2)
213. (1)	**214.** (2)	**215.** (3)	**216.** (1)
217. (4)	**218.** (4)	**219.** (3)	**220.** (1)
221. (4)	**222.** (2)	**223.** (3)	**224.** (4)
225. (2)	**226.** (3)	**227.** (3)	**228.** (4)
229. (4)	**230.** (3)	**231.** (4)	**232.** (3)
233. (2)	**234.** (4)	**235.** (3)	**236.** (1)
237. (3)	**238.** (1)	**239.** (3)	**240.** (3)
241. (4)	**242.** (4)	**243.** (3)	**244.** (3)
245. (1)	**246.** (3)	**247.** (2)	**248.** (4)
249. (1)	**250.** (1)	**251.** (4)	**252.** (2)
253. (1)	**254.** (2)	**255.** (1)	**256.** (4)
257. (4)	**258.** (2)	**259.** (1)	**260.** (4)
261. (4)			

TYPE-V

1. (4)	**2.** (2)	**3.** (1)	**4.** (2)
5. (1)	**6.** (1)	**7.** (1)	**8.** (1)
9. (3)	**10.** (3)	**11.** (3)	**12.** (3)
13. (1)	**14.** (2)	**15.** (4)	**16.** (3)
17. (4)	**18.** (3)	**19.** (2)	**20.** (2)
21. (1)	**22.** (4)	**23.** (3)	**24.** (3)
25. (2)	**26.** (3)	**27.** (2)	**28.** (4)
29. (2)	**30.** (3)	**31.** (3)	**32.** (3)
33. (2)	**34.** (2)	**35.** (1)	**36.** (3)
37. (4)	**38.** (2)	**39.** (4)	**40.** (4)
41. (4)	**42.** (4)	**43.** (2)	**44.** (2)
45. (3)	**46.** (3)	**47.** (2)	**48.** (3)
49. (4)	**50.** (3)	**51.** (2)	**52.** (1)
53. (1)	**54.** (4)	**55.** (3)	**56.** (3)
57. (2)	**58.** (3)	**59.** (3)	**60.** (2)
61. (1)	**62.** (4)	**63.** (1)	**64.** (4)
65. (4)	**66.** (2)	**67.** (1)	**68.** (2)
69. (4)	**70.** (2)	**71.** (1)	**72.** (3)
73. (1)	**74.** (3)	**75.** (2)	**76.** (1)
77. (4)	**78.** (4)	**79.** (2)	**80.** (2)
81. (3)	**82.** (3)	**83.** (3)	**84.** (2)

85. (2)	**86.** (3)	**87.** (3)	**88.** (4)
89. (1)	**90.** (1)	**91.** (4)	**92.** (3)
93. (4)	**94.** (4)	**95.** (4)	**96.** (4)
97. (3)	**98.** (4)	**99.** (1)	**100.** (4)
101. (3)	**102.** (1)	**103.** (4)	**104.** (4)
105. (3)	**106.** (4)	**107.** (1)	**108.** (4)
109. (3)	**110.** (2)	**111.** (1)	**112.** (2)
113. (3)	**114.** (2)	**115.** (2)	**116.** (1)
117. (4)	**118.** (2)	**119.** (1)	**120.** (3)
121. (2)	**122.** (3)	**123.** (1)	**124.** (3)
125. (3)	**126.** (1)	**127.** (2)	**128.** (3)

TYPE-VI

1. (1)	**2.** (1)	**3.** (2)	**4.** (3)
5. (3)	**6.** (3)	**7.** (4)	**8.** (1)
9. (3)	**10.** (2)	**11.** (4)	**12.** (2)
13. (4)	**14.** (1	**15.** (1)	**16.** (4)
17. (4)	**18.** (1)	**19.** (4)	**20.** (1)
21. (1)	**22.** (4)	**23.** (4)	**24.** (4)
25. (1)	**26.** (4)	**27.** (4)	**28.** (4)
29. (2)	**30.** (4)	**31.** (4)	**32.** (2)
33. (3)	**34.** (3)	**35.** (4)	**36.** (1)
37. (4)			

TYPE-VII

1. (3)	**2.** (1)	**3.** (2)	**4.** (3)
5. (2)	**6.** (1)	**7.** (3)	**8.** (3)
9. (3)	**10.** (1)	**11.** (1)	**12.** (2)
13. (3)	**14.** (4)	**15.** (1)	**16.** (1)
17. (3)	**18.** (3)	**19.** (4)	**20.** (4)
21. (2)	**22.** (2)	**23.** (3)	**24.** (3)
25. (4)	**26.** (1)	**27.** (4)	**28.** (3)
29. (4)	**30.** (4)	**31.** (4)	**32.** (1)
33. (3)	**34.** (3)	**35.** (2)	**36.** (3)
37. (3)	**38.** (1)	**39.** (4)	**40.** (4)
41. (4)	**42.** (2)	**43.** (2)	**44.** (4)
45. (2)	**46.** (2)	**47.** (2)	**48.** (2)
49. (4)	**50.** (3)	**51.** (2)	**52.** (2)
53. (1)	**54.** (2)	**55.** (4)	**56.** (3)
57. (2)	**58.** (1)	**59.** (4)	**60.** (4)

EXPLANATIONS

TYPE-I

1. (2) Using Rule 10,
Side of square

$= \frac{\text{Diagonal}}{\sqrt{2}}$

$\therefore$ Area $= \frac{(\text{Diagonal})^2}{2}$

$= \frac{(5.2)^2}{2} = \frac{27.04}{2} = 13.52\ cm^2$

2. (3) Using Rule 10,

Side $= \frac{\text{Diagonal}}{\sqrt{2}} = \frac{a}{\sqrt{2}}$

$\therefore$ Area = (Side)^2

$= \left(\frac{a}{\sqrt{2}}\right)^2$ sq.cm. $= \frac{a^2}{2}$ sq.cm.

3. (4) Using Rule 10,
Side of the first square

$= \frac{1}{\sqrt{2}} \times 4\sqrt{2} = 4$ cm.

Its area = $(4)^2 = 16$ cm^2.

$\therefore$ Area of second square
$= 2 \times 16 = 32$ cm^2.

Its side $= \sqrt{32} = 4\sqrt{2}$ cm.

$\therefore$ Required diagonal

$= \sqrt{2} \times 4\sqrt{2} = 8$ cm

4. (3) Using Rule 10,
Area of the square A

$= \frac{(\text{diagonal}))^2}{2}$

$= \frac{(a+b)^2}{2}$

Area of the new square

$= \frac{(a+b)^2}{2} \times 2 = (a+b)^2$

$\Rightarrow$ Side = (a + b)

$\therefore$ Diagonal = $\sqrt{2} \times$ side

$= \sqrt{2}\ (a+b)$

5. (2) Let the length of the smaller line segment = x cm.
The length of larger line segment = $(x + 2)$ cm.
According to the question,
$(x + 2)^2 - x^2 = 32$
$\Rightarrow x^2 + 4x + 4 - x^2 = 32$
$\Rightarrow 4x = 32 - 4 = 28$

$\Rightarrow x = \frac{28}{4} = 7$

The required length
$= x + 2 = 7 + 2 = 9$ cm.

6. (3) Using Rule 10,
Let diagonals be $2x$ and $5x$.

$\therefore \frac{A_1}{A_2} = \frac{\frac{1}{2} \times (2x)^2}{\frac{1}{2} \times (5x)^2} = \frac{4}{25}$

$\Rightarrow 4 : 25$

7. (3) Using Rule 10,
Side of the squares are 6 cm, 8 cm, 10 cm, 19 cm and 20 cm respectively.
Sum of their areas = $(6^2 + 8^2 + 10^2 + 19^2 + 20^2)$ cm^2
=(36+64+100 + 361 + 400)cm^2
= 961 cm^2
$\therefore$ Area of largest other square
= 961 cm^2

$\Rightarrow$ Its side = $\sqrt{961} = 31$ cm

$\therefore$ Required perimeter
$= 4 \times 31 = 124$ cm.

8. (2) Using Rule 10,
Let the side of square be a units.
Area of this square = a^2

The diagonal of square = $\sqrt{2}\ a$

$\therefore$ Area of square = $2a^2$
$\therefore$ Required ratio = $a^2 : 2a^2$
$= 1 : 2$

9. (2) Using Rule 10,

Area of sectors = $\pi r^2 = 4\pi$ sq.cm.
$\Rightarrow$ Area of square = $4 \times 4 = 16$ sq.cm.
$\therefore$ Area of the remaining portion
$= (16 - 4\pi)$ sq.cm.

10. (4) Diagonal of square

$= \sqrt{2} \times$ side

$\therefore \sqrt{2} \times$ side $= 15\sqrt{2}$

$\Rightarrow$ Side $= \frac{15\sqrt{2}}{\sqrt{2}} = 15$

$\therefore$ Area of square = (side)^2
$= 15 \times 15 = 225$ sq.cm.

Method 2 :

Quicker Approach

Area of square $= \frac{1}{2} \times (\text{diagonal})^2$

$= \frac{1}{2} \times 15\sqrt{2} \times 15\sqrt{2} = 225$ sq.cm.

11. (1) Using Rule 6 and 10,
Area of paper = Area of square + Area of equilateral triangle

$= \frac{1}{2}$ (diagonal)^2 + $\frac{\sqrt{3}}{4} \times$ (side)^2

$= \frac{1}{2} \times 32 \times 32 + \frac{\sqrt{3}}{4} \times 8 \times 8$

$= 512 + 16 \times 1.732$
$= 512 + 27.712 = 539.712$ cm^2

[**Note :** Diagonal of a square = $\sqrt{2}$ side]

12. (1) Using Rule 9,
Let the length of rectangular hall = x–metre

$\therefore$ Breadth $= \left(\frac{3}{4} \times x\right)$ metre

Area of rectangular
= Length × Breadth

$= x \times \frac{3}{4}x$ sq.m. $= \frac{3}{4}x^2$ m^2

$\therefore$ According to question,

$\frac{3}{4}x^2 = 768$

$\therefore x^2 = \frac{768 \times 4}{3}$

or, $x = \sqrt{\frac{768 \times 4}{3}} = 32$m

$\therefore$ Length = 32 m and
Breadth = 24m
$\therefore$ Required difference
$= 32 - 24 = 8$ m

13. (1) Using Rule 9,
Let breadth of plot = x m
$\therefore$ length = $5x$ m.
According to question,

$\frac{5x^2}{2} = 245$

$\Rightarrow x^2 = \frac{245 \times 2}{5} = 98$

$\Rightarrow x = 7\sqrt{2}$ m
$\therefore$ Length
$= 5 \times 7\sqrt{2} = 35\sqrt{2}$ m

14. (1) Using Rule 9 and 10,
Area of the rectangular garden = $12 \times 5 = 60\ m^2$
= Area of the square garden
∴ Side of the square garden
$= \sqrt{60} m^2$
∴ Diagonal of the square garden
$= \sqrt{2} \times$ side
$= \sqrt{2} \times \sqrt{60} = \sqrt{120} = \sqrt{4 \times 30}$
$= 2\sqrt{30} m$

15. (2) Using Rule 9 and 14,
Radius of circular wire
$= \frac{42}{2} = 21$ cm
Circumference of wire = $2\pi r$
$= 2 \times \frac{22}{7} \times 21 = 132$ cm
Let the length and breadth of rectangle be $6x$ and $5x$ cm respectively.
∴ Perimeter of rectangle
$= 2(6x + 5x) = 22x$
According to the question,
$22x = 132$
$\Rightarrow x = \frac{132}{22} = 6$
∴ Length of rectangle
$= 6x = 6 \times 6 = 36$ cm
Breadth of rectangle
$= 5x = 5 \times 6 = 30$ cm
∴ Area = 36×30
$= 1080\ cm^2$

16. (4) Using Rule 9,

BD = length of diagonal
= speed × time
$= \frac{52}{60} \times 15 = 13$ metre
BD = $\sqrt{l^2 + b^2}$
$\Rightarrow l^2 + b^2 = 169$ ...(i)
Again,
$(l + b) = \frac{68}{60} \times 15 = 17$ ...(ii)
∴ $(l + b)^2 = l^2 + b^2 + 2lb$
$\Rightarrow 17^2 = 169 + 2lb$
$\Rightarrow 2lb = 289 - 169 = 120$
$\Rightarrow lb = \frac{120}{2} = 60\ m^2$

17. (4) Using Rule 9,
Let the breadth be x m.
∴ Length = $(23 + x)$ m
$\Rightarrow 2(x + 23 + x) = 206$
$\Rightarrow 4x = 206 - 46$
$\Rightarrow x = \frac{160}{4} = 40m$
∴ Length = 40 + 23 = 63 m
∴ Required area = 63×40
$= 2520\ m^2$

18. (3) Using Rule 14,
Area of the tank
$= 180 \times 120 = 21600\ m^2$.
Total area of the circular plot
$= 40000 + 21600 = 61600\ m^2$.
∴ $\pi r^2 = 61600$
$\Rightarrow r^2 = \frac{61600 \times 7}{22}$
$= 2800 \times 7$
$\Rightarrow r = \sqrt{2800 \times 7}$
$\Rightarrow r = 2 \times 7 \times 10 = 140m$

19. (4) Using Rule 9,
Let the breadth of rectangular hall = x m.
∴ length = $(x + 5)$ m.
Area of hall
= Length × Breadth
$\Rightarrow 750 = (x + 5)x$
$\Rightarrow x^2 + 5x - 750 = 0$
$\Rightarrow x^2 + 30x - 25x - 750 = 0$
$\Rightarrow x(x + 30) - 25(x + 30) = 0$
$\Rightarrow (x - 25)(x + 30) = 0$
$\Rightarrow x = 25$, as x cannot be negative.
∴ Length of hall = $x + 5$
$= 25 + 5 = 30$ m.

20. (1) Using Rule 9,
Let the length and breadth of the rectangle be $3x$ and $2x$ cm respectively. Then,
$2(3x + 2x) = 20$
$\Rightarrow 10x = 20 \Rightarrow x = \frac{20}{10} = 2$
∴ Length = $3x = 3 \times 2$
= 6 cm
Breadth = $2x = 2 \times 2 = 4$ cm
∴ Area = $6 \times 4 = 24\ cm^2$

21. (2)

Let the width of path be x m.
Area of rectangular field
$= 38 \times 32 = 1216\ m^2$
Area of rectangular field without path = $(38 - 2x)(32 - 2x)$
$= 1216 - 64x - 76x + 4x^2$
$= 1216 - 140x + 4x^2$
∴ Area of the path
$= 1216 - 1216 + 140x - 4x^2$
$= 140x - 4x^2$
∴ $140x - 4x^2 = 600$
$\Rightarrow 4x^2 - 140x + 600 = 0$
$\Rightarrow x^2 - 35x + 150 = 0$
$\Rightarrow x^2 - 30x - 5x + 150 = 0$
$\Rightarrow x(x - 30) - 5(x - 30) = 0$
$\Rightarrow (x - 5)(x - 30) = 0$
$\Rightarrow x = 5$ as $x \neq 30$
Aliter : Using Rule 3,
Here, L = 38 m, B = 32 m
w = ?,
Area of path = $600\ m^2$
Area of path = 2w [L + B – 2w]
600 = 2w [38 + 32 – 2w]
300 = w (70 – 2w)
$2w^2 - 70w + 300 = 0$
$w^2 - 35w + 150 = 0$
(w – 30) (w – 5) = 0
⇒ Either w – 30 = 0, w = 30
But w ≠ 30
or, w – 5 = 0, w = 5
∴ w = 5 is the width of path.

22. (2) Using Rule 10,
Net Effect on area of rectangle
$= \left(20 + 25 + \frac{20 \times 25}{100}\right)\% = 50\%$
$\left[\because \text{Net \% change} = \frac{a + b + ab}{100}\right]\%$

23. (3) Let the breadth of floor be x metre.
∴ Length = $(x + 20)$ metre
∴ Area of the floor
$= (x + 20)x$ sq. metre
According to question,
$(x + 10)(x + 5) = x(x + 20)$
$\Rightarrow x^2 + 15x + 50 = x^2 + 20x$
$\Rightarrow 20x = 15x + 50$
$\Rightarrow 5x = 50$
$\Rightarrow x = 10$ metre
∴ Length = $x + 20 = 10 + 20$
= 30 metre
∴ Area of the floor = 30×10
= 300 sq.metre

24. (1) Area of garden without street
$= 200 \times 180 = 36000$ sq.metre
Area of garden with street
$= 220 \times 200 = 44000$ sq.metre
∴ Area of the path
= 44000 – 36000
= 8000 sq.metre
Aliter : Using Rule 3,
Here, L = 200 m, B = 180 m
w = 10 m,
Area of path = 2w [L + B + 2w]
$= 2 \times 10(200 + 180 + 2 \times 10)$
= 20 (400)
$= 8000\ m^2$

25. (3) Using Rule 10,
Required percentage

$= \left(x + y + \frac{xy}{100}\right)\%$

Negative sign for decrease

$= \left(5 - 2 - \frac{5 \times 2}{100}\right)\% = 2.9\%$

26. (1) Using Rule 9,

$\frac{1}{12}$ hectare $= \frac{1}{12} \times 10000$ sq.metre

$= \frac{2500}{3}$ sq. metre

$\therefore 3x \times 4x = \frac{2500}{3}$

$\Rightarrow x^2 = \frac{2500}{3 \times 3 \times 4} \Rightarrow x = \frac{50}{6}$

$\Rightarrow$ Width $= 3x = 3 \times \frac{50}{6}$

= 25 metre

27. (1) Using Rule 9 and 10,
Side of a square = x cm
$\therefore$ Area of rectangle = 3 × area of square

$\Rightarrow 20 \times \frac{3}{2}x = 3 \times x^2$

$\Rightarrow x = \frac{20 \times 3}{2 \times 3} = 10$ cm

28. (4)

Let length of rectangular field = $7x$ metre & breadth = $4x$ metre
Length of field with path
= $(7x + 8)$ metre
Breadth = $(4x + 8)$ metre
$\therefore$ Area of path
$= (7x + 8) \times (4x + 8) - 7x \times 4x$
$= 28x^2 + 32x + 56x + 64 - 28x^2$
$= 88x + 64$
$\therefore 88x + 64 = 416$
$\Rightarrow 88x = 416 - 64 = 352$
$\Rightarrow x = 4$
$\therefore$ Breadth of field = 16 metre
Aliter : Using Rule 3,
Here, L = $7x$, B = $4x$
w = 4 m,
Area of path = 2w [L + B + 2w]
$416 = 2 \times 4\ (7x + 4x + 2 \times 4)$
$416 = 8\ (11x + 8)$
$52 = 11x + 8$
$11x = 44$
$x = 4$
$\therefore$ Breadth of field = 4 × 4 = 16 m

29. (4) Using Rule 1,

Given : AB = 5
DB = 3
$\therefore$ AD = 5 – 3 = 2
In the figure we can see that both ΔADC and ΔABC have the same height, h.
Area of a triangle

$= \frac{1}{2} \times \text{base} \times \text{height}$

When height is constant,
We know, Area of triangle α base,

$\therefore \frac{\text{Area of } \Delta ADC}{\text{Area of } \Delta ABC} = \frac{AD}{AB} = \frac{2}{5}$

30. (4) Using Rule 1,
Let the base and altitude be 3x and 4x respectively.
$\therefore$ According to question,

$\frac{1}{2}$ base × altitude = 1176 cm²

or, $\frac{1}{2} \times 3x \times 4x = 1176$

$12x^2 = 1176 \times 2$

$x^2 = \frac{1176 \times 2}{12}$

$x^2 = 196$

$\Rightarrow x = \sqrt{196} = 14$ cm.

$\therefore$ Altitude of a triangle = 4x
= 4 × 14 cm = 56 cm

31. (2) Using Rule 1,
Area of the first triangle

$= \frac{1}{2} \times \text{base} \times \text{height}$

$= \frac{1}{2} \times 15 \times 12 = 90$ cm²

According to the question
Area of the another (second) triangle = 2 × 90 = 180 cm²
$\therefore$ Area of the new triangle =

180 cm² $= \frac{1}{2} \times 20 \times$ height

$\therefore$ Height $= \frac{180 \times 2}{20} = 18$ cm

32. (3) Using Rule 1,

$3^2 + 4^2 = 5^2$
Δ ABC is a right angled triangle.

$\therefore$ area ABC $= \frac{1}{2} \times AB \times BC$

$= \frac{1}{2} \times 3 \times 4 = 6\text{cm}^2$

$\therefore$ Required Area of Δ DEF

$= \frac{1}{4} \times 6 = \frac{3}{2}$ sq.cm.

33. (3)

D is the mid-point of AB and E is the mid-point of AC.
$\therefore$ DE is parallel to BC.

and DE $= \frac{1}{2}$ BC

ΔADE and ΔABC are similar, because

$\angle D = \angle B$ and $\angle E = \angle C$

$\therefore \frac{\Delta ADE}{\Delta ABC} = \frac{DE^2}{BC^2} = \frac{1}{4}$

$\Rightarrow 4\Delta ADE = \Delta ABC$
$\therefore$ Area of trapezium DBCE
= ΔABC – ΔADE
4ΔADE – ΔADE = 3.ΔADE
$\therefore$ Required percentage

$= \frac{3}{4} \times 100 = 75\%$

34. (3) Using Rule 1,
Let the respective altitudes be p_1 and p_2.

$\therefore \frac{a}{b} = \frac{\frac{1}{2} \times x \times p_1}{\frac{1}{2} \times y \times p_2}$

$\Rightarrow \frac{p_1}{p_2} = \frac{ay}{bx}$

$\Rightarrow ay : bx$

35. (2) Using Rule 1,

$x^2 + x^2 = (5)^2 \Rightarrow 2x^2 = 25$

$\Rightarrow x^2 = \frac{25}{2} \Rightarrow x = \frac{5}{\sqrt{2}}$

Area = $\frac{1}{2} \times \frac{5}{\sqrt{2}} \times \frac{5}{\sqrt{2}}$

$= \frac{25}{4} = 6.25$ sq.cm

36. (3)

AB = AC = 10 cm

$\therefore$ Area = $\frac{1}{2}$ bc sin A

$= \frac{1}{2} \times 10 \times 10 \sin 45°$

$= \frac{50}{\sqrt{2}} = \frac{50 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} = 25\sqrt{2}$ cm^2

37. (3) Using Rule 1 and 6,
Let the side of the equilateral triangle ABC be x cm.

According to the question,

$\frac{1}{2} \times x \times 6 + \frac{1}{2} \times x \times 8 + \frac{1}{2} \times x \times 10 = \frac{\sqrt{3}}{4} \times x^2$

$\Rightarrow 3x + 4x + 5x = \frac{\sqrt{3}}{4} x^2$

$\Rightarrow \frac{\sqrt{3}}{4} x = 12$

$\Rightarrow x = \frac{12 \times 4}{\sqrt{3}} = 16\sqrt{3}$ cm

$\therefore$ Area of Δ ABC

$= \frac{\sqrt{3}}{4} \times \left(16\sqrt{3}\right)^2 = 192\sqrt{3}$ cm^2

38. (3) The ratio of the area of two similar triangles is equal to the ratio of square of the corresponding altitudes.

Ratio of altitudes = $\frac{\sqrt{25}}{\sqrt{36}} = \frac{5}{6}$

or 5 : 6

39. (3) Using Rule 17,

Each angle of the triangle = 60°
Required area of the three sectors = $3 \times \frac{60}{360} \times \pi(1)^2$

$= \frac{\pi}{2}$ cm^2

Area of triangle

$= \frac{\sqrt{3}}{4} \times 4 = \sqrt{3}\ cm^2$

$\therefore$ Required area

$= \left(\sqrt{3} - \frac{\pi}{2}\right) cm^2$

40. (2) Using Rule 1,

Let AB = BC = x;
AC = $16\sqrt{2}$

$\therefore x^2 + x^2 = \left(16\sqrt{2}\right)^2$

$\Rightarrow 2x^2 = 16 \times 16 \times 2$
$\Rightarrow x^2 = 16 \times 16$
$\Rightarrow x = 16$

$\therefore$ Area of triangle

$= \frac{1}{2} \times$ base $\times$ height

$= \frac{1}{2} \times 16 \times 16 = 128$ cm^2

41. (4) Using Rule 2 and 3,
Ratio = 2 : 3 : 4
= 4 : 6 : 8
Perimeter = 18 cm

$\therefore$ Semi-perimeters = $\frac{4+6+8}{2}$

= 9

$\therefore$ Area of triangle

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{9(9-4)(9-6)(9-8)}$

$= \sqrt{9 \times 5 \times 3 \times 1} = 3\sqrt{15}$ sq.cm.

42. (3) Using Rule 6,
If the side of the equilateral triangle be x units,
then,

$3x = \sqrt{3}\left(\frac{\sqrt{3}}{4} x^2\right)$

$\Rightarrow 3x = \frac{3x^2}{4}$

$\Rightarrow x = 4$ units

43. (1) Using Rule 6,
Area of the equilateral triangle =

$\frac{\sqrt{3}}{4} \times (\text{side})^2$

$= \frac{\sqrt{3}}{4} \times 6 \times 6 = 9\sqrt{3}$ sq.cm.

44. (3) Using Rule 1 and 14,
Let the corresponding altitude of the triangle = x cm.
According to the question,
Area of the triangle = Area of the circle

$\Rightarrow \frac{1}{2} x \times 8 = \pi \times 8 \times 8$

$\Rightarrow x = 2 \times 8\pi = 16\pi$ cm.

45. (4) Using Rule 1,
$3^2 + 4^2 = 5^2$
$\therefore$ Base = 3 cm and perpendicular = 4 cm
$\therefore$ Area of the right angled triangle

$= \frac{1}{2} \times$ base $\times$ height

$= \frac{1}{2} \times 3 \times 4 = 6$ sq.cm.

46. (4) Using Rule 6,
Area of the equilateral triangle =

$\frac{\sqrt{3}}{4} \times \text{Side}^2$

$\therefore\ 4\sqrt{3} = \frac{\sqrt{3}}{4}(\text{Side})^2$

$\Rightarrow (\text{Side})^2 = \frac{4\sqrt{3} \times 4}{\sqrt{3}} = 16$

$\therefore$ Side $= \sqrt{16} = 4$ cm

47. (2) Using Rule 1,
AG = 6 cm.

BG $= \frac{2}{3} \times 12 = 8$ cm.

GC $= \frac{2}{3} \times 15 = 10$ cm.

Area of ΔABG $= \frac{1}{2} \times 6 \times 8$

= 24 sq. cm.
$\therefore$ Area of ΔABC
= 3 × 24 = 72 sq. cm.

48. (1) Putting $y = 0$ in the equation $3x + 2y = 6$,
$3x + 0 = 6 \Rightarrow x = 2$

$\therefore$ Point of intersection on x-axis = (2, 0)
Putting $x = 0$, in the equation $3x + 2y = 6$,
gives $0 + 2y = 6$
$\Rightarrow y = 3$
$\therefore$ Point of intersection on y-axis = (0, 3)
So, OA = 2, OB = 3

$\therefore\ \Delta\text{OAB} = \frac{1}{2} \times \text{OA} \times \text{OB}$

$= \frac{1}{2} \times 2 \times 3 = 3$ sq. units

49. (4) Using Rule 1 and 3,
Let Sides = $3x$, $3x$ and $4x$
Semi perimeter

$= \frac{3x + 3x + 4x}{2} = 5x$

$\therefore \Delta = \sqrt{5x(5x-3x)(5x-3x)(5x-4x)}$

$= \sqrt{5x \times 2x \times 2x \times x}$

$= 2\sqrt{5}x^2$

$\therefore\ 2\sqrt{5}x^2 = 18\sqrt{5}$
$\Rightarrow x^2 = 9 \Rightarrow x = 3$
$\therefore$ Third side $= 4x = 4 \times 3$
= 12 units

50. (3) Using Rule 1,
Here, $(3x)^2 + (4x)^2 = (5x)^2$
$\therefore$ It is a right angled triangle.
So, Area of the triangle

$= \frac{1}{2} \times 3x \times 4x = 6x^2$

$\therefore 6x^2 = 72 \Rightarrow x^2 = 12$

$\Rightarrow x = 2\sqrt{3}$

Hence, Smallest side

$= 3x = 6\sqrt{3}$ units

51. (1) Using Rule 6,
Side of equilateral triangle
= x units.

$\therefore\ \frac{\sqrt{3}}{4}\left((x+2)^2 - x^2\right) = 3 + \sqrt{3}$

$\Rightarrow \frac{\sqrt{3}}{4}(4x + 4) = 3 + \sqrt{3}$

$\Rightarrow \sqrt{3}x + \sqrt{3} = 3 + \sqrt{3} = \sqrt{3}x = 3$

$\Rightarrow x = \sqrt{3}$ units

52. (3) Using Rule 2 and 3,
Semi-perimeter,

$S = \frac{9 + 10 + 11}{2} = 15$ cm

Area of triangle

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{15(15-9)(15-10)(15-11)}$

$= \sqrt{15 \times 6 \times 5 \times 4} = 30\sqrt{2}$ cm^2

53. (3) Using Rule 1,

Let, AB = AC = x units
BD = DC = 1 unit [$\because$ BC = 2 units]

Now, AD $= \sqrt{AB^2 - BD^2}$

$= \sqrt{x^2 - 1}$

$\therefore\ \frac{1}{2} \times \text{BC} \times \text{AD} = 4$

$\Rightarrow \frac{1}{2} \times 2 \times \sqrt{x^2 - 1} = 4$

$\Rightarrow \sqrt{x^2 - 1} = 4$
$\Rightarrow x^2 - 1 = 16$
$\Rightarrow x^2 = 17$

$\Rightarrow x = \sqrt{17}$ units

54. (2) Using Rule 1 and 6,
Sides of triangle
Let $3x$, $4x$ and $5x$ units
Here, $(3x)^2 + (4x)^2 = (5x)^2$
$\therefore$ It is a right angled triangle.
Now, Area of triangle

$= \frac{1}{2} \times 3x \times 4x = 6x^2$

$\therefore 6x^2 = 72$

$\Rightarrow x^2 = \frac{72}{6}$

$\Rightarrow x = \sqrt{12} = 2\sqrt{3}$

Perimeter of right angled triangle
$= 3x + 4x + 5x$

$= 12x = 12 \times 2\sqrt{3}$

$= 24\sqrt{3}$ units

$\therefore$ Perimeter of equilateral triangle $= 24\sqrt{3}$ units

Its side $= \frac{24\sqrt{3}}{3} = 8\sqrt{3}$ units

Area $= \frac{\sqrt{3}}{4} \times (\text{side})^2$

$= \frac{\sqrt{3}}{4} \times 8\sqrt{3} \times 8\sqrt{3}$

$= 48\sqrt{3}$ sq units.

55. (2) Using Rule 1 and 14,

$\angle$ACB = 90°
AC = CB = x cm
AB = 14 cm
From Δ ABC
$AC^2 + BC^2 = AB^2$
$\Rightarrow x^2 + x^2 = 14^2$
$\Rightarrow 2x^2 = 14 \times 14$
$\Rightarrow x^2 = 14 \times 7$

$\Rightarrow x = \sqrt{14 \times 7} = 7\sqrt{2}$ cm

$\therefore$ Area of Δ ABC

$= \frac{1}{2} \times AC \times BC$

$= \frac{1}{2} \times 7\sqrt{2} \times 7\sqrt{2} = 49$ sq. cm

Area of semi-circle

$= \frac{\pi r^2}{2} = \frac{22}{7 \times 2} \times 7 \times 7$

= 77 sq. cm

$\therefore$ Area of the shaded region

= 77 – 49 = 28 sq. cm = 28 cm^2

56. (1) Using Rule 2 and 3,

Let the sides of triangle be a, b and c respectively.

$\therefore 2s = a + b + c = 32$

$\Rightarrow 11 + b + c = 32$

$\Rightarrow b + c = 32 - 11 = 21$ .....(i)

and $b - c = 5$ .....(ii)

By adding equations (i) and (ii)

$2b = 26 \Rightarrow b = 13$

$\Rightarrow c = 13 - 5 = 8$

Now, $2s = 32 \Rightarrow s = 16$

$a = 11$, $b = 13$, $c = 8$

$\therefore$ Area of triangle

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{16(16-11)(16-13)(16-8)}$

$= \sqrt{16 \times 5 \times 3 \times 8}$

$= 8\sqrt{30}$ sq. cm.

57. (3)

Putting $y = 0$ in the equation $3x + 4y = 12$,

$3x + 0 = 12 \Rightarrow x = 4$

Co-ordinates of point B = (4, 0)

Putting $x = 0$ in the equation $3x + 4y = 12$

$0 + 4y = 12 \Rightarrow y = 3$

$\therefore$ Co-ordinates of point A = (0, 3)

$\Rightarrow$ OB = 4 and OA = 3

$\therefore$ Area of Δ OAB

$= \frac{1}{2} \times OB \times OA$

$= \frac{1}{2} \times 4 \times 3 = 6$ sq. units

58. (3) Using Rule 6,

Let AB = BC = CA = $2a$ cm,

AD $\perp$ BC

$AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{4a^2 - a^2} = \sqrt{3}\, a$

$\therefore \sqrt{3}\, a = 15$

$\Rightarrow a = 5\sqrt{3}$

$\therefore 2a$ = Side $= 10\sqrt{3}$ cm

$\therefore$ Area of triangle

$= \frac{\sqrt{3}}{4} \times \left(10\sqrt{3}\right)^2$

$= 75\sqrt{3}$ sq. cm.

59. (2) Using Rule 6,

$\frac{\sqrt{3}}{4} \times \text{side}^2 = 9\sqrt{3}$

$\Rightarrow \text{Side}^2 = 9 \times 4 = 36$

$\Rightarrow$ Side $= \sqrt{36} = 6$ metre

$\therefore$ BD = 3 metre

$AD = \sqrt{AB^2 - BD^2} = \sqrt{6^2 - 3^2}$

$= \sqrt{36 - 9} = \sqrt{27} = 3\sqrt{3}$ metre

60. (3) Using Rule 2 and 3,

Semi–perimeter

$S = \frac{16 + 12 + 20}{2}$

$= \frac{48}{2} = 24$ cm

Area of triangle

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{24(24-16)(24-12)(24-20)}$

$= \sqrt{24 \times 8 \times 12 \times 4} = 96$ sq.cm.

61. (3)

$\frac{ar(\Delta ABC)}{ar(\Delta DEF)} = \frac{AB^2}{DE^2}$

$\Rightarrow \frac{360}{250} = \frac{8 \times 8}{DE^2}$

$\Rightarrow DE^2 = \frac{8 \times 8 \times 250}{360} = \frac{8^2 \times 5^2}{6^2}$

$\Rightarrow DE = \frac{8 \times 5}{6} = \frac{20}{3} = 6\frac{2}{3}$ cm

62. (4)

Let AD be the altitude.

Base = x cm

Each equal side $= \frac{5x}{6}$ cm

$\therefore x + 2 \times \frac{5x}{6} = 544$

$\Rightarrow \frac{3x + 5x}{3} = 544$

$\Rightarrow 8x = 544 \times 3$

$\Rightarrow x = \frac{544 \times 3}{8} = 204$

$\therefore$ BD = 102 cm

$\Rightarrow AB = \frac{5x}{6} = \frac{5 \times 204}{6} = 170$ cm

and $AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{170^2 - 102^2}$

$= \sqrt{(170 + 102)(170 - 102)}$

$= \sqrt{272 \times 68} = 136$ cm

$\therefore \Delta ABC = \frac{1}{2} BC \times AD$

$= \frac{1}{2} \times 204 \times 136$

= 13872 sq.cm.

63. (4)

Let AB = AC = x cm
and BD = DC = y cm
then, $AD^2 = x^2 - y^2$
$\Rightarrow x^2 - y^2 = 64$
$x + x + 2y = 64$
$\Rightarrow 2x + 2y = 64$
$\Rightarrow x + y = 32$

$\therefore \dfrac{x^2 - y^2}{x + y} = \dfrac{64}{32}$

$\Rightarrow x - y = 2$
$\therefore$ $x + y = 32$
$x - y = 2$
$2x = 34$
$\Rightarrow x = 17$ cm
Also, $x + y = 32$
$\Rightarrow y = 32 - 17 = 15$ cm

$\therefore$ area of $\Delta ABC = \dfrac{1}{2} \times BC \times AD$

$= \dfrac{1}{2} \times 30 \times 8 = 120$ sq.cm.

64. (2) Using Rule 12,

Perimeter of rhombus
= 4 × side
$\therefore$ 4 × side = 40

$\Rightarrow$ Side $= \dfrac{40}{4} = 10$ m.

As, rhombus is a parallelogram of equal sides, its area = base × height = 10 × 5 = $50m^2$.

65. (1) Using Rule 13,
Let the parallel sides be $5x$ and $3x$ metres.

Area of trapezium $= \dfrac{1}{2}$ (sum of parallel sides) × distance between them

$\Rightarrow 1440 = \dfrac{1}{2}(5x + 3x) \times 24$

$\Rightarrow 12 \times 8x = 1440$

$\Rightarrow x = \dfrac{1440}{12 \times 8} = 15$

$\therefore$ The longer parallel side
$= 5x = 5 \times 15 = 75$ metres

66. (2) Using Rule 12,
Let d_1, d_2 be the diagonals of a rhombus, Area $= \dfrac{1}{2} d_1 . d_2$

$\Rightarrow 150 = \dfrac{1}{2} \times 10 \times d_2$

$\Rightarrow d_2 = \dfrac{150}{5} = 30$cm.

67. (3) Using Rule 12,
Perimeter of rhombus

$= 2\sqrt{d_1^2 + d_2^2}$

Where d_1 and d_2 are diagonals.

$\therefore 2\sqrt{d_1^2 + d_2^2} = 100$

$\Rightarrow \sqrt{d_1^2 + d_2^2} = 50$

$\Rightarrow d_1^2 + d_2^2 = 2500$

$\Rightarrow (14)^2 + d_2^2 = 2500$

$\Rightarrow d_2^2 = 2500 - 196 = 2304$

$\therefore d_2 = \sqrt{2304} = 48$

$\therefore$ Area of the rhombus

$= \dfrac{1}{2} d_1 \times d_2$

$= \dfrac{1}{2} \times 14 \times 48 = 336$ sq.cm.

68. (3) Using Rule 12,

AB = 10cm, AC = 16 cm;
$\Rightarrow$ AO = 8 cm

$\therefore BO = \sqrt{10^2 - 8^2}$

$= \sqrt{100 - 64}$

$= \sqrt{36} = 6$ cm

$\therefore$ BD = 12cm
Hence, Area of rhombus

$= \dfrac{1}{2} d_1 d_2$

$= \dfrac{1}{2} \times 16 \times 12 = 96$ cm^2

69. (4) Using Rule 13,

Area of the trapezium $= \dfrac{1}{2}$ (sum of parallel sides) × altitude

$\Rightarrow 450 = \dfrac{1}{2}(3x + 2x) \times 15$

$\Rightarrow 5x = \dfrac{450 \times 2}{15} = 60$ cm

70. (3) Using Rule 2 and 3,

Area of parallelogram ABCD
= Area of 2 ΔABC
Semi-perimeter of ΔABC

$S = \dfrac{20 + 7 + 15}{2} = \dfrac{42}{2} = 21$ cm

$\therefore$ area of Δ ABC

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{21(21-7)(21-20)(21-15)}$

$= \sqrt{21 \times 14 \times 6} = 42$ sq.cm.

$\therefore$ Area of parallelogram = 2 × 42
= 84 sq. cm.

71. (2) Using Rule 11,
Let the sides of parallelogram be $5x$ and $4x$.
Base × Height
= Area of parallelogram
$\therefore 5x \times 20 = 1000$

$\Rightarrow x = \dfrac{1000}{5 \times 20} = 10$

$\Rightarrow$ Sides = 50 and 40 units
$\therefore 40 \times h = 1000$

$\Rightarrow h = \dfrac{1000}{40} = 25$ units

72. (2) Using Rule 12,

Side $= \dfrac{40}{4} = 10$ cm

AB = AD = 10 cm
$\angle ABD = \angle ADB = 60°$
$\therefore$ Area of the rhombus

$= 2 \times \frac{\sqrt{3}}{4} \times (AB)^2$

$= 2 \times \frac{\sqrt{3}}{4} \times 10 \times 10$

$= 50\sqrt{3}$ cm^2

73. (4) Using Rule 13,
Let Sides of the trapezium be $2x$ and $3x$ cm

$\therefore \frac{1}{2}(2x + 3x) \times 12 = 480$

$\Rightarrow 5x = \frac{480}{6} = 80$

$\Rightarrow x = \frac{80}{5} = 16$

$\therefore$ Larger side $= 3x = 16 \times 3$
$= 48$ cm

74. (4) $l + b + h = 24$ [given]
$l^2 + b^2 + h^2 = 225$ [given]
$\therefore (l + b + h)^2$
$= l^2 + b^2 + h^2 + 2(lb + bh + hl)$
$\Rightarrow (24)^2 = 225 + 2(lb + bh + hl)$
$\Rightarrow 2(lb + bh + hl)$
$= 576 - 225 = 351$ sq. cm.

75. (4) Using Rule 12,

Side of rhombus $= \frac{20}{4} = 5$ cm

OB = 4 cm

$OA = \sqrt{5^2 - 4^2} = \sqrt{9} = 3$ cm

AC = 6 cm

Area of rhombus

$= \frac{1}{2}d_1d_2 = \frac{1}{2} \times 8 \times 6 = 24$ sq. cm

76. (3) Using Rule 12,

BD = 40 cm

BE = 20 cm

AE = x cm

$AB = \frac{100}{4} = 25$ cm

$\therefore$ From ΔABE,

$AE = \sqrt{25^2 - 20^2}$

$= \sqrt{45 \times 5} = 15$ cm

$\therefore$ AC = 30 cm

Area of rhombus ABCD

$= \frac{1}{2}d_1d_2 = \frac{1}{2} \times 40 \times 30$

= 600 sq.cm

77. (4)

$DE \parallel AC \therefore \Delta DBE \cong \Delta ABC$

$\frac{AD}{DB} = \frac{EC}{EB} = \frac{3}{2}$

$\frac{AD}{DB} + 1 = \frac{3}{2} + 1$

$\Rightarrow \frac{AB}{DB} = \frac{5}{2}$

$\therefore \frac{\Delta ABC}{\Delta DBE} = \frac{AB^2}{BD^2} = \frac{25}{4}$

$\Rightarrow \frac{\Delta ABC}{\Delta DBE} - 1 = \frac{25}{4} - 1$

$\Rightarrow \frac{\Delta ABC - \Delta DBE}{\Delta DBE} = \frac{25 - 4}{4}$

$\Rightarrow \frac{\square ACED}{\Delta DBE} = \frac{21}{4}$ or 21 : 4

78. (1)

Let CD = x
$\Rightarrow AB = 2x$. Δ COD ~ Δ AOB because CD || AB and take BD and AC as transversals.

$\therefore \frac{ar(COD)}{ar(AOB)} = \frac{CD^2}{AB^2} = \frac{x^2}{4x^2} = \frac{1}{4}$.

$\Rightarrow \Delta ABD - \Delta AOD$
$= \Delta ACB - \Delta BOC$

$\Rightarrow \Delta AOB = \Delta AOB$

$\Rightarrow \frac{\Delta AOB}{\Delta COD} = \frac{1}{1}$ or 1 : 1

79. (4) Using Rule 12,

Side of rhombus = side of square.

$= \sqrt{2a} = 40\sqrt{2} \Rightarrow a = 40$

$AC \perp BD$; $\angle AOD = 90°$

Let AC = $3x$ and BD = $4x$ cm

$\therefore AO = \frac{3x}{2}$; OD = $2x$ cm

From ΔAOD,
$OA^2 + OD^2 = AD^2$

$\Rightarrow \left(\frac{3x}{2}\right)^2 + 4x^2 = 40^2$

$\Rightarrow 9x^2 + 16x^2 = 1600 \times 4$
$\Rightarrow 25x^2 = 6400$
$\Rightarrow x^2 = 6400 \div 25 = 256$

$\Rightarrow x = \sqrt{256} = 16$

$\therefore$ AC = 3 × 16 = 48 cm
and BD = 4 × 16 = 64 cm
$\therefore$ Area of rhombus

$= \frac{1}{2} \times AC \times BD$

$= \frac{1}{2} \times 48 \times 64$

= 1536 sq. cm.

80. (1) Area of regular hexagon

$= \frac{3\sqrt{3}}{2} \times (\text{side})^2$

$= \frac{3\sqrt{3}}{2} \times 2\sqrt{3} \times 2\sqrt{3}$

$= 18\sqrt{3}$ cm^2.

81. (1) Area of a regular hexagon

$= \frac{3\sqrt{3}}{2} \times (\text{Side})^2$

$= \frac{3\sqrt{3}}{2} \times 1 = \frac{3\sqrt{3}}{2} \text{cm}^2$

82. (3) Tricky approach

Side of the regular hexagon

$= \frac{1}{3} \times 6 = 2 \text{ cm}$

∴ Area of the hexagon

$= \frac{3\sqrt{3}}{2} a^2$

$= \frac{3\sqrt{3}}{2} \times 2 \times 2$

$= 6\sqrt{3}$ sq. cm.

83. (3) Perimeter of regular hexagon = Perimeter of equilateral triangle.
i.e. If a side of the regular hexagon be x units, then side of triangle = $2x$ units.
∴ Required ratio

$= 6\frac{\sqrt{3}}{4} x^2 : \frac{\sqrt{3}}{4} (2x)^2$

= 6 : 4 = 3 : 2

84. (2) Using Rule 17,
Here, l = arc length= 3.5 cm
r = radius = 5 cm

∴ Area of sector = $\frac{1}{2} l r$

$= \frac{1}{2} \times 3.5 \times 5 = 8.75 \text{ cm}^2$

85. (4)

The diameter of the largest circle inscribed inside a square is equal to its side.
∴ d = a = 28cm.

Area of the circle $= \frac{\pi d^2}{4}$

$= \frac{1}{4} \times \frac{22}{7} \times (28)^2 \text{cm}^2$

= 22 × 28 cm² = 616 cm²

86. (3) When the circumference is doubled, it means radius of circle is doubled, as circumference = $2\pi r$
Since, area = πr^2, it will quadrupled.

87. (2)

According to question,
Circumference of outer circle
= $2\pi r$ = 132 cm

$\Rightarrow r = \frac{132}{2 \times 22} \times 7 = 21 \text{ cm}$

Circumference of inner circle
= $2\pi r_1$ = 88cm

$\Rightarrow r_1 = \frac{88}{2 \times 22} \times 7 = 14cm$

∴ Area of outer circle = πr^2

$= \frac{22}{7} \times 21 \times 21 = 1386 \text{ cm}^2$

and Area of inner circle = πr_1^2

$= \frac{22}{7} \times 21 \times 21 = 1386 \text{ cm}^2$

∴ Area of ring
= (1386 – 616) cm² = 770cm²

88. (2) Using Rule 6 and 17,

Radius of each circle = 3.5 cm
From the figure.
ΔABC will be an equilateral triangle of side 7 cm each.
Now, the required area
= Area of DABC – 3× (Area of a sector of angle 60° in a circle of radius 3.5 cm)

$= \frac{\sqrt{3}}{4} \times (7)^2 - 3\left[\frac{60}{360} \times \frac{22}{7} \times (3.5)^2\right] \text{cm}^2$

$= \left[\frac{49\sqrt{3}}{4} - 19.25\right] \text{cm}^2$

= [21.217 – 19.25] cm²
= 1.967 cm²

89. (1) Using Rule 14,

∵ $\pi r^2 = 2464$ sq.m.

$\Rightarrow r^2 = \frac{2464 \times 7}{22} = 784$

⇒ r = 28 m.
∴ Required distance = 2r
= 2 × 28 = 56 metres

90. (2) Using Rule 10 and 14,
Area of shaded part

= Area of square – Area of circle

$= (2a)^2 - \pi r^2 = 4a^2 - \frac{22}{7} a^2$

$\Rightarrow \frac{28a^2 - 22a^2}{7} = \frac{6a^2}{7}$

91. (2) Using Rule 6 AND 17,

Obviously, the triangle ABC will be equilateral.
AB = BC = CA = 2 cm.
Area of ΔABC

$= \frac{\sqrt{3}}{4} \times 2 \times 2$

$= \sqrt{3}$ cm².

Then, area 'A' of the three sectors each of angle 60° in a circle of radius 1 cm.

$A = 3 \times \frac{60}{360} \times \pi \times 1 = \frac{\pi}{2}$

∴ Area of the shaded portion

$= \left(\sqrt{3} - \frac{\pi}{2}\right)$ cm².

92. (2) Using Rule 1,
The largest triangle inscribed in a semi-circle will have base equal to $2r$ cm and height equal to r cm as shown in figure.

$\therefore$ Area = $\frac{1}{2}\times$ base $\times$ height

$= \frac{1}{2}\times 2r \times r = r^2$ cm^2

93. (1) Using Rule 14,
Area of original circle
$= \pi \times (6)^2 = 36\,\pi$ cm^2
After trisection, the area of the smallest circle

$= \frac{1}{3} \times 36\pi = 12\pi$

$= \pi \times \left(2\sqrt{3}\right)^2$

$\therefore$ Required radius = $2\sqrt{3}$ cm

94. (3) Using Rule 1 and 14,

Let Radius of circle = a units
$\therefore$ Area of semi circle

$= \frac{\pi a^2}{2}$ sq.units

Both triangles Δ ABC and Δ BCD are isosceles and equal.

$\therefore$ Area of each triangle $= \frac{1}{2}a^2$

$\Rightarrow$ Area of both triangles

$= 2 \times \frac{1}{2}a^2 = a^2$ sq.units

$\therefore$ Area of shaded region

$= \frac{\pi a^2}{2} - a^2 \;= a^2\left(\frac{\pi}{2} - 1\right)$ sq.units

95. (3) Using Rule 14,
Let the original radius be r cm.
According to the question,
$\pi(r+1)^2 - \pi r^2 = 22$
$\Rightarrow \pi\,(r^2+2r+1-r^2) = 22$

$\Rightarrow (2r+1) \times \frac{22}{7} = 22$

$\Rightarrow 2r+1 = \frac{22 \times 7}{22} = 7$

$\Rightarrow 2r = 7-1 = 6 \;\Rightarrow r = \frac{6}{2} = 3$ cm.

96. (1) Using Rule 14,
Required ratio
$= \pi\,(4r)^2 : \pi\,(2r)^2 : \pi\,(r)^2$
$= 16 : 4 : 1$

97. (1) Using Rule 17,
Let the radius of the circle be r cm.

According to the question,

$2\pi r = 11 \Rightarrow 2 \times \frac{22}{7} r = 11$

$\Rightarrow r = \frac{11 \times 7}{2 \times 22} = \frac{7}{4}$ cm

$\therefore$ Area of the sector AOB

$= \frac{\theta}{360^\circ} \times \pi r^2$

$= \frac{60^\circ}{360^\circ} \times \frac{22}{7} \times \frac{7}{4} \times \frac{7}{4}$ sq.cm

$= \frac{77}{48} = 1\frac{29}{48}$ sq.cm.

98. (1) Using Rule 14,
If the radius of the circular park be r metre, then $2\,\pi r = 176$

$\Rightarrow 2 \times \frac{22}{7} \times r = 176$

$\Rightarrow r = \frac{176 \times 7}{2 \times 22} = 28$ metre

Radius of the park with road
$= 28 + 7 = 35$ metre
$\therefore$ Area of the road

$= \frac{22}{7}\,(35^2 - 28^2)$

$= \frac{22}{7} \times 63 \times 7 = 1386$ m^2

99. (4) Using Rule 10 and 14,

Side of the square = 8 cm
$\therefore$ Area of the square
$= 8 \times 8 = 64$ sq.cm.
Area of the four sectors
$= \pi \times 4^2 = 16\pi$ sq.cm.
$\therefore$ Required area $= 64 - 16\pi$
$= 16\,(4 - \pi)$ sq.cm.

100. (2) Using Rule 10 and 17,

Area of the shaded region
= Area of square of side
6cm – 4 × a right angled sector

$= 36 - 4 \times \frac{\pi \times 3^2}{4}$

$= 36 - 9\pi = 9(4 - \pi)$ sq. cm.

101. (1) Using Rule 14,
$\pi(r + 1)^2 - \pi r^2 = 22$

$\Rightarrow \pi(r^2 + 2r + 1 - r^2) = 22$
$\Rightarrow 2\pi r + \pi = 22$

$\Rightarrow \frac{22}{7}(2r + 1) = 22$

$\Rightarrow 2r + 1 = 7$
$\Rightarrow 2r = 6 \Rightarrow r = 3$ cm.

102. (1) Using Rule 14,
$\pi r^2 = \pi \times 5^2 + \pi \times 12^2$
$\Rightarrow r^2 = 25 + 144 = 169$

$\Rightarrow r = \sqrt{169} = 13$ cm

103. (4) Using Rule 14,
$\pi r + 2r = 36$

$\Rightarrow r\left(\frac{22}{7} + 2\right) = 36$

$\Rightarrow r\left(\frac{22+14}{7}\right) = 36$

$\Rightarrow r = \frac{36 \times 7}{36} = 7$ metre

Area $= \frac{\pi r^2}{2}$

$= \frac{1}{2} \times \frac{22}{7} \times 7 \times 7$
$= 77$ sq. metre

104. (1) Using Rule 14,

$\pi r_1^2 : \pi r_2^2 = 4 : 7$

$\Rightarrow r_1 : r_2 = \sqrt{4} : \sqrt{7} = 2 : \sqrt{7}$

105. (1) Using Rule 1,

$x = AB = a + b$
$y = BC = b + c$
$z = CA = a + c$

$\therefore s = \dfrac{AB + BC + CA}{2} = a + b + c$

$\therefore$ Area of Δ ABC

$= \sqrt{s(s-x)(s-y)(s-z)}$

$= \sqrt{(a+b+c)abc}$

106. (3) Using Rule 14,

Area of circle $= kr^2$
Area of shaded region
$= k(5^2 - 3^2) = 16\pi$ sq. units
Area of larger circle $= k \times 5^2$
$= 25\pi$ sq. units
$\therefore$ Required ratio $= 16 : 25$

107. (1) Using Rule 10 and 14,
Let Side of square $= x$ units
Diagonal of square $= \sqrt{2}x$ units
then Radius of smaller circle $= \dfrac{x}{2}$ units
Radius of larger circle

$= \dfrac{\sqrt{2}x}{2} = \dfrac{x}{\sqrt{2}}$ units

$\therefore$ Required ratio of areas

$= \pi\dfrac{x^2}{4} : \dfrac{\pi x^2}{2}$

$= 2 : 4 = 1 : 2$

108. (4) Using Rule 6 and 17,

Let AB = BC = CA = $2a$ cm.
$\angle BAC = \angle ACB = \angle ABC = 60°$

Area of $\Delta ABC = \dfrac{\sqrt{3}}{4} \times (\text{side})^2$

$= \dfrac{\sqrt{3}}{4} \times 4a^2$

$= \sqrt{3}a^2$ sq.cm.

Area of three sectors

$= 3 \times \dfrac{60}{360} \times \pi \times a^2$

$= \dfrac{\pi a^2}{2}$ sq.cm.

Area of the shaded region

$= \sqrt{3}a^2 - \dfrac{\pi}{2}a^2$

$= \left(\dfrac{2\sqrt{3} - \pi}{2}\right)a^2$ sq.cm.

109. (4) Using Rule 14,
Let the required radius $= r$ cm, then
$\pi r^2 = \pi r_1^2 + \pi r_2^2$
$\Rightarrow r^2 = r_1^2 + r_2^2 = 10^2 + 24^2$
$= 100 + 576 = 676$

$\therefore r = \sqrt{676} = 26$ cm

110. (3) Using Rule 14,

The diameter of the greatest circle inscribed inside a square will be equal to the side of square i.e., 21 cm.

$\therefore$ Radius of the circle $= \dfrac{21}{2}$

$\therefore$ Area of the circle
$= \pi \times (\text{radius})^2$

$= \dfrac{22}{7} \times \dfrac{21}{2} \times \dfrac{21}{2} = \dfrac{693}{2}$ cm^2.

$= 346.5$ cm^2.

111. (1) Using Rule 14,

Side of the square

$= \dfrac{120}{4} = 30$ cm.

Clearly, diameter of the greatest circle = Side of the square = 30 cm

$\therefore$ Radius $= \dfrac{30}{2} = 15$ cm

Required area $= \pi \times (\text{radius})^2$

$= \dfrac{22}{7} \times (15)^2$ cm^2.

112. (2)

Let ABC be the equilateral triangle of side 42 cm and let AD be perpendicular from A on BC. Since the triangle is equilateral, so D bisects BC.
$\therefore$ BD = CD = 21 cm.
The centre of the inscribed circle will coincide with the centroid of Δ ABC.

Therefore, $OD = \dfrac{1}{3}AD$

In Δ ABC
$AB^2 = AD^2 + BD^2$
$\Rightarrow 42^2 = AD^2 + 21^2$

$\Rightarrow AD = \sqrt{42^2 - 21^2}$

$= \sqrt{(42+21)(42-21)}$

$= \sqrt{63 \times 21} = 3 \times 7\sqrt{3}$ cm,

$\therefore OD = \dfrac{1}{3}AD = 7\sqrt{3}$ cm.

$\therefore$ Area of the incircle $= \pi (OD)^2$

$= \dfrac{22}{7} \times 7\sqrt{3} \times 7\sqrt{3}$

$= 22 \times 7 \times 3 = 462$ cm^2

113. (1) Using Rule 14,

Let the side of the square be $2x$.
Then radius of incircle $= a$
Radius of circum-circle

$\sqrt{a^2 + a^2} = \sqrt{2}a$

$\therefore$ Ratio of area

$= \pi a^2 : \pi\left(\sqrt{2}a\right)^2 = a^2 : 2a^2 = 1 : 2$

114. (1) Using Rule 6,

Area of $\Delta ABC = \frac{\sqrt{3}}{4} \times (\text{side})^2$

$\Rightarrow \frac{\sqrt{3}}{4} \times (\text{side})^2 = 4\sqrt{3}$

$\Rightarrow$ side $= \sqrt{16} = 4$ cm

$\therefore \angle BOD = 60°$

$\therefore \sin 60° = \frac{BD}{OB}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{2}{OB} \Rightarrow OB = \frac{4}{\sqrt{3}}$

$\therefore$ Area of circle $= \pi r^2$

$= \pi \times \frac{16}{3} = \frac{16}{3}\pi \text{ cm}^2$

115. (2) Using Rule 14,

The largest circle will have radius equal to 7 cm.

$\therefore$ Area $= \pi \times r^2$

$= \frac{22}{7} \times 7 \times 7 = 154 \text{ cm}^2$

116. (2) Using Rule 6 and 14,

Radius of in-circle = BD cot 60°

$= \frac{4}{\sqrt{3}} \text{ cm}$

Area of the circle

$= \pi \times \frac{4}{\sqrt{3}} \times \frac{4}{\sqrt{3}}$

$= \frac{16}{3}\pi \text{ cm}^2 = 16.76 \text{ cm}^2$

Area of the triangle

$= \frac{\sqrt{3}}{4} \times 8 \times 8$

$= 16\sqrt{3} \text{ cm}^2$

$\therefore$ Required area $= 16\sqrt{3} - 16.76$

$= (27.71 - 16.76) = 10.95 \text{ cm}^2$

117. (3) Let the each side of the equilateral triangle be $2x$ cm.

Then BD = x

Radius of incircle = OD = $\frac{1}{3}$ AD

$= \frac{1}{3}\sqrt{(2x)^2 - x^2}$

$= \frac{\sqrt{3}x}{3} = \frac{x}{\sqrt{3}}$ cm

Radius of circum circle

$= BO = \sqrt{BD^2 + OD^2}$

$= \sqrt{x^2 + \frac{x^2}{3}} = \frac{2x}{\sqrt{3}}$ cm

According to the question,

$\pi\left(\frac{2x}{\sqrt{3}}\right)^2 - \pi\left(\frac{x}{\sqrt{3}}\right)^2 = 44$

$\Rightarrow \frac{4\pi x^2}{3} - \frac{\pi x^2}{3} = 44$

$\Rightarrow \pi x^2 = 44$

$\Rightarrow x^2 = \frac{44 \times 7}{22} = 14$

$\therefore$ Area of the equilateral triangle

$= \frac{\sqrt{3}}{4} \times \text{side}^2 = \frac{\sqrt{3}}{4} \times (2x)^2$

$= \sqrt{3}x^2 = 14\sqrt{3}$ Sq. cm.

118. (3) Using Rule 10 and 14,

$\therefore$ Area of the circle $= \pi r^2 = 9\pi$

$\Rightarrow r^2 = 9$

$\Rightarrow r = \sqrt{9} = 3$ cm

$\therefore$ Side of the square $= 2r = 6$ cm

$\therefore$ Area of the Square = side^2

$= 6 \times 6 = 36 \text{ cm}^2$

119. (4) Using Rule 1,

Here, $6^2 + 8^2 = 10^2$

Hence, ΔABC is right angled

BD is perpendicular to AC

$\therefore \frac{1}{2} \times AB \times BC = \frac{1}{2} \times AC \times BD$

$\Rightarrow \frac{1}{2} \times 6 \times 8 = \frac{1}{2} \times 10 \times BD$

$\Rightarrow BD = \frac{48}{10} = \frac{24}{5}$

$\therefore$ BD = diagonal of square

$\therefore$ Area of square $= \frac{24 \times 24}{2 \times 5 \times 5}$

$= \frac{576}{50} \text{cm}^2$

120. (2)

Let $AD \perp BC$

$\therefore$ BD = 4 cm and

AB = 8 cm

$\therefore AD = \sqrt{AB^2 - BD^2} = \sqrt{8^2 - 4^2}$

$= \sqrt{64 - 16} = \sqrt{48} = 4\sqrt{3}$ cm

$\therefore$ OD = radius of the in circle

$= \frac{1}{3} \times 4\sqrt{3}$ cm $= \frac{4}{\sqrt{3}}$ cm

$\therefore$ Area of the in circle

$= \pi\left(\frac{4}{\sqrt{3}}\right)^2 \text{ cm}^2 = \frac{16}{3}\pi \text{ cm}^2$

AO = radius of circum-circle

$= \frac{2}{3} \times 4\sqrt{3} = \frac{8}{\sqrt{3}}$ cm

$\therefore$ Area of the cirum-circle

$= \pi \times \left(\frac{83}{\sqrt{3}}\right)^2 = \frac{64}{3}\pi \text{ cm}^2$

$\therefore$ Area of the required region

$= \left(\frac{64}{3}\pi - \frac{16}{3}\pi\right)$ cm^2

$= \frac{48\pi}{3} = 16\pi$ cm^2

$= \frac{16 \times 22}{7} = \frac{352}{7} = 50\frac{2}{7}$ cm^2

121. (3)

BD = DC = $7\sqrt{3}$ cm

AD = $\sqrt{AB^2 - BD^2}$

$= \sqrt{\left(14\sqrt{3}\right)^2 - \left(7\sqrt{3}\right)^2}$

$= \sqrt{\left(14\sqrt{3} + 7\sqrt{3}\right)\left(14\sqrt{3} - 7\sqrt{3}\right)}$

$= \sqrt{21\sqrt{3} \times 7\sqrt{3}} = 21$cm

$\therefore$ OD = Radius of circle

$= \frac{1}{3} \times 21 = 7$cm

$\therefore$ Area of circle = πr^2

$= \frac{22}{7} \times 7 \times 7 = 154$ sq.cm.

122. (2) Using Rule 10 and 14,

Side of square $= \sqrt{2}$ metre

Radius of in-circle

$= \frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$ metre

Area of the circle $= \pi r^2$

$= \pi \times \frac{1}{2} = \frac{\pi}{2}$ sq. metre.

123. (1) Using Rule 1 and 6,

Let the side of the equilateral triangle be x cm.

$\therefore \Delta AOB + \Delta BOC + \Delta COA$
$= \Delta ABC$

$\Rightarrow \frac{1}{2}x \times 3 + \frac{1}{2} \times x \times 4 + \frac{1}{2} \times x \times 5$

$= \frac{\sqrt{3}}{4}x^2$

$\Rightarrow 6 = \frac{\sqrt{3}}{4}x \Rightarrow x = \frac{24}{\sqrt{3}} = 8\sqrt{3}$

$\therefore$ Area of Δ ABC $= \frac{\sqrt{3}}{4} \times$ side^2

$= \frac{\sqrt{3}}{4} \times 8\sqrt{3} \times 8\sqrt{3} = 48\sqrt{3}$ sq.cm.

124. (2) For the equilateral triangle of side a,

In radius $= \frac{a}{2\sqrt{3}}$

Circum-radius $= \frac{a}{\sqrt{3}}$

$\therefore$ Required ratio

$= \pi\left(\frac{a}{\sqrt{3}}\right)^2 : \pi\left(\frac{a}{2\sqrt{3}}\right)^2$

$= \frac{1}{3} : \frac{1}{12} = 4:1$

125. (4)

DB= DC = 3cm.

AD = $\sqrt{AB^2 - BD^2} = \sqrt{6^2 - 3^2}$

$= \sqrt{36 - 9} = \sqrt{27} = 3\sqrt{3}$ cm.

$\therefore$ OD = In-radius

$= \frac{1}{3} \times 3\sqrt{3} = \sqrt{3}$ cm.

$\therefore$ Area of the in-circle = πr^2

$= \pi \times \sqrt{3} \times \sqrt{3} = 3\pi$ sq.cm.

126. (3) Using Rule 10,

BD = Diagonal = 16 cm

[$\because$ Radius = 8 cm]

Area of square $= \frac{1}{2} \times BD^2$

$= \frac{1}{2} \times 16 \times 16 = 128$ sq. cm.

127. (3)

Let AB = BC = CA = x units, then

AD $= \sqrt{x^2 - \frac{x^2}{4}} = \frac{\sqrt{3}x}{2}$

OD $= \frac{1}{3}$ AD $= \frac{x}{2\sqrt{3}}$ = radius of circle

$\Rightarrow$ Diagonal of square

$= 2 \times \frac{x}{2\sqrt{3}} = \frac{x}{\sqrt{3}}$

$\therefore$ Triangle : Square

$= \frac{\sqrt{3}}{4}x^2 : \frac{x^2}{2 \times 3}$

$= \frac{\sqrt{3}}{2} : \frac{1}{3} = 3\sqrt{3} : 2$

128. (3)

Let AB = BC = AC = $2x$ units

AD $= \sqrt{4x^2 - x^2} = \sqrt{3}x$

OD $= \frac{1}{3} \times \sqrt{3}x = \frac{x}{\sqrt{3}}$

$\therefore$ OB $= \sqrt{x^2 + \frac{x^2}{3}}$

$= \frac{2x}{\sqrt{3}}$ = Circum radius

$\therefore$ ΔABC : Area of circum-circle

$= \frac{\sqrt{3}}{4} \times 4x^2 : \pi \times \frac{4x^2}{3}$

$= 3\sqrt{3} : 4\pi$

129. (2) Using Rule 10,
Area of a square = (side)^2

$= \left(\frac{\text{Perimeter}}{4}\right)^2 = \left(\frac{44}{4}\right)^2$

$=(11)^2 = 121$ cm^2
Area of a cricle = π (radius)^2

$= \pi\left(\frac{\text{Circumference}}{2\pi}\right)^2$

$= \frac{(\text{Circumference})^2}{4\pi}$

$= \frac{44 \times 44}{4 \times \frac{22}{7}} = 22 \times 7 = 154$ cm^2

Area of circle – Area of square
$= 154 - 121 = 33$cm^2
$\therefore$ Area of the circle is larger than the area of the square by 33 cm^2.

130. (2) Using Rule 14,
Area of circular field = πr^2
= 3850 sq.m.
$\Rightarrow \pi r^2 = 3850$

$\Rightarrow r^2 = \frac{3850}{22} \times 7$

$\Rightarrow r^2 = 1225$

$\therefore r = \sqrt{1225} = 35$ m

Now, circumference of circle = $2\pi r$

$= 2 \times \frac{22}{7} \times 35 = 44 \times 5 = 220$ m

$\therefore$ According to question,
Perimeter of Square = Circumference of circle
Let side of square be x m.
then, 4x = 220m
$\Rightarrow$ x = 55m
$\therefore$ Area of square = x^2
= 55 × 55m^2 = 3025 m^2

131. (4) Using Rule 10,
Let the length of the side of the square be x cm.
$\therefore x^2 = (x + 5)(x - 3)$
$\Rightarrow x^2 = x^2 + 5x - 3x - 15$

$\Rightarrow 2x = 15 \Rightarrow x = \frac{15}{2}$ cm.

Now, length of the rectangle

$= x + 5 = \frac{15}{2} + 5 = \frac{25}{2}$ cm

and breadth

$= \frac{15}{2} - 3 = \frac{15-6}{2} = \frac{9}{2}$ cm

$\therefore$ Required perimeter

$= 2\left(\frac{25}{2} + \frac{9}{2}\right) = 2 \times \frac{34}{2} = 34$ cm

132. (2) Using Rule 10,
The length of wire
= perimeter of the square

$= 4 \times \sqrt{\text{Area of square}}$

$= 4 \times \sqrt{81} = 4 \times 9 = 36$ cm

Now, perimeter of semicircular shape = 36 cm
$\Rightarrow (\pi \times r + 2r) = 36$ cm.

$\Rightarrow r\left(\frac{22}{7} + 2\right) = 36$ cm

$\Rightarrow r \times \frac{36}{7} = 36$ cm

$\Rightarrow r = \frac{36 \times 7}{36} = 7$ cm

$\therefore$ Required area

$= \frac{\pi r^2}{2} = \frac{22 \times 7 \times 7}{7 \times 2}$

$= 77$ cm^2.

133. (1) Let the length and breadth of rectangle are a and b respectively.
According to the question,
$2(a + b) = 160$
$\Rightarrow a + b = 80$ ...(i)
$a - b = 48$ ...(ii)

$2a = 128$ (On adding)

$\Rightarrow a = \frac{128}{2} = 64m$

From equation (i),
$b = 80 - 64 = 16\ m$
$\therefore$ Area of rectangle
$= 64 \times 16\ m^2$
$\therefore$ Area of square
$= 64 \times 16\ m^2$
$\Rightarrow (\text{side})^2 = 64 \times 16$
$\Rightarrow$ side $= 8 \times 4 = 32\ m$

134. (2) Using Rule 1 and 10,
Area of square = (12)^2
= 144 cm^2
Area of triangle

$= \frac{1}{2} \times$ base $\times$height

$= \frac{1}{2} \times 12 \times$ height

$\Rightarrow \frac{1}{2} \times 12 \times$ height = 144

$\Rightarrow$ Height $= \frac{144 \times 2}{12} = 24$cm

135. (2) Using Rule 9 and 10,
Let the length of rectangle
= 48 m. and
breadth = 16m.
Perimeter of square
= Perimeter of rectangle
= 2(48 + 16)
$\Rightarrow 4 \times$ Side $= 2 \times 64$

$\Rightarrow$ Side $= \frac{2 + 64}{4} = 32$ metres

$\therefore$ Area of the square = (32)^2
= 1024 metre^2

136. (4) Using Rule 6 and 10,
As a square and an equilateral triangle are drawn on the same base, side of triangle and square will be the same. Let the side be x units.

$\therefore \frac{\text{Area of square}}{\text{Area of triangle}} = \frac{x^2}{\frac{\sqrt{3}}{4}x^2}$

$= \frac{4}{\sqrt{3}} \Rightarrow 4 : \sqrt{3}$

137. (3) Using Rule 10 and 14,
Side of the square

$= \sqrt{121} = 11$ cm
$\therefore$ Length of the wire = 4 × side
= 4 × 11 = 44 cm
Now the wire is bent into the form of a circle.
If the radius of the circle be r cm, then,
$\therefore 2\pi r = 44$

$\Rightarrow r = \frac{44}{2\pi} = \frac{44 \times 7}{2 \times 22} = 7$ cm

$\therefore$ Area of the circle = πr^2

$= \frac{22}{7} \times 7 \times 7 = 154$ cm^2

138. (3) Using Rule 6 and 14,
Area of the equilateral triangle

$= \frac{\sqrt{3}}{4}$ side^2

$\Rightarrow 121\sqrt{3} = \frac{\sqrt{3}}{4} \times$ side^2

$\therefore$ Side$^2 = \frac{121\sqrt{3} \times 4}{\sqrt{3}} = 121 \times 4$

$\therefore$ Side $= \sqrt{121 \times 4}$
$= 11 \times 2 = 22$ cm
$\therefore$ Total length of wire= 3 × 22
= 66 cm
Let the radius of the circle be r cm, then
$2\pi r = 66$

$\Rightarrow \frac{2 \times 22}{7} \times r = 66$

$\Rightarrow r = \frac{66 \times 7}{2 \times 22} = \frac{21}{2}$ cm

$\therefore$ Area of the circle = πr^2

$= \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2}$

= 346.5 cm^2

139. (4) Using Rule 10 and 14,
Side of a square

$= \sqrt{81} = 9$ cm

$\therefore$ Length of the wire

= 4 × 9 = 36 cm.

$\therefore$ Perimeter of semi-circle

$= (\pi + 2)r$ where r = radius

$\Rightarrow \left(\frac{22}{7} + 2\right)r = 36$

$\Rightarrow \frac{36}{7}r = 36$

$\Rightarrow r = \frac{36 \times 7}{36} = 7$ cm.

140. (2) Using Rule 17,
Area grazed by all cows

$= \frac{180°}{360°}\pi r^2 = \frac{\pi r^2}{2}$

$= \frac{1}{2} \times \frac{22}{7} \times 7 \times 7 = 77$ sq.metre

Semi-perimeter of triangular field

$S = \frac{26 + 28 + 30}{2} = 42$ metres

$\therefore$ Area of the field

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{42(42-26)(42-28)(42-30)}$

$= \sqrt{42 \times 16 \times 14 \times 12}$

= 336 sq.metre

$\therefore$ Area ungrazed by the cows

= 336 – 77

= 259 sq.metre

141. (3) Using Rule 6 and 10,
Let the side of the square be x units, then

diagonal $= \sqrt{2}x$ units

$\therefore$ Area of the square $= x^2$

and area of triangle

$= \frac{\sqrt{3}}{4}(\sqrt{2}x)^2$

$= \frac{\sqrt{3}x^2}{2}$ sq. units

$\therefore$ Required ratio

$= x^2 : \frac{\sqrt{3}x^2}{2} = 2 : \sqrt{3}$

142. (3) Using Rule 17,

Required area = $\frac{\pi}{4}r^2$

$= \frac{22 \times 14 \times 14}{7 \times 4} = 154m^2$

143. (2) Using Rule 10 and 14,
Let the radius of circle be r units and the side of square be x units, then

$x^2 = \pi r^2$

$\Rightarrow \frac{x^2}{r^2} = \frac{\pi}{1} \Rightarrow \frac{x}{r} = \frac{\sqrt{\pi}}{1}$ or $\sqrt{\pi}:1$

144. (4) Using Rule 9 and 10,
Let Side of rectangle are $2x$ and x units.
and Side of square = y units

$\therefore 4y = 6x$

$\Rightarrow \frac{x}{y} = \frac{4}{6} = \frac{2}{3}$

$\therefore \frac{2x \times x}{y^2} = \frac{2x^2}{y^2} = \frac{2 \times 4}{9}$

= 8 : 9

145. (3) Using Rule 1 and 9,
Let Length of rectangle = x units and breadth = y units

$\therefore$ Side of triangle = y units

$\Rightarrow 2x + 2y = 3y$

$\Rightarrow 2x = y$ ...(i)

$\therefore \frac{\text{Area of rectangle}}{\text{Area of triangle}}$

$= \frac{xy}{\frac{\sqrt{3}}{4}y^2} = \frac{4x}{\sqrt{3}y}$

$= \frac{4x}{\sqrt{3}.2x} = \frac{2}{\sqrt{3}}$ or $2 : \sqrt{3}$

146. (2) Using Rule 10 and 14,
Radius of circle = Side of square = r units

$\therefore$ Area of circle : Area of square

$= \pi r^2 : r^2$

$= \pi : 1$

147. (3) Using Rule 10,

According to question,
Area of original rectangle
= xy
Area of new rectangle
= 1.25x × 0.80y
= xy

$\therefore$ Effective change

$= \left(25 - 20 - \frac{25 \times 20}{100}\right)\% = 0\%$

i.e. Hence, the area of the rectangle remains unchanged.

148. (2) Using Rule 10,
Let the length and breadth of a rectangle are changed by x and y per cent respectively, then the net change

$= \left(x + y + \frac{xy}{100}\right)\%$, where positive and negative signs show increase and decrease respectively.

$\therefore$ Net change

$= -10 + 10 - \frac{10 \times 10}{100} = -1\%$

149. (3) Using Rule 10,
Net effect

$= \left(20 + 20 + \frac{20 \times 20}{100}\right)\%$

= 40 + 4 = 44%

150. (4) Let radius = r

$\therefore$ Circumference = $2\pi r$

Reduced circumference

$= \pi r = 2\pi \times \frac{r}{2}$

$\therefore$ New radius = $\frac{r}{2}$

$\therefore$ Reduced area

$= \pi \times \left(\frac{r}{2}\right)^2 = \frac{\pi r^2}{4}$

It is 25% of πr^2 (the original area)

$\therefore$ Area is reduced by 75%.

151. (4) Using Rule 12,
Let the side of a square is increased by x %, its area is increased by $\left(2x + \frac{x^2}{100}\right)\%$.

Here, x = 25%

$\therefore$ Effective increase in area

$$= \left(2 \times 25 + \frac{25 \times 25}{100}\right)\% = 56.25\%$$

152. (1) Using Rule 12,
If the radius of circle is increased by x%, the area changes by

$$\left(2x + \frac{x^2}{100}\right)\%$$

$$= \left(2 \times 50 + \frac{50 \times 50}{100}\right)\% = 125\%$$

153. (2) Using Rule 10,
Effective change in area

$$= \left(x + y + \frac{xy}{100}\right)\%$$

where x and y denote percentage change

$$= \left(20 - 20 - \frac{20 \times 20}{100}\right)\%$$

$= -4$ %
Hence, the area will decrease by 4%

154. (2) Using Rule 10,
Effective increase

$$= \left(50 + 50 + \frac{50 \times 50}{100}\right)\% = 125\ \%$$

155. (3) Let the base of triangle be decreased by x%.
According to the question,

$$10 - x - \frac{10x}{100} = 0$$

[$\because$ Area remains same]

$$\Rightarrow x + \frac{x}{10} = 10$$

$$\Rightarrow \frac{10x + x}{10} = 10 \Rightarrow \frac{11x}{10} = 10$$

$$\Rightarrow x = \frac{100}{11} = 9\frac{1}{11}\%$$

156. (4) Using Rule 10,
For an increase of 50% in the circumference of circle, the radius of circle should be increased by 50%.
Then, required percentage increase in the area of the circle

$$= 50 + 50 + \frac{50 \times 50}{100}$$

$= 100 + 25 = 125$ %

157. (2) Using Rule 10,
Percentage increase in the area of rectangle

$$= \left(12 + 15 + \frac{12 \times 15}{100}\right)\%$$

$$= \left(27 + \frac{9}{5}\right)\% = 28\frac{4}{5}\%$$

158. (2) Using Rule 10,
Let the length and breadth of a rectangle are changed by x% and y% respectively, the effective change in area

$$= \left(x + y + \frac{xy}{100}\right)\%$$

Here, $x = -40$
$y = -40$
$\therefore$ Percentage decrease

$$= \left(-40 - 40 + \frac{40 \times 40}{100}\right)\%$$

$= (-80 + 16)\ \% = -64\%$
Negative sign shows decrease.

159. (1) Using Rule 10,
For changes of x% and y% in length and breadth respectively, effective change in area

$$= \left(x + y + \frac{xy}{100}\right)\%$$

(decrease with negative sign)

$$\therefore 60 - y - \frac{60y}{100} = 0$$

$$\Rightarrow y + \frac{3y}{5} = 60 \Rightarrow \frac{8y}{5} = 60$$

$$y = \frac{60 \times 5}{8} = \frac{75}{2} = 37\frac{1}{2}\%$$

160. (2) Using Rule 10,
Increase percent in area

$$= \left(10 + 10 + \frac{10 \times 10}{100}\right)\% = 21\%$$

161. (2) Using Rule 10,

$$\text{Net \% effect} = \left(x - y - \frac{xy}{100}\right)\%$$

$$= \left(5 - 10 - \frac{5 \times 10}{100}\right)\%$$

$= (-5 - 0.5)\% = -5.5\%$
The negative sign shows decrease.

162. (4) Using Rule 10,
%Effect on area

$$= \left(1 + 1 + \frac{1 \times 1}{100}\right)\% = 2.01\%$$

163. (3) Using Rule 10,
Required net effect

$$= \left(x + y + \frac{xy}{100}\right)\%$$

Negative sign shows decrease

$$= \left(5 - 2 - \frac{5 \times 2}{100}\right)\% = 2.9\%$$

164. (4) Using Rule 10,
Percentage increase in area

$$= \left(30 + 20 + \frac{30 \times 20}{100}\right)\% = 56\%$$

165. (4) Using Rule 10,
Required percentage increase

$$= \left(40 + 40 + \frac{40 \times 40}{100}\right)\% = 96\%$$

Or Let edge = 10, S. Area = 600,
New edge = 14 $\Rightarrow$ New surface area = $6 \times 14^2 = 6 \times 196 = 1176$.

$$\%\ \text{increase} = \left(\frac{1176 - 600}{600}\right)100$$

$$= \frac{576}{6} = 96\%\ .$$

166. (1) Using Rule 10,
Required percentage increase

$$= \left(8 + 8 + \frac{8 \times 8}{100}\right)\% = 16.64\%$$

167. (1) Using Rule 10,
If the required percentage be x, then

$$30 - x - \frac{30x}{100} = 0$$

$$\Rightarrow 300 - 10x - 3x = 0$$

$$\left(\text{Percentage Effect} = \left(x + y + \frac{xy}{100}\right)\%\right)$$

$$\Rightarrow 13x = 300$$

$$\Rightarrow x = \frac{300}{13} = 23\frac{1}{13}\%$$

168. (3) Using Rule 10,
Percentage increase in area

$$= \left(100 + 100 + \frac{100 \times 100}{100}\right)\%$$

$= 300\%$

169. (3) Using Rule 6,

PQ Ω BC
$\angle APQ = \angle ABC = 60°$
$\angle AQP = \angle ACB = 60°$

$\therefore$ Area of $\Delta APQ = \frac{\sqrt{3}}{4} \times (PQ)^2$

$= \frac{\sqrt{3}}{4} \times (5)^2 = \frac{25\sqrt{3}}{4}$ sq.cm.

170. (3) Using Rule 1,

AD = b
Let BD = DC = x
Each angle = 60°
[$\because \Delta$ is equilateral]

$\therefore \tan 60° = \frac{AD}{BD}$

$\Rightarrow \sqrt{3} = \frac{b}{x} \Rightarrow x = \frac{b}{\sqrt{3}}$

$\Rightarrow BC = 2x = \frac{2b}{\sqrt{3}}$

$\therefore$ Area of the triangle

$= \frac{1}{2} \times BC \times AD$

$a = \frac{1}{2} \times \frac{2b}{\sqrt{3}} \times b$

$\Rightarrow \frac{b^2}{a} = \sqrt{3}$

Let AB = BC = AC = S Area of equilateral Δ i.e. $a = \frac{\sqrt{3}}{4}S^2$

Also AD (height)

$= \sqrt{S^2 - \left(\frac{S}{2}\right)^2} = \sqrt{S^2 - \frac{S^2}{4}} = \sqrt{\frac{3S^2}{4}}$

$\Rightarrow b = \frac{\sqrt{3}\,S}{2} \quad \therefore \frac{b^2}{a}$

$= \frac{\left(\frac{\sqrt{3}\,S}{2}\right)^2}{\frac{\sqrt{3}}{4}S^2} = \frac{3S^2}{4} \times \frac{4}{\sqrt{3}\,S^2}$

$= \frac{3}{\sqrt{3}} = \sqrt{3}$

171. (3) Using Rule 6,

AB = x units
BC = x units
AC = $\sqrt{2}\,x$ units
[Using Pythagorus]

$\therefore \frac{\Delta ABE}{\Delta ACD} = \frac{\frac{\sqrt{3}}{4}x^2}{\frac{\sqrt{3}}{4}\left(\sqrt{2}x\right)^2}$

$= \frac{1}{2} = 1 : 2$

172. (2) $\frac{\Delta ABC}{\Delta DEF} = \frac{AB^2}{DE^2} = \frac{100}{64} = \frac{25}{16}$
$= 25 : 16$
[$\because \Delta ABC \sim \Delta DEF$]

173. (3)

$\Delta ABC \sim \Delta DEF$

$\therefore \frac{\Delta ABC}{\Delta DEF} = \frac{3^2}{4^2} \Rightarrow \frac{54}{\Delta DEF} = \frac{9}{16}$

$\Rightarrow \Delta DEF = \frac{16 \times 54}{9}$

= 96 sq.cm.

174. (2) $\frac{\Delta ABC}{\Delta DEF} = \frac{AB^2}{DE^2}$

$\Rightarrow \frac{20}{45} = \frac{25}{DE^2}$

$\Rightarrow DE^2 = \frac{45 \times 25}{20} = \frac{225}{4}$

$\therefore DE = \frac{15}{2} = 7.5$ cm

175. (1) Join AC & DQ
$\because \Delta APC$ and ΔBCP lie on the same base PC and between the same parallels AB and PC
$\therefore$ ar (ΔAPC) = ar (ΔBCP)
Now,
AD $\parallel$ CQ and AD = CQ ...(i)
$\therefore$ ADQC is a parallelogram.
Again ΔADC and ΔDAQ are on the same base AD and between same parallels AD and CQ.

$\therefore$ ar (ΔADC) = ar (ΔADQ)
Subtracting ar (DAP) from both sides, we get
ar (ΔAPC) = ar (ΔDPQ) ...(ii)
From (i) and (ii), we get ar (ΔBPC) = ar (ΔDPQ)

176. (4) Using Rule 13,

Area of the trapezium $= \frac{1}{2}$ (sum of parallel sides) × altitude

$\Rightarrow 450 = \frac{1}{2}(3x + 2x) \times 15$

$\Rightarrow 5x = \frac{450 \times 2}{15} = 60$ cm

177. (1)

AB = AC = tangents from the same point
OB = OC = 3 cm
OA = 12 cm
$\angle ABO = 90°$

$\therefore AB = \sqrt{12^2 - 3^2}$

$= \sqrt{15 \times 9} = 3\sqrt{15}$

$\Delta OAB = = \frac{1}{2}$ OB × AB

$= \frac{1}{2} \times 3 \times 3\sqrt{15} = \frac{9\sqrt{15}}{2}$

$\therefore$ Area of OABC $= \frac{9\sqrt{15}}{2}$ sq.cm.

178. (2)

$\angle OQP = \angle ORP = 90°$

$PQ = \sqrt{OP^2 - OQ^2}$

$= \sqrt{13^2 - 5^2} = 12$

$\therefore$ Area of PQOR = 2 × Δ OPQ

$= 2 \times \frac{1}{2} \times 5 \times 12$

= 60 sq. cm

179. (2)

$ar(\Delta AOE) = ar(\Delta BOD)$
$= ar(\Delta BOF)$
Area of quadrilateral BDOF
= 2 × 15 = 30 sq.cm.

180. (2)

ΔDBC and ΔEBC lie on the same base and between same parallel lines.
$\therefore$ ΔDBC = ΔBEC
$\Rightarrow$ ΔABC ~ ΔDBC
$\Rightarrow$ ΔABC ~ ΔBEC
$\Rightarrow$ ΔADE = ΔABE = 36 sq.cm

181. (3)

In Δs ODE and BOC,
$\angle BOC = \angle DOE$
$\angle DEO = \angle OBC$; $\angle ODE = \angle OCB$
$\therefore$ Both triangles are similar,

$\therefore \frac{\Delta ODE}{\Delta BOC} = \frac{DE^2}{BC^2}$

DE ∥ BC and DE = $\frac{1}{2}$BC

and area of Δ ABC
= 3 × Area of Δ OBC

$\therefore \frac{\Delta\ ODE}{\Delta\ ABC} = \frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$

or, 1 : 12

182. (4) Using Rule 1,

AB = 4 + 6 = 10 cm
BC = 6 + 8 = 14 cm
CA = 8 + 4 = 12 cm
$\therefore$ Semi-perimeter

$= \frac{10 + 14 + 12}{2} = 18$ cm

Area = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{18(18-10)(18-14)(18-12)}$

$= \sqrt{18 \times 8 \times 4 \times 6}$

$= 3 \times 2 \times 2 \times 2\sqrt{6}$

$= 24\sqrt{6}$ sq.cm.

183. (2) Using Rule 13,

ABDE will be a trapezium
AB = 4 units

DE = $\frac{1}{2}$ AB = 2 units

FB = 1 unit, BD = 2 units.

$\therefore$ DF = $\sqrt{2^2 - 1^2} = \sqrt{3}$ units

$\therefore$ Area of ABDE

$= \frac{1}{2}$ (AB + DE) × DF

$= \frac{1}{2}$ (4 + 2) × $\sqrt{3}$

$= 3\sqrt{3}$ sq. units

184. (3)

Δ A′B′C ~ ΔABC
$\angle C = \angle C$,

$\frac{CA'}{CA} = \frac{1}{2}$ *and* $\frac{CB'}{CB} = \frac{1}{2}$

and

$\therefore \frac{\Delta ABC}{\Delta A'B'C} = \frac{(2x)^2}{x^2} = \frac{4}{1}$

[$\because$ BC = 2B′C and AC = 2A′C]

$\Rightarrow \frac{\Delta A'B'C}{\Delta ABC} = \frac{1}{4}$

$\Rightarrow 1 - \frac{\Delta A'B'C}{\Delta ABC} = 1 - \frac{1}{4}$

$\Rightarrow \frac{\square AA'B'C}{\Delta ABC} = \frac{3}{4} = 3 : 4$

185. (1) Both the triangles are congruent.
$\therefore$ Δ ABC = 60 sq.cm.
Δ PQR = 60 sq.cm.

186. (4) Using Rule 1,

QR = 4.5 cm

SR = 1.5 cm

$\therefore$ QS = 4.5 – 1.5 = 3 cm

$\frac{\Delta PQS}{\Delta PSR} = \frac{\frac{1}{2} \times h \times QS}{\frac{1}{2} \times h \times SR}$

$= \frac{3}{1.5} = 2 : 1$

187. (2) Using Rule 14,
Radius of the larger circle
= R cm
Radius of the smaller circle
= r cm
$\therefore$ R – r = 14 cm
and $\pi (R^2 - r^2) = 1056$

$\Rightarrow R^2 - r^2 = \frac{1056}{\pi} = \frac{1056 \times 7}{22}$

$\Rightarrow R^2 - r^2 = 336$

$\Rightarrow (R + r)(R - r) = 336$

$\Rightarrow R + r = \frac{336}{14} = 24$ cm

$\therefore (R + r) - (R - r) = 24 - 14$

$\Rightarrow 2r = 10 \Rightarrow r = 5$ cm

188. (3)

$\Delta APQ = \frac{3}{8}$ (▢ABCD)

$= \frac{3}{4}\ \Delta ABC$

$= \frac{3}{4} \times 12 = 9$ sq.cm.

189. (3) Using Rule 1,

In Δ ABC and Δ A' B' C
A' B' || AB
$\angle B' = \angle B$, $\angle A' = \angle A$
$\therefore \Delta$ ABC ~ Δ A' B' C

$\therefore$ A' B' $= \frac{1}{2}$AB.

$\therefore$ Area of Δ A' B' C

$= \frac{1}{2} \times B'C \times A'B'$

$= \frac{1}{2} \times \frac{1}{2} BC \times \frac{1}{2} AB$

$= \frac{1}{4} (\frac{1}{2} \times BC \times AB)$

$= \frac{1}{4} \times$ Area of Δ ABC

190. (2) Using Rule 14,
Circumference of circle
$= 2\pi r = 44$

$\Rightarrow 2 \times \frac{22}{7} \times r = 44$

$\Rightarrow r = \frac{44 \times 7}{2 \times 22} = 7$ cm.

Area of circle $= \pi r^2$

$= \frac{22}{7} \times 7 \times 7 = 154$ sq. cm.

Perimeter of square = 44 cm.

Side of square $= \frac{44}{4} = 11$cm.

Area of square = 11 × 11
= 121 sq. cm.
Difference = 154 – 121
= 33 sq. cm.

191. (2) Using Rule 1,

Semiperimeter of Δ ABC(s)

$= \frac{a + b + c}{2}$

$= \frac{60 + 40 + 80}{2} = 90$ metre

$\therefore$ Area of Δ ABC

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{90\ (90 - 60)\ (90 - 40)\ (90 - 80)}$

$= \sqrt{90 \times 30 \times 50 \times 10}$

$= \sqrt{3 \times 30 \times 30 \times 5 \times 10 \times 10}$

$= 30 \times 10\sqrt{15}$

$= 300\sqrt{15}$ sq. metre

$\therefore$ Area of ▢ ABCD

$= 2 \times$ Area of Δ ABC

$= 2 \times 300\sqrt{15}$

$= 600\sqrt{15}$ sq. metre

192. (4)

Angle at the semi-circle is a right angle.

$\therefore \angle ACB = 90°$

AB = 5 cm.

AC = $3x$ cm. BC = $4x$ cm.

$\therefore (3x)^2 + (4x)^2 = (5)^2$

$\Rightarrow 9x^2 + 16x^2 = 25 \Rightarrow 25x^2 = 25$

$\Rightarrow x^2 = 1$

$\Rightarrow x = 1$

$\therefore$ Area of Δ ABC $= \frac{1}{2} \times BC \times AC$

$= \frac{1}{2} \times 4 \times 3 = 6$ sq.cm.

193. (1)

$\because 8^2 + 6^2 = 10^2$

$\therefore \Delta$ ABC is a right angled triangle.

CM = MB = 4 cm.

N is the mid point of AC.

$\therefore$ CN = 3 cm.

$\therefore$ Area of trapezium ABMN

= Area of Δ ABC – Area of Δ CMN

$= \frac{1}{2} \times 6 \times 8 - \frac{1}{2} \times 3 \times 4$

= 24 – 6 = 18 sq. cm.

194. (4) Using Rule 13,

EF is perpendicular on side AD.

$\therefore$ Area of trapezium

$= \frac{1}{2}(AD + BC) \times EF$

Area of $\Delta AED = \frac{1}{2} \times AD \times EF$

$\therefore$ Required ratio

$= \frac{\frac{1}{2}(AD + BC) \times EF}{\frac{1}{2} \times AD \times EF}$

$= \frac{AD + BC}{AD}$

195. (1) Using Rule 18, 6 and 14,

In-radius $= \frac{a}{2\sqrt{3}}$

$= \frac{24}{2\sqrt{3}} = 4\sqrt{3}$ cm

Area of triangle $= \frac{\sqrt{3}}{4} \times (\text{side})^2$

$= \frac{\sqrt{3}}{4} \times 24 \times 24$

$= 144\sqrt{3}$ sq.cm. $= 144 \times 1.732$

$= 249.408$ sq.cm.

Area of circle $= \pi r^2$

$= \frac{22}{7} \times 4\sqrt{3} \times 4\sqrt{3}$

$= \frac{1056}{7} = 150.86$ sq.cm.

Area of remaining part

$= (249.408 - 150.86)$ sq.cm.

$= 98.548$ sq.cm.

≈ 98.55 sq.cm.

196. (3) Using Rule 12,

Side of a rhombus

$= \frac{2p}{4} = \frac{p}{2}$ units

OA = OC = y (let)

$\therefore$ AC = $2y$ units

OB = OD = x (let)

$\therefore$ BD = $2x$ units

From Δ OAB,

$\angle AOB = 90°$

$AB^2 = OA^2 + OB^2$

$\Rightarrow \frac{p^2}{4} = x^2 + y^2$

$\Rightarrow p^2 = 4x^2 + 4y^2$ ...(i)

and $2x + 2y = m$

On squaring both sides,

$4x^2 + 4y^2 + 8xy = m^2$

$\Rightarrow p^2 + 8xy = m^2$

$\Rightarrow 8xy = m^2 - p^2$

$\Rightarrow 4xy = \frac{1}{2}(m^2 - p^2)$

$\therefore$ Area of the rhombus

$= \frac{1}{2} \times AC \times BD$

$= \frac{1}{2} \times 2x \times 2y = \frac{1}{2} \times 4xy$

$= \frac{1}{2} \times \frac{1}{2}(m^2 - p^2)$

$= \frac{1}{4}(m^2 - p^2)$ sq. units

197. (4) Using Rule 1,

$AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{32^2 + 24^2}$

$= \sqrt{1024 + 576}$

$= \sqrt{1600} = 40$ metre

$\therefore$ Area of Δ ABC

$= \frac{1}{2} \times BC \times AB$

$= \frac{1}{2} \times 24 \times 32$

$= 384$ sq. metre

Semi-peri meter of Δ ADC (s)

$= \frac{25 + 25 + 40}{2}$

$= \frac{90}{2} = 45$ metre

$\therefore$ Area of ΔADC

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{45(45-25)(45-25)(45-40)}$

$= \sqrt{45 \times 20 \times 20 \times 5} = 20 \times 15$

$= 300$ sq. metre

$\therefore$ Area of the plot $= 384 + 300$

$= 684$ sq.metre

198. (3) Using Rule 1,

BD $\perp$ AC

AB $\perp$ BC

Hypotenuse of ΔABC

$= \sqrt{AB^2 + BC^2}$

$= \sqrt{a^2 + b^2}$

Area of ΔABC $= \frac{1}{2} \times AB \times BC$

$= \frac{1}{2} \times AC \times BD$

$\Rightarrow AB \times BC = AC \times BD$

$\Rightarrow ab = \sqrt{a^2 + b^2} \times p$

On squaring both sides,

$a^2b^2 = (a^2 + b^2)\, p^2$

$\therefore p^2 = \frac{a^2b^2}{a^2 + b^2}$

199. (1) Using Rule 14,

Diameter = AB = 8 + 4 = 12 units

Radius $= \frac{12}{2} = 6$ units

$\therefore$ Area of circle $= \pi r^2 = \pi \times 6^2$

$= 36\pi$ sq. units

200. (4) Using Rule 10,

Change in area $= \frac{-10 \times 10}{100} = -1$ %

Negative sign shows decrease.

201. (1)

AB = $2x$ units

BD = DC = x units

$AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{4x^2 - x^2}$

$= \sqrt{3x^2}$

$= \sqrt{3}x$ units

Area of ΔABC $= \frac{\sqrt{3}}{4} \times (2x)^2$

According to question,

$\because \frac{\sqrt{3}}{4} \times (2x)^2 = \sqrt{3}x$

$\Rightarrow \frac{\sqrt{3}}{4} \times 4x^2 = \sqrt{3}x$

$\Rightarrow x^2 = x \Rightarrow x(x-1) = 0$

$\Rightarrow x = 1$ Hence length of side $2 \times 1 = 2$ units

$\therefore$ Length of side = 9 units

202. (1) Length of side of square $= 2x$ units

Diameter of circle $= 2x$ units

Radius $= x$ units

$\therefore$ Required ratio $= 4x^2 : \pi x^2$

$= 4 : \frac{22}{7}$

$= 14 : 11$

203. (4) Using Rule 6,

AB = BC = AC = a cm

AD = Median = $6\sqrt{3}$ cm.

$\therefore \frac{\sqrt{3}}{2} a = 6\sqrt{3}$

$\Rightarrow a = \frac{6\sqrt{3} \times 2}{\sqrt{3}} = 12$ cm.

$\therefore$ Area of Δ ABC $= \frac{\sqrt{3}}{4} \times \text{side}^2 =$

$\frac{\sqrt{3}}{4} \times 12 \times 12$

$= 36\sqrt{3}$ sq. cm.

204. (2) Using Rule 14,

Radius of circle $= r$ units

According to question,

Area of circle = circumference of circle

$\Rightarrow \pi r^2 = 2 \pi r$

$\Rightarrow r = 2$ units

$\therefore$ Area of circle $= \pi r^2$

$= 4\pi$ sq. units

205. (*) Using Rule 6,

Area of equilateral triangle $= \frac{\sqrt{3}}{4} \times (\text{side})^2$

$\Rightarrow \frac{\sqrt{3}}{4} \times (\text{side})^2 = 48$

$(\text{Side})^2 = \frac{48 \times 4}{\sqrt{3}}$

$= \frac{16 \times \sqrt{3} \times \sqrt{3} \times 4}{\sqrt{3}} = 64\sqrt{3}$

$\therefore$ Side $= \sqrt{64\sqrt{3}} = 8\sqrt[4]{3}$ cm

206. (3) Using Rule 6,

Area of regular hexagon

6 equilateral triangles

$= 6 \times \frac{\sqrt{3}}{4} (\text{side})^2$

$= \frac{3\sqrt{3}}{2} a^2$

$= \frac{3\sqrt{3} \times \sqrt{3}}{2\sqrt{3}} a^2$

$= \frac{9}{2\sqrt{3}} a^2$ sq. units

207. (2)

In-radius of circular plot $= r$ metre (let)

Width of path $= x$ metre

$\therefore$ Ex radius $= (r + x)$ metre

According to the question

$2\pi(r + x) - 2\pi r = 33$

$\Rightarrow 2\pi r + 2\pi x - 2\pi r = 33$

$\Rightarrow 2\pi x = 33$

$\Rightarrow 2 \times \frac{22}{7} \times x = 33$

$\Rightarrow x = \frac{33 \times 7}{2 \times 22} = \frac{21}{4}$ metre

$= 5.25$ metre

208. (2)

DE || BC

$\therefore \angle ADE = \angle ABC$

$\angle AED = \angle ACB$

$\therefore \Delta ADE \sim \Delta ABC$

$\therefore \frac{AD}{BD} = \frac{2}{3}$

$\Rightarrow \frac{BD}{AD} = \frac{3}{2}$

$\Rightarrow \frac{BD}{AD} + 1 = \frac{3}{2} + 1$

$\Rightarrow \frac{BD + AD}{AD}$

$= \frac{3+2}{2} \Rightarrow \frac{AB}{AD} = \frac{5}{2}$

$\therefore \frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta ABC} = \frac{AD^2}{AB^2}$

$= \left(\frac{2}{5}\right)^2 = \frac{4}{25}$

$\Rightarrow 1 - \frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta ABC}$

$= 1 - \frac{4}{25}$

$\Rightarrow \frac{\text{Area of } \Delta ABC - \text{Area of } \Delta ADE}{\text{Area of } \Delta ABC}$

$= \frac{25 - 4}{25}$

$\therefore \frac{\text{Area of trapezium DECB}}{\text{Area of } \Delta ABC} = \frac{21}{25}$

209. (1) Using Rule 12,

AB = BC = CD = DA = 10 cm

AC = 16 cm

In ΔOAB

OA = 8 cm

AB = 10 cm

$\angle AOB = 90°$

$\therefore OB = \sqrt{AB^2 - OA^2}$

$= \sqrt{10^2 - 8^2}$

$= \sqrt{(10+8)(10-8)}$

$= \sqrt{18 \times 2} = \sqrt{36} = 6$ cm

$\therefore BD = 2 \times OB = 2 \times 6 = 12$ cm

$\therefore$ Area of rhombus ABCD

$= \frac{1}{2} d_1 \times d_2$

$= \frac{1}{2} \times 16 \times 12 = 96$ sq.cm.

210. (2) Using Rule 1,
Ratio of the lengths of sides
= 5 : 6 : 7
Sum of ratios = 5 + 6 + 7 = 18

$\therefore$ Sides $\Rightarrow \frac{5}{18} \times 54$ = 15 metre;

$\frac{6}{18} \times 54$ = 18 metre;

$\frac{7}{18} \times 54$ = 21 metre;

Semi-perimeter (s)

$= \frac{15+18+21}{2}$

$= \frac{54}{2} = 27$

$\therefore$ Area of triangle

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{27\ (27-15)\ (27-18)\ (27-21)}$

$= \sqrt{27 \times 12 \times 9 \times 6}$

$= \sqrt{3 \times 3 \times 3 \times 2 \times 2 \times 3 \times 3 \times 3 \times 2 \times 3}$

$= 3 \times 3 \times 3 \times 2\sqrt{6}$

$= 54\sqrt{6}$ sq.metre

211. (2) Using Rule 13,
Area of trapezium

$= \frac{1}{2}$ (sum of parallel sides) × perpendicular distance

$= \frac{1}{2}(6+8) \times 4 = \frac{1}{2} \times 14 \times 4$

= 28 sq. cm.

212. (2) Using Rule 1,

BC = a units, AB = b units

AC = $\sqrt{a^2+b^2}$ = 10

$\Rightarrow a^2 + b^2 = 100$ .....(i)

Area of Δ ABC

$= \frac{1}{2}$ × base × height

$= \frac{1}{2}\ ab$

$\therefore \frac{1}{2}\ ab = 20$

$\Rightarrow ab = 40$ square units .....(ii)

$\therefore (a+b)^2 = a^2 + b^2 + 2ab$

= 100 + 2 × 40 = 180 square units

213. (1) Using Rule 14,
If the radius of circle be r cm, then

$\pi r^2 = 154$

$\Rightarrow \frac{22}{7} r^2 = 154$

$\Rightarrow r^2 = \frac{154 \times 7}{22} = 7 \times 7$

$\therefore r = 7$ cm

$\therefore$ Length of wire $= 2\pi r$

$= 2 \times \frac{22}{7} \times 7$ = 44 cm

= Perimeter of equilateral triangle

$\therefore$ Side of equilateral triangle

$= \frac{44}{3}$ cm

$\therefore$ Area of equilateral triangle

$= \frac{\sqrt{3}}{4} \times \text{side}^2$

$= \frac{\sqrt{3}}{4} \times \frac{44}{3} \times \frac{44}{3}$

$= \frac{1.732 \times 44 \times 11}{9} = \frac{838.288}{9}$

≈ 93.14 sq.cm.

214. (2) Using Rule 1,

Area of triangle $= \frac{1}{2}$ × base × height $= \frac{1}{2}$bh

$\therefore \frac{\frac{1}{2} b_1 h_1}{\frac{1}{2} b_2 h_2} = \frac{4}{3}$

$\Rightarrow \frac{b_1 \times 3}{b_2 \times 4} = \frac{4}{3}$

$\Rightarrow \frac{b_1}{b_2} = \frac{4 \times 4}{3 \times 3} = \frac{16}{9}$

215. (3) A = 10^2 = 100 sq. cm.

B = $\frac{1}{2} \times 14^2$ = 98 sq. cm.

$\therefore$ A – B = 100 – 98

= 2 sq. cm.

216. (3) Using Rule 1,
Area of parallelogram = base × height
= 25 × 10 = 250 sq. cm.
If the required altitude be x cm, then
$x \times 20 = 250$

$\Rightarrow x = \frac{250}{20}$ = 12.5 cm.

217. (3) Using Rule 6,
Side of equilateral triangle = x metre

$\therefore$ Difference of area = $\sqrt{3}$

$\Rightarrow \frac{\sqrt{3}}{4}\ [(x+1)^2 - x^2] = \sqrt{3}$

$\Rightarrow x^2 + 2x + 1 - x^2 = 4$

$\Rightarrow 2x + 1 = 4$

$\Rightarrow 2x = 3 \Rightarrow x = \frac{3}{2}$ metre

218. (1) Using Rule 1,

OD = OE = OF = 6 cm.
Area of triangle ABC
= Area of (Δ AOB + Δ BOC + Δ AOC)

$= \frac{1}{2}$ AB × OF + $\frac{1}{2}$ BC × OD + $\frac{1}{2}$ AC × DE

$= \frac{1}{2} \times 6$ (AB + BC + CA)

$= \frac{1}{2} \times 6 \times 50$ = 150 square cm.

219. (3)

sin 15° = sin (45° – 30°)
= sin 45° × cos 30° – cos 45° × sin 30°

$= \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}} \times \frac{1}{2}$

$= \frac{\sqrt{3}}{2\sqrt{2}} - \frac{1}{2\sqrt{2}} = \frac{\sqrt{3}-1}{2\sqrt{2}}$

and cos 15° = cos (45°– 30°)
= cos 45°. cos 30° + sin 45°. sin 30°

$= \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \times \frac{1}{2}$

$= \frac{\sqrt{3}}{2\sqrt{2}} + \frac{1}{2\sqrt{2}} = \frac{\sqrt{3}+1}{2\sqrt{2}}$

$\therefore$ AB = AC sin 15°

$= \frac{\sqrt{3}-1}{2\sqrt{2}}$ metre,

BC = AC cos 15° = $\frac{\sqrt{3}+1}{2\sqrt{2}}$ metre

$\therefore$ Area of Δ ABC

$= \frac{1}{2} \times AB \times BC$

$= \left(\frac{1}{2} \times \frac{\sqrt{3}-1}{2\sqrt{2}} \times \frac{\sqrt{3}+1}{2\sqrt{2}}\right)$ square metre

$= \left(\frac{3-1}{16}\right)$ square metre

$= \frac{1}{8}$ square metre.

$= \frac{10000}{8} = 1250$ square cm.

220. (3)

AD, is perpendicular on BC.

BD = DC = $\frac{b}{2}$

AD = $\sqrt{AB^2 - BD^2}$

$= \sqrt{a^2 - \left(\frac{b}{2}\right)^2} = \sqrt{a^2 - \frac{b^2}{4}}$

$= \frac{\sqrt{4a^2 - b^2}}{2}$ units

$\therefore$ Area of Δ ABC

$= \frac{1}{2} \times BC \times AD$

$= \frac{1}{2}\ b \times \frac{\sqrt{4a^2 - b^2}}{2}$

$= \frac{b}{4}\ \sqrt{4a^2 - b^2}$ square units.

221. (3)

OA = $\frac{700}{2}$ = 350 metre

OB = $\frac{728}{2}$ = 364 metre

Width of path = OB – OA
= 364 – 350 = 14 metre

222. (4) Using Rule 1,

In Δ ABD, AB = 20 cm. AD = 30 cm.
BD = 40 cm.

$\therefore$ Semi–Perimeter (s)

$= \frac{a+b+c}{2} = \frac{20+30+40}{2}$

= 45 cm

$\therefore$ Area of Δ ABD

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{45(45-20)(45-30)(45-40)}$

$= \sqrt{45 \times 25 \times 15 \times 5}$

$= \sqrt{5 \times 3 \times 3 \times 5 \times 5 \times 5 \times 3 \times 5}$

$= \sqrt{5^2 \times 5^2 \times 5 \times 3^2 \times 3}$

$= 5 \times 5 \times 3\ \sqrt{15}$

$= 75\sqrt{15}$ square cm.

$\therefore$ Area of parallelogram ABCD

$= 2 \times 75\sqrt{15}$

$= 150\sqrt{15}$ square cm.

223. (4) Using Rule 10,
Side of the given square
= x cm (let)
Side of new square

$= \frac{3x}{2}$ cm. (let)

$\therefore$ Required ratio of areas

$= \left(\frac{3x}{2}\right)^2 : x^2 = \frac{9x^2}{4} : x^2$

= 9 : 4

224. (1) Using Rule 14,
Area of circle = πr^2

$\Rightarrow \pi r^2 = 324\pi$

$\Rightarrow r^2 = 324$

$\therefore r = \sqrt{324} = 18$ cm.

$\therefore$ Length of longest chord of circle = Diameter
= 2 × 18 = 36 cm.

225. (1) Using Rule 12,
One diagonal of rhombus
= $d_1 = x$ cm.
Second diagonal = $d_2 = 2x$ cm.

Area of rhombus = $\frac{1}{2} d_1 . d_2$

$\therefore \frac{1}{2} d_1.d_2 = 256$

$\Rightarrow \frac{1}{2} x . 2x = 256$

$\Rightarrow x^2 = 256$

$\Rightarrow x = \sqrt{256} = 16$ cm.

$\therefore$ Larger diagonal = $2x$
= 2 × 16 = 32 cm.

226. (3) Using Rule 10,
Diagonal of square

$= \sqrt{2} \times$ side

$\Rightarrow \frac{3-x}{\sqrt{2}} = \sqrt{2} \times \frac{1}{2}(x+1)$

$\Rightarrow 3 - x = \sqrt{2} \times \sqrt{2} \times \frac{1}{2}(x+1)$

$\Rightarrow 3 - x = x + 1$

$\Rightarrow x + x = 3 - 1$

$\Rightarrow 2x = 2 \Rightarrow x = 1$ unit

227. (2)

The centre of incircle is point 'O'.
OD = OE = OF = r

$\therefore 2\pi r = 44$

$\Rightarrow 2 \times \frac{22}{7} \times r = 44$

$\Rightarrow r = \frac{44 \times 7}{2 \times 22} = 7$ cm.

$\therefore$ Area of Δ ABC

$= \frac{1}{2}$ (AB + BC + CA) × r

$= \frac{1}{2} \times 24 \times 7 = 84$ square cm.

228. (3)

$AD = AB \sin 45° = 10 \times \frac{1}{\sqrt{2}}$

$= 5\sqrt{2}$ cm.

$\therefore$ Area of Δ ABC

$= \frac{1}{2} \times BC \times AD$

$= \frac{1}{2} \times 10 \times 5\sqrt{2}$

$= 25\sqrt{2}$ square cm.

229. (3)

$BD = \sqrt{BC^2 + CD^2}$

$= \sqrt{4^2 + 3^2} = \sqrt{16+9} = \sqrt{25}$

= 5 metre

230. (1)

$\sin 30° = \frac{PQ}{PR}$

$\Rightarrow \frac{1}{2} = \frac{PQ}{20}$

$\Rightarrow PQ = 20 \times \frac{1}{2} = 10$ cm.

$\cos 30° = \frac{QR}{PR}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{QR}{20}$

$\Rightarrow QR = \frac{\sqrt{3}}{2} \times 20 = 10\sqrt{3}$ cm.

$\therefore$ Area of triangle PQR

$= \frac{1}{2} \times 10 \times 10\sqrt{3}$

$= 50\sqrt{3}$ square cm.

231. (1) Using Rule 6,

Side of the equilateral triangle = x units (let)

According to the question,

$3x = 2\pi r$

$\Rightarrow x = \frac{2}{3}\pi r$

$\therefore$ Area of equilateral triangle

$= \frac{\sqrt{3}}{4} \times \text{side}^2$

$= \frac{\sqrt{3}}{4} \times \left(\frac{2}{3}\pi r\right)^2$

$= \frac{\sqrt{3}}{4} \times \frac{4}{9} \pi^2 r^2$

$= \frac{\pi^2 r^2}{3\sqrt{3}}$ sq. units.

$\therefore$ Required ratio $= \frac{\pi^2 r^2}{3\sqrt{3}} : \pi r^2$

$= \pi : 3\sqrt{3}$

$= \frac{22}{7} : 3\sqrt{3} = 22 : 21\sqrt{3}$

232. (2) Using Rule 1 and 6,

OD = a cm., OE = b cm.

OF = c cm.

BC = AC = AB

Area of Δ ABC

= Area of (ΔBOC + ΔCOE + ΔBOA)

$= \frac{1}{2} \times BC \times a + \frac{1}{2} AC \times b + \frac{1}{2} \times AB \times c$

$= \frac{1}{2} BC (a + b + c)$ ...(i)

($\because$ AB = BC = CA)

Again, Area of Δ ABC

$= \frac{\sqrt{3}}{4} \times BC^2$

$\therefore \frac{\sqrt{3}}{4} \times BC^2 = \frac{1}{2} BC (a + b + c)$

$\Rightarrow BC = \frac{2}{\sqrt{3}} (a + b + c)$

$\therefore$ Required area

$= \frac{1}{2} \times \frac{2}{\sqrt{3}} (a + b + c)^2$

[From equation (i)]

$= \frac{\sqrt{3}}{\sqrt{3} \times \sqrt{3}} (a + b + c)^2$

$= \frac{\sqrt{3}}{3} (a + b + c)^2$ sq. units

233. (3) Using Rule 14,

Area of circle = πr^2

Area of square = x^2

According to the question,

$x^2 = \pi r^2 \Rightarrow x = \sqrt{\pi}\, r$

$\therefore$ Required ratio $= \frac{x}{r} = \frac{\sqrt{\pi} r}{r}$

$= \sqrt{\pi} : 1$

234. (4) Using Rule 10 and 14,

Radius of circle = r units

Area of circle = πr^2 sq. units

In square ABCD

Diagonal = BD = $2r$ units

$\therefore$ Area of square

$= \frac{1}{2} \times (2r)^2 = 2r^2$

$\therefore$ Required difference = $\pi r^2 - 2r^2$

$= r^2 (\pi - 2)$ sq. units

235. (3) Using Rule 9 and 1,

AE = FB = 6 cm.

In Δ ADE,

$DE = \sqrt{AD^2 - AE^2}$

$= \sqrt{12^2 - 6^2}$

$= \sqrt{(12+6)(12-6)}$

$= \sqrt{18 \times 6}$

$= 6\sqrt{3}$ cm

$\therefore$ Area of CDEF = 28 × $6\sqrt{3}$

= 168 $\sqrt{3}$ sq. cm.

Area of Δ ADE

$= \frac{1}{2} \times AE \times DE$

$= \frac{1}{2} \times 6 \times 6\sqrt{3}$

$= 18\sqrt{3}$ sq. cm.

$\therefore$ Area of trapezium

$= \left(168\sqrt{3} + 2 \times 18\sqrt{3}\right)$ sq. cm.

$= 204\sqrt{3}$ sq. cm.

236. (2)

If the radius of circle be r cm, then

Perimeter of quadrant OAB

$= OA + \overset{\frown}{AB} + OB$

$= r + \frac{2\pi r}{4} + r = \frac{\pi r}{2} + 2r$

$\therefore \frac{\pi r}{2} + 2r = 75$

$\Rightarrow r\left(\frac{\pi}{2} + 2\right) = 75$

$\Rightarrow r\left(\frac{22}{7 \times 2} + 2\right) = 75$

$\Rightarrow r \times \frac{50}{14} = 75$

$\Rightarrow r = \frac{75 \times 14}{50} = 21$ cm

$\therefore$ Required area $= \frac{\pi r^2}{4}$

$= \left(\frac{22}{7 \times 4} \times 21 \times 21\right)$ sq.cm.

= 346.5 sq.cm.

237. (1) Using Rule 1,

AC = 24 metre

BE = 8 metre

DF = 13 metre

$\therefore$ Area of quadrilateral ABCD

= Area of ΔABC + Area of ΔACD

$= \frac{1}{2} \times AC \times BE + \frac{1}{2} \times AC \times DF$

$= \frac{1}{2}(24 \times 8 + 24 \times 13)$

$= \frac{1}{2} \times 24\ (8 + 13)$

$= \frac{1}{2} \times 24 \times 21 = 252$ sq.metre

238. (4)

∠A = ∠D

$\therefore$ ∠B = ∠E; ∠C = ∠F

$\therefore$ Ratio of altitudes

$= \sqrt{\frac{9}{16}} = 3 : 4$

239. (4) Using Rule 1,

Let, AE ⊥ BC

$\therefore \frac{\text{Area of } \Delta ABD}{\text{Area of } \Delta ADC}$

$= \frac{\frac{1}{2} \times BD \times AE}{\frac{1}{2} \times CD \times AE}$

$\Rightarrow \frac{60}{\Delta ADC} = \frac{BD}{CD}$

$\Rightarrow \frac{60}{\Delta ADC} = \frac{4}{5}$

$\Rightarrow \Delta ADC = \frac{60 \times 5}{4}$

= 75 sq. cm.

240. (2) Using Rule 14,

$A = \pi r^2$

$C = 2\pi r$

$\therefore \frac{A}{C} = \frac{\pi r^2}{2\pi r} = \frac{r}{2}$

$\Rightarrow rC = 2A$

241. (4)

In the rhombus ABCD,

AB = AD = 12 cm.

∠BAD = 60°

$\therefore$ ∠ABD = ∠ADB = 60°

$\therefore$ BD = 12 cm. because ΔABD is an equilateral triangle.

242. (3) Using Rule 6,

∠BGC = 60°

BG = GC

$\therefore$ ∠GBC = ∠GCB = 60°

$\therefore$ ΔGBC is an equilateral triangle.

$\therefore$ Area of ΔGBC

$= \frac{\sqrt{3}}{4} \times 8^2$

$= 16\sqrt{3}$ sq. cm.

$\therefore$ Area of ΔABC

$= 3 \times 16\sqrt{3}$

$= 48\sqrt{3}$ sq. cm.

243. (4) Using Rule 14,

$OO' = r_1 + r_2 = 14$ cm. --(i)
Again, $\pi r_1^2 + \pi r_2^2 = 130\pi$
$\Rightarrow r_1^2 + r_2^2 = 130$
$\Rightarrow r_1^2 + (14 - r_1)^2 = 130$
[From equation (i)]
$\Rightarrow r_1^2 + 196 - 28r_1 + r_1^2 = 130$
$\Rightarrow 2r_1^2 - 28r_1 + 196 - 130 = 0$
$\Rightarrow 2r_1^2 - 28r_1 + 66 = 0$
$\Rightarrow r_1^2 - 14r_1 + 33 = 0$
$\Rightarrow r_1^2 - 11r_1 - 3r_1 + 33 = 0$
$\Rightarrow r_1 (r_1 - 11) - 3 (r_1 - 11) = 0$
$\Rightarrow (r_1 - 11)(r_1 - 3) = 0$
$\Rightarrow r_1 = 11$ or, 3 cm.
$\therefore r_2 = 3$ or, 11 cm.

244. (2) Using Rule 1 and 14,
It is a right angled triangle.

Radius of circum circle C_2

$= \frac{5}{2}$ cm. because

AC = Diameter of circle
Semi-perimeter of $\Delta ABC(s)$

$= \frac{3+4+5}{2} = 6$ cm.

Area of $\Delta ABC = \frac{1}{2} \times 3 \times 4$

= 6 sq. cm.

$\therefore$ In-radius $= \frac{\Delta}{s} = \frac{6}{6} = 1$ cm.

$\therefore \frac{\text{Area of } C_1}{\text{Area of } C_2} = \frac{\pi \times 1^2}{\pi \times \left(\frac{5}{2}\right)^2}$

$= \frac{1}{\frac{25}{4}} = \frac{4}{25}$

245. (2) Using Rule 6,

$AD = 12\sqrt{3}$ cm.
AB = $2x$ cm. (let)
BD = x cm.
From ΔABD,

$AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{(2x)^2 - x^2}$

$= \sqrt{4x^2 - x^2} = \sqrt{3x^2} = \sqrt{3}\,x$

$\therefore \sqrt{3}\,x = 12\sqrt{3}$
$\Rightarrow x = 12$ cm.
$\therefore AB = 2x = 2 \times 12 = 24$ cm.

$\therefore$ Area of $\Delta ABC = \frac{\sqrt{3}}{4} \times \text{side}^2$

$= \frac{\sqrt{3}}{4} \times 24 \times 24$

$= 144\sqrt{3}$ sq. cm.

246. (1)

The ratio of the areas of two similar triangles is equal to the ratio of squares of any two corresponding sides.

$\therefore \frac{\text{Area of } \Delta PQR}{\text{Area of } \Delta ABC} = \frac{PR^2}{AC^2}$

$\Rightarrow \frac{PR^2}{AC^2} = \frac{256}{441}$

$\Rightarrow \frac{12^2}{AC^2} = \frac{256}{441}$

Taking square roots of both sides,

$\frac{12}{AC} = \frac{16}{21}$

$\Rightarrow 16 \times AC = 12 \times 21$

$\Rightarrow AC = \frac{12 \times 21}{16} = \frac{63}{4}$

= 15.75 cm.

247. (4)

$\angle APB = 110° = \angle CPD$
$\therefore \angle APD = 180° - 110° = 70°$
$= \angle BPC$
$\therefore \angle PCB = 180° - 70° - 30°$
$= 80°$
Angles subtended by same arcs at the circumference are equal.
$\therefore \angle ACB$ or $\angle PCB = \angle ADB$
$= 80°$

248. (4)

Let the radius of swimming pool be r metre.
Breadth of shaded part = 4 metre
$\therefore$ OB = (r + 4) metre
According to the question,
$\pi \times OB^2 - \pi \times OA^2$

$= \frac{11}{25} \pi \times OA^2$

$\Rightarrow (r + 4)^2 - r^2 = \frac{11}{25} r^2$

$\Rightarrow r^2 + 8r + 16 - r^2 = \frac{11}{25} r^2$

$\Rightarrow 8r + 16 = \frac{11}{25} r^2$

$\Rightarrow 200r + 400 = 11r^2$
$\Rightarrow 11r^2 - 200r - 400 = 0$
$\Rightarrow 11r^2 - 220r + 20r - 400 = 0$
$\Rightarrow 11r(r - 20) + 20(r - 20) = 0$
$\Rightarrow (r - 20)(11r + 20) = 0$
$\Rightarrow r = 20$ metre because

$r \neq -\frac{20}{11}$ metre

249. (2)

$\Delta ABC \sim \Delta DEF$

$\therefore \frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$

$= \frac{AB + BC + AC}{DE + EF + DF} = \frac{4}{1}$

$\therefore \frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta DEF}$

$= \frac{AB^2}{DE^2} = \frac{16}{1} = 16 : 1$

250. (2) Area of the field with side 50 m = 50 × 50 = 2500 sq. metre

Area of the field of side 100 m

= 100 × 100

= 10000 sq. metre

$\because$ 2500 sq. metre ≡ 750 kg.

$\therefore$ 10000 sq. metre

$\equiv \frac{750}{2500} \times 10000$ kg.

= 3000 kg.

251. (4)

More distance, more time (speed is constant)

$\therefore \frac{2\pi(r+5)}{2\pi r} = \frac{20}{19}$

$\Rightarrow \frac{r+5}{r} = \frac{20}{19}$

$\Rightarrow 20r = 19r + 95$

$\Rightarrow 20r - 19r = 95$

$\Rightarrow r = 95$ metre

$\therefore$ Internal diameter

= (2 × 95) metre

= 190 metre

252. (3)

DE ∥ BC

Area of ΔADE = Area of quadrilateral BDEC

$\Rightarrow$ Area of $\Delta ABC = 2 \times$ Area of ΔADE

In ΔADE and ΔABC,

$\angle D = \angle B$; $\angle E = \angle C$

$\therefore \Delta ADE \sim \Delta ABC$

$\therefore \frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta ADE} = \frac{AB^2}{AD^2}$

$\Rightarrow \frac{AB^2}{AD^2} = 2 \Rightarrow AB = \sqrt{2}\, AD$

$\Rightarrow AB = \sqrt{2}\,(AB - DB)$

$\Rightarrow \sqrt{2}\,AB - AB = \sqrt{2}\,DB$

$\Rightarrow AB(\sqrt{2} - 1) = \sqrt{2}\,DB$

$\Rightarrow \frac{DB}{AB} = \frac{\sqrt{2}-1}{\sqrt{2}}$

253. (4) Using Rule 1,

$\Delta GBC = \Delta ACG = \Delta AGB$

$\therefore$ Area of ΔGBC

$= \frac{1}{3} \times$ Area of ΔABC

$= \frac{1}{3} \times 60 = 20$ sq.cm.

254. (2)

DC || AB

$\angle DCA = \angle CAB$

$\angle CDB = \angle DBA$

$\therefore \Delta COD \sim \Delta AOB$

$\therefore \frac{\text{Area of } \Delta COD}{\text{Area of } \Delta AOB}$

$= \frac{CD^2}{AB^2} = \frac{CD^2}{4\,CD^2} = \frac{1}{4}$

$\therefore$ Area of ΔCOD

$= \frac{1}{4} \times 84$

= 21 sq. cm.

255. (2) Using Rule 1,

Area of triangle $= \frac{1}{2} \times$ base × height

$= \frac{1}{2} \times b \times h$

$\therefore$ According to the question,

$\frac{\frac{1}{2} \times b_1 h_1}{\frac{1}{2} b_2 h_2} = \frac{3}{2}$

$\Rightarrow \frac{b_1}{b_2} \times \frac{4}{5} = \frac{3}{2}$

$\Rightarrow \frac{b_1}{b_2} = \frac{3}{2} \times \frac{5}{4} = \frac{15}{8} = 15 : 8$

256. (3) Using Rule 13,

BC = 7x cm.

AD = 4x cm.

AB = DC ; AE ⊥ BC ; DF ⊥ BC

Area of trapezium ABCD

$= \frac{1}{2} \times (AD + BC) \times AE$

$\Rightarrow 176 = \frac{1}{2} \times 11x \times \frac{2}{11} \times 11x$

$\Rightarrow 176 = 11x^2$

$\Rightarrow x^2 = \frac{176}{11} = 16$

$\Rightarrow x = \sqrt{16} = 4$

$\therefore$ BC = 7 × 4 = 28 cm.

AD = 4 × 4 = 16 cm.

$\therefore$ BE = FC $= \frac{1}{2}$ (28 – 16) cm.

= 6 cm.

$\therefore$ BF = 16 + 6 = 22 cm.

$\therefore$ DF $= \frac{2}{11} \times 11x = 2x$

= 8 cm.

$\therefore$ Diagonal BD $= \sqrt{BF^2 + FD^2}$

$= \sqrt{22^2 + 8^2}$

$= \sqrt{484+64}$

$= \sqrt{548} = \sqrt{4\times137}$

$= 2\sqrt{137}$ cm.

257. (4) Using Rule 10,

Side of square $= \sqrt{4}$

= 2 units

Diagonal of square

$= 2\sqrt{2}$ units

= radius of the circle

$\therefore$ Area of circle $= \pi r^2$

$= \pi \times \left(2\sqrt{2}\right)^2$

$= 8\pi$ sq. units.

258. (3) Using Rule 9,

Let the length of carpet be l metre and breadth be b metre.

$\therefore$ Diagonal $= \sqrt{l^2+b^2}$ ...(i)

According to the question,

$lb = 120$

and, $2(l+b) = 46$

$\Rightarrow l + b = 23$

On squaring both sides,

$(l+b)^2 = 23^2$

$\Rightarrow l^2 + b^2 + 2lb = 529$

$\Rightarrow l^2 + b^2 + 2\times120 = 529$

$\Rightarrow l^2 + b^2 = 529 - 240 = 289$

$\therefore \sqrt{l^2+b^2} = \sqrt{289}$

= 17 metre

= Diagonal of the carpet

259. (1) Volume of the plate of square base = Area of base × height

$= x^2 \times \frac{1}{10} = \frac{x^2}{10}$ cu. cm.

According to the question,

$\frac{x^2}{10}\times 8.4 = 4725$

$\Rightarrow x^2 = \frac{4725\times10}{8.4} = 5625$

$\Rightarrow x = \sqrt{5625} = 75$ cm.

260. (2) Using Rule 13,

Area of the trapezium

$= \frac{1}{2}$ × (Sum of parallel sides) × height

$\Rightarrow 175 = \frac{1}{2}(15+20)\times h$

$\Rightarrow \frac{175\times2}{35} = h$

$\Rightarrow h = 10$ cm

261. (1)

From ΔABC

$AC = \sqrt{AB^2+BC^2}$

$= \sqrt{BC^2+BC^2}$

$= \sqrt{2}$ BC

Δ QBC ~ Δ PAC

$\therefore \frac{\text{Area of } \Delta QBC}{\text{Area of } \Delta PAC} = \frac{BC^2}{AC^2}$

$= \frac{BC^2}{\left(\sqrt{2}BC\right)^2}$

$= \frac{BC^2}{2BC^2} = \frac{1}{2}$

262. (1)

AC = 39 cm.

BC – AB = 21 cm.

On squaring both sides,

$(BC - AB)^2 = 21^2$

$\Rightarrow BC^2 + AB^2 - 2BC.AB = 441$

$\Rightarrow AC^2 - 2BC.AB = 441$

$\Rightarrow 39^2 - 2BC.AB = 21^2$

$\Rightarrow 2.BC.AB = 39^2 - 21^2$

$\Rightarrow 2.BC.AB = (39+21)(39-21)$

$\Rightarrow 2\ BC\ .\ AB = 60\times18$

$\Rightarrow BC\ .\ AB = \frac{60\times18}{2}$

$= 60\times9$

$\therefore$ Area of triangle

$= \frac{1}{2}$ BC.AB

$= \frac{1}{2}\times60\times9 = 270$ sq. cm.

263. (3) Distance covered by man in 8 minutes

$= \left(\frac{12\times1000\times8}{60}\right)$ metre.

= 1600 metre = Perimeter of park

Length of park = $3x$ metre (let)

Width = $2x$ metre

$\therefore 2(3x+2x) = 1600$

$\Rightarrow 5x = \frac{1600}{2} = 800$

$\Rightarrow x = \frac{800}{5} = 160$

$\therefore$ Area of park $= 3x\times2x = 6x^2$

$= 6\times(160)^2$

= 153600 sq. metre

264. (1)

Area of rectangular park

= 60 × 40 = 2400 sq. metre

Let the width of cross-road be x metre.

$\therefore$ Area of cross-roads

$= 60x + 40x - x^2$

$= 100x - x^2$

According to the question,

$100x - x^2 = 2400 - 2109$

$\Rightarrow 100x - x^2 = 291$

$\Rightarrow x^2 - 100x + 291 = 0$

$\Rightarrow x^2 - 3x - 97x + 291 = 0$

$\Rightarrow x(x-3) - 97(x-3) = 0$

$\Rightarrow (x-3)(x-97) = 0$

$\Rightarrow x = 3$ because $x \neq 97$

265. (2)

Diagonal of square = $2r$ cm.

$\therefore$ Area of square $= \frac{1}{2}\times(2r)^2$

$= 2r^2$ sq. cm.

Area of ΔOAB $= \frac{\sqrt{3}}{4}r^2$ sq. cm.

$\therefore$ Area of hexagon $= \frac{6\sqrt{3}}{4}r^2$

$= \frac{3\sqrt{3}}{2}r^2$ sq. cm.

$\therefore$ Required ratio

$= 2r^2 : \frac{3\sqrt{3}}{2}r^2$

$= 4 : 3\sqrt{3}$

266. (2) $\Delta ABC \sim \Delta DEF$

$$\therefore \frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta DEF} = \frac{BC^2}{EF^2}$$

$$\Rightarrow \frac{9}{16} = \frac{(2.1)^2}{(EF)^2}$$

$$\Rightarrow \frac{3}{4} = \frac{2.1}{EF}$$

$$\Rightarrow EF = \frac{4 \times 2.1}{3} = 2.8 \text{ cm.}$$

267. (4)

DE || BC and DE = $\frac{1}{2}$BC

$$\therefore \frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta ADE} = \frac{BC^2}{DE^2} = 4$$

$\therefore$ Area of $\Delta ADE = \frac{1}{4} \times$ Area of ΔABC

Area of ▢ BCED

$= \frac{3}{4} \times$ Area of ΔABC

$\therefore$ Required ratio = 1 : 3

268. (3)

$\because 360° \equiv \pi r^2$

$$\therefore 120° \equiv \frac{120}{360} \times \pi r^2$$

$$\equiv \frac{\pi r^2}{3} = \frac{22}{7 \times 3} \times 4 \times 4$$

$$= \frac{352}{21} = 16.76 \text{ sq. cm.}$$

269. (4)

BG = GC, $\angle BGC = 120°$

$\therefore \angle GBC = \angle GCB = 30°$

$\therefore \Delta ABC$ is an equilateral triangle.

$\therefore$ Area of ΔABC

$$= \frac{\sqrt{3}}{4} \times \text{Side}^2$$

$$= \frac{\sqrt{3}}{4} \times 10 \times 10$$

$= 25\sqrt{3}$ Sq. cm.

270. (2) Length of room = 16 metre 5 cm.

= 1605 cm.

Width = 1500 cm.

Largest side of square tile

= HCF of 1605 cm and 1500 cm

= 15 cm.

```
1500) 1605 (1
      1500
       105) 1500 (14
            105
            450
            420
             30) 105 (3
                 90
                 15) 30 (2
                     30
                      ×
```

$\therefore$ Number of tiles

$$= \frac{1605 \times 1500}{15 \times 15}$$

= 10700

271. (3)

AB = BC = AC = 2 cm.

($\because$ Radius of each circle = 1 cm.)

$$\therefore AP = \frac{\sqrt{3}}{2} \times 2 = \sqrt{3} \text{ cm.}$$

Point O is the centroid.

$$OA = \frac{2}{3} \times \sqrt{3} = \frac{2}{\sqrt{3}}$$

$$\therefore OM = \frac{2}{\sqrt{3}} + 1 = \frac{2+\sqrt{3}}{\sqrt{3}} \text{ cm.}$$

OM = radius of larger circle

$\therefore$ Required area = πR^2

$$= \pi \left(\frac{2+\sqrt{3}}{\sqrt{3}}\right)^2$$

$$= \frac{\pi}{3}\left(2+\sqrt{3}\right)^2$$

272. (1)

Diagonal of square

$= 6\sqrt{2}$ cm.

$$\therefore \text{Side of square} = \frac{6\sqrt{2}}{\sqrt{2}}$$

= 6 cm.

$\therefore$ Diameter of circle = 6 cm.

Its radius = 3 cm.

$\therefore$ Area of circle = πr^2

$= \pi (3)^2$ sq. cm.

$= 9\pi$ sq. cm.

273. (2) Area of square

$$= \frac{1}{2} \times (\text{diagonal})^2$$

$$\therefore \text{Required ratio} = \frac{\frac{1}{2}(d_1)^2}{\frac{1}{2}(d_2)^2}$$

$$= \left(\frac{d_1}{d_2}\right)^2 = \left(\frac{5}{2}\right)^2 = \frac{25}{4}$$

274. (3)

M is the mid point of QR.
$\therefore$ PM is the median.
$\therefore$ Δ PMQ and Δ PMR are equal in area.
$\angle B = Q$, $\angle C = \angle R$
By AA - similarity theorem,
Δ ABC ~ Δ PQR

$$\therefore \frac{\Delta ABC}{\Delta PQR} = \frac{AB^2}{PQ^2} = \left(\frac{7}{4}\right)^2$$

$$\Rightarrow \frac{\Delta ABC}{2\Delta PMR} = \frac{49}{16}$$

$$\Rightarrow \frac{\Delta ABC}{\Delta PMR} = \frac{49}{16} \times 2 = \frac{49}{8}$$

275. (2) Area of square

$= \frac{1}{2} \times (\text{diagonal})^2$

$\therefore$ Required ratio $= \frac{d_1^2}{d_2^2}$

$= \left(\frac{3}{7}\right)^2 = \frac{9}{49} = 9 : 49$

276. (1) Side of square $= \frac{24}{4}$ cm.

= 6 cm.
Base of triangle = 6 cm.
$\because$ $6^2 + 8^2 = 10^2$ and 6 + 8 + 10 = 24
$\therefore$ Height of triangle = 8 cm.
$\therefore$ Area of triangle

$= \frac{1}{2} \times 6 \times 8 = 24$ sq. cm.

277. (1)

Side of square = x units
Diagonal of square

$= \sqrt{2}\, x$ units

$$\frac{\text{Area of } \Delta PBC}{\text{Area of } \Delta QAC} = \frac{\frac{\sqrt{3}}{4}x^2}{\frac{\sqrt{3}}{4}\left(\sqrt{2}x\right)^2}$$

$= \frac{1}{2}$

278. (4)

BD = DC = CF = AF =
AE = BE = DE = EF = DF
$\Delta BDE \cong \Delta DCF \cong \Delta AEF \cong \Delta DEF$
$\therefore$ Area of ΔDEF = Area of Δ DCF
$\therefore$ Required ratio = 1 : 1

279. (4) Let the length of rectangle be a cm and its breadth be b cm.
According to the question,
Area of rectangle
$= ab = 60$ ... (i)
and, perimeter of rectangle
$= 2(a + b)$
$\Rightarrow 2(a + b) = 34$
$= a + b = 17$
On squaring both sides,
$a^2 + b^2 + 2ab = 17^2 = 289$
$\Rightarrow a^2 + b^2 + 2 \times 60 = 289$
[From equation (i)]
$\Rightarrow a^2 + b^2 = 289 - 120 = 169$
$\therefore$ Diagonal of rectangle

$= \sqrt{a^2 + b^2} = \sqrt{169}$
= 13 cm.

280. (2)

Point G is the centroid of ΔABC.
$\therefore$ Δ BGC $\cong$ Δ AGC $\cong$ AGB

$\therefore$ Area of Δ BGC $= \frac{1}{3} \times 72$

= 24 sq. units

281. (2)

Area of the trapezium ABCD

$= \frac{1}{2}(AB + CD) \times AE$

$\Rightarrow 16 = \frac{1}{2}(AB + 6) \times 4$

$\Rightarrow 16 = 2\,(AB + 6)$
$\Rightarrow AB + 6$

$= \frac{16}{2} = 8$

$\Rightarrow AB = 8 - 6 = 2$ cm.

282. (4)

AC = 10 cm.
AB = 8 cm.

$\therefore$ BC $= \sqrt{AC^2 - AB^2}$

$= \sqrt{10^2 - 8^2} = \sqrt{100 - 64}$

$= \sqrt{36} = 6$ cm.

$\therefore$ Area of $\Delta ABC = \frac{1}{2} \times AB \times BC$

$= \frac{1}{2} \times 8 \times 6 = 24$ sq. cm.

283. (4)

DE || BC
$\therefore$ $\angle ADE = \angle ABC$
$\angle AED = \angle ACB$
By AA–similarity,
$\Delta ADE \sim \Delta ABC$

$$\therefore \frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta ADE} = \frac{BC^2}{DE^2}$$

$$\Rightarrow \frac{\text{Area of } \Delta ABC}{15} = \frac{6^2}{3^2}$$

$= \frac{36}{9} = 4$

$\therefore$ Area of $\Delta ABC = 4 \times 15$
= 60 sq. cm.

284. (3)

The angle in a semi–circle is a right angle.
$\therefore$ BC = 2 × 3 = 6 cm.
OA = 2 cm.
$\therefore$ Area of ΔABC

$= \frac{1}{2} \times BC \times OA$

$= \frac{1}{2} \times 6 \times 2 = 6$ sq. cm.

285. (4) Area of the rhombus

$= \frac{1}{2} d_1 \times d_2$

$= \left(\frac{1}{2} \times 8 \times 6\right)$ sq. cm.

= 24 sq. cm.

286. (4)

Area of parallelogram ABCD

= 2 × Area of Δ ABC

AB = 21 cm. = c

BC = 20 cm. = a

AC = 29 cm. = b

∴ Semi-perimeter of Δ ABC

$= s = \frac{a+b+c}{2}$

$= \left(\frac{20+29+21}{2}\right)$ cm.

$= \frac{70}{2} = 35$ cm.

∴ Area of Δ ABC

$= \sqrt{8(s-a)(s-b)(s-c)}$

$= \sqrt{35(35-20)(35-29)(35-21)}$

$= \sqrt{35 \times 15 \times 6 \times 14}$

$= \sqrt{7 \times 5 \times 5 \times 3 \times 2 \times 3 \times 2 \times 7}$

= 7 × 2 × 3 × 5 = 210 sq.cm.

∴ Area of ABCD

= (2 × 210) sq. cm.

= 420 sq. cm.

287. (4)

Let, AB = BC = CA

= $2x$ units

∴ BD = BE = x units

Area of Δ ABC

$= \frac{\sqrt{3}}{4} \times (2x)^2$

$= \sqrt{3}x^2$ sq. units

Area of Δ BDE = $\frac{\sqrt{3}}{4}x^2$

∴ Area of a trapezium ADEC

$= \left(\sqrt{3}x^2 - \frac{\sqrt{3}}{4}x^2\right)$ sq. units

$= \frac{3\sqrt{3}x^2}{4}$ sq. units

∴ Required ratio

$= s\sqrt{3x^2} : \frac{3\sqrt{3}}{4}x^2 = 4 : 3$

288. (3) Length of rectangle = l metre, its breadth = b metre

Side of square = x metre

According to the question,

$4x = 2(l + b)$

$\Rightarrow l + b = 2x$ ..... (i)

Area of square = A = x^2

Area of rectangle = B = lb

∴ A – B = $x^2 - lb$

$= \left(\frac{l+b}{2}\right)^2 - lb$

$= \frac{l^2 + b^2 + 2lb}{4} - lb$

$= \frac{l^2 + b^2 + 2lb - 4lb}{4}$

$= \frac{(l-b)^2}{4} > 0$

⇒ A > B

289. (2)

Let AB = 4 cm.

Diagonal of rectangle = Diameter of cirlce = 5 cm.

In ΔABC,

$BC = \sqrt{AC^2 - AB^2}$

$= \sqrt{5^2 - 4^2} = \sqrt{25 - 16}$

$= \sqrt{9} = 3$ cm.

∴ Area of rectangle = 4 × 3

= 12 sq. cm.

290. (2)

Let AB = 4 cm.

∴ AC = Diameter of circle

= Diagonal of rectangle = 5 cm.

∴ In ΔABC

$BC = \sqrt{AC^2 - AB^2}$

$= \sqrt{5^2 - 4^2} = \sqrt{25 - 16}$

$= \sqrt{9} = 3$ cm.

∴ Area of rectangle = (4 × 3) sq. cm.

= 12 sq. cm.

291. (3)

Point O is the centroid of ΔABC.

∴ ΔAOB ≡ ΔAOC ≡ ΔBOC

Again, ΔBOD ≡ ΔCOD

∴ Area of ΔBOD = $\frac{1}{6}$ × Area of ΔABC

$= \frac{1}{6} \times 96 = 16$ sq. cm.

292. (1)

ΔABC ~ ΔDEF

$\therefore \frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta DEF} = \frac{AB^2}{DE^2}$

$= \frac{k^2}{1}$ $k^2 : 1$

293. (2) Height of equilateral triangle

$= \frac{\sqrt{3}}{2} \times$ Side

$\Rightarrow 18 = \frac{\sqrt{3}}{2} \times$ Side

$\Rightarrow$ Side $= \frac{18 \times 2}{\sqrt{3}} = 12\sqrt{3}$ cm.

∴ Area of triangle $= \frac{\sqrt{3}}{4} \times \text{Side}^2$

$= \frac{\sqrt{3}}{4} \times 12\sqrt{3} \times 12\sqrt{3}$

$= 108\sqrt{3}$ sq. cm.

294. (2) Perimeter of rectangular land

$= \frac{6000}{7.5} = 800$ metre

Length = $5x$ metre

Breadth = $3x$ metre

∴ $2(5x + 3x) = 800$

$\Rightarrow 16x = 800 \Rightarrow x = \frac{800}{16} = 50$

∴ Required difference

= $5x - 3x = 2x$ metre

= (2 × 50) metre = 100 metre

295. (1) Side of square = x metre

Radius of circle = $\frac{x}{2}$ metre

$\therefore \frac{\text{Area of square}}{\text{Area of circle}} = \frac{x^2}{\pi\left(\frac{x}{2}\right)^2}$

$= \frac{x^2}{\frac{22}{7} \times \frac{x^2}{4}} = \frac{28}{22} = \frac{14}{11}$

= 14 : 11

296. (1) Side of equilateral triangle = $\frac{132}{3}$ = 44 cm.

Its area = $\left(\frac{\sqrt{3}}{4} \times 44 \times 44\right)$ sq. cm.

$= 484\sqrt{3}$ sq. cm.

= 484 × 1.7 = 822.8 sq. cm.

Side of square = $\frac{132}{4}$ = 33 cm.

Area of square = 33 × 33

= 1089 sq. cm.

Circumference of circle = $2\pi r$

$\Rightarrow 2 \times \frac{22}{7} \times r = 132$

$\Rightarrow r = \frac{132 \times 7}{2 \times 22} = 21$ cm.

∴ Area of circle

$= \frac{22}{7} \times 21 \times 21 = 1386$ sq. cm.

297. (4) The areas of triangles on the same base and between the same parallel lines are equal.

∴ ΔABC = ΔABD

298. (2) Perimeter of rhombus

= 4 × side

∴ Each side = $\frac{240}{4}$ = 60 metre

Distance between parallel sides = 20 metre

∴ Area of rhombus = 60 × 20

= 1200 sq. metre

299. (1)

The angle in a semi-circle is a right angle.

Let point C be the mid-point of arc ABC.

Maximum height of ΔABC

= OC = radius

∴ Area of triangle ABC

$= \frac{1}{2} \times AB \times OC$

$= \frac{1}{2} \times 12 \times 6$ = 36 sq. metre

300. (1) Area of circle = πr^2

Area of square = side^2

∴ Side^2 = πr^2

$\Rightarrow \frac{\text{Side}^2}{r^2} = \pi$

$\therefore \frac{\text{Side}}{r} = \sqrt{\pi} : 1$

301. (1)

OQ ⊥ QP ; OR ⊥ PR

OR = OQ = radius

PQ = PR = Tangents from an exterior point

OP is common.

∴ ΔORP ≅ ΔOPQ

In right ΔOPQ,

OP = 13 cm., OQ = 5 cm.

∴ PQ = $\sqrt{13^2 - 5^2} = \sqrt{169 - 25}$

$= \sqrt{144}$ = 12 cm.

Area of ΔOPQ = $\frac{1}{2} \times 12 \times 5$

= 30 sq. cm.

∴ Area of quadrilateral PQOR = 2 × 30 = 60 sq. cm.

302. (3) Median of equilateral triangle

= Its height = $12\sqrt{3}$ cm.

If the side of equilateral triangle be x cm, then its height

$= \frac{\sqrt{3}}{2}x$ cm.

$\therefore \frac{\sqrt{3}}{2}x = 12\sqrt{3}$

$\Rightarrow x = \frac{12\sqrt{3} \times 2}{\sqrt{3}} = 24$ cm.

∴ Required area

$= \left(\frac{\sqrt{3}}{4} \times 24 \times 24\right)$ sq. cm.

$= 144\sqrt{3}$ sq. cm.

303. (2)

Let OA = R and O'A = r cm.

According to the question,

$\pi R^2 + \pi r^2 = 130\pi$

$\Rightarrow R^2 + r^2 = 130$ ..... (i)

Again, R + r = 14 cm.

$\Rightarrow r = (14 - R)$ cm.

$\therefore R^2 + r^2 = 130$

$\Rightarrow R^2 + (14 - R)^2 = 130$

$\Rightarrow R^2 + 196 - 28R + R^2 = 130$

$\Rightarrow 2R^2 - 28R + 196 - 130 = 0$

$\Rightarrow 2R^2 - 28R + 66 = 0$

$\Rightarrow R^2 - 14R + 33 = 0$

$\Rightarrow R^2 - 11R - 3R + 33 = 0$

$\Rightarrow R(R - 11) - 3(R - 11) = 0$

$\Rightarrow (R - 11)(R - 3) = 0$

$\Rightarrow R = 11$ or 3 cm.

∴ r = 3 or 11 cm.

∴ Radius of larger circle

= 11 cm.

304. (4)

Radius of circle = $\frac{a}{2\sqrt{3}}$

$= \frac{24}{2\sqrt{3}} = 4\sqrt{3}$ cm.

∴ Area of circle = $\pi\left(4\sqrt{3}\right)^2$

$= 48\pi$ sq. cm.

$= \left(48 \times \frac{22}{7}\right)$ sq. cm.

= 150.86 sq. cm.

Area of ΔABC

$= \left(\frac{\sqrt{3}}{4} \times 24 \times 24\right)$ sq. cm.

= 144 × 1.732

= 249.408 sq. cm.

∴ Area of the shaded region

= (249.408 – 150.86) sq. cm.

= 98.548 sq. cm.

305. (2) In-radius

$= \frac{\text{Area}}{\text{Semi – perimeter}}$

$\Rightarrow 4 = \frac{34}{\text{Semi – perimeter}}$

$\Rightarrow$ Semi-perimeter = $\frac{34}{4} = 8.5$

∴ Perimeter of triangle

= (8.5 × 2) cm = 17 cm

306. (4)

AP is the median at BC.

∴ Area of ΔABP = Area of ΔAPC

Again, 2AQ = QB

∴ Area of ΔAPQ

$= \frac{1}{3}$ Area of ΔABP

$\therefore$ Area of ΔAPQ

$= \frac{1}{6}$ Area of ΔABC

$= \left(\frac{1}{6} \times 10.8\right)$ sq.cm

$= 1.8$ sq.cm.

307. (3)

According to the question,

$\pi \times 12^2 = 2\pi r^2$

$\Rightarrow 2r^2 = 12 \times 12$

$\Rightarrow r^2 = \frac{12 \times 12}{2} = 72$

$\Rightarrow r = \sqrt{72} = 6\sqrt{2}$ cm.

308. (1)

Area of ΔABD = Area of ΔADC = Area of ΔBCE

Clearly,

Area of ΔBDG = Area of ΔCGD = Area of ΔCEG

$\Delta BDG : \square GDCE = 1 : 2$

309. (3)

$\angle AOC = \angle BOD = 180° - 150°$

$= 30°$

$\therefore$ Area of region x

$= \frac{60}{360} \times \pi r^2$

$= \frac{1}{6}\pi r^2$ sq. units.

310. (1) $w = \pi y^2$ = Area of larger circle

$w' = \pi y^2 - \pi x^2$

$\Rightarrow w' = w - \pi x^2$

$\Rightarrow \pi x^2 = w - w'$

$\therefore \frac{\pi x^2}{\pi y^2} = \frac{w - w'}{w}$

$\Rightarrow \frac{x^2}{y^2} = 1 - \frac{w'}{w}$

$\Rightarrow \frac{x}{y} = \sqrt{1 - \frac{w'}{w}}$

311. (2)

EF || CB and FE = $\frac{1}{2}$BC

$\Delta DFE \sim \Delta ABC$

$\therefore \frac{\text{Area of } \Delta DEF}{\text{Area of } \Delta ABC} = \frac{EF^2}{BC^2}$

$= \frac{EF^2}{4EF^2} = \frac{1}{4}$

312. (2)

Let the length of arc AB be y units and radius of circle be r units.

$\angle AOB = x$ radians

$\therefore \theta = \frac{l}{r}$

$\Rightarrow x = \frac{y}{r}$ ....(i)

Again area of sector AOB

$= \frac{\theta}{2\pi} \times \pi r^2 = \frac{x}{2} r^2$ sq. units

According to the question,

$\frac{xr^2}{2} = y^2 = (xr)^2$

[From equation (i)]

$\Rightarrow \frac{xr^2}{2} = x^2 r^2$

$\Rightarrow x = \frac{1}{2}$

312. (1)

$R_1 = 68$ cm.

$R_2 = 22$ cm.

Area of the shaded region

$= \pi \left(R_1^2 - R_2^2\right)$

$= \pi (R_1 + R_2)(R_1 - R_2)$

$= \pi (68 + 22)(68 - 22)$

$= \pi \times 90 \times 46$

$= 4140\pi$ sq. cm.

314. (3)

$\angle ADC = 90°$

AC = 41 cm.

CD = 40 cm.

$\therefore AD = \sqrt{AC^2 - CD^2}$

$= \sqrt{41^2 - 40^2}$

$= \sqrt{(41 + 40)(41 - 40)}$

$= \sqrt{81} = 9$ cm.

$\therefore$ Area of trapezium ABCD

$= \frac{1}{2}(AB + CD) \times AD$

$= \frac{1}{2}(15 + 40) \times 9$

$= \frac{1}{2} \times 55 \times 9 = 247.5$ sq. cm.

315. (2)

The diagonals of a rhombus bisect each other at right angles.

Let, AB = 10 cm.

AC = 12 cm.

$\therefore$ OA = OC = 6 cm.

$\angle AOB = 90°$

$\therefore OB = \sqrt{AB^2 - OA^2}$

$= \sqrt{10^2 - 6^2} = \sqrt{100 - 36}$

$= \sqrt{64} = 8$ cm.

$\therefore$ BD = 2 × OB = 16 cm.

$\therefore$ Area of rhombus $= \frac{1}{2} d_1 d_2$

$= \frac{1}{2} \times 12 \times 16 = 96$ sq. cm.

316. (3) Area of circular field

$= \frac{\text{Total Expenditure}}{\text{Rate per square metre}}$

$= \left(\frac{7700}{\frac{1}{2}}\right)$ sq. metre

= (7700 × 2) sq. metre
= 15400 sq. metre
If radius of field = r metre then,
$\pi r^2 = 15400$

$\Rightarrow \frac{22}{7} r^2 = 15400$

$\Rightarrow r^2 = \frac{15400 \times 7}{22} = 7 \times 700$

$\therefore$ $r = \sqrt{7 \times 7 \times 100} = 70$ metre

$\therefore$ Circumference of circular field
$= 2\pi r$ metre

$= 2 \times \frac{22}{7} \times 70 = 440$ metre

$\therefore$ Total expenditure fencing
= Rs. (440 × 1.2)
= Rs. 528

317. (1)

Let, AB = a cm.
BC = b cm.
According to the question,
$a + b = 6$ ..... (i)
and diagonal of rectangle

$= \sqrt{a^2 + b^2}$ = side of square

$\therefore \frac{\text{Area of square}}{\text{Area of rectangle}}$

$= \frac{\left(\sqrt{a^2 + b^2}\right)^2}{ab}$

$\Rightarrow \frac{5}{2} = \frac{a^2 + b^2}{ab}$

$\Rightarrow \frac{5}{4} = \frac{a^2 + b^2}{2ab}$

$\Rightarrow \frac{5+4}{5-4} = \frac{a^2 + b^2 + 2ab}{a^2 + b^2 - 2ab}$

[By componendo and dividendo]

$\Rightarrow \frac{9}{1} = \frac{(a+b)^2}{(a-b)^2}$

$\Rightarrow \frac{9}{1} = \frac{6 \times 6}{(a-b)^2}$

$\Rightarrow (a - b)^2 = \frac{6 \times 6}{9} = 4$

$\Rightarrow a - b = 2$ ..... (ii)

$\therefore$ Area of square = $a^2 + b^2$

$= \frac{1}{2} [(a + b)^2 + (a - b)^2]$

$= \frac{1}{2} (36 + 4)$

$= \frac{1}{2} \times 40 = 20$ sq. cm.

318. (2)

Radius of in circle = $\frac{a}{2\sqrt{3}}$ cm.

Radius of circum-circle

$= \frac{a}{\sqrt{3}}$ cm.

Where a = side of triangle

$\therefore$ Required area = Area of circum-circle – area of in–circle

$= \pi \left(\left(\frac{a}{\sqrt{3}}\right)^2 - \left(\frac{a}{2\sqrt{3}}\right)^2 \right)$

$= \pi \left(\frac{a^2}{3} - \frac{a^2}{12} \right)$

$= \pi \left(\frac{4a^2 - a^2}{12} \right)$

$= \frac{3a^2\pi}{12} = \frac{\pi a^2}{4}$

$= \frac{22}{7} \times \frac{8 \times 8}{4}$

$= \frac{352}{7} = 50\frac{2}{7}$ sq. cm.

319. (2)

Distance between centres = diagonal of square = $\sqrt{2}$ cm.

$\therefore$ Ex radii = $\frac{1}{\sqrt{2}}$ cm.

Required area = Area of ex-circle – area of square

$= \frac{\pi}{2} - 1$

320. (2)

DE || BC
$\angle ADE = \angle ABC$
$\angle AED = \angle ACB$
By AA–similarity.
$\Delta ABC \sim \Delta ADE$

$\therefore \frac{AD}{AB} = \frac{DE}{BC}$

$\therefore \frac{AD}{DB} = \frac{4}{5}$

$\Rightarrow \frac{DB}{AD} = \frac{5}{4}$

$\Rightarrow \frac{DB + AD}{AD} = \frac{5+4}{4}$

$\Rightarrow \frac{AB}{AD} = \frac{9}{4} = \frac{BC}{DE}$

$\Delta DEF \sim \Delta CBF$

$\therefore \frac{\text{Area of } \Delta DEF}{\text{Area of } \Delta CBF} = \frac{DE^2}{BC^2}$

$= \frac{16}{81} = 16 : 81$

321. (1)

In ΔCOD and ΔAOB,
$\angle OAB = \angle OCD$
$\angle OBA = \angle ODC$
By AA–similarity,
$\Delta AOB \sim \Delta COD$

$\therefore \frac{\text{Area of } \Delta AOB}{\text{Area of } \Delta COD} = \frac{AB^2}{CD^2}$

$= \frac{4CD^2}{CD^2} = \frac{4}{1} = 4 : 1$

TYPE-II

1. (2) Side of square, whose perimeter is 24 cm $= \frac{24}{4} = 6$ cm

So, Area of the square = 6^2
= 36 cm^2
Again, side of square, whose perimeter is 32cm $= \frac{32}{4} = 8$ cm

So, Area of this square = 8^2
= 64 cm^2
According to the question
Area of new square
= 64 + 36 = 100cm^2
∴ Side of the new square
$= \sqrt{100} = 10$ cm
Hence, Perimeter of new square
= 10 × 4 = 40 cm

2. (1) Side of one square $= \frac{40}{4} = 10$ cm.
[∵Perimeter = 4 × side]
Side of other square $= \frac{32}{4}$
= 8 cm.
According to the question,
Area of third square
= $(10)^2 - (8)^2 = 100 - 64$
= 36 sq.cm.
Side of third square $= \sqrt{36} = 6$ cm.
Its perimeter = 4 × 6 = 24 cm.

3. (3) Ratio of area $= \frac{225}{256}$
⇒ Ratio of side
$= \sqrt{\frac{225}{256}} = \frac{15}{16}$
∴ Ratio of perimeter
$= \frac{4 \times 15}{4 \times 16} = \frac{15}{16} \Rightarrow 15 : 16$

4. (2) Side of the first square
$= \frac{40}{4} = 10$ cm
Side of the second square
$= \frac{24}{4} = 6$ cm
Difference of the area of these squares
= (10 × 10 – 6 × 6) cm^2
= (100 – 36) cm^2
= 64 cm^2
∴ Area of the third square
= 64 cm^2
⇒ Side of third square
$= \sqrt{64} = 8$ cm
∴ Perimeter of this square
= (4 × 8) cm = 32 cm

5. (2) Using Rule 9,
Let length be 3x and breadth be 2x
∴ Perimeter = 2 (length + breadth)
= 2(3x + 2x) = 10x
According to question,
10x = 80m
⇒ x = 8m
∴ Breadth = 2x = 2× 8 = 16 m

6. (3) Using Rule 9,
Area of rectangle = $l \times b$
∴ 5x × 4x = 500 sq.m.
or, $20x^2$ = 500 sq.m.
$\Rightarrow x^2 = \frac{500}{20} = 25$
⇒ x = 5
∴ $l = 5 \times 5 = 25$ m
$b = 5 \times 4 = 20$ m
∴ Perimeter = 2 $(l + b)$m
= 2 (25 + 20) = 2 × 45 = 90 m

7. (2) Using Rule 9,
Let the length = l m and breadth = b m.
∴ $2(l + b) = 28$
$\Rightarrow l + b = 14$ ... (i)
$l\,b = 48$ ....(ii)
Now, $(l - b)^2 = (l + b)^2 - 4lb$
$= (14)^2 - 4 \times 48$ [From (i) & (ii)]
= 196 – 192 = 4
$\Rightarrow l - b = 2$ ....(iii)
∴ $l = 8,\ b = 6$
∴ Diagonal $= \sqrt{8^2 + 6^2} = 10$ m.

8. (4) Using Rule 9,
Let the length of the rectangle be x units and breadth be y units.
∴Perimeter of rectangle
= 2 $(x + y)$ cm
According to the question,
$$\frac{x}{2x + 2y} = \frac{5}{16}$$
$$\Rightarrow \frac{x}{x + y} = \frac{5}{8}$$
$$\Rightarrow \frac{x + y}{x} = \frac{8}{5}$$
$$\Rightarrow \frac{x}{x} + \frac{y}{x} = \frac{8}{5} \Rightarrow \frac{y}{x} = \frac{8}{5} - 1$$
$$\Rightarrow \frac{y}{x} = \frac{3}{5} \Rightarrow x : y = 5 : 3$$

9. (3) $\frac{l}{2(l + b)} = \frac{5}{18} \Rightarrow \frac{l}{l + b} = \frac{5}{9}$
$$\Rightarrow \frac{l + b}{l} = \frac{9}{5} \Rightarrow \frac{l + b}{l} - 1 = \frac{9}{5} - 1$$
$$\Rightarrow \frac{b}{l} = \frac{4}{5}$$
$\Rightarrow l : b = 5 : 4$

10. (1) $x^2 + 7x + 10$
$= x^2 + 5x + 2x + 10$
$= x(x + 5) + 2(x + 5)$
$= (x + 2)(x + 5)$
∴ Possible perimeter
$= 2(x + 2 + x + 5)$
$= 2(2x + 7) = (4x + 14)$ cm

11. (4) Using Rule 9,
If the length and breadth of the plot be x and y respectively, then $2(x + y) = 48$
$\Rightarrow x + y = 24$ .....(i)
$xy = 108$ .....(ii)
$\therefore (x - y)^2 = (x + y)^2 - 4xy$
$= (24)^2 - 4 \times 108$
= 576 – 432 = 144
$\therefore x - y = 12$ .....(iii)
From equations (i) and (iii),
$x = 18$ metre and $y = 6$ metre

12. (3) According to question,
Ratio of sides of triangle
$= \frac{1}{2} : \frac{1}{3} : \frac{1}{4} = 6 : 4 : 3$
Now, 6x + 4x + 3x = 52 cm.
13x = 52
∴ x = 4cm
∴ Length of smallest side = 3x = 4 × 3 = 12cm

13. (1) Using Rule 6,
Area of equilateral triangle
$= \frac{\sqrt{3}}{4} \times (\text{side})^2$
$\Rightarrow \frac{\sqrt{3}}{4} \times (\text{side})^2 = 400\sqrt{3}$
$\Rightarrow (\text{Side})^2 = \frac{400\sqrt{3} \times 4}{\sqrt{3}}$
⇒ Side $= \sqrt{4 \times 400} = 40$ metres
∴ Perimeter = 3 × side
= 3 × 40 = 120 metres

14. (3) Using Rule 1,

Let ABC be an equilateral triangle of side x cm.

Also, Let OD $= \sqrt{3}$ cm,

OE $= 2\sqrt{3}$ cm and OF $= 5\sqrt{3}$ cm.

From the figure,

ar. DBOC + ar. DAOC + ar. DAOB = ar. DABC

or, $\frac{1}{2}\times x\times\sqrt{3}+\frac{1}{2}\times x\times 2\sqrt{3}+\frac{1}{2}\times x\times 5\sqrt{3}$

$= \frac{\sqrt{3}}{4}x^2$

or, $2\sqrt{3}+4\sqrt{3}+10\sqrt{3}=\sqrt{3}x$

or, $x = 2 + 4 + 10 = 16$

$\therefore$ Perimeter of the triangle $= 3x$

$= 3 \times 16 = 48$ cm

15. (3) Using Rule 1,

The perimeter of a triangle = 30 cm.

Area = 30 cm^2

We know that, $5^2 + 12^2 = 13^2$

$\therefore$ The triangle is right angled.

Now, Area $= \frac{1}{2}\times 5\times 12 = 30\,\text{cm}^2$

And, Perimeter = 5 + 12 + 13 = 30

Hence, the smallest side = 5 cm

16. (4) Using Rule 1,

Let the sides be $3x$, $4x$ and $5x$ respectively.

Here, $(3x)^2 + (4x)^2 = (5x)^2$

Hence, the triangle is right angled.

$\therefore \frac{1}{2}\times 3x\times 4x = 216$

$\Rightarrow 6x^2 = 216 \Rightarrow x^2$

$= \frac{216}{6} = 36$

$\therefore x = \sqrt{36} = 6$

Perimeter of triangle

$= (3x + 4x + 5x)$ cm

$= 12x$ cm

$= 12 \times 6 = 72$ cm

17. (3) Using Rule 1,

Semi-perimeter,

$S = \frac{30+72+78}{2} = 90$

Area of triangle ABC

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{90(90-30)(90-72)(90-78)}$

$= \sqrt{90\times 60\times 18\times 12}$

$= 1080$ m^2

If the altitude AD be h metre, then,

$\frac{1}{2}\times$ base $\times$ height $= 1080$

$\Rightarrow \frac{1}{2}\times 72\times h = 1080$

$\Rightarrow h = \frac{1080}{36} = 30$ metre

18. (1) Using Rule 1,

Let ABC be a right-angled isosceles triangle where

AB = BC = x and $\angle B = 90°$.

$\therefore$ AC $= \sqrt{x^2+x^2} = \sqrt{2}x$

$\therefore$ Perimeter of the triangle ABC

$= 4\sqrt{2} + 4$

$\Rightarrow x + x + \sqrt{2}x = 4\sqrt{2} + 4$

$\Rightarrow 2x + \sqrt{2}x = 4\sqrt{2} + 4$

$\Rightarrow 2x + \sqrt{2}x = 2.2\sqrt{2} + \sqrt{2}.2\sqrt{2}$

$\Rightarrow x = 2\sqrt{2}$

$\therefore$ Length of the hypotenuse

$= \sqrt{2}.x = \sqrt{2}.2\sqrt{2} = 4$ cm.

19. (3)

AQ || CB ,and AC || QB

$\therefore$ AQBC is a parallelogram

$\Rightarrow$ BC = AQ

Again, AR || BC and AB || RC

$\therefore$ ARCB ,is a parallelogram.

$\Rightarrow$ BC = AR

$\Rightarrow$ AQ = AR

$\Rightarrow$ AQ = AR $= \frac{1}{2}$QR

$\Rightarrow$ BC $= \frac{1}{2}$QR

Similarly, AB $= \frac{1}{2}$PR and

AC $= \frac{1}{2}$PQ

$\therefore$ Required ratio

= (PQ + QR + RP) : (AB + BC + CA)

= 2 : 1

20. (3) $\frac{1}{3} : \frac{1}{4} : \frac{1}{5}$

or $\frac{1}{3}\times 60 : \frac{1}{4}\times 60 : \frac{1}{5}\times 60$

or 20 : 15 : 12

$\therefore$ $20x + 15x + 12x = 94$

[As per question]

$\Rightarrow 47x = 94 \Rightarrow x = \frac{94}{47} = 2$

$\therefore$ The smallest side $= 12x$

$= 12 \times 2 = 24$ cm

21. (1) Perimeter of isosceles triangle

$= 15 + 15 + 22$ or $15 + 22 + 22$

= 52 or 59 units

22. (1)

$a + b + c = 56$ ...(i)

$\frac{1}{2}ac = 84$

$\Rightarrow ac = 168$ sq.cm.

$\therefore b^2 = a^2 + c^2$

$\Rightarrow b^2 = (a + c)^2 - 2ac$

$\Rightarrow b^2 = (56 - b)^2 - 2 \times 168$ [By (i)]

$\Rightarrow b^2 = 3136 - 112\,b + b^2 - 336$

$\Rightarrow 112b = 2800$

$\Rightarrow b = \frac{2800}{112} = 25$ cm

23. (3)

If AB = x cm, then

$BD = \frac{x}{2}$ cm

$\therefore$ From ΔABD

$AB^2 = BD^2 + AD^2$

$\Rightarrow x^2 = \frac{x^2}{4} + \left(6\sqrt{3}\right)^2$

$\Rightarrow x^2 - \frac{x^2}{4} = 36 \times 3$

$\Rightarrow \frac{3x^2}{4} = 36 \times 3$

$\Rightarrow x^2 = 36 \times 4$

$\Rightarrow x = 6 \times 2 = 12$ cm

$\therefore$ Perimeter of equilateral triangle

$= 3 \times 12 = 36$ cm

24. (1) Using Rule 6,

$\frac{\sqrt{3}}{4}x^2 = 4\sqrt{3}$

$\Rightarrow x^2 = 4 \times 4 \Rightarrow x = 4$ cm

$\therefore$ Perimeter of equilateral triangle

$= 3 \times 4 = 12$ cm

25. (4) Ratio of the sides of triangle

$= \frac{1}{4} : \frac{1}{6} : \frac{1}{8}$

$= \frac{1}{4} \times 24 : \frac{1}{6} \times 24 : \frac{1}{8} \times 24$

[LCM of 4, 6, 8 = 24]

$= 6 : 4 : 3$

$\therefore 6x + 4x + 3x = 91$

$\Rightarrow 13x = 91$

$\Rightarrow x = \frac{91}{13} = 7$

$\therefore$ Required difference

$= 6x - 3x = 3x$

$= 3 \times 7 = 21$ cm

26. (1) Using Rule 12,

We know that rhombus is parallelogram whose all four sides are equal and its diagonals bisect each other at 90°.

$\therefore AB = \sqrt{(16)^2 + (12)^2}$

$= \sqrt{256 + 144} = \sqrt{400}$

$= 20$ cm = side of the rhombus

$\therefore$ Perimeter of the rhombus

$= 20 \times 4 = 80$ cm

27. (4) Using Rule 12,

If d_1 and d_2 are the lengths of diagonals of a rhombus. Then

Perimeter $= 2\sqrt{d_1^2 + d_2^2}$

$= 2\sqrt{24^2 + 10^2}$

$= 2\sqrt{576 + 100} = 2\sqrt{676}$

$= 2 \times 26 = 52$ cm

28. (3) Using Rule 12,

$4 \times$ side $= 40$ cm [given]

$\Rightarrow$ Side $= \frac{40}{4} = 10$ cm.

In Δ AOB,

$OB = \sqrt{(10)^2 - (6)^2}$

$= \sqrt{100 - 36} = \sqrt{64} = 8$ cm

$\therefore$ Diagonal $BD = 8 \times 2$

$= 16$ cm

29. (3) Using Rule 12,

If d_1 and d_2 be the diagonals of a rhombus, we have

Perimeter $= 4 \times$ side

$= 2\sqrt{d_1^2 + d_2^2}$

$\left[\because \text{Side} = \frac{1}{2}\sqrt{d_1^2 + d_2^2}\right]$

$\Rightarrow 40 = 2\sqrt{12^2 + d_2^2}$

$\Rightarrow 20 = \sqrt{144 + d_2^2}$

$\Rightarrow 144 + d_2^2 = 20^2 = 400$

$\Rightarrow d_2^2 = 400 - 144 = 256$

$\Rightarrow d_2 = \sqrt{256} = 16$ cm.

30. (1) $3x + 4x + 5x + 6x = 72$

$\Rightarrow 18x = 72$

$\Rightarrow x = 4$

$\therefore$ Largest side $= 6x = 6 \times 4$

$= 24$ cm.

31. (2) Using Rule 12,

Area of rhombus $= \frac{1}{2} d_1 d_2$

$\Rightarrow 216 = \frac{1}{2} \times 24 \times d_2$

$\Rightarrow d_2 = \frac{216}{12} = 18$ cm

$\therefore AO = 12$ cm, $BO = 9$ cm

$\Rightarrow AB = \sqrt{12^2 + 9^2} = \sqrt{144 + 81}$

$= \sqrt{225} = 15$ cm

$\therefore$ Perimeter of rhombus

$= 4 \times 15 = 60$ cm

32. (1) Using Rule 14,

We know that

Area of circle $= \pi r^2$

According to question,

$\pi r^2 = 38.5$

$\Rightarrow r^2 = \frac{38.5}{22} \times 7 = (3.5)^2$

$\Rightarrow r = 3.5$ cm

$\therefore$ Circumference of circle

$= 2\pi r = 2 \times \frac{22}{7} \times 3.5 = 22$cm

33. (2) Using Rule 7,

Circumference of wheel $= \pi D$

$= \frac{22}{7} \times 14 = 44$ cm.

$\therefore$ Total distance travelled by wheel in 15 revolutions

$= 15 \times 44$ cm $= 660$ cm

34. (3) Using Rule 7,

Circumference $= 2\pi r$

$= \frac{44}{7} \times r$ metre

Distance covered in 8 times

$= 16\pi r$ metres

$\therefore$ Speed $= \frac{\text{Distance}}{\text{Time}}$

$= \frac{16\pi r}{40}$ m / minute

$= \frac{2\pi r}{5}$ m/minute

New circumference

$= 2\pi r \times 10 = 20\ \pi r$

$\therefore$ Required time

$= \frac{20\pi r}{2\pi r} \times 5$ minute $= 50$ minutes

35. (2) Using Rule 7,

Diameter of the wheel = 3 metres

$\therefore$ Circumference = $\pi \times$ diameter

$= \frac{22}{7} \times 3 = \frac{66}{7}$ metres

Since a wheel covers a distance equal to its circumference in one revolution, therefore, distance covered in 28 revolutions

$= 28 \times \frac{66}{7}$

= 264 metres

Now, 264 metres distance is covered in 1 minute

$\therefore$ 5280 metres distance will be covered in $= \frac{5280}{264}$

= 20 minutes.

36. (2) Using Rule 7,

The distance covered

= 2 km 26 decameters

= (2 ×1000 + 26 × 10) m.

= 2260 m.

The distance covered in one revolution

$= \frac{\text{Total distance}}{\text{Number of revolutions}}$

$= \frac{2260}{113} = 20$ m.

Clearly,

Circumference of wheel

= distance covered in 1 revolution

= 20 m

$\pi \times$ diameter = 20 m.

Diameter $= \frac{20}{\pi} = \frac{20 \times 7}{22}$

$= \frac{70}{11} = 6\frac{4}{11}$ m.

37. (1) Using Rule 7,

Distance covered in 1 revolution = Circumference of wheel

$= 2 \times \frac{22}{7} \times 1.75$ m

$\therefore$ Number of revolutions

$= \frac{11 \times 1000}{2 \times \frac{22}{7} \times 1.75}$

$= \frac{11 \times 7 \times 1000}{2 \times 22 \times 1.75} = 1000$

38. (1) Using Rule 7,

Circumference of the circular wire $= 2\pi r$

$= 2 \times \frac{22}{7} \times 42 = 264$ cm

$\Rightarrow$ Perimeter of rectangle = 264 cm

Let the sides of rectangle be $6x$ and $5x$ cm.

$\therefore 2(6x + 5x) = 264$

$\Rightarrow 2 \times 11\ x = 264$

$\Rightarrow x = \frac{264}{22} = 12$

$\therefore$ The smaller side

$= 5x = 5 \times 12 = 60$ cm.

39. (1) Using Rule 7,

Distance covered in 1 revolution = Circumference of wheel

$= 2\pi r = 2 \times \frac{22}{7} \times 20$ cm.

Total distance = 176 m

= 17600 cm

$\therefore$ Number of revolutions

$= \frac{17600}{2 \times \frac{22}{7} \times 20}$

$= \frac{17600 \times 7}{2 \times 22 \times 20} = 140$

40. (2) Using Rule 14,

Let the radius of the circle be r cm.

Then, $2\pi r - 2r = 30$

$2r(\pi - 1) = 30$

$\Rightarrow 2r \times \frac{22-7}{7} = 30$

$\Rightarrow 2r \times 15 = 30 \times 7 \Rightarrow r = \frac{30 \times 7}{30}$

$\Rightarrow r = 7$ cm

41. (4) Using Rule 14,

If the radius be r metre, then

$\pi r + 2r = 144$

$\Rightarrow r(\pi + 2) = 144$

$\Rightarrow r = \frac{144}{\pi + 2} = \frac{144}{\frac{22}{7} + 2}$

$= \frac{144 \times 7}{36} = 28$

$\therefore$ Diameter $= 2r = 2 \times 28$

= 56 metre

42. (3) Using Rule 14,

Let the radius of the semi – circle be r metre.

According to the question,

$\pi r + 2r = \pi r^2$

$= \pi + 2 = \frac{\pi r^2}{2}$

$\Rightarrow 2\pi + 4 = \pi r$

$r = \frac{2\pi + 4}{\pi} = 2 + \frac{4}{\pi} = 2 + \frac{28}{22}$

$= 2 + \frac{14}{11} = \frac{36}{11}$

$\therefore$ Diameter

$= \frac{2 \times 36}{11} = \frac{72}{11} = 6\frac{6}{11}$ metres

43. (2) Using Rule 14,

Circumference of circle $= 2\pi r$

$= 2\pi \times 3 = 6\pi$ cm

Area of circle $= \pi r^2 = \pi \times 3 \times 3$

$= 9\pi$ cm^2

$\therefore$ Required ratio $= 6\pi : 9\pi$

$= 2 : 3$

44. (2) Tricky Approach

Ratio of the circumference

= Ratio of radii = 3 : 4

45. (3)

AC $= \sqrt{13^2 - 12^2} = \sqrt{169 - 144}$

$= \sqrt{25} = 5$ cm

$\therefore$ AB = 10 cm

46. (1) Using Rule 7,

Distance covered by wheel in one revolution = circumference of the wheel

$= \pi \times$ diameter $= \frac{22}{7} \times 98$

= 308 cm

$\therefore$ Number of revolutions

$= \frac{1540 \times 100}{308} = 500$

47. (2) Using Rule 7,

Distance covered by wheel in one revolution

= Circumference of wheel

$\therefore \pi \times$ diameter $= \frac{440}{1000}$

$\Rightarrow \frac{22}{7} \times \text{diameter} = \frac{440}{1000}$

$\Rightarrow \text{Diameter} = \frac{440}{1000} \times \frac{7}{22}$

$= 0.14$ m

48. (2) Using Rule 7,
Distance covered by wheel in one revolution
= Circumference of wheel

$= \frac{11000}{5000} = \frac{11}{5}$ metre

$= \frac{11}{5} \times 100$ cm = 220 cm

$\therefore 2\pi r = 220$

$\Rightarrow 2 \times \frac{22}{7} \times r = 220$

$\Rightarrow r = \frac{220 \times 7}{2 \times 22} = 35$ m

49. (2) Length of the rubber band
$= 3d + 2\pi r$
$= (30 + 10\pi)$ cm

50. (3) The chord nearer to the centre is larger.

$\therefore \frac{15}{8} = \frac{x}{16}$

$\Rightarrow x = \frac{15 \times 16}{8} = 30$ cm

51. (2) Using Rule 14,
Perimeter of semi-circular shaped window
$= (\pi r + 2r)$ cm $= r(\pi + 2)$ cm

$= \frac{63}{2}\left(\frac{22}{7} + 2\right)$ cm

$= \frac{63}{2} \times \frac{36}{7} = 162$ cm

52. (1) Number of revolutions

$= \frac{12 \times 42}{18} = 28$

53. (2) Using Rule 14,
Perimeter of semi-circular region
= 18 cm

$\therefore \pi r + 2r = 18$

$\Rightarrow r(\pi + 2) = 18$

$\Rightarrow r\left(\frac{22}{7} + 2\right) = 18$

$\Rightarrow r\left(\frac{36}{7}\right) = 18$

$\Rightarrow r = \frac{18 \times 7}{36} = \frac{7}{2} = 3\frac{1}{2}$ cm

54. (1)

Breadth of road $= r_2 - r_1$

$\therefore 2\pi r_2 - 2\pi r_1 = 66$

$\Rightarrow 2\pi(r_2 - r_1) = 66$

$\Rightarrow r_2 - r_1 = \frac{66}{2\pi} = \frac{66 \times 7}{2 \times 22}$

= 10.5 metres

55. (4) Let the radius of circular field be r metre, then

$\frac{2\pi r}{30} - \frac{2r}{30} = \frac{30}{60}$

$\Rightarrow \frac{\pi r}{15} - \frac{r}{15} = \frac{1}{2}$

$\Rightarrow \pi r - r = \frac{15}{2}$

$\Rightarrow r(\pi - 1) = \frac{15}{2}$

$\Rightarrow r\left(\frac{22}{7} - 1\right) = \frac{15}{2}$

$\Rightarrow r \times \frac{15}{7} = \frac{15}{2}$

$\Rightarrow r = \frac{7}{2} = 3.5$ metre

56. (1) If the diameter of the circle be d units, then

$\pi d - d = X$

$\Rightarrow d(\pi - 1) = X$

$\Rightarrow d = \frac{X}{\pi - 1}$ units

57. (2) Radius of the circle

$= \frac{100}{2\pi}$ cm

When a square is inscribed in the circle, diagonal of the square is equal to diameter of the circle.
$\therefore$ Diagonal of square

$= 2 \times \frac{100}{2\pi} = \frac{100}{\pi}$ cm

$\therefore$ Side of square $= \frac{\text{Diagonal}}{\sqrt{2}}$

$= \frac{100}{\sqrt{2}\pi} = \frac{50\sqrt{2}}{\pi}$ cm.

58. (3) Let the internal radius of the park be r and the external radius (with the path) be R.
The difference between the internal and external circumferences is 132 m.
i.e. $2\pi R - 2\pi r = 132$

$\Rightarrow 2\pi(R - r) = 132$

$\Rightarrow R - r = \frac{132}{2\pi} = \frac{132 \times 7}{2 \times 22} = 21$

Hence, the width of path
= 21 metres

59. (3)

Let the shaded portion be the circular path.
Let the inner radius be r metres.
$\therefore$ Outer radius R = (r + 5) metres.
According to the question,

$\frac{2\pi R}{2\pi r} = \frac{23}{22}$

$\Rightarrow \frac{R}{r} = \frac{23}{22}$

$\Rightarrow \frac{r + 5}{r} = \frac{23}{22}$

$\Rightarrow 23r = 22r + 110$

$\Rightarrow r = 110$ metres

$\therefore$ Diameter=2×110 = 220 metres

60. (3)

OD = OE = OF = 2cm.
$\therefore$ Area of Δ ABC
= Area of Δ AOB
+ Area of Δ BOC
+ Area of Δ AOC

$\Rightarrow 6 = \frac{1}{2} \times AB \times 2 + \frac{1}{2} \times BC \times 2$

$+ \frac{1}{2} \times CA \times 2$

$\Rightarrow AB + BC + CA = 6$ cm

61. (2) Using Rule 18,

$\text{Circum-radius} = \frac{\text{Side}}{\sqrt{3}}$

$\therefore$ Area of circum-circle

$= \pi \times \frac{\text{side}^2}{3} = 3\pi$

$\Rightarrow$ Side^2 = 9 $\Rightarrow$ Side = 3 cm

$\therefore$ Perimeter of triangle

= 3 + 3 + 3 = 9 cm

62. (3) Using Rule 10 and 14,
Area of the square = (side)^2
484 sq.cm. = (side)^2

Side $= \sqrt{484} = 22$ cm

$\therefore$ Perimeter of the square
= 4 × side = 4 × 22 = 88 cm
According to the question, the circle is made by same wire.
Therefore,
Perimeter of the square
= circumference of the circle
88 cm = $2\pi r$

$88 \text{ cm} = 2 \times \frac{22}{7} \times r$

$\Rightarrow r = \frac{88 \times 7}{2 \times 22} = 14$ cm

$\therefore$ Area of circle = πr^2

$= \frac{22}{7} \times (14)^2 = \frac{22}{7} \times 14 \times 14$

= 616 sq.cm.

63. (2) Using Rule 10 and 14,
Side of the square paper sheet = $\sqrt{784} = 28$ cm.
Obviously, radius of each circle

$= \frac{28}{4} = 7$ cm.

Circumference of each circular plate = $2\pi r$

$= 2 \times \frac{22}{7} \times 7 = 44$ cm

64. (4) Using Rule 10 and 14,
Let the radius of circle = r and side of square = x units,
Then,

$\frac{\text{Area of circle}}{\text{Area of square}} = \frac{\pi r^2}{x^2} = 1$

$\Rightarrow x^2 = \pi r^2 \Rightarrow x = \sqrt{\pi}\, r$

Now,

$\frac{\text{Circumference of circle}}{\text{Perimeter of square}}$

$= \frac{2\pi r}{4\sqrt{\pi}\, r} = \frac{\sqrt{\pi}}{2}$ or $\sqrt{\pi} : 2$

65. (1) Using Rule 10,
Side of square

$= \sqrt{121} = 11$ cm

$\therefore$ Length of wire = 4 × 11
= 44 cm

$\therefore 2\pi r = 44$

$\Rightarrow 2 \times \frac{22}{7} \times r = 44$

$\Rightarrow r = \frac{44 \times 7}{2 \times 22} = 7$ cm

66. (3) Using Rule 10,
Let the side of square be 1 cm, then 2 ($l + b$)
= 4 × side = 4 × 1
$\Rightarrow l + b = 2$, If $l = 1.5$, $b = 0.5$
$\therefore$ Area of square = 1 sq.cm.
and Area of rectangle = 1.5 × 0.5
= 0.75 sq.cm.
For a given perimeter, square has the largest area. i.e, P > Q

67. (4) Using Rule 14,
$2\pi r = 2\ (18 + 26)$

$\Rightarrow 2 \times \frac{22}{7} \times r = 44 \times 2$

$\Rightarrow$ r = 14 cm

$\therefore$ Area of circle = πr^2

$= \frac{22}{7} \times 14 \times 14 = 616$ sq. cm.

68. (2) Let the side of equilateral triangle be x units.
$\therefore$ Perimeter = $3x$ units.
After increase,
Perimeter = $1.2x + 1.3x + 1.5x$
= $4x$ units
Increase = $4x - 3x = x$ units
$\therefore$ % Increase

$= \frac{x}{3x} \times 100 = \frac{100}{3} = 33\frac{1}{3}\%$

69. (1)

$\theta = 72° \rightarrow 88$m

$\because 360° \rightarrow \frac{88}{72} \times 360 = 440$ m

$\Rightarrow 2\pi r = 440$

$r = \frac{440}{2} \cdot \frac{7}{22}$

$\therefore r = 70$m
= OA which is the length of the rope.

70. (1)

AE = AD = 3.5 cm
BE = BF = 4.5 cm
CD = CF = 5.5 cm
$\therefore$ Perimeter of triangle
= AB + BC + CA
= AE + EB + BF + FC + CD+ DA
= 2(AE + BE + CD)
= 2(3.5 + 4.5 + 5.5)
= 2 × 13.5 = 27 cm

71. (3)

In Δ OAB,
Mid-point of OA = E
Mid-point of OB = H

$\therefore$ EH || AB and HE = $\frac{1}{2}$AB

Similarly, HG = $\frac{1}{2}$BC,

FG = $\frac{1}{2}$ CD and EF = $\frac{1}{2}$AD

$\therefore$ EH + HG + FG + EF

$= \frac{1}{2}$(AB + BC + CD + AD)

$\Rightarrow$ Perimeter of EFGH

$= \frac{1}{2} \times$ Perimeter of ABCD

$\therefore$ Required ratio = 1: 2

72. (1) Using Rule 14,
Circumference of circular shape
= π × diameter

$= \frac{22}{7} \times 112 = 352$ cm

= length of wire
$\therefore$ Perimeter of rectangle
= 2 (length + breadth)
$\Rightarrow 2\ (l + b) = 352$

$\Rightarrow l + b = \frac{352}{2} = 176$ $\therefore$

Smaller side of rectangle

$= \frac{7}{16} \times 176 = 77$ cm

73. (3) Perimeter of equilateral triangle = 3 × side

$\therefore$ 3 × side = 18

$\Rightarrow$ Side = $\frac{18}{3}$ = 6 cm.

$\therefore$ Length of median

$= \frac{\sqrt{3}}{2} \times$ side

$= \frac{\sqrt{3}}{2} \times 6 = 3\sqrt{3}$ cm.

74. (1) Using Rule 14,

Radius of circular paper sheet

$\frac{\text{Circumference}}{2\pi} = \frac{352}{2\pi}$

$= \frac{352}{2 \times \frac{22}{7}}$

$= \frac{352 \times 7}{2 \times 22}$ = 56 cm

$\therefore$ Radius of each plate $= \frac{56}{2}$

= 28 cm

$\therefore$ Circumference of each circular plate $= 2\pi r$

$= 2 \times \frac{22}{7} \times 28$ = 176 cm

75. (1) Using Rule 12,

AC = 24 cm = d_2

BD = 32 cm = d_1

$\therefore$ OD = 16 cm

OC = 12 cm

$\angle$COD = 90°

$\therefore$ CD = $\sqrt{OC^2 + OD^2}$

$= \sqrt{12^2 + 16^2}$

$= \sqrt{144 + 256} = \sqrt{400}$ = 20 cm

$\therefore$ Perimeter of rhombus

= 4 × CD = 4 × 20 = 80 cm

76. (1) Using Rule 18,

In-radius $= \frac{\text{Side}}{2\sqrt{3}}$

$\therefore \sqrt{3} = \frac{\text{Side}}{2\sqrt{3}}$

$\Rightarrow$ Side $= 2\sqrt{3} \times \sqrt{3}$ = 6 cm

$\therefore$ Perimeter of equilateral

= 3 × 6 = 18 cm

77. (1) Using Rule 10 and 14,

Side of a square

= AB = $\sqrt{2}\ a$ units

$\therefore$ AC = Diagonal = $\sqrt{2} \times \sqrt{2}\ a$

= $2a$ units

= Diameter (d) of circle

$\therefore$ Circumference of circle

$= \pi \times d$

$= \pi \times 2a = 2\pi a$ units

78. (2) Using Rule 9,

Perimeter of rectangle

= 40 metre

Length = 12 metre

$\therefore 2(l + b) = 40$

$\Rightarrow 2\ (12 + b) = 40$

$\Rightarrow 12 + b = \frac{40}{2} = 20$

$\Rightarrow b = 20 - 12 = 8$ metre

79. (2) Using Rule 14,

Circumference of circle

$= \pi \times$ diameter $= \pi d$

$\therefore \pi d - d = 150$

$\Rightarrow d\ (\pi - 1) = 150$

$\Rightarrow d\left(\frac{22}{7} - 1\right) = 150$

$\Rightarrow d\left(\frac{22-7}{7}\right) = 150$

$\Rightarrow d \times \frac{15}{7} = 150$

$\Rightarrow d = \frac{150 \times 7}{15} = 70$

$\therefore$ Radius $= \frac{d}{2} = \frac{70}{2}$

= 35 metre

80. (2)

PA = AQ = QB = 5 cm.

$\therefore \angle AQB = 90°$

$\therefore$ AB = $\sqrt{AQ^2 + QB^2}$

$= \sqrt{5^2 + 5^2} = \sqrt{25 + 25} = \sqrt{50}$

$= 5\sqrt{2}$ cm.

$\therefore$ Perimeter of ABCD

$= 4 \times 5\sqrt{2} = 20\sqrt{2}$ cm.

81. (2) Using Rule 14,

Length of wire = Circumference of circle = $2\pi r$

$= 2 \times \frac{22}{7} \times 84$ = 528 cm.

$\therefore$ Perimeter of square = 528 cm.

$\Rightarrow$ 4 × side = 528

$\Rightarrow$ Side $= \frac{528}{4}$ = 132 cm.

82. (2) If the required side be x cm, then

$\frac{30}{20} = \frac{9}{x}$

$\Rightarrow 3x = 9 \times 2$

$\Rightarrow x = \frac{9 \times 2}{3}$ = 6 cm

83. (1) Using Rule 1,

Let the sides of triangle be $3x$, $4x$ and $5x$ units.

Here, $(3x)^2 + (4x)^2 = (5x)^2$

Hence, it is a right angled triangle.

Area of ΔABC

$= \frac{1}{2} \times AB \times BC$

$\Rightarrow \frac{1}{2} \times 3x \times 4x = 7776$

$\Rightarrow 6x^2 = 7776$

$\Rightarrow x^2 = \frac{7776}{6} = 1296$

$\Rightarrow x = \sqrt{1296} = 36$ cm.

$\therefore$ Perimeter of triangle

$= 3x + 4x + 5x$

$= 12x = 12 \times 36 = 432$ cm.

84. (3) Using Rule 7,

Circumference of the wheel of car $= \pi \times d$

$= \frac{22}{7} \times 70 = 220$ cm.

= Distance covered in one rotation

$\therefore$ Distance covered by car in 1 minute = (400 × 220) cm.

$\therefore$ Distance covered by car in 1 hour = (400 × 220 × 60) cm.

$= \left(\frac{400 \times 220 \times 60}{1000 \times 100}\right)$ km.

= 52.8 km.

$\therefore$ Speed of car = 52.8 kmph

85. (1)

Since tangents drawn from an exterior point to a circle are equal in length.

$\therefore$ AP = AS

BP = BQ

CR = CQ

DR = DS

On adding all these,

AP + BP + CR + DR = AS + BQ + CQ + DS

$\Rightarrow$ (AP + BP) + (CR + DR) = (AS + DS) + (BQ + CQ)

$\Rightarrow$ AB + CD = BC + DA

$\Rightarrow$ 7 + 9.2 = 8.5 + DA

$\Rightarrow$ 16.2 = 8.5 + DA

$\Rightarrow$ DA = 16.2 – 8.5 = 7.7 cm.

86. (2) Using Rule 12,

Side of rhombus

$= \frac{\text{Perimeter}}{4} = \frac{60}{4} = 15$ cm.

d_1 = AC = 24 cm.

OC = 12 cm.

CD = 15 cm.

$\angle COD = 90°$

$\therefore$ In ΔOCD,

$OD = \sqrt{CD^2 - OC^2}$

$= \sqrt{15^2 - 12^2} = \sqrt{225 - 144}$

$= \sqrt{81} = 9$ cm.

$\therefore$ d_2 = BD = 2 × 9 = 18 cm.

$\therefore$ Area of rhombus

$= \frac{1}{2} d_1 d_2 = \frac{1}{2} \times 24 \times 18$

= 216 sq. cm.

87. (3) Using Rule 14,

$\frac{\text{Circumference}}{\text{Diameter}} = \frac{22}{7}$

$\Rightarrow \frac{\frac{11}{7}}{2r} = \frac{22}{7}$

$\Rightarrow \frac{11}{14r} = \frac{22}{7}$

$\Rightarrow 14r \times 22 = 11 \times 7$

$\Rightarrow r = \frac{11 \times 7}{14 \times 22} = \frac{1}{4}$ metre

88. (1)

Radius of each circle $= \frac{140}{2}$

= 70 cm.

Area of the four sectors $= \pi r^2$

$= \frac{22}{7} \times 70 \times 70$

= 15400 sq. cm.

Area of square

= (140 × 140) sq. cm.

= 19600 sq. cm.

$\therefore$ Required area

= (19600 – 15400) sq. cm.

= 4200 sq. cm.

89. (2) Let the second side of triangle $= x$ cm.

$\therefore$ First side $= 2x$ cm.

Third side $= (x + 11)$ cm.

$\therefore$ Perimeter of triangle

= 67 cm.

$\Rightarrow 2x + x + x + 11 = 67$

$\Rightarrow 4x = 67 - 11 = 56$

$\Rightarrow x = \frac{56}{4} = 14$ = smallest side

90. (3) Distance covered bu whole in 1 revolution circumference of wheel

$= 2\pi r = \left(2 \times \frac{22}{7} \times 25\right)$ cm.

$\therefore$ Required number of revolutions

$= \frac{11 \times 1000 \times 100}{\left(2 \times \frac{22}{7} \times 25\right)}$ cm.

$= \frac{11 \times 100000 \times 7}{2 \times 22 \times 25} = 7000$

91. (3) Let radius of circle A be r_1 units.

Radius of semi-circle = r_2 units.

According to the question,

$2\pi r_1 = \pi r_2 + 2r_2$

$\Rightarrow 2\pi r_1 = r_2 (\pi + 2)$

$\Rightarrow \frac{r_1}{r_2} = \frac{\pi+2}{2\pi}$

$\therefore$ Ratio of their areas $= \frac{\pi r_1^2}{\pi r_2^2}$

$= \frac{(\pi+2)^2}{(2\pi)^2} = (\pi+2)^2 : 4\pi^2$

92. (4) PQ = QR = RS = 2 cm.
Perimeter of shaded region = Arc $\widehat{QS}$ + Arc $\widehat{PS}$ + Arc $\widehat{PQ}$
$= \pi \times 2 + \pi \times 1 + \pi \times 3$

$= 6\pi = 6 \times \frac{22}{7} = \frac{132}{7}$

$= 18\frac{6}{7}$ cm.

93. (2)

AB = BC = x cm.

$\therefore$ AC $= \sqrt{AB^2 + BC^2}$

$= \sqrt{x^2 + x^2} = \sqrt{2x^2} = \sqrt{2}x$ cm.

$\therefore$ AB + BC + CA $= 10 + 10\sqrt{2}$

$\Rightarrow 2x + \sqrt{2}x = 10 + 10\sqrt{2}$

$\Rightarrow \sqrt{2}x\ (\sqrt{2}+1) = 10(1+\sqrt{2})$

$\Rightarrow \sqrt{2}x = 10$ cm. = AC

94. (3) Distance covered by wheel in one revolution = Circumference of wheel $= 2\pi r$

$= 2 \times \frac{22}{7} \times \frac{35}{4} = 55$ cm.

$\therefore$ Required number of revolutions

$= \frac{55 \times 100}{55} = 100$

95. (2) Ratio of the sides of triangle

$= \frac{1}{2} : \frac{1}{3} : \frac{1}{4}$

$= \frac{1}{2} \times 12 : \frac{1}{3} \times 12 : \frac{1}{4} \times 12$

= 6 : 4 : 3
Sum of the terms of ratio
= 6 + 4 + 3 = 13

$\therefore$ Largest side $= \left(\frac{6}{13} \times 104\right)$ cm.

= 48 cm.

96. (3) Let the third side of isosceles triangle be x units and side of equilateral triangle be y units.
According to the question,
$2x + 2x + x = 3y$
$\Rightarrow 5x = 3y$ ..... (i)
Area of equilateral triangle

$= \frac{\sqrt{3}}{4}y^2$

AB = $2x$; BD $= \frac{x}{2}$ units

$\therefore$ AD $= \sqrt{AB^2 - BD^2}$

$= \sqrt{4x^2 - \frac{x^2}{4}}$

$= \sqrt{\frac{16x^2 - x^2}{4}} = \frac{\sqrt{15}}{2}x$

Area of isosceles triangle ABC =

$\frac{1}{2} \times x \times \frac{\sqrt{15}}{2}x$

$= \frac{\sqrt{15}}{4}x^2$

$= \frac{\sqrt{15}}{4} \times \left(\frac{3}{5}y\right)^2$

$= \frac{9\sqrt{15}}{100}y^2$

$\therefore$ Required ratio

$= \frac{9\sqrt{15}}{100}y^2 : \frac{\sqrt{3}}{4}y^2$

$= 36\sqrt{5} : 100$

97. (3) In-radius (x) $= \frac{\text{Side}}{2\sqrt{3}}$

$= \frac{2\sqrt{3}}{2\sqrt{3}} = 1$ cm.

98. (1) Sides of quadrilateral
= $2x$, $3x$, $4x$ and $5x$ metre
According to the question,
$2x + 3x + 4x + 5x = 280$

$\Rightarrow 14x = 280 \Rightarrow x = \frac{280}{14} = 20$

$\therefore$ Largest side = $5x = 5 \times 20$
= 100 cm.

OR

$a : b : c : d = 2 : 3 : 4 : 5$
Sum of the terms of ratio
= 2 + 3 + 4 + 5 = 14
$a + b + c + d = 280$ metre

$\therefore$ Largest side $= \frac{5}{14} \times 280$

= 100 metre

99. (2) Diameter of circle = z = $2r$

$\Rightarrow r = \frac{z}{2}$ units

Circumference $= 2\pi r = 2\pi \times \frac{z}{2}$

$\Rightarrow y = \pi z$ units
Area $= \pi r^2$

$\Rightarrow x = \pi\left(\frac{z}{2}\right)^2$

$\Rightarrow x = \frac{\pi z^2}{4}$ sq. units

$\therefore \frac{x}{yz} = \frac{\frac{\pi z^2}{4}}{\pi z \times z} = \frac{1}{4} = 1 : 4$

100. (1)

The diagonals of a rhombus bisect each other at right angles.
Let AC = 24 cm.
$\therefore$ AO = 12 cm.
BD = 10 cm.
$\therefore$ BO = 5 cm.
In ΔAOB,

AB $= \sqrt{OA^2 + OB^2} = \sqrt{12^2 + 5^2}$

$= \sqrt{144 + 25} = \sqrt{169}$

= 13 cm.

$\therefore$ Perimeter of rhombus
= 4 × 13 = 52 cm.

101. (4) Let each of the equal sides of isosceles triangle be a units.
$\therefore$ Perimeter of triangle
= $2a$ + base
$\therefore$ $2a + 2x - 2y + 4z$
$= 4x - 2y + 6z$
$\Rightarrow 2a = 4x - 2y + 6z - (2x - 2y + 4z)$

$= (4x - 2x) + (2y - 2y) + (6z - 4z)$
$= 2x + 2z$

$\therefore\ a = \frac{1}{2}(2x + 2z) = x + z$

102. (2) In a right angled triangle, Perpendicular^2 = base^2 + perpendicular^2
$13^2 = 12^2 + 5^2 = 144 + 25 = 169$
$\Rightarrow$ 13 : 12 : 5

103. (2) Side of square field
$= \sqrt{1127.6164} = 33.58$ metre

3	$\overline{11}\,\overline{27}.\overline{61}\,\overline{64}$	33.58
3	9	
63	227	
3	189	
665	3861	
5	3325	
6708	53664	
8	53664	
6716	×	

$\therefore$ Perimeter of square field
$= (4 \times 33.58)$ metre
$= 134.32$ metre
$\therefore$ Required time

$= \left(\frac{134.32}{\frac{49}{20}}\right)$ minutes

$= \left(\frac{134.32 \times 20}{49}\right)$ minutes
$= 54.82$ minutes

TYPE-III

1. (4) Area of the floor = 8 × 6
= 48 sq. m. = 4800 sq. dm.
Area of a square tile = 4 × 4
= 16 sq. dm

$\therefore$ Number of tiles $= \frac{4800}{16} = 300$

2. (2) We will need 600 m of 50cm wide carpet to cover the floor of corridor.
$\therefore$ Total Cost = 600×15 = ₹ 9000.

3. (3) $15^2 + 20^2 = 25^2$
$\therefore$ The triangular field is right angled.
$\therefore$ Area of the field

$= \frac{1}{2} \times 15 \times 20$
= 150 sq. metre
Hence, Cost of sowing seeds
= 150 × 5 = ₹ 750

4. (3) Using Rule 7,
The distance travelled by wheel in one revolution

$= 2\pi r = 2 \times \frac{22}{7} \times 1.75\text{m} = 11\text{m}$

Therefore, the number of revolution to cover 11 km i.e. 11000 m by wheel

$= \frac{11000}{11} = 1000$

5. (4) Using Rule 7,
Circumference of wheel = $2\pi r$

$= 2 \times \frac{22}{7} \times 21$ cm = 132 cm

$\therefore$ Number of revolutions

$= \frac{92400}{132} = 700$

6. (1) Using Rule 9,
Area of rectangular field

$= \frac{1000}{\frac{1}{4}} = 4000$ sq. metre

$\therefore$ Length $= \frac{4000}{50} = 80$ metre

New length of field = 100 metre
New area = 100 × 50 = 5000 sq. metre
$\therefore$ Required expenditure

$=$ ₹ $(5000 \times \frac{1}{4})$ = ₹ 1250

7. (4) Using Rule 10,
Percentage increase in area

$= \left(x + y + \frac{xy}{100}\right)\%$

Here, $x = 100\%$
$y = 100\%$

$= \left(100 + 100 + \frac{100 \times 100}{100}\right)\%$
$= 300\%$

8. (1) Using Rule 12,
Required per cent increase =

$\left(2x + \frac{x^2}{100}\right)\%$

$= \left(2 \times 5 + \frac{5 \times 5}{100}\right)\% = 10.25\%$

9. (4) Required per cent

$= \frac{10}{100 + 10} \times 100 = \frac{100}{11} = 9\frac{1}{11}\%$

10. (4) Using Rule 10,
Required percentage increase in area

$= \left(x + y + \frac{xy}{100}\right)\%$

$= \left(20 + 20 + \frac{20 \times 20}{100}\right)\%$
$= 44\%$

11. (3) Using Rule 12,
Percentage decrease

$= \left(2x + \frac{x^2}{100}\right)\%$

$= \left(2 \times (-10) + \frac{(-10)^2}{100}\right)\%$

$= (-20 + 1)\% = -19\%$

12. (4) External radius of circular path = R metre
$\therefore 2\pi R = 528$

$\Rightarrow 2 \times \frac{22}{7} \times R = 528$

$\Rightarrow R = \frac{528 \times 7}{2 \times 22} = 84$ metre

$\therefore$ In-radius (r)
$= 84 - 14 = 70$ metre
$\therefore$ Area of path $= \pi(R^2 - r^2)$

$= \frac{22}{7}(84^2 - 70^2)$

$= \frac{22}{7}(84 + 70)(84 - 70)$

$= \frac{22}{7} \times 154 \times 14$
= 6776 sq. metre
$\therefore$ Required cost = 6776 × 10
= Rs. 67760

13. (4) Increase in each side = x% (let)

$\therefore 2x + \frac{x^2}{100} = 44$

If $x = 20$

$2x + \frac{x^2}{100} = 2 \times 20 + \frac{400}{100}$

$= 44\%$

14. (4) Percentage increase in area =

$\left(2x + \frac{x^2}{100}\right)\%$

$= \left(2 \times 10 + \frac{10 \times 10}{100}\right)\%$
$= 21\%$

15. (2) Percentage increase in area

$= \left(x + y + \frac{xy}{100}\right)\%$

$= \left(10 + 8 + \frac{10 \times 8}{100}\right)\%$

$= \left(18 + \frac{4}{5}\right)\% = 18\frac{4}{5}\%$

TYPE-IV

1. (2) Sides of the box = x, $2x$ and $3x$ cm

$\therefore$ $2(x \times 2x + 2x \times 3x + 3x \times x) = 88$

$\Rightarrow 11x^2 = 44$

$\Rightarrow x^2 = 4$

$\Rightarrow x = 2$

$\therefore$ Volume of the box

$= x \times 2x \times 3x$

$= 6x^3 = 6 \times 8 = 48$ cu.cm.

2. (1) Clearly, $r = 4$ cm, $h = 3$cm.

$\therefore$ Volume of cone $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi \times 16 \times 3 = 16\pi \text{ cm}^3$

3. (1) Volume of the tetrahedron

$= \frac{1}{3} \times$ Area of base $\times$ height

$\therefore$ Area of the base

$= \frac{\sqrt{3}}{4} \times 12 \times 12 = 36\sqrt{3}$ sq.cm

A regular tetrahedron is made up of 4 equilateral triangles. One is the base triangles and other are the 3 faces.

In ΔDBC, draw DF $\perp$ BC. ΔDBC is are equilateral triangle.

DF (perpendicular) [DF 1 AF]

$= \sqrt{DC^2 - FC^2}$

$= \sqrt{12^2 - 6^2} = \sqrt{18 \times 6}$

$= 6\sqrt{3}$ = AF [altitude of ΔABC]

[ΔABC is also an equilateral Δ with side 12cm].

$FE = \frac{1}{3} \times 6\sqrt{3} = 2\sqrt{3}$ cm.

[E is the centroid].

$\therefore AE = \sqrt{AF^2 - FE^2}$

$= \sqrt{(6\sqrt{3})^2 - (2\sqrt{3})^2}$

$= \sqrt{108 - 12} = \sqrt{96} = 4\sqrt{6}$ cm

$\therefore$ Required volume

$= \frac{1}{3} \times 36\sqrt{3} \times 4\sqrt{6}$

$= 144\sqrt{2}$ cu.cm.

4. (1) Let radius are r_1 and r_2 respectively, then $\pi r_1^2 h_1 = \pi r_2^2 h_2$ where h_1 and h_2 are heights

According to question,

$h_1 : h_2 = 1 : 2$

$\therefore r_1 : r_2 = \sqrt{h_2 : h_1} = \sqrt{2:1} = \sqrt{2} : 1$

5. (4) Circumference of the base, $C = 2\pi r$

where, r = radius of the base

$\Rightarrow r = \frac{C}{2\pi}$

Given; C = 66cm, h = 40cm

Volume $= \pi r^2 h$

$= \pi\left(\frac{C}{2\pi}\right)^2 h = \frac{C^2 h}{4\pi}$

$= \frac{66 \times 66 \times 40}{4 \times \frac{22}{7}} \text{cm}^3$

$= 7 \times 3 \times 66 \times 10 \text{ cm}^3$

$= 13860 \text{ cm}^3$

6. (2) Let the radii of two cylinders are r_1, r_2 and length of the cylinders are h_1, h_2 respectively.

According to the question

$\frac{r_1}{r_2} = \frac{2}{3}$ and $\frac{h_1}{h_2} = \frac{5}{3}$

$\therefore$ Ratio of their volume

$= \pi r_1^2 h_1 : \pi r_2^2 h_2$

$= r_1^2 h_1 : r_2^2 h_2$

$= (2)^2 \times 5 : (3)^2 \times 3$

$= 4 \times 5 : 9 \times 3 = 20 : 27$

7. (4) If r be radius of base and h the height, then

Curved surface of cylindrical pillar $= 2\pi rh$.

and volume $= \pi r^2 h$.

$\therefore 2\pi rh = 264 \text{ m}^2$ ...(i)

$\pi r^2 h = 924 \text{ m}^3$ ...(ii)

On dividing (ii) by (i), we get

$\frac{\pi r^2 h}{2\pi rh} = \frac{924}{264}$m.

$\Rightarrow \frac{r}{2} = \frac{924}{264}$m

$\Rightarrow r = \frac{924 \times 2}{264}$m = 7 m

$\therefore$ Diameter = 2 × 7 = 14m

From (i),

$h = \frac{264}{\pi \times d} = \frac{264 \times 7}{22 \times 14} = 6$m

$\therefore$ Required ratio

$= \frac{14}{6}$ i.e, 7 : 3

8. (3) The volume of iron used

$= \pi r_1^2 h - \pi r_2^2 h = \pi h\left(r_1^2 - r_2^2\right)$

$= \frac{22}{7} \times 20\left(4^2 - 3^2\right)$

$= \frac{22}{7} \times 20 \times 7 = 440$ cu.cm.

9. (1) The pipe can be assumed as hollow cylinder.

External radius $= \frac{8}{2} = 4$ cm,

Thickness = 1 cm

$\therefore$ Internal radius

$= 4 - 1 = 3$ cm.

Volume of the material

$= \pi h (R^2 - r^2)$

$= \frac{22}{7} \times 21 \times \left(4^2 - 3^2\right)$

$= \frac{22}{7} \times 21 \times 7$

$= 462 \text{ cm}^3$.

Now, 1cm^3 iron weighs = 8 gm

$\therefore$ 462 cm^3 iron weighs

$= 462 \times 8$ gm

$= \frac{462 \times 8}{1000}$ kg

= 3.696 kg

10. (2) Volume of the cube = $(\text{edge})^3$

$= (11 \times 11 \times 11)\text{cm}^3$

$\therefore$ Volume of cylinder

$= 11 \times 11 \times 11$

$\Rightarrow \pi r^2 \times 14 = 11 \times 11 \times 11$

$\Rightarrow r^2 = \frac{11 \times 11 \times 11 \times 7}{22 \times 14} = \frac{11 \times 11}{4}$

$\Rightarrow r = \sqrt{\frac{(11)^2}{4}} = \frac{11}{2} = 5.5$ cm

11. (2) Let the radius of base be r metres.

$\therefore \pi r^2 h = 9\pi h$

$\Rightarrow r^2 = 9 \Rightarrow r = 3$ m

$\therefore$ Diameter = 2 × 3

= 6 metres.

12. (3) Curved surface area of cylinder = Area of rectangular tin foil

$\Rightarrow 2\pi rh = 16 \times 22$

$\Rightarrow 2 \times \frac{22}{7} \times r \times 16 = 16 \times 22$

$\Rightarrow r = \frac{7}{2}$ cm

$\therefore$ Volume of the cylinder = $\pi r^2 h$

$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 16 = 616 \text{ cm}^3$

13. (1) Let the thickness of the pipe be x cm

$\therefore$ If the external radius = 9 cm then, in radius = $(9 - x)$ cm

According to the question,

$\pi \times 9^2 \times 14 - \pi \times 14 \times (9 - x)^2 = 748$

$\Rightarrow \pi \times 14 (81 - (81 + x^2 - 18x)) = 748$

$\Rightarrow \pi \times 14 (-x^2 + 18x) = 748$

$\Rightarrow -x^2 + 18x$

$= \frac{748}{\pi \times 14} = \frac{748 \times 7}{22 \times 14}$

$\Rightarrow -x^2 + 18x = 17$

$\Rightarrow x^2 - 18x + 17 = 0$

$\Rightarrow x^2 - 17x - x + 17 = 0$

$\Rightarrow x(x - 17) - 1(x - 17) = 0$

$\Rightarrow (x - 1)(x - 17) = 0$

$\Rightarrow x = 1$ or 17 but

$x = 17$ is inadmissible

$\therefore x = 1$ cm

14. (2) When the two iron sheets are immersed in water, it will displace water equal to its volume.

Let the water be raised in the vessel by x cm.

$\therefore 2 \times \frac{4}{3} \times \pi \times (3)^3 = \pi \times (6)^2 \times x$

$\Rightarrow 72\pi = 36\pi x$

$\Rightarrow x = \frac{72}{36} = 2$ cm

15. (1) Let the radius of the base of cylinder A be $3x$ units and that of cylinder B be $2x$ units.

Similarly, height of cylinder A = ny units and that of cylinder B be y units.

Since, Volume of cylinder = $\pi r^2 h$

According to the question

$\pi (3x)^2 \times ny = 3\pi (2x)^2 \times y$

$\Rightarrow 9x^2 y.n = 12x^2 y$

$\Rightarrow n = \frac{12}{9} = \frac{4}{3}$

16. (1) Volume of water flowing per second = $\pi r^2 h$

$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 12 = 462 \text{ cm}^3$

$\therefore$ Volume of water pumped out in 1 hour

$= 462 \times 60 \times 60 \text{ cm}^3$

$= 1663200 \text{ cm}^3 = 1663.2$ litres

17. (4) Let the radius of base be r cm and height be 16 cm.

then $2\pi rh = 1056$

$\Rightarrow 2 \times \frac{22}{7} \times r \times 16 = 1056$

$\Rightarrow r = \frac{1056 \times 7}{2 \times 22 \times 16} = \frac{21}{2}$ cm

$\therefore$ Volume of the cylinder = $\pi r^2 h$

$= \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times 16 = 5544 \text{ cm}^3$

18. (3) Let the radius of the new cylinder be R then,

$2\pi r^2 h = \pi R^2 h$

$\Rightarrow R^2 = 2r^2 \Rightarrow R = \sqrt{2}r = r\sqrt{2}$

19. (1) $\frac{d_1}{d_2} = \frac{r_1}{r_2} = \frac{3}{2}$

$\therefore \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2} = 1 \Rightarrow \frac{9}{4} \times \frac{h_1}{h_2} = 1$

$\Rightarrow \frac{h_1}{h_2} = \frac{4}{9} \Rightarrow 4 : 9$

20. (1) Volume of the remaining solid

$\pi r^2 h - \frac{1}{3}\pi r^2 h$

$= \frac{2}{3}\pi r^2 h = \frac{2}{3}\pi \times 6 \times 6 \times 10$

$= 240\pi$ cu.cm.

21. (3) Volume of solid cylinder

$= \pi r^2 h$

Volume of cone = $\frac{1}{3}\pi r^2 h$

Difference = $\pi r^2 h - \frac{1}{3}\pi r^2 h$

$= \frac{2}{3}\pi r^2 h = \frac{2}{3} \times \frac{22}{7} \times 5 \times 5 \times 12$

$= 628.57$ cu.cm.

22. (1) Let radius be increased by x cm.

then Volume of cylinder

$= \pi(10 + x)^2 \times 4$

Again, let height be increased by x cm.

then Volume of cylinder

$= \pi \times 10^2 (4 + x)$

$\therefore \pi (10 + x)^2 \times 4$

$= \pi (10)^2 (4 + x)$

$\Rightarrow (10 + x)^2 = 25 (4 + x)$

$\Rightarrow 100 + 20x + x^2 = 100 + 25x$

$\Rightarrow x^2 - 5x = 0 \Rightarrow x(x - 5) = 0$

$\Rightarrow x = 5$ cm

23. (2)

$\frac{\text{Volume of cylinder}}{\text{Volume of cone}} = \frac{\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2}$

$= 3.\left(\frac{r_1}{r_2}\right)^2 \left(\frac{h_1}{h_2}\right)$

$= 3 \times \left(\frac{\sqrt{3}}{\sqrt{2}}\right)^2 \times \frac{\sqrt{2}}{\sqrt{3}}$

$= 3 \times \frac{\sqrt{3}}{\sqrt{2}} = 3\sqrt{3} : \sqrt{2}$

24. (4) $2\pi rh : 2\pi rh + 2\pi r^2 = 1 : 2$

$\Rightarrow 2\pi rh : 616 = 1 : 2$

$\Rightarrow 2\pi rh = \frac{616}{2} = 308$

$\therefore 2\pi rh + 2\pi r^2 = 616$

$\Rightarrow 308 + 2\pi r^2 = 616$

$\Rightarrow 2\pi r^2 = 308$

$\Rightarrow r^2 = \frac{308 \times 7}{22 \times 2} = 49$

$\Rightarrow r = 7$

$\therefore 2 \times \frac{22}{7} \times 7 \times h = 308$

$\Rightarrow h = \frac{308}{44} = 7$

$\therefore$ Volume of cylinder = $\pi r^2 h$

$= \frac{22}{7} \times 7 \times 7 \times 7 = 1078$ cu.cm.

25. (4) If the radius of base of cylinder be r units and its height be h units, then

$2\pi r = a$

$\Rightarrow r = \frac{a}{2\pi}$ units

$\therefore$ Volume of cylinder = $\pi r^2 h$

$\Rightarrow V = \pi \times \frac{a^2}{4\pi^2} \times h$

$\Rightarrow h = \frac{4\pi V}{a^2}$ units

26. (4) Volume of sphere

$= \frac{4}{3}\pi \times (6)^3$ cu. cm.

$\therefore$ Volume of cylinder = $\pi r^2 h$

$= \pi \times (6)^2 \times h$

Now, $\pi \times (6)^2 \times h = \frac{4}{3}\pi \times (6)^3$

$\Rightarrow \pi = \frac{4}{3} \times 6 = 8$ cm.

27. (1) Diagonal of cube $= \sqrt{3a^2}$

$\therefore$ According to question,

$\sqrt{3}\ a = 2\sqrt{3}$

$\Rightarrow a = 2$

$\therefore$ Its volume $= a^3 = 2^3$

$= 8$ cu cm

28. (1) Volume of cube = $(\text{Side})^3$

$\therefore$ Ratio of volume = 27 : 1

$\therefore$ Ratio of the edges $= \sqrt[3]{\frac{27}{1}}$

or 3 : 1

29. (3) Surface area of cuboid

$= 2 \times (l \times b + b \times h + h \times l)$

$= 2\ (3x \times 2x + 2x \times x + x \times 3x)$

$= 2\ (6x^2 + 2x^2 + 3x^2) = 22x^2$

$\therefore 22x^2 = 88$

$\Rightarrow x^2 = 4$

$\Rightarrow x = \sqrt{4} = 2$

$\therefore l = 6$ cm, $b = 4$ cm, $h = 2$ cm

$\therefore$ Volume of cuboid $= l \times b \times h$

$= 6 \times 4 \times 2\ \text{cm}^3 = 48\ \text{cm}^3$

30. (3) Diagonal of a cube

$= \sqrt{3} \times \text{side}$

$\Rightarrow 4\sqrt{3} = \sqrt{3} \times \text{side}$

$\therefore$ Side = 4 cm

$\therefore$ Volume of the cube

$= (\text{side})^3 = (4)^3 = 64\ \text{cm}^3$

31. (2) Let the length of tank = x dm

Depth $= \frac{x}{3}$ dm

$\Rightarrow$ Breadth $= \left(x - \frac{x}{3}\right) \times \frac{1}{3} \times \frac{1}{2}$

$= \frac{2x}{3} \times \frac{1}{3} \times \frac{1}{2} = \frac{x}{9}$ dm

$\therefore$ Volume of tank

$= x \times \frac{x}{9} \times \frac{x}{3} = \frac{x^3}{27}$

According to the question,

$\frac{x^3}{27} = 216$

$\Rightarrow x^3 = 27 \times 216$

$\Rightarrow x = (27 \times 216)^{1/3}$

$\therefore x = 3 \times 6 = 18$ dm

32. (1) The external dimensions of the box are :

Length = 20 cm, Breadth = 12cm, Height = 10 cm

External volume of the box

$= 20 \times 12 \times 10 = 2400\ \text{cm}^3$.

Thickness of the wood = 1 cm

Internal length = 20 – 2 = 18 cm

$\therefore$ Internal breadth

= 12 – 2 = 10 cm

Internal height = 10 – 2 = 8 cm

Internal volume

$= 18 \times 10 \times 8 = 1440\ \text{cm}^3$.

Volume of the wood

$= (2400 - 1440)\ \text{cm}^3 = 960\ \text{cm}^3$.

33. (1) If l, b, h be the dimensions of the cuboid, then volume of the cuboid $= l \times b \times h$

Now, $x = l \times b$, $y = l \times h$,

$z = b \times h$

$\therefore xyz = l^2 b^2 h^2 = v^2$

34. (4) Water supplied by pipe in 1 hour = $(0.3 \times 0.2 \times 20 \times 1000)$ cubic metre = 1200 cubic metre

$\therefore$ Total time

$= \frac{\text{Volume of water to be filled in the tank}}{1200}$

$= \frac{200 \times 150 \times 8}{1200} = 200$ hours

35. (1) Length of the box

$= 40 - 2 \times 4 = 32$ cm

Breadth of the box $= 15 - 2 \times 4$

= 7 cm

Height of the box = 4 cm

$\therefore$ Volume of the box $= 32 \times 7 \times 4$

= 896 cu. cm.

36. (4) Let the length, breadth and height of the cuboid be x, y and z cm respectively, then

$xy = 12$; $yz = 20$; $zx = 15$

$\therefore x^2y^2z^2 = 12 \times 20 \times 15$

$= 3600\ \text{cm}^6$

$\therefore v = xyz = \sqrt{3600} = 60\ \text{cm}^3$

37. (4) Let the length, breadth and height of a cuboid be l, b and h units respectively, then

$p = lb$; $q = bh$, $r = hl$

$\Rightarrow pqr = l^2b^2h^2$

$\therefore$ Volume of the cuboid $= lbh$

$= \sqrt{pqr}$

38. (2) If the height of the godown be h metre, then

$2(15 \times 12) = 2 \times h(15 + 12)$

$\Rightarrow 27h = 15 \times 12$

$\Rightarrow h = \frac{15 \times 12}{27} = \frac{20}{3}$ metre

$\therefore$ Volume of the godown

$= \frac{15 \times 12 \times 20}{3}$

= 1200 cu.metre

39. (3) Let Edge of cube = x cm

$\therefore 6x^2 = 96 \Rightarrow x^2 = \frac{96}{6} = 16$

$\Rightarrow x = \sqrt{16} = 4$ cm

Volume of cube $= (\text{edge})^3 = (4)^3$

= 64 cu. cm

40. (2) Let the height be h_1 and h_2 and radii be r and 2r respectively.

$\therefore \frac{V_1}{V_2} = \frac{\frac{1}{3}\pi r^2 h_1}{\frac{1}{3}\pi (2r)^2 \times h_2}$

$\Rightarrow \frac{r^2 \times h_1}{4r^2 \times h_2} = \frac{2}{3}$

$\Rightarrow \frac{h_1}{h_2} = \frac{2}{3} \times \frac{4}{1} = \frac{8}{3} = 8 : 3$

41. (3) Case I : When height $= h_1$, radius $= r_1$,

Volume of the cone $V_1 = \frac{1}{3}\pi r_1^2 h_1$

Case II,

When height $h_2 = 2h_1$,

radius $r_2 = r_1$ [radius is same]

Volume of the cone V_2

$= \frac{1}{3}\pi r_1^2 . 2h_1$

$\therefore$ The required ratio = 1 : 2

42. (4) Volume of original cone, V_1

$= \frac{1}{3}\pi r^2 h$

Now, radius of new cone, $r_1 = 2r$

height, $h_1 = h$

$\therefore$ Volume $V_2 = \frac{1}{3}\pi r_1^2 h_1$

$= \frac{1}{3}\pi (2r)^2 \times h = \frac{4}{3}\pi r^2 h$

$\therefore \frac{V_2}{V_1} = \frac{\frac{4}{3}\pi r^2 h}{\frac{1}{3}\pi r^2 h} = 4 : 1$

43. (1) Volume of sphere

$= \frac{4}{3}\pi \times 8^3 =$ Volume of cone

Volume of cone $= \frac{1}{3}\pi r^2 h$

$\therefore \frac{1}{3} \times \pi \times 8 \times 8 \times h$

$= \frac{4}{3}\pi \times 8^3$

$\Rightarrow h = 32$ cm.

$\therefore$ Slant height $= \sqrt{h^2 + r^2}$

$= \sqrt{32^2 + 8^2} = \sqrt{1024 + 64}$

$= \sqrt{64\ (16 + 1)} = 8\sqrt{17}$ cm.

44. (1) Volume of the cone

$= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times (15)^2 \times 15$

$= \frac{1}{3}\pi \times (15)^3 \text{ cm}^3$

Volume of the wooden sphere

$= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi \times (15)^3 \text{ cm}^3$

Wasted wood

$= \frac{4}{3}\pi \times (15)^3 - \frac{1}{3}\pi(15)^3$

$= \pi \times (15)^3 \text{ cm}^3$

$\therefore$ Required percentage

$= \frac{\pi \times (15)^3}{\frac{4}{3}\pi(15)^3} \times 100 = 75\%$

45. (2)

In ΔAPD and ΔAOC

$\frac{AP}{AO} = \frac{PD}{OC}$ [$\because$ ΔAPD $\cong$ Δ AOC]

$PD = \frac{AP \times OC}{AO} = \frac{12 \times 7}{24} = 3.5$ cm

$\therefore$ Volume $= \frac{1}{3}\pi r^2 \times h$

$= \frac{1}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times 12$

$= 154 \text{ cm}^3$

46. (4) Area of the base of cone

$= 770 \text{ cm}^2$

$\Rightarrow r^2 = 770$

$\Rightarrow \frac{22}{7}r^2 = 770$

$\Rightarrow r^2 = \frac{770 \times 7}{22} = 245$

$\therefore r = \sqrt{245} = 7\sqrt{5}$ cm

Curved surface area of the cone

$= \pi r l = 814$

$\Rightarrow \frac{22}{7} \times 7\sqrt{5} \times l = 814$

$\Rightarrow l = \frac{814}{22 \times \sqrt{5}} = \frac{37}{\sqrt{5}}$ cm

Let the height of the cone be h cm, then $h^2 + r^2 = l^2$

$\Rightarrow h^2 + \left(7\sqrt{5}\right)^2 = \left(\frac{37}{\sqrt{5}}\right)^2$

$\Rightarrow h^2 + 245 = \frac{1369}{5}$

$\Rightarrow h^2 = \frac{1369}{5} - 245$

$\Rightarrow h^2 = \frac{1369 - 1225}{5} = \frac{144}{5}$

$\Rightarrow h = \frac{12}{\sqrt{5}}$ cm

$\therefore$ Volume of the cone $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 7\sqrt{5} \times 7\sqrt{5} \times \frac{12}{\sqrt{5}}$

$= 616\sqrt{5} \text{ cm}^3$

47. (4) Let the height of the cones be h_1 and h_2 respectively.

$\therefore \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = \frac{1}{4}$

(r_1 and r_2 are radii)

$\Rightarrow \frac{h_1}{h_2} = \frac{1}{4} \times \frac{r_2^2}{r_1^2} = \frac{1}{4} \times \frac{25}{16} = \frac{25}{64}$

$\Rightarrow 25 : 64$

48. (4) Let H and R be the height and radius of bigger cone respectively and h and r that of smaller cone.

From triangles AOB and AMN.

$\angle$A is common and $MN \parallel OB$.

$\therefore$ Triangles AOB and AMN are similar,

$\therefore \frac{AO}{AM} = \frac{BO}{MN}$

$\Rightarrow \frac{30}{h} = \frac{R}{r}$ ...(i)

Volume of smaller cone $= \frac{1}{3}\pi r^2 h$

Volume of bigger cone $= \frac{1}{3}\pi R^2 H$

According to the question,

$\frac{1}{3}\pi r^2 h = \left(\frac{1}{3}\pi R^2 H\right) \times \frac{1}{27}$

$\Rightarrow r^2 h = \frac{R^2 H}{27} \Rightarrow 27r^2 h = R^2 H$

$\Rightarrow \frac{27h}{H} = \frac{R^2}{r^2}$

$\Rightarrow \frac{27h}{H} = \left(\frac{30}{h}\right)^2$ [From (i)]

$\Rightarrow \frac{27h}{H} = \frac{900}{h^2}$

$\Rightarrow 27h^3 = 900H = 900 \times 30$

$\Rightarrow h^3 = \frac{900 \times 30}{27} = 1000$

$\Rightarrow h = \sqrt[3]{1000} = 10$ cm

$\therefore$ Required height $= 30 - 10$

$= 20$ cm

49. (2) Let the radius of the base of the cone be $5x$ cm and its height be $12x$ cm.

$\therefore V = \frac{1}{3}\pi r^2 h$

$\Rightarrow 314\frac{2}{7} = \frac{1}{3} \times \frac{22}{7} \times 5x \times 5x \times 12x$

$\Rightarrow x^3 = \frac{2200 \times 3 \times 7}{7 \times 22 \times 25 \times 12} = 1$

$\Rightarrow x = 1$

$\therefore$ Slant height of the cone

$= \sqrt{5^2 + 12^2} = \sqrt{25 + 144}$

$= \sqrt{169} = 13$ cm.

[Note : For a right circular cone, $5^2 + 12^2 = 13^2$]

50. (3) Let the height be h units.

$\therefore \frac{1}{3}\pi h(r_1^2 + r_2^2) = \frac{4}{3}\pi R^3$

$\Rightarrow h(r_1^2 + r_2^2) = 4R^3$

$\Rightarrow h = \frac{4R^3}{r_1^2 + r_2^2}$

51. (1) $\frac{V_1}{V_2} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = \left(\frac{r_1}{r_2}\right)^2 \times \frac{h_1}{h_2}$

$= \left(\frac{3}{4}\right)^2 \times \frac{4}{3}$

$= \frac{3}{4} \times \frac{3}{4} \times \frac{4}{3} = \frac{3}{4} \Rightarrow 3 : 4$

52. (4) Let FQ = r_1, DP = r_2 and BO = r_3

Also, AQ = QP = PO = $\frac{h}{3}$

From Δ AFQ and Δ ADP,

$\frac{FQ}{DP} = \frac{AQ}{AP}$

$\Rightarrow \frac{r_1}{r_2} = \frac{1}{2} \Rightarrow r_2 = 2r_1$

From Δ AFQ and Δ ABO,

$\frac{FQ}{BO} = \frac{AQ}{AO}$

$\Rightarrow \frac{r_1}{r_3} = \frac{1}{3} \Rightarrow r_3 = 3r_1$

$\therefore V_1 : V_2 : V_3 = \frac{1}{3}\pi r_1^2 \times \frac{h}{3} :$

$\frac{1}{3}\pi\frac{h}{3}\left(r_1^2 + r_2^2 + r_1 r_2\right)$

$: \frac{1}{3}\pi\frac{h}{3}\left(r_2^2 + r_3^2 + r_2 r_3\right)$

$= r_1^2 : \left(r_1^2 + 4r_1^2 + 2r_1^2\right)$

$: \left(4r_1^2 + 9r_1^2 + 6r_1^2\right)$

$= r_1^2 : 7r_1^2 : 19r_1^2$

$= 1 : 7 : 19$

53. (1) Volume of bucket

$= \frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2)$

$= \frac{1}{3} \times \frac{22}{7} \times 45(28^2 + 7^2 + 28 \times 7)$

$= \frac{1}{3} \times \frac{22}{7} \times 45(784 + 49 + 196)$

$= \frac{1}{3} \times \frac{22}{7} \times 45 \times 1029$

= 48510 cu. cm.

54. (3) Let, Height of the cone = $3x$ cm and diameter = $2x$ cm.

$\therefore$ Radius = x cm.

Volume = $\frac{1}{3}\pi r^2 h$

$\Rightarrow 1078 = \frac{1}{3} \times \frac{22}{7} \times x^2 \times 3x$

$\Rightarrow 1078 = \frac{22}{7} x^3$

$\Rightarrow x^3 = \frac{1078 \times 7}{22} = 343$

$\Rightarrow x = \sqrt[3]{343} = 7$

$\therefore$ Height = 3 × 7 = 21 cm

55. (2) Original volume of cone

$= \frac{1}{3}\pi r^2 h$

New volume of cone

$= \frac{1}{3}\pi(2r)^2 h = \frac{4}{3}\pi r^2 h$

$= 4 \times \frac{1}{3}\pi r^2 h$

i.e. Four times of the previous volume.

56. (1) Required ratio

$= \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2}$

$= \left(\frac{r_1}{r_2}\right)^2 \times \frac{h_1}{h_2} = \left(\frac{3}{5}\right)^2 \times \frac{1}{3}$

$= \frac{3}{25} \Rightarrow 3 : 25$

57. (2) $\frac{1}{3}\pi a^2 h = \frac{4}{3}\pi a^3$

$\Rightarrow h = 4a$

58. (3) Circumference of the base of cone = 33 cm

$\Rightarrow 2\pi r = 33$

$\Rightarrow 2 \times \frac{22}{7} \times r = 33$

$\Rightarrow r = \frac{33 \times 7}{2 \times 22} = \frac{21}{4}$ cm

$\therefore$ Volume of the cone

$= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times \frac{21}{4} \times \frac{21}{4} \times 16$

= 462 cu.cm.

59. (2) $2\pi r = 8 \Rightarrow \pi r = 4$

$\Rightarrow r = \frac{4}{\pi}$

$\therefore V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times \frac{4 \times 4}{\pi \times \pi} \times 21$

$= \frac{112}{\pi}$ cu.cm.

60. (3) $\frac{V_1}{V_2} = \frac{r_1^2 h_1}{r_2^2 h_2}$

$\Rightarrow \frac{4}{1} = \frac{25}{16} \times \frac{h_1}{h_2}$

$\Rightarrow \frac{h_1}{h_2} = \frac{16 \times 4}{25} = \frac{64}{25}$ or 64 : 25

61. (4) $\pi r^2 = 154$

$\Rightarrow \frac{22}{7} \times r^2 = 154$

$\Rightarrow r^2 = \frac{154 \times 7}{22} \Rightarrow r = 7$ metre

$\therefore \frac{1}{3}\pi r^2 h = 1232$

$\Rightarrow \frac{h}{3} = \frac{1232}{154} = 8$

$\Rightarrow h = 24$ metre

Area of canvas curved surface area of cone = $\pi r l$

$= \pi r\sqrt{h^2 + r^2}$

$= \frac{22}{7} \times 7 \times \sqrt{24^2 + 7^2}$ sq. metre

= 22 × 25 = 550 sq. metre

$\therefore$ Its length = $\frac{550}{2} = 275$ metre

62. (2) Ratio of the volumes of cone

$= \frac{\frac{1}{3}\pi r_1^2 h}{\frac{1}{3}\pi r_2^2 h} = \left(\frac{r_1}{r_2}\right)^2 = \left(\frac{3}{4}\right)^2$

$= \frac{9}{16}$ or 9 : 16

63. (3) External radius,

$R = \frac{6}{2} = 3$ cm

Internal radius, r

$= 3 - \frac{1}{2} = \frac{5}{2}$ cm.

$\therefore$ Volume of hollow sphere (material)

$= \frac{4}{3}\pi (R^3 - r^3)$

$= \frac{4}{3}\pi\left[3^3 - \left(\frac{5}{2}\right)^3\right]$ cm^3

$= \frac{4}{3} \times \frac{22}{7}\left(27 - \frac{125}{8}\right)$ cm.^{3}

$= \frac{4}{3} \times \frac{22}{7}\left(\frac{216-125}{8}\right)$ cm^3

$= \frac{4}{3} \times \frac{22}{7} \times \frac{91}{8}$

$= \frac{143}{3} = 47\frac{2}{3}$ cm^3

64. (2) According to question

$r_1 + r_2 = 10$ ... (i)

$\frac{4}{3}\pi (r_1^3 + r_2^3) = 880$

$\Rightarrow r_1^3 + r_2^3 = \frac{880 \times 3 \times 7}{22 \times 4} = 210$ ...(ii)

$\therefore (r_1 + r_2)^3 = 1000$

$\Rightarrow r_1^3 + r_2^3 + 3r_1r_2(r_1 + r_2) = 1000$

$\Rightarrow 210 + 3r_1r_2(10) = 1000$

$\Rightarrow 30r_1r_2 = 1000 - 210 = 790$

$\Rightarrow r_1r_2 = \frac{790}{30} = \frac{79}{3} = 26\frac{1}{3}$

65. (4) Volume of sphere

$= \frac{4}{3}\pi r^3$

Volume of second sphere

$= \frac{4}{3}\pi(2r)^3 = 8 \times \left(\frac{4}{3}\pi r^3\right)$

66. (4) Ratio of the volume of both spheres $= \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3}$

$= \left(\frac{r_1}{r_2}\right)^3 = \left(\frac{3}{2}\right)^3 = \frac{27}{8}$

or 27 : 8

67. (2) If the radius of the solid hemisphere be r cm,

then total surface area = $3\pi r^2$

$\Rightarrow 3\pi r^2 = 108\pi$

$\Rightarrow r^2 = \frac{108}{3} = 36$

$\Rightarrow r = \sqrt{36} = 6$ cm

$\therefore$ Volume of the hemisphere

$= \frac{2}{3}\pi r^3$

$= \frac{2}{3}\pi \times 6 \times 6 \times 6$

$= 144\pi$ cubic cm

68. (4) Radius of the largest sphere

$= \frac{7}{2}$ cm

$\therefore$ Volume of sphere $= \frac{4}{3}\pi r^3$

$= \left(\frac{4}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2}\right)$ cm^3

$= 179.67$ cm^3

69. (3) Let the radii of the first and second sphere be r_1 and r_2 units respectively.

According to the question,

$\frac{4\pi r_1^2}{4\pi r_2^2} = \frac{4}{9}$

$\Rightarrow \frac{r_1^2}{r_2^2} = \frac{4}{9} \Rightarrow \frac{r_1}{r_2} = \frac{2}{3}$

$\therefore \frac{V_1}{V_2} = \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3} = \frac{r_1^3}{r_2^3}$

$= \left(\frac{2}{3}\right)^3 = \frac{8}{27}$ or 8 : 27

70. (4) Let the radius of sphere be r_1 units and that of hemisphere be r_2 units, then,

$\frac{4}{3}\pi r_1^3 = \frac{2}{3}\pi r_2^3$

$\Rightarrow \left(\frac{r_1}{r_2}\right)^3 = \frac{1}{2}$

$\Rightarrow \frac{r_1}{r_2} = \frac{1}{\sqrt[3]{2}}$ or $1 : \sqrt[3]{2}$

71. (1) Volume of original sphere

$= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi \times 3 \times 3 \times 3$

$= 36\pi$ cu. cm.

$\therefore 8 \times \frac{4}{3}\pi r_1^3 = 36\pi$

$\Rightarrow r_1^3 = \frac{36 \times 3}{8 \times 4} = \frac{27}{8}$

$\therefore r_1 = \sqrt[3]{\frac{27}{8}} = \frac{3}{2} = 1.5$ cm

72. (1) Surface area of sphere $= 4\pi r^2$

$\Rightarrow 4\pi r^2 = 8\pi$

$\Rightarrow r^2 = 2 \Rightarrow r \Rightarrow \sqrt{2}$ units

$\therefore$ Volume of sphere

$= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi \times \left(\sqrt{2}\right)^3$

$= \frac{8\sqrt{2}}{3}\pi$ cubic units

73. (3) Volume of the pyramid $= \frac{1}{3} \times$ height $\times$ area of the base

$= \frac{1}{3} \times 10 \times 57 = 190$ cu.cm.

74. (3) Area of the base

$= 6 \times \frac{\sqrt{3}}{4} \times (2a)^2$

$= 6 \times \frac{\sqrt{3}}{4} \times 4a^2 = 6\sqrt{3}a^2$ sq.cm.

Height $= \sqrt{\left(\frac{5a}{2}\right)^2 - (2a)^2}$

$= \sqrt{\frac{25}{4}a^2 - 4a^2} = \sqrt{\frac{9a^2}{4}}$

$= \frac{3}{2}a$ cm.

$\therefore$ Volume of pyramid

$= \frac{1}{3} \times$ area of base $\times$ height

$= \frac{1}{3} \times 6\sqrt{3}a^2 \times \frac{3}{2}a$

$= 3\sqrt{3}a^3$ cm^3

75. (3) Area of the base = 40 × 40 = 1600 sq.cm

We know, Volume of pyramid

$= \frac{1}{3} \times$ area of base $\times$ height

$\Rightarrow 8000 = \frac{1}{3} \times 1600 \times h$

$\Rightarrow h = \frac{8000 \times 3}{1600} = 15$ cm

76. (3) Area of the base

$= \frac{1}{2}$ (sum of parallel sides) ×(perpendicular distance)

$= \frac{1}{2}$ (14 + 8) × 8 = 88 sq. cm.

∴ Volume = Area of the base × height

⇒ 1056 = 88 × h

$\Rightarrow h = \frac{1056}{88} = 12$ cm

77. (3) Total surface area of prism = Curved surface area + 2 × Area of base

⇒ 608 = Perimeter of base × height + 2 × Area of base

⇒ 608 = $4x \times 15 + 2x^2$

(Where x = side of square)

⇒ $x^2 + 30x - 304 = 0$

⇒ $x^2 + 38x - 8x - 304 = 0$

⇒ $x(x + 38) - 8(x + 38) = 0$

⇒ $(x - 8)(x + 38) = 0$

⇒ $x = 8$

⇒ Volume of prism = Area of base × height

= 8 × 8 ×15 = 960 cu. cm.

78. (2) Area of the base $= \frac{\sqrt{3}}{4} \times (\text{side})^2$

$= \frac{\sqrt{3}}{4} \times 8 \times 8 = 16\sqrt{3}$ sq. cm

∴ Volume of prism = Area of base × height

$= 16\sqrt{3} \times 10 = 160\sqrt{3}$ cu. cm

79. (4) Volume of prism = Area of base × height

$\Rightarrow 366 = \frac{1}{2} \times 4 \times 28 \times h$

$\Rightarrow h = \frac{366}{56} = 6.53$ cm

80. (1) Area of base = Area of right angled triangle

$= \frac{1}{2} \times 5 \times 12 = 30$ sq.cm.

[$\because 5^2 + 12^2 = 13^2$]

∴ Volume $= \frac{1}{3} \times$ Area of base × height

$\Rightarrow 330 = \frac{1}{3} \times 30 \times h$

$\Rightarrow h = \frac{330}{10} = 33$ cm

81. (1) Volume of earth : Volume of moon

$= \frac{4}{3}\pi r^3 : \frac{4}{3}\pi\left(\frac{r}{4}\right)^3 = 64 : 1$

82. (3) In both the vessels, the volume of liquid will be same.

∴ Volume of liquid in cylinder = Volume of liquid in cone.

Let the height of liquid column in cylinder be h cm, then

$\pi r^2 h = \frac{1}{3}\pi \times (12)^2 \times 50$

$\therefore h = \frac{1}{3} \times \frac{12 \times 12 \times 50}{10 \times 10} = 24$cm

83. (2) Volume of the cone

$= \frac{1}{3}\pi \times (15)^2 \times 108$ cm

Volume of cylinder

$= \pi \times r^2 \times 9$ cm^3

According to the question,

$\pi \times r^2 \times 9$

$= \frac{1}{3}\pi \times 15 \times 15 \times 108$

$\Rightarrow r^2 = \frac{5 \times 15 \times 108}{9}$

$\Rightarrow r^2 = 900 \Rightarrow r = 30$

Diameter of base

= 2r = 2 × 30 = 60 cm.

84. (2) Total surface area of cube $= 6x^2$

Surface area of sphere $= 4\pi r^2$

According to question

$6x^2 = 4\pi r^2$

$\Rightarrow r = \sqrt{\frac{6x^2}{4\pi}} = \frac{x\sqrt{6}}{2\sqrt{\pi}}$

So, Volume of sphere

$= \frac{4}{3}\pi \times \frac{x\sqrt{6}}{2\sqrt{\pi}} \times \frac{x\sqrt{6}}{2\sqrt{\pi}} \times \frac{x\sqrt{6}}{2 \times \sqrt{\pi}}$

$= \frac{4}{3}\pi \times \frac{6x^2 \times x\sqrt{6}}{8\pi \times \sqrt{\pi}}$

∴ Required ratio

$= \frac{x^3 \times 3 \times 8\pi \times \sqrt{\pi}}{4\pi \times 6x^3 \times \sqrt{6}} = \frac{\sqrt{\pi}}{\sqrt{6}} = \sqrt{\pi} : \sqrt{6}$

85. (2) $2\pi r = 22$

$\Rightarrow 2 \times \frac{22}{7} \times r = 22 \quad \therefore r = \frac{7}{2}$

Volume of cylinder $= \pi r^2 h$

$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 12 = 462$ cm^3

86. (2) As the sphere fits exactly inside the cube, the diameter of sphere will be equal to the edge of cube.

Let the edge of cube be x units.

∴ Radius of sphere $= \frac{x}{2}$

Then,

$\frac{\text{Volume of cube}}{\text{Volume of sphere}}$

$= \frac{x^3}{\frac{4}{3}\pi\left(\frac{x}{2}\right)^3} = \frac{6}{\pi}$ or 6 : π

87. (1) Volume of sphere $= \frac{4}{3}\pi r^3$

Volume of cylinder $= \pi r^2 h$

As given,

$\pi r^2 h = \frac{4}{3}\pi r^3 \Rightarrow h = \frac{4}{3}r$

$\Rightarrow \frac{h}{r} = \frac{4}{3} \Rightarrow \frac{h}{2r} = \frac{4}{3 \times 2} = \frac{2}{3}$

$\Rightarrow \frac{d}{h} = \frac{3}{2}$, where $d = 2r$

or 3 : 2

88. (3) When the rectangular sheet is rolled along its length, the length of the sheet forms the circumference of the base of cylinder and breadth of sheet forms the height of cylinder.

Circumference = 100

$\Rightarrow 2\pi r = 100$

$\Rightarrow 2 \times \frac{22}{7} \times r = 100$

$\Rightarrow r = \frac{700}{44} = \frac{175}{11}$ cm

∴ Volume of the cylinder

$= \pi r^2 h$

$= \frac{22}{7} \times \frac{175}{11} \times \frac{175}{11} \times 44$

$= \frac{245000}{7} = 35000$ cm^3

89. (1) Required ratio

$= \frac{1}{3}\pi r^2 h : \frac{2}{3}\pi r^2 h : \pi r^2 h$

$= \frac{1}{3} : \frac{2}{3} : 1 = 1 : 2 : 3$

90. (3) Let radius of cylinder = $3x$
radius of cone = $4x$
Also, let height of cylinder = $2y$
and height of cylinder = $3y$

$\frac{\text{Volume of the cylinder}}{\text{Volume of the cone}}$

$= \frac{\pi(3x)^2 \times 2y}{\frac{1}{3}\pi(4x)^2 \times 3y}$

$= \frac{18\pi x^2 y}{16\pi x^2 y} = 9 : 8$

91. (1) Water flowed by the pipe in 1 hour = $\pi r^2 h$

$= \frac{22}{7} \times \frac{7 \times 7}{100 \times 100} \times 5000 = 77$ m

Volume of expected water in the tank

$= \frac{50 \times 44 \times 7}{100} = 154$ m^3

$\therefore$ Required time

$= \frac{154}{77} = 2$ hours

92. (1) According to question,
$2\pi rh + 2\pi r^2 = 8\pi r^2$
$\Rightarrow 2\pi rh = 6\pi r^2$

$\Rightarrow \frac{h}{r} = 3$

$\therefore$ Required ratio

$= \pi r^2 h : \frac{4}{3}\pi r^3$

$= 3h : 4r = 9 : 4$

93. (2) If the height of increased water level be h cm, then

$\pi r^2 h = \frac{4}{3}\pi R^3$

$\Rightarrow 12 \times 12 \times h = \frac{4}{3} \times 6 \times 6 \times 6$

$\Rightarrow h = \frac{4 \times 2 \times 6 \times 6}{12 \times 12} = 2$cm

94. (4)

Radius of cone = 4.2cm
Height of cone = 10.2 – 4.2
= 6cm
Volume of the toy
= Volume of cone + Volume of hemisphere

$= \frac{1}{3}\pi(4.2)^2 \times 6 + \frac{2}{3}\pi(4.2)^3$

$= \frac{1}{3}\pi(4.2)^2(6 + 2 \times 4.2)$

$= \frac{1}{3} \times \frac{22}{7} \times 4.2 \times 4.2 \times 14.4$

= 266 cu.cm.

95. (3) Let Radius of hemisphere = Height of cylinder = r units

$\therefore \frac{\text{Volume of hemisphere}}{\text{Volume of cylinder}} = 1$

$\Rightarrow \frac{\frac{2}{3}\pi r^3}{\pi r_1^2 r} = 1 \Rightarrow \frac{r^2}{r_1^2} = \frac{3}{2}$

$\Rightarrow \frac{r}{r_1} = \frac{\sqrt{3}}{\sqrt{2}}$ or $\sqrt{3} : \sqrt{2}$

96. (2) $\frac{\text{Volume of the cube}}{\text{Volume of the sphere}}$

$= \frac{363}{49}$

$\Rightarrow \frac{x^3}{\frac{4}{3}\pi r^3} = \frac{363}{49}$

$\Rightarrow \frac{x^3}{r^3} = \frac{363}{49} \times \frac{4}{3} \times \frac{22}{7}$

$= \frac{121 \times 4 \times 22}{49 \times 7}$

$\Rightarrow \frac{x^3}{r^3} = \frac{11 \times 11 \times 11 \times 2 \times 2 \times 2}{7 \times 7 \times 7}$

$\therefore \frac{x}{r} = \frac{11 \times 2}{7} = \frac{22}{7}$ or 22 : 7

97. (3) Volume of the cylinder
$= \pi r^2 h$

$= \frac{22}{7} \times 10 \times 10 \times 21$

= 6600 cu. cm
Volume of the cone
= 6600 – 4400 = 2200 cu.cm

$\therefore 2200 = \frac{1}{3}\pi \times 10^2 \times h$

$\Rightarrow 2200 = \frac{2200}{21} \times h$

$\Rightarrow h = 21$ cm.

98. (3) Volume of required water
= 2 × volume of cone
$= 2 \times 27\pi = 54\pi$ cu.cm

99. (3) Increase in water level

$= \frac{\text{Volume of sphere}}{\text{Area of base of cylinder}}$

$= \frac{\frac{4}{3}\pi r^3}{\pi r^2}$

$= \frac{4}{3}r = \frac{4}{3} \times 3.5 = \frac{14}{3}$ cm.

$\therefore$ Required water level

$= 7 - \frac{14}{3} = \frac{7}{3}$ cm.

100. (2) Volume of cylinder = $\pi r^2 h$
$\Rightarrow A = \pi r^2 (2r) = 2\pi r^3 \quad [\because h = 2r]$

Volume of sphere = $\frac{4}{3}\pi r^3$

$\Rightarrow B = \frac{4}{3}\pi r^3$

$\Rightarrow \frac{A}{B} = \frac{2\pi r^3}{\frac{4}{3}\pi r^3} = \frac{6}{4} = \frac{3}{2}$

101. (2) $\frac{1}{3}\pi a^2 h = \frac{4}{3}\pi a^3$

$\Rightarrow h = 4a$

102. (2) $\frac{\text{Volume of cylinder}}{\text{Volume of cone}}$

$= \frac{\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = 3.\left(\frac{r_1}{r_2}\right)^2 \left(\frac{h_1}{h_2}\right)$

$= 3 \times \left(\frac{\sqrt{3}}{\sqrt{2}}\right)^2 \times \frac{\sqrt{2}}{\sqrt{3}}$

$= 3 \times \frac{\sqrt{3}}{\sqrt{2}} = 3\sqrt{3} : \sqrt{2}$

103. (2) Let the radius of the base of cup be r cm,
$2\pi r = \pi \times 14$
$\Rightarrow r = 7$ cm
Slant height = 14 cm;

Height = $\sqrt{14^2 - 7^2}$

$= \sqrt{21 \times 7} = 7\sqrt{3}$ cm

$\therefore$ Capacity of cup = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 7\sqrt{3}$

= 622.36 cubic cm.

104. (4) Volume of water in conical flask

$= \frac{1}{3}\pi r^2 h$

If the height of water level in cylindrical flask be H units, then

$\pi m^2 r^2 H = \frac{1}{3}\pi r^2 h$

$\Rightarrow H = \frac{1}{3} \cdot \frac{\pi r^2 h}{\pi m^2 r^2} = \frac{h}{3m^2}$

105. (2) $\frac{\text{Volume of cylinder}}{\text{Volume of cone}} = \frac{3}{1}$

$\Rightarrow \frac{\pi r_1^2 h}{\frac{1}{3}\pi r_2^2 h} = \frac{3}{1} \Rightarrow r_1 = r_2$

$\therefore$ Diameter of cylinder = Diameter of cone

106. (1) Volume of cone

$= \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 1 \times 7$

$= \frac{22}{3}$ cu.cm.

Volume of cubical block

$= 10 \times 5 \times 2$ cm^3. $= 100$ cm^3.

Wastage of wood

$= \left(100 - \frac{22}{3}\right)\text{cm}^3$

$= \frac{300 - 22}{3} = \frac{278}{3}$ cm^3

$\therefore$ % Wastage $= \frac{\frac{278}{3}}{100} \times 100$

$= \frac{278}{3} = 92\frac{2}{3}\%$

107. (3) Required percentage decrease

$= 100 - \frac{50 \times 50 \times 150}{100 \times 100}$

$= 100 - 37{\cdot}5 = 62{\cdot}5\%$

108. (1) Required per cent

$\therefore \frac{200 \times 200 \times 200}{100 \times 100} - 100$

$= 800 - 100 = 700\%$

109. (4) Let height and radius both of a cylinder change by x%, then volume changes by

$\left[3x + \frac{3x^2}{100} + \frac{x^3}{100^2}\right]\%$

$= \left[3 \times 20 + \frac{3 \times 20 \times 20}{100} + \frac{20 \times 20 \times 20}{10000}\right]\%$

$= (60 + 12 + 0.8)\% = 72.8\%$

110. (4) Volume of original cone

$= \frac{1}{3}\pi r^2 h$

Now, r_1 = radius of new cone

$= \frac{r}{2}$

h_1 = height of new cone = $3h$

$\therefore V_1 = \frac{1}{3}\pi r_1^2 h_1 = \frac{1}{3}\pi \frac{r^2}{4} \times 3h$

$= \frac{1}{3}\pi r^2 h \times \frac{3}{4} = \frac{3}{4}V$

$\therefore$ Decrease % $= \left(\frac{V - \frac{3}{4}V}{V}\right) \times 100$

$= 25\%$

111. (4) For original cone,

$V = \frac{1}{3}\pi r^2 h$

For the second cone,

$r_1 = 2r$

$h_1 = 2h$

$\therefore V_1 = \frac{1}{3}\pi r_1^2 h_1$

$= \frac{1}{3}\pi (2r)^2 \times 2h$

$= 8 \times \frac{1}{3}\pi r^2 h = 8V$

112. (2) Let the radius of a right circular cylinder is changed by x% and height is changed y%, then Volume change by

$\left(2x + y + \frac{x^2 + 2xy}{100} + \frac{x^2 y}{100^2}\right)\%$

$\therefore$ Effective change

$= \left(-2 \times 50 + 60 + \frac{2500 - 6000}{100} + \frac{150000}{10000}\right)$

$= (-100 + 60 - 35 + 15)$

$= (75 - 135) = -60\%$

Negative sign shows decrease.

113. (4) Let length, breadth and height of a cuboid are increased by x%, y% and z% respectively, then its volume is increased by

$\left(x + y + z + \frac{xy + yz + zx}{100} + \frac{xyz}{10000}\right)\%$

$\therefore$ Effective increase

$= \left(100 + 200 + 200 + 20000 + 40000 + \frac{20000}{100} + \frac{4000000}{10000}\right)\%$

$= 500 + 800 + 400 = 1700\%$

$= 1700 \times \frac{1}{100} = 17$ times

Method : 2

Original volume $= x \times 2x \times 3x$

$= 6x^3$ cubic units

New volume $= 2x \times 6x \times 9x$

$= 108x^3$ cubic units

Change in volume

$= 108x^3 - 6x^3$

$= 102x^3$ cubic units

Increase $= \frac{102x^3}{6x^3} = 17$ times.

114. (3) Intial area of the cylinder

$= \pi r^2 h$

Voiume of the new cylinder

$= \pi (1.1r)^2 \times 1.1h$

$= 1.331\ \pi r^2 h$

$\therefore$ Increase in area

$= (1.331 - 1)\ \pi r^2 h$

$= 0.331\ \pi r^2 h$

$\therefore$ Percentage increase

$= \frac{0.331\pi r^2 h}{\pi r^2 h} \times 100 = 33.1\%$

115. (1) Volume of the cone

$= \frac{1}{3}\pi r^2 h$, new height = 100%h

$\therefore$ Percentage increase in volume

$= 100\%$

116. (1) Volume of the hemispherical cup $= \frac{2}{3}\pi r^3$

$= \frac{2}{3}\pi \times 4 \times 4 \times 4$

$= \frac{128\pi}{3}$ cu.cm.

Volume of cone $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi \times 8 \times 8 \times 16$

$= \frac{128 \times 8\pi}{3}$ cu.cm.

Part filled $= \frac{1}{8}$

$\therefore$ Part remaining empty

$= \frac{7}{8} = 87.5\%$

117. (2) 1 hectare = 10000 sq.metre then Area of the ground = 15000 sq.metre

$\therefore$ Required volume

$= 15000 \times \frac{5}{100}$

$= 750$ cubic metre

118. (1) Area of the tetrahedron

$= \frac{1}{3} \times$ area of base × height

Area of the base

$= \frac{\sqrt{3}}{4} \times (\text{side})^2$

$= \frac{\sqrt{3}}{4} \times 3 \times 3 = \frac{9\sqrt{3}}{4}$ cm²

Now, length of the perpendicular in the equilateral triangle

$= \sqrt{3^2 - \left(\frac{3}{2}\right)^2}$

$= \sqrt{9 - \frac{9}{4}} = \frac{3\sqrt{3}}{2}$ cm

$\therefore$ Height $= \sqrt{\left(\frac{3\sqrt{3}}{2}\right)^2 - \left(\frac{\sqrt{3}}{2}\right)^2}$

$= \sqrt{\frac{27}{4} - \frac{3}{4}} = \sqrt{6}$ cm

$\therefore$ Required area $= \frac{1}{3} \times \frac{9\sqrt{3}}{4} \times \sqrt{6}$

$= \frac{9\sqrt{2}}{4}$ cu.cm.

119. (4)

Radius of the in-circle = OE = OD = OF = 3 cm

Area of triangular base

$= \left(\frac{1}{2} AB \times OF + \frac{1}{2} \times BC \times OD + \frac{1}{2} \times AC \times OE\right)$

$= \frac{1}{2} \times 3 \times (AB + BC + AC)$

$= \frac{1}{2} \times 3 \times 15 = \frac{45}{2}$ sq. cm.

Volume of the prism

= Area of the base × height

$\Rightarrow 270 = \frac{45}{2} \times$ height

$\therefore$ Height $= \frac{270 \times 2}{45} = 12$ cm.

120. (2) Area of the base of prism

$= \frac{1}{2} \times 10 \times 12 = 60$ sq. cm.

$\therefore$ Volume of prism = Area of the base × height = 60 × 20

=1200 cu.cm

$\therefore$ Mass of prism

= Volume × density

= (1200 × 6) gm

$= \left(\frac{1200 \times 6}{1000}\right)$ kg. = 7.2 kg.

121. (2) Let the radius of wire = r cm.

Volume of copper rod

$= \pi \times \left(\frac{1}{2}\right)^2 \times 8 = 2\pi$ cm³

Volume of wire = $\pi r^2 \times 1800$

= 1800 πr^2 cm³

Clearly,

$1800\pi r^2 = 2\pi$

$\Rightarrow r^2 = \frac{1}{900} \Rightarrow r = \frac{1}{30}$

122. (3) Radius of the base of well

$= \frac{20}{2} = 10$m

Volume of the earth taken out

$= \pi r^2 h = \frac{22}{7} \times 10^2 \times 14 \text{m}^3$

Let the height of embankment be x metres.

Then,

Volume = $\pi (R^2 - r^2) \times x$, where R = 15 m, r = 10m

$= \frac{22}{7}(15^2 - 10^2) \times x$

$= \frac{22}{7} \times 25 \times 5 \times x$

Clearly,

$\frac{22}{7} \times 25 \times 5 \times x$

$= \frac{22}{7} \times 10^2 \times 14$

$\Rightarrow x = \frac{100 \times 14}{25 \times 5} = 11.2$ m

123. (2) Sum of the volume of two cylinders

$= \pi r_1^2 h_1 + \pi r_2^2 h_2$

$= \frac{22}{7}$ (4 × 4 × 6 + 5 × 5 × 4)

$= \frac{22}{7}$ (96 + 100)

$= \frac{22}{7} \times 196 = 616$ cm³

Let the radius of the disc be r cm.

$\therefore \pi r^2 \times 1 = 616$

$\Rightarrow \frac{22}{7} \times r^2 = 616$

$\Rightarrow r^2 = \frac{616 \times 7}{22} = 196$

$\Rightarrow r = \sqrt{196} = 14$ cm

124. (1) When we change shape of a solid figure, volume remains constant

$\therefore$ Volume of hemisphere

= Volume of cone

$\Rightarrow \frac{2}{3}\pi R^3 = \frac{1}{3}\pi R^2 H \quad \therefore 2R = H$

125. (4) According to the question, three solid metallic spheres are melted and recast into a new solid sphere. It means that the volume of new solid sphere will be equal to the sum of volume of three solid spheres.

$\therefore$ Volume of new solid sphere

$= \frac{4}{3}\pi\left(\frac{6}{2}\right)^3 + \frac{4}{3}\pi\left(\frac{8}{2}\right)^3 + \frac{4}{3}\pi\left(\frac{10}{2}\right)^3$

$\frac{4}{3}\pi r^3 = \frac{4}{3}\pi\left[(3)^3 + (4)^3 + (5)^3\right]$

$\Rightarrow r^3 = 27 + 64 + 125$

$\Rightarrow r^3 = 216$

$\Rightarrow r^3 = (6)^3$

$\Rightarrow r = 6$ cm

$\therefore$ Diameter of the new sphere

= 2 × 6 = 12 cm

126. (4) Let the radius of new ball = R cm

then $\frac{4}{3}\pi R^3 = \frac{4}{3}\pi\left(3^3 + 4^3 + 5^3\right)$

$R^3 = 27 + 64 + 125 = 216$

$\Rightarrow R = \sqrt[3]{6 \times 6 \times 6} = 6$ cm

127. (4) $\frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi(1)^3 + \frac{4}{3}\pi(6)^3 + \frac{4}{3}\pi(8)^3$

$\Rightarrow \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(1 + 216 + 512)$

$\Rightarrow r^3 = 729 \Rightarrow r = \sqrt[3]{729}$

$\Rightarrow r = 9$ cm

128. (3) According to question
Volume of sphere = Volume of displaced water

$\Rightarrow \frac{4}{3}\pi \times 2 \times 2 \times 2 = \pi \times 4 \times 4 \times h$

$\therefore h = \frac{2}{3}$ cm

129. (2) Volume of cylinder
$= \pi r^2 h = \pi \times (8)^2 \times 2 = 128\pi$ cm^3
Let the radius of each sphere be r cm.

$\therefore 12 \times \frac{4}{3}\pi r^3 = 128\pi$

$\Rightarrow 16\pi r^3 = 128\pi$

$\Rightarrow r^3 = \frac{128\pi}{16\pi}$

$\Rightarrow r = \sqrt[3]{8} = 2$ cm

$\therefore$ Diameter = 2 × 2 = 4cm

130. (1) Volume of original sphere

$= \frac{4}{3}\pi(6)^3 = 288\pi$ cm^3

Let the radii of small spheres be $3x$, $4x$ and $5x$ cm respectively

$\therefore \frac{4}{3}\pi\left[(3x)^3 + (4x)^3 + (5x)^3\right]$

$= 288\pi$

$\Rightarrow \frac{4}{3}\pi(27x^3 + 64x^3 + 125x^3)$

$= 288\pi$

$\Rightarrow \frac{4}{3}\pi \times 216x^3 = 288\pi$

$\Rightarrow x^3 = \frac{288\pi \times 3}{4\pi \times 216} = 1$

$\Rightarrow x = 1$

$\therefore$ Required radius
= 3 × 1 = 3cm.

131. (3) Volume of solid sphere

$= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi(0.3)^3$ cubic metre

If the radius of the circular sheet be R, then
Volume of the sheet
$= \pi R^2 \times 0.001$

$= \frac{4}{3}\pi(0.3)^3$

$R^2 \times 0.001 = \frac{4}{3} \times 0.3 \times 0.3 \times 0.3$

$R^2 = 36 \Rightarrow R = 6$ metres

$\therefore$ Diameter = 12 metres

132. (2) Volume of the wire $= \pi r^2 h$
$= \pi \times 0.1 \times 0.1 \times 3600$ cm^3
$= 36\pi$ cm^3

Volume of the sphere $= \frac{4}{3}\pi R^3$

$= 36\pi$

$\Rightarrow R^3 = \frac{36 \times 3}{4} = 27$

$\therefore R = \sqrt[3]{27} = 3$ cm

133. (1) Volume of the cone $= \frac{1}{3}\pi r^2 h$

$= \frac{\pi}{3} \times 6 \times 6 \times 24$ cm^3

= Volume of the sphere
If the radius of the sphere be r cm, then

$\frac{4}{3}\pi r^3 = \frac{\pi}{3} \times 6 \times 6 \times 24$

$\Rightarrow r^3 = 6 \times 6 \times 6$

$\therefore r = \sqrt{6 \times 6 \times 6} = 6$ cm.

134. (4) Radius of ball = 3 cm
Volume of the metallic spherical ball

$= \frac{4}{3} \times \pi \times (3)^3 = 36\pi$ cm^3.

Let h be the height of the cone.
Volume of cone = Volume of ball

$\Rightarrow \frac{1}{3}\pi \times 6 \times 6 \times h = 36\pi$

$\Rightarrow h = \frac{36\pi \times 3}{\pi \times 6 \times 6} = 3$ cm

135. (2) Radius of the iron ball $= \frac{14}{2}$
= 7 cm
Volume of the ball

$= \frac{4}{3}\pi \times (7)^3$ cm^3.

Let the radius of cylinder be r cm.
$\therefore$ Volume of cylinder

$= \pi r^2 \times \frac{7}{3}$ cm^3

Clearly,

$\pi r^2 \times \frac{7}{3} = \frac{4}{3}\pi \times (7)^3$

$\Rightarrow r^2 = \frac{4 \times 7 \times 7 \times 7 \times 3}{7 \times 3}$

$\Rightarrow r = \sqrt{4 \times 7 \times 7} = 14$ cm

$\therefore$ Diameter = 2 × 14
= 28 cm

136. (3) Volume of the cylinder
$= \pi r^2 \times h$
$= \pi r^2 \times 6$
$= 6\pi r^2$ cm^3
Let the height of the cone be h cm.

$\therefore$ Volume of the cone $= \frac{1}{3}\pi r^2 h$

According to the question,
Volume of the cone = Volume of the cylinder

$\Rightarrow \frac{1}{3}\pi r^2 h = 6\pi r^2$

$\Rightarrow h = 18$ cm.

137. (2) Volume of the cone = Volume of the cylinder

$\Rightarrow \frac{1}{3}\pi r^2 h_1 = \pi r^2 h_2$

$\Rightarrow h_1 = 3h_2 = 3 \times 7 = 21$ cm.

138. (4) Volume of the solid sphere

$= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi \times 7 \times 7 \times 7$ cu. cm.

If the length of wire (cylindrical) be h cm, then

$\pi R^2 h = \frac{4}{3} \times \pi \times 7 \times 7 \times 7$

$\Rightarrow 7 \times 7 \times h = \frac{4}{3} \times 7 \times 7 \times 7$

$\Rightarrow h = \frac{28}{3}$ cm

139. (4) In this case volume remains same.

$\therefore \frac{4}{3}\pi R^3 = \frac{1}{3}\pi R^2 H$

$\Rightarrow 4R = H$

$\Rightarrow H : R = 4 : 1$

140. (2) Volume of sphere $= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi \times 3 \times 3 \times 3$

$= 36\pi$ cu. cm.

If the water level rises by h cm, then

$\pi R^2 h = 36\pi$

$\Rightarrow 6 \times 6 \times h = 36$

$\Rightarrow h = 1$ cm

141. (2) Volume of sphere

$= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi \times 9 \times 9 \times 9$

$= 972\ \pi$ cubic.cm.

If the length of wire be h cm., then

$\pi \times (0.2)^2 \times h = 972\ \pi$

$\Rightarrow h = \frac{972}{0.2 \times 0.2} = 24300$ cm

or 243 metres

142. (1) Volume of block

$= 21 \times 77 \times 24$ cu. cm.

Let the radius of sphere be r cm, then

$\frac{4}{3}\pi r^3 = 21 \times 77 \times 24$

$\Rightarrow r^3 = \frac{21 \times 77 \times 24 \times 3 \times 7}{4 \times 22}$

$= 21 \times 7 \times 3 \times 3 \times 7$

$= 3^3 \times 7^3$

$\Rightarrow r = 3 \times 7 = 21$ cm

143. (4) Let Length of rod $= x$ cm

$\therefore$ Volume of cylinder = Volume of 6 spheres

$\Rightarrow \pi r^2 h = 6 \times \frac{4}{3}\pi r^3$

$\Rightarrow h = 6 \times \frac{4}{3} \times r = 8 \times 50$

$= 400$ cm $= 4$ metres

144. (2) Volume of cone = Volume of sphere

$\Rightarrow \frac{1}{3}\pi r_1^2 h + \frac{1}{3}\pi r_2^2 h = \frac{4}{3}\pi r^3$

$\Rightarrow (r_1^2 + r_2^2)h = 4r^3$

$\Rightarrow (9 + 16)h = 4 \times 5^3$

$\Rightarrow 25h = 4 \times 125$

$\Rightarrow h = 4 \times 5 = 20$ cm

145. (3) Volume of earth taken out

$= 40 \times 30 \times 12$

$= 14400$ cu.metre

Area of the rectangular field

$= 1000 \times 30 = 30000$ sq. metre

Area of the region of tank

$= 40 \times 30 = 1200$ sq. metre

Remaining area

$= 30000 - 1200$

$= 28800$ sq. metre

Increase in level

$= \frac{14400}{28800} = 0.5$ metre

146. (4) Area of the base of pyramid

$= \frac{1}{2} \times (\text{diagonal})^2$

$= \frac{1}{2} \times 1152 = 576$ sq.metre

Volume of pyramid $= \frac{1}{3} \times$ Area of base $\times$ Height

$= \frac{1}{3} \times 576 \times 6 = 1152$ cu.metre

147. (1) $\frac{V_1}{V_2} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = \left(\frac{r_1}{r_2}\right)^2 \times \frac{h_1}{h_2}$

$\Rightarrow \frac{2}{3} = \left(\frac{1}{2}\right)^2 \times \frac{h_1}{h_2}$

$\Rightarrow \frac{h_1}{h_2} = \frac{2}{3} \times 4 = \frac{8}{3} = 8 : 3$

148. (3) Edges of cubes $= x$ and y units (let)

$\therefore$ Ratio of volumes $= \frac{x^3}{y^3}$

$\therefore \frac{x^3}{y^3} = \frac{27}{64} \Rightarrow \frac{x}{y} = \frac{3}{4}$

$\therefore$ Raito of surface areas $= \frac{6x^2}{6y^2}$

$= \frac{x^2}{y^2} = \left(\frac{3}{4}\right)^2 = \frac{9}{16}$

149. (1) Volume of a cone $= \frac{1}{3}\pi r^2 h$

Again, $r_1 = 2r$, $h_1 = 2h$

$\therefore$ Volume of the second cone

$= \frac{1}{3}\pi r_1^2 h_1$

$= \frac{1}{3}\pi (2r)^2 \times 2h$

$= \frac{1}{3}\pi r^2 h \times 8$

= Eight times of the previous volume

150. (1) Ratio of the volumes of spheres

$= \frac{8 \times 64}{289 \times 17}$

$\Rightarrow \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3} = \frac{8 \times 8 \times 8}{17 \times 17 \times 17}$

$\Rightarrow \frac{r_1^3}{r_2^3} = \left(\frac{8}{17}\right)^3$

$\Rightarrow \frac{r_1}{r_2} = \frac{8}{17}$

151. (1) Volume of the new cube

$= [(6)^3 + (8)^3 + (1)^3]$ cu.cm.

$= (216 + 512 + 1)$ cu.cm.

$= 729$ cu.cm.

Edge of new cube $= \sqrt[3]{729}$

$= 9$ cm

Its surface area $= 6 \times (\text{edge})^2$

$= 6 \times 9 \times 9 = 486$ sq. cm.

152. (1) Volume of conical vessel

$= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \pi \times 6 \times 6 \times 12$

$= 144\ \pi$ cu. cm.

If the radius of sphere be R cm, then

$8 \times \frac{2}{3}\pi R^3 = 144\pi$

$\Rightarrow R^3 = \frac{144 \times 3}{8 \times 2}$

$= 9 \times 3 = 3 \times 3 \times 3$

$\therefore R = \sqrt[3]{3 \times 3 \times 3} = 3$ cm.

153. (4) Radius of cylinder $= r$ units

Radius of sphere $= \frac{r}{2}$ units

Let the height of cylinder be h units,

$\therefore$ Volume of cylinder = Volume of sphere

$\Rightarrow \pi r^2 h = \frac{4}{3}\pi \left(\frac{r}{2}\right)^3$

$\Rightarrow \pi r^2 h = \frac{1}{6}\pi r^3$

$\Rightarrow h = \frac{1}{6} r$

$\Rightarrow \frac{h}{r} = \frac{1}{6}$

154. (2) Volume of pile = 20 cu. metre

$= 20 \times (100)^3$ cu.cm.

Volume of one brick

$= (25 \times 12.5 \times 8)$ cu.cm.

$\therefore$ Required number of bricks

$= \frac{20 \times 100 \times 100 \times 100}{25 \times 12.5 \times 8} = 8000$

155. (2) Let H and R be the height and radius of bigger cone respectively and h and r that of smaller cone.

From triangles AOB and AMN.
$\angle A$ is common and MN || OB.
$\therefore$ Triangles AOB and AMN are similar,

$$\therefore \frac{AO}{AM} = \frac{BO}{MN}$$

$$\Rightarrow \frac{30}{h} = \frac{R}{r} \quad ...(i)$$

Volume of smaller cone

$$= \frac{1}{3}\pi r^2 h$$

Volume of bigger cone

$$= \frac{1}{3}\pi R^2 H$$

$\therefore$ According to the question,

$$\frac{1}{3}\pi r^2 h = \left(\frac{1}{3}\pi R^2 H\right) \times \frac{1}{27}$$

$$\Rightarrow r^2 h = \frac{R^2 H}{27}$$

$$\Rightarrow 27r^2 h = R^2 H$$

$$\Rightarrow \frac{27h}{H} = \frac{R^2}{r^2}$$

$$\Rightarrow \frac{27h}{H} = \left(\frac{30}{h}\right)^2 \quad ...[\text{From (i)}]$$

$$\Rightarrow \frac{27h}{H} = \frac{900}{h^2}$$

$$\Rightarrow 27h^3 = 900H = 900 \times 30$$

$$\Rightarrow h^3 = \frac{900 \times 30}{27} = 1000$$

$$\Rightarrow h = \sqrt[3]{1000} = 10 \text{ cm}$$

$\therefore$ Required height = 30 – 10 = 20 cm

156. (1) Volume of pyramid

$$= \frac{1}{3} \times \text{area of base} \times \text{height}$$

$$\Rightarrow 500 = \frac{1}{3} \times 30 \times h$$

$$\Rightarrow 10h = 500$$

$$\Rightarrow h = \frac{500}{10} = 50 \text{ metre}$$

157. (1) Lateral surface area of prism = 3 × side × height

$\therefore$ 3 × side × height = 120

$$\Rightarrow \text{Side} \times \text{height} = \frac{120}{3}$$

= 40 sq.cm. ...(i)

Volume of prism = Area of base × height

$$\Rightarrow 40\sqrt{3} = \frac{\sqrt{3}}{4} \times \text{side}^2 \times \text{height}$$

$$\Rightarrow \frac{40\sqrt{3} \times 4}{\sqrt{3}} = \text{side}^2 \times \text{height}$$

$\Rightarrow$ side^2 × height

= 160 cu.cm ...(ii)

Dividing equation (ii) by (i),

$$\text{Side} = \frac{160}{40} = 4 \text{ cm.}$$

158. (4) Volume of lead

$$= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi \times 2^3$$

If the thickness of gold be x cm, then

Volume of gold

$$= \frac{4}{3}\pi\left((2+x)^3 - 2^3\right) \text{cu.cm}$$

$$\therefore \frac{4}{3}\pi\left((2+x)^3 - 2^3\right)$$

$$= \frac{4}{3}\pi \times 2^3$$

$\Rightarrow (2 + x)^3 - 2^3 = 2^3$
$\Rightarrow (2 + x)^3 = 8 + 8 = 16$
$\Rightarrow (2 + x)^3 = 2^3.2$

$$\Rightarrow 2 + x = 2 \times \sqrt[3]{2}$$

$\Rightarrow 2 + x = 2 \times 1.259 = 2.518$
$\therefore x = 2.518 - 2 = 0.518$ cm

159. (4) Radius of larger sphere = R units

$$\therefore \text{Its volume} = \frac{4}{3}\pi R^3 \text{ cu. units}$$

Volume of smaller cone

$$= \frac{1}{3}\pi R^3 \text{ cubic units}$$

Volume of smaller sphere

$$= \frac{1}{3}\pi R^3$$

$$\therefore \frac{4}{3}\pi r^3 = \frac{1}{3}\pi R^3$$

$$\Rightarrow r^3 = \frac{R^3}{4}$$

$$\Rightarrow r = \frac{R}{\sqrt[3]{4}}$$

$\therefore$ Surface area of smaller sphere : Surface area of larger sphere

$= 4\pi r^2 : 4\pi R^2$
$= r^2 : R^2$

$$= \left(\frac{R}{\sqrt[3]{4}}\right)^2 : R^2 = 1 : \left(\sqrt[3]{4}\right)^2$$

$$= 1 : \left((2^2)^{\frac{1}{3}}\right)^2 = 1 : 2^{\frac{4}{3}}$$

160. (1)

$$\text{Volume of hemisphere} = \frac{2}{3}\pi r^3,$$

Where r = radius = 7 cm.

$$= \left(\frac{2}{3} \times \frac{22}{7} \times 7 \times 7 \times 7\right) \text{ cu.cm.}$$

Volume of conical part

$$= \frac{1}{3}\pi r^2 h$$

$[\because r = h]$

$$= \left(\frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 7\right) \text{ cu.cm.}$$

$\therefore$ Volume of ice-cream

$$= \frac{2}{3} \times \frac{22}{7} \times 7^3 + \frac{1}{3} \times \frac{22}{7} \times 7^3$$

$$= \frac{22}{7} \times 7^3 = 22 \times 7^2$$

= 1078 cu.cm.

161. (3) Volume of material of hollow sphere $= \frac{4}{3}\pi\left(r_1^3 - r_2^3\right)$

$$= \frac{4}{3} \times \pi\left(5^3 - 3^3\right)$$

$$= \frac{4}{3} \times \pi \times (125 - 27)$$

$$= \frac{4}{3} \times \pi \times 98 \text{ cu.cm.}$$

Volume of cone = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \pi \times 4^2 \times h$

$\therefore \frac{1}{3}\pi \times 16 \times h = \frac{4}{3} \times \pi \times 98$

$\Rightarrow 4h = 98$

$\Rightarrow h = \frac{98}{4} = 24.5$ cm

162. (3) Volume of the tetrahedron

$= \frac{a^3}{6\sqrt{2}}$, where a = edge = 4 cm

$= \frac{4 \times 4 \times 4}{6\sqrt{2}} = \frac{16\sqrt{2}}{3}$ cu.cm.

163. (4) Radius of the base of conical shape = r cm (let)

Radius of base of cylinder

$= \frac{r}{3}$ cm

Volume of water = Volume of cone

$= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi r^2 \times 24$

$= 8\pi r^2$ cu. cm.

$\therefore$ Volume of cylinder = $\pi R^2 H$

$= \pi \times \left(\frac{r}{3}\right)^2 H = \frac{\pi r^2 H}{9}$ cu. cm.

$\therefore \frac{\pi r^2 H}{9} = 8\pi r^2$

$\Rightarrow H = 9 \times 8 = 72$ cm

164. (1) Edge of cube = a cm (let)

$\therefore$ Its total surface area = $6a^2$

$\therefore 6a^2 = 150$

$\Rightarrow a^2 = \frac{150}{6} = 25$

$\Rightarrow a = \sqrt{25} = 5$ cm

$\therefore$ Volume of cube = a^3

= (5 × 5 × 5) cu.cm

= 125 cu.cm

165. (2) Volume of metallic sphere

$= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \pi \times 3 \times 3 \times 3$

= 36π cu.cm.

$\therefore$ Volume of cone

= 36π cu.cm.

$\Rightarrow \frac{1}{3}\pi R^2 h = 36\pi$

Þ $R^2 h = 108$

$\Rightarrow 6 \times 6 \times h = 108$

$\Rightarrow h = \frac{108}{6 \times 6} = 3$ cm.

166. (4) Volume of hemi-spherical bowl

$= \frac{2}{3}\pi r^3$

$= \left(\frac{2}{3} \times \pi \times 15 \times 15 \times 15\right)$ cu.cm

Volume of a bottle = $\pi R^2 h$

$= \pi \times \frac{5}{2} \times \frac{5}{2} \times 6$ cu.cm

$\therefore$ Number of bottles

$= \frac{2 \times \pi \times 15 \times 15 \times 15}{3 \times \pi \times \frac{5}{2} \times \frac{5}{2} \times 6} = 60$

167. (*) Volume of cone

$= V_1 = \frac{1}{3}\pi r^2 h$

$= \frac{\pi}{3} r^3$ ($\because h = r$)

Volume of sphere = $V_2 = \frac{4}{3}\pi r^3$

Volume of cylinder = $V_3 = \pi r^2 h$

$= \pi r^3$

$\therefore V_1 : V_2 : V_3 = \frac{1}{3} : \frac{4}{3} : 1$

= 1 : 4 : 3

$\therefore V_1 = \frac{V_2}{4} = \frac{V_3}{3}$

168. (2) Volume of sphere

$= \frac{4}{3}\pi r^3$ cu. units

Case II,

R = 2r units

$\therefore$ Volume of sphere = $\frac{4}{3}\pi R^3$

$= \frac{4}{3}\pi (2r)^3$

$= \frac{32}{3}\pi r^3$ cu. units

Difference = $\frac{32}{3}\pi r^3 - \frac{4}{3}\pi r^3$

$= \frac{28}{3}\pi r^3$

$\therefore$ Percentage increase

$= \frac{\frac{28}{3}\pi r^3}{\frac{4}{3}\pi r^3} \times 100$

= 700%

OR

Single equivalent per cent increase for increases of 100% and 100%

$= \left(100 + 100 + \frac{100 \times 100}{100}\right)\%$

= 300%

Single equivalent per cent increase for increases of 300% and 100%

$= \left(300 + 100 + \frac{300 \times 100}{100}\right)\%$

= 700%

169. (4) Volume of tank = $(1.2)^3$ cubic metre

= 1.728 cubic metre

$\therefore$ 64 × Volume of 1 bucket

$= \frac{2 \times 1.728}{3}$ cubic metre

$\therefore$ Volume of 1 bucket

$= \left(\frac{1.728 \times 2}{3 \times 64}\right)$ cubic metre

= 0.018 cubic metre

= (0.018 × 1000) litres

= 18 litres

170. (4) Volume of wooden box

= (8 × 7 × 6) cu.m.

= (8 × 7 × 6 ×100^3) cu.cm.

Volume of a box

= (8 × 7× 6) cu.cm.

$\therefore$ Maximum number of boxes

$= \frac{8 \times 7 \times 6 \times 100^3}{8 \times 7 \times 6}$

= 1000000

171. (3) $\pi r_1^2 h_1 = \pi r_2^2 h_2$

$\Rightarrow \left(\frac{r_1}{r_2}\right)^2 = \frac{h_2}{h_1} = \frac{2}{1}$

$\therefore \frac{r_1}{r_2} = \frac{\sqrt{2}}{1} = \sqrt{2} : 1$

172. (3) Paper is folded along the length.

$\therefore$ Circumference of the base

= 22 cm,

Height of cylinder = 12 cm

$\therefore\ 2\pi r = 22$

$\Rightarrow\ 2 \times \frac{22}{7} \times r = 22$

$\Rightarrow r = \frac{7}{2}$ cm

$\therefore$ Volume of cylinder

$= \pi r^2 h$

$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 12$

= 462 cu.cm.

173. (1) Height of cylinder

= 2 R units

Radius of base = R units

$\therefore$ Volume of cylinder $= \pi R^2 h$

$\Rightarrow \pi (R)^2 (2R) = 2\pi R^3$

174. (*)

Area of the base of pyramid

$= \frac{\sqrt{3}}{4} \times \text{side}^2$

$= \frac{\sqrt{3}}{4} \times 4 \times 4 = 4\sqrt{3}$ sq. cm.

Length of median on the base (AD)

$= \sqrt{4^2 - 2^2} = \sqrt{12} = 2\sqrt{3}$ cm

$\therefore$ OD $= \frac{1}{3} \times 2\sqrt{3} = \frac{2}{\sqrt{3}}$ cm

Height of pyramid

$= \sqrt{5^2 - \left(\frac{2}{\sqrt{3}}\right)^2}$

$= \sqrt{25 - \frac{4}{3}} = \frac{\sqrt{71}}{\sqrt{3}}$ cm

$\therefore$ Volume of pyramid

$= \frac{1}{3} \times$ area of base $\times$ height

$= \frac{1}{3} \times 4\sqrt{3} \times \frac{\sqrt{71}}{\sqrt{3}}$

$= \frac{4\sqrt{71}}{3}$ cu.cm.

175. (1) Curved surface area of cone = 550 sq. cm.

$\Rightarrow \pi r l = 550$

$\Rightarrow \frac{22}{7} \times 7 \times \sqrt{r^2 + h^2} = 550$

$\Rightarrow \frac{22}{7} \times 7 \times \sqrt{49 + h^2} = 550$

$\Rightarrow \sqrt{49 + h^2} = \frac{550}{22} = 25$

$\Rightarrow 49 + h^2 = (25)^2 = 625$

$\Rightarrow h^2 = 625 - 49 = 576$

$\Rightarrow h = \sqrt{576} = 24$ cm.

$\therefore$ Volume of cone $= \frac{1}{3} \pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 24$

= 1232 cu. cm.

176. (1) Volume of cylinder $= \pi r^2 h = (\pi \times 9^2 \times 162)$ cu.cm.

$\therefore$ Volume of hemisphere

$= (\pi \times 9^2 \times 162)$ cu. cm.

$\therefore\ \frac{2}{3}\pi \times R^3 = \pi \times 9^2 \times 162$

$\Rightarrow R^3 = \frac{9^2 \times 162 \times 3}{2}$

$= 9^2 \times 81 \times 3$

$\therefore R = \sqrt[3]{9^2 \times 9^2 \times 3}$

$= 9 \times 3 = 27$ cm.

177. (1) Volume of iron sphere

$= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi \times 27 \times 27 \times 27$

$= (36 \times 27 \times 27)\pi$ cu. cm.

$\therefore$ If the radius of wire be R cm., then

$\pi \times R^2 \times 729 = 36 \times 27 \times 27\ \pi$

$[\because V = \pi R^2 H]$

$\Rightarrow R^2 = \frac{36 \times 27 \times 27}{729} = 36$

$\therefore R = \sqrt{36} = 6$ cm.

178. (4)

Radius of cylinder = radius of hemisphere

= r units

$\therefore$ Required ratio

$= \pi r^2.r : \frac{2}{3}\pi r^3$

= 3 : 2

179. (1) Ratio of the volumes of cubes

$= \frac{8}{125}$

$\Rightarrow \frac{l_1^3}{l_2^3} = \frac{8}{125} \Rightarrow \frac{l_1}{l_2} = \frac{2}{5}$

$\therefore$ Ratio of their total surface areas $= \frac{6l_1^2}{6l_2^2} = \frac{l_1^2}{l_2^2} = \frac{4}{25}$

180. (1) Volume of water

$= \frac{4}{3}\pi r^3 + \frac{1}{4} \times \frac{4}{3}\pi r^3$

$= \frac{5}{3}\pi r^3 = \frac{5}{3}\pi$ cube cm.

181. (3) Volume of one drop of water

$= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \pi \times \left(\frac{1}{20}\right)^3$ cube cm.

$\therefore$ Volume of 32000 drops of water

$= \frac{4\pi}{3} \times \frac{32000}{20 \times 20 \times 20}$ cubic cm.

$= \frac{16\pi}{3}$ cubic cm.

$\therefore$ Volume of glass $= \frac{1}{3}\pi R^2 H$

Here, $R = \frac{H}{2}$

$\therefore\ \frac{1}{3}\pi \left(\frac{H}{2}\right)^2 . H = \frac{16\pi}{3}$

$\Rightarrow \frac{H^3}{4} = 16$

$\Rightarrow H^3 = 64$

$\therefore H = \sqrt[3]{64} = 4$ cm.

182. (3) If the radius of base of cylinder be r units, then,

Height $= 4 \times 2\pi r$

$= 8\pi r$ units

$\therefore\ 2\pi r = c$

$\therefore\ r = \frac{c}{2\pi}$ and $h = 4c$

$\therefore$ Volume of cylinder $= \pi r^2 h$

$= \frac{\pi c^2}{4\pi^2} \times 4c$

$= \frac{c^3}{\pi}$ cubic units

183. (2)

Volume of pyramid

$= \frac{1}{3} \times$ area of base $\times$ height

$\Rightarrow 1296 = \frac{1}{3} \times 324 \times h$

$\Rightarrow h = \frac{1296 \times 3}{324} = 12$ metre

$\therefore$ Side of square base $= \sqrt{324}$

$= 18$ metre

$\therefore$ Slant height $= \sqrt{12^2 + \left(\frac{18}{2}\right)^2}$

$= \sqrt{12^2 + 9^2}$

$= \sqrt{144 + 81}$

$= \sqrt{225} = 15$ metre

$\therefore$ Area of the lateral surfaces

$= \frac{1}{2} \times$ perimeter of base $\times$ slant height

$= \frac{1}{2} \times 4 \times 18 \times 15$

$= 540$ sq.metre.

184. (2) Radii of spheres $= r_1$ and r_2 units

According to the question

$\frac{4\pi r_1^2}{4\pi r_2^2} = \frac{9}{16}$

$\Rightarrow \frac{r_1^2}{r_2^2} = \frac{9}{16}$

$\Rightarrow \frac{r_1}{r_2} = \sqrt{\frac{9}{16}} = \frac{3}{4}$

$\therefore$ Ratio of their volumes

$= \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3}$

$= \left(\frac{r_1}{r_2}\right)^3 = \left(\frac{3}{4}\right)^3 = \frac{27}{64}$

185. (4) Volume of cylinder $= \pi r^2 h$

$= (\pi \times 20 \times 20 \times 9)$ cu.cm.

$= 3600\ \pi$ cu.cm.

$\therefore$ Volume of cone

$= 3600\ \pi$ cu.cm.

$\Rightarrow \frac{1}{3}\ \pi R^2 H = 3600\ \pi$

$\Rightarrow \frac{1}{3} \times R^2 \times 108 = 3600$

$\Rightarrow R^2 = \frac{3600 \times 3}{108} = 100$

$\Rightarrow R = \sqrt{100} = 10$ cm.

186. (4) Radius of the base of the cylinder = radius of the base of cone $= x$ units

$\frac{\text{Volume of cone}}{\text{Volume of cylinder}}$

$= \frac{\frac{1}{3}\pi\ r^2 H}{\pi\ r^2 h}$

$= \frac{1}{3} \cdot \frac{H}{h} = \frac{1}{3} \times \frac{2}{3} = 2 : 9$

187. (3) Ratio of volumes

= cone : cylinder : hemi-sphere

$= \frac{1}{3}\pi\ r^2 h : \pi\ r^2\ h : \frac{2}{3}\ \pi\ r^3$

$= \frac{1}{3}\pi r^3 : \pi r^3 : \frac{2}{3}\pi r^3$

$[\because r = h]$

$= \frac{1}{3} : 1 : \frac{2}{3} = 1 : 3 : 2$

188. (2) Volume of the material of the hollow cylinder

$= \frac{4}{3}\pi\left(R^3 - r^3\right)$

$= \frac{4}{3}\pi\left(5^3 - 3^3\right)$

$= \frac{4}{3}\pi\ (125 - 27)$

$= \frac{4 \times 98}{3}\ \pi$ cu.cm.

If the radius of the cylinder be R cm, then

$\pi R^2 \times \frac{8}{3} = \frac{4 \times 98\pi}{3}$

$\Rightarrow R^2 = \frac{4 \times 98}{8} = 49$

$\Rightarrow R = \sqrt{49} = 7$ cm.

$\therefore$ Diameter $= 2\ R = 2 \times 7$

$= 14$ cm.

189. (1) According to the question,

$\pi\ (R^2 - r^2)\ h = 748$

$\Rightarrow \frac{22}{7}\ (R^2 - r^2) \times 14 = 748$

$\Rightarrow R^2 - r^2 = \frac{748 \times 7}{22 \times 14} = 17$

$\Rightarrow 9^2 - r^2 = 17 \Rightarrow 81 - r^2 = 17$

$\Rightarrow r^2 = 81 - 17 = 64$

$\Rightarrow r = \sqrt{64} = 8$ cm.

$\therefore$ Thickness of pipe

$= R - r = 9 - 8 = 1$ cm.

190. (3) Volume of the two spheres of radius 6 cm. each

$= 2 \times \frac{4}{3}\ \pi\ r^3$

$= 2 \times \frac{4}{3} \times \pi \times (6)^3$

$= 576\ \pi$ cu. cm.

According to the question,

$\pi \times 12 \times 12 \times h = 576\ \pi$

$\Rightarrow h = \frac{576}{12 \times 12} = 4$ cm.

191. (3) Perimeter of a face of cube

$= 20$ cm.

$\therefore$ An edge of cube

$= \frac{20}{4} = 5$ cm.

$\therefore$ Volume of cube = (edge)^3

$= (5)^3 = 125$ cu. cm.

192. (1) Radius of sphere $= r$ units

According to the question,

$\frac{4}{3}\ \pi r^3 = 4\ \pi r^2 \Rightarrow r = 3$ units

$\therefore$ Diameter $= 2 \times 3 = 6$ units

193. (4) Radius of cylindrical vessel = r cm. (let).

Volume of conical piece of iron =

$\frac{1}{3}\pi R^2 h$

$= \left(\frac{1}{3}\pi \times 14 \times 14 \times 30\right)$ cu. cm.

Volume of raised water

$= \pi r^2 \times 6.4$ cu. cm.

$\therefore \pi r^2 \times 6.4$

$= \frac{1}{3}\pi \times 14 \times 14 \times 30$

$\Rightarrow r^2 = \frac{14 \times 14 \times 10}{6.4}$

$\Rightarrow r^2 = \dfrac{14^2 \times 10^2}{8^2}$

$\Rightarrow r = \dfrac{14 \times 10}{8}$

$\Rightarrow 2r = \dfrac{2 \times 14 \times 10}{8}$

= 35 cm = diameter

194. (1) The base of a prism is a triangular.

Semi-perimeter of triangle(s)

$= \dfrac{5+10+13}{2} = \dfrac{28}{2} = 14$ cm.

∴ Area of triangle

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{14(14-5)(14-10)(14-13)}$

$= \sqrt{14 \times 9 \times 4 \times 1}$

$= 6\sqrt{14}$ sq. cm.

∴ Volume of prism

= Area of base × height

$= 6\sqrt{14} \times 10 = 60\sqrt{14}$ cu.cm.

= 60 × 3.742 = 224.52 cu.cm.

∴ Weight of the prism

= (224.52 × 7) gram

= 1571.64 gram

195. (3) Volume of cone $= \dfrac{1}{3}\pi r^2 h$

$= \dfrac{1}{3} \times \pi \times 15 \times 15 \times 20$

$= 1500\pi$ cu.cm.

∴ Volume of a smaller cone

$= \dfrac{1}{3}\pi \times 1.5 \times 1.5 \times 5$

$= 3.75\pi$ cu.cm.

∴ Number of smaller cones

$= \dfrac{1500\pi}{3.75\pi} = 400$

196. (2) In Δ ABC,

$a = 13$ cm., $b = 20$ cm., $c = 21$ cm.,

Semi-perimeter = s = $\dfrac{a+b+c}{2}$

$= \left(\dfrac{13+20+21}{2}\right)$ cm.

$= \dfrac{54}{2} = 27$ cm.

∴ Area of ΔABC = Area of the base of prism

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{27(27-13)(27-20)(27-21)}$

$= \sqrt{27 \times 14 \times 7 \times 6}$

$= \sqrt{3 \times 3 \times 3 \times 2 \times 7 \times 7 \times 2 \times 3}$

= 3 × 3 × 2 × 7 = 126 sq. cm.

∴ Volume of prism = Area of base × height

= 126 × 9 = 1134 cu. cm.

197. (3) Volume of earth and stones taken out from the tunnel

$= \pi r^2 h$

$= \left(\dfrac{22}{7} \times 2 \times 2 \times 56\right)$ cu. metre

= 704 cu. metre

Volume of ditch

= (48 × 16.5 × 4) cu. metre

= 3168 cu. metre

∴ Part of ditch filled

$= \dfrac{704}{3168} = \dfrac{2}{9}$ parts

198. (3) Volume of hemisphere

$= \dfrac{2}{3}\pi R^3$ cu. units

Volume of newphere

$= \dfrac{4}{3}\pi r^3$ cu. units

According to the question,

$\dfrac{2}{3}\pi R^3 = 4 \times \dfrac{4}{3}\pi r^3$

$\Rightarrow R^3 = 8r^3$

$\Rightarrow R = 2r$ units

$\therefore r = \dfrac{1}{2}$ R Units

199. (2) Volume of cylinder $= \pi r^2 h$

$= (\pi \times 8 \times 8 \times 2)$ cu. cm.

$= 128\,\pi$ cu. cm.

If the radius of the base of cone be R cm. then

$\dfrac{1}{3}\pi R^2 H = 128\pi$

$\Rightarrow R^2 \times 6 = 128 \times 3$

$\Rightarrow R^2 = \dfrac{128 \times 3}{6} = 64$

$\Rightarrow R = \sqrt{64} = 8$ cm.

200. (4)

OA′ = h units

AA′ = H units

AB = R units

A′B′ = r units.

A′B′ ∥ AB

∠ OA′ B′ = ∠ OAB

∠ OB′A′ = ∠ OBA

∴ Δ OAB ~ Δ OA′B′

$\therefore \dfrac{OA'}{OA} = \dfrac{A'B'}{AB}$

$\Rightarrow \dfrac{h}{H+h} = \dfrac{r}{R}$

According to the question,

$\dfrac{1}{3}\pi r^2 h = \dfrac{1}{3}\pi R^2 (H + h) - \dfrac{1}{3}\pi r^2 h$

$\Rightarrow \dfrac{2}{3}\pi r^2 h = \dfrac{1}{3}\pi R^2 (H + h)$

$\Rightarrow 2\,\dfrac{r^2}{R^2} = \dfrac{H+h}{h}$

$\Rightarrow 2.\,\dfrac{h^2}{(H+h)^2} = \dfrac{H+h}{h}$

$\Rightarrow \dfrac{(H+h)^3}{h^3} = 2$

$\Rightarrow \dfrac{H+h}{h} = \sqrt[3]{2}$

$\Rightarrow \dfrac{H}{h} + 1 = \sqrt[3]{2}$

$\Rightarrow \dfrac{H}{h} = \dfrac{\sqrt[3]{2}-1}{1}$

$\therefore \dfrac{h}{H} = 1 : \sqrt[3]{2} - 1$

201. (4) Volume of sphere $= \dfrac{4}{3}\pi r^3$

∴ Total volume of both spheres

$= \dfrac{4}{3}\pi (r_1^3 + r_2^3)$

$= \dfrac{4}{3}\pi (1^3 + 6^3)$

$= \dfrac{4}{3}\pi (1 + 216)$

$= \left(\frac{4\pi}{3} \times 217\right)$ cu. cm.

If the internal radius of hollow sphere = r cm, then

$\therefore$ Volume of the iron of this sphere = $\frac{4}{3}\pi(9^3 - r^3)$ cu.cm.

According to the question,

$\frac{4}{3}\pi(9^3 - r^3) = \frac{4\pi}{3} \times 217$

$\Rightarrow 729 - r^3 = 217$

$\Rightarrow r^3 = 729 - 217 = 512$

$\Rightarrow r^3 = (8)^3$

$\Rightarrow r = 8$ cm

$\therefore$ Required thickness

$= 9 - r = 9 - 8 = 1$ cm.

202. (1) Area of the base of prism

$= \frac{1}{2}(10 + 6) \times 5$

$= \frac{1}{2} \times 16 \times 5 = 40$ sq. cm.

$\therefore$ Volume of prism

= Area of base × height

= 40 × 8 = 320 cu. cm.

203. (4) Capacity of bowl = $\frac{2}{3}\pi r^3$

$= \left(\frac{2}{3} \times \frac{22}{7} \times 6 \times 6 \times 6\right)$ cu. cm.

$= \frac{3168}{7} = 452.57$ cu. cm.

204. (4) Volume of regular tetrahedron

$= \frac{a^3}{6\sqrt{2}}$ cu. cm.

$= \frac{1}{6\sqrt{2}} = \frac{\sqrt{2}}{6\sqrt{2} \times \sqrt{2}}$ cu. cm.

$= \frac{\sqrt{2}}{12}$ cu. cm.

205. (3)

The volume of cone should be maximum.

$\therefore$ Radius of the base of cone

$= \frac{\text{Edge of cube}}{2}$

$= \frac{4.2}{2} = 2.1$ dm.

Height = Edge of cube = 4.2 dm.

$\therefore$ Volume of cone = $\frac{1}{3}\pi r^2 h$

$= \left(\frac{1}{3} \times \frac{22}{7} \times 2.1 \times 2.1 \times 4.2\right)$ cu.dm.

= 19.404 cu. dm.

206. (2) Length of base = $3x$ cm and breadth = $2x$ cm (let)

Total surface area of prism

= perimeter of base × height + 2 × area of base

= $[2(3x + 2x) \times 12 + 2 \times 3x \times 2x]$ sq. cm.

= $(120x + 12x^2)$ sq. cm.

According to the question,

$120x + 12x^2 = 288$

$\Rightarrow x^2 + 10x = 24$

$\Rightarrow x^2 + 10x - 24 = 0$

$\Rightarrow x^2 + 12x - 2x - 24 = 0$

$\Rightarrow x(x + 12) - 2(x + 12) = 0$

$\Rightarrow (x - 2)(x + 12) = 0$

$\Rightarrow x = 2$ because $x \neq -12$

$\therefore$ Volume of prism

= Area of base × height

= $(3x \times 2x \times 12)$ cu. cm.

= $72x^2 = (72 \times 2 \times 2)$ cu. cm.

= 288 cu. cm.

207. (4) Radius of cone so formed = 9 cm

Its height = 12 cm

$\therefore$ Volume of cone = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \pi \times 9 \times 9 \times 12$

= 324 π cu. cm.

208. (4) Volume of right circular cylinder = $\pi r^2 h$

$= \frac{22}{7} \times 5 \times 5 \times 21$

= 1650 cu. cm.

209. (2)

Radius of the base of cone

$= \frac{7}{2}$ cm

Its height = 7 cm

$\therefore$ Volume of cone = $\frac{1}{3}\pi r^2 h$

$= \left(\frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 7\right)$ cu.cm.

$= \frac{539}{6} = 89.83$ cu.cm.

210. (1) Volume of two solid metallic spheres = $\frac{4}{3}\pi(r_1^3 + r_2^3)$

$= \frac{4\pi}{3}(1^3 + 6^3)$

$= \frac{4\pi}{3}(1 + 216)$

$= \left(\frac{4\pi}{3} \times 217\right)$ cu cm.

Internal radius of hollow sphere = r cm (let)

$\therefore \frac{4}{3}\pi((r+1)^3 - r^3)$

$= \frac{4\pi}{3} \times 217$

$\Rightarrow r^3 + 3r^2 + 3r + 1 - r^3 = 217$

$\Rightarrow 3r^2 + 3r + 1 = 217$

$\Rightarrow 3r^2 + 3r - 216 = 0$

$\Rightarrow r^2 + r - 72 = 0$

$\Rightarrow r^2 + 9r - 8r - 72 = 0$

$\Rightarrow r(r + 9) - 8(r + 9) = 0$

$\Rightarrow (r - 8)(r + 9) = 0$

$\Rightarrow r = 8$ cm. because $r \neq -9$

$\therefore$ External radius of hollow sphere = 9 cm.

211. (1)

AB = AC = 5 cm.

BD = DC = 3 cm.

From Δ ABD,

AD = $\sqrt{AB^2 - BD^2}$

$= \sqrt{5^2 - 3^2} = \sqrt{25 - 9}$

$= \sqrt{16} = 4$ cm.

$\therefore$ Area of the base of prism

$= \frac{1}{2} \times BC \times AD$

$= \frac{1}{2} \times 6 \times 4 = 12$ sq. cm.

$\therefore$ Volume of prism

= Area of base × height

= 12 × 8 = 96 cu. cm.

212. (2) Increase in water level
$= x$ cm (let)
According to the question,
$2.1 \times 1.5 \times 10000 \times x$
$= 630 \times 1000$ cu. cm.
$\Rightarrow 21 \times 15 \times 100 \times x = 630000$
$\Rightarrow x = \frac{630000}{21 \times 15 \times 100} = 20$ cm.
$= 0.2$ metre

213. (1) Volume of larger sphere
$= \frac{4}{3}\pi R^3 = \frac{4}{3}\pi\ (9)^3$ cu.cm.
$= 972\ \pi$ cu.cm.
Volume of smaller sphere
$= \frac{4}{3}\pi\ (6)^3 = 288\ \pi$ cu.cm.
Volume of cylinder
$= \pi r^2 h$
$= \pi \times 36\ h$
$= 36\pi h$ cu.cm.
$\therefore 288\pi + 36\pi\ h = 972\pi$
$\Rightarrow 288 + 36h = 972$
$\Rightarrow 36h = 972 - 288 = 684$
$\Rightarrow h = \frac{684}{36} = 19$ cm.

214. (2) Volume of used iron
$= \pi\ (R^2 - r^2)h$
where R = 4 cm; r = 3 cm.
$= \frac{22}{7}\ (4^2 - 3^2) \times 20$
$= \frac{22}{7} \times (4 + 3)\ (4 - 3) \times 20$
$= \frac{22}{7} \times 7 \times 20 = 440$ cu. cm.

215. (3) Let the length of rectangular box be l cm.
Width = b cm.
Height = h cm.
According to the question,
$lb = 12$ sq. cm.
$bh = 15$ sq. cm.
$hl = 20$ sq. cm.
On multiplying,
$l^2 \times b^2 \times h^2 = 12 \times 15 \times 20$
$\therefore$ Volume of box
$= \sqrt{12 \times 15 \times 20}$
$= \sqrt{3600} = 60$ cu. cm.

216. (1) Volume of removed material =
$\pi r^2 h - \frac{1}{3}\pi r^2 h = \frac{2}{3}\ \pi r^2 h$
$= \left(\frac{2}{3} \times \frac{22}{7} \times 0.6 \times 0.6 \times 1.4\right)$ cu. cm.
$= 1.056$ cu. cm.

217. (4) Volume of bowl $= \frac{2}{3}\pi r^3$
$= \frac{2}{3}\pi \times 9 \times 9 \times 9$
$= 486\pi$ cu. cm. = volume of liquid
Volume of 1 bottle $= \pi R^2 H$
$= \pi \times \frac{3}{2} \times \frac{3}{2} \times 4$
$= 9\pi$ cu. cm.
$\therefore$ Number of bottles $= \frac{486\pi}{9\pi}$
$= 54$

218. (4) Volume of water filled by pipe in 30 minutes
$= \left(\frac{40 \times 1000000}{2}\right)$ cu.cm
$= 20000000$ cu. cm.
$\therefore$ Height of water level
$= \frac{20000000}{8000 \times 4000} = \frac{5}{8}$ cm.

219. (3) Let the radius of cylinder be r cm.
Height = h cm.
According to the question,
$2\pi rh + 2\pi r^2 = 231$
Again, $2\pi rh = \frac{2}{3} \times 231 = 154$
$\therefore\ 2\pi r^2 = 231 - 154$
$\Rightarrow 2 \times \frac{22}{7}\ r^2 = 77$
$\Rightarrow r^2 = \frac{77 \times 7}{22 \times 2} = \frac{49}{2 \times 2}$
$\therefore\ r = \frac{7}{2}$ cm.
$\therefore\ 2\pi rh = 154$
$\Rightarrow 2 \times \frac{22}{7} \times \frac{7}{2} \times h = 154$
$\Rightarrow 22h = 154$
$\Rightarrow h = \frac{154}{22} = 7$ cm.
$\therefore$ Volume of cylinder $= \pi r^2 h$
$= \left(\frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 7\right)$ cu. cm.
$= 269.5$ cu. cm.

220. (1) Total volume of ice-cream = $\pi r^2 h$
$= \pi\left(\frac{21}{2}\right)^2 \times 38$ cu. cm.
$= \frac{8379\pi}{2}$ cu. cm.
For a cone of ice-cream,
Volume of cone
$= \frac{1}{3}\pi \times \left(\frac{7}{2}\right)^2 \times 12$ cu. cm.
$\therefore$ Volume of hemi–sphere
$= \frac{2}{3}\pi\left(\frac{7}{2}\right)^3$ cu. cm.
Total volume of cone–shaped ice cream
$= \frac{\pi}{3}\left(\frac{49}{4} \times 12 + \frac{343}{4}\right)$ cu. cm.
$= \frac{\pi}{3}\left(147 + \frac{343}{4}\right)$ cu. cm.
$= \frac{\pi}{3}\left(\frac{588 + 343}{4}\right)$ cu. cm.
$= \frac{\pi}{3} \times \frac{931}{4}$ cu. cm.
$\therefore$ Number of cones
$= \frac{8379\pi}{2} \times \frac{3 \times 4}{\pi \times 931} = 54$

221. (4) According to the question,
$2\pi r = 7$
$\Rightarrow 2 \times \frac{22}{7} \times r = 7$
$\Rightarrow r = \frac{7 \times 7}{2 \times 22}$ cm.
$\therefore$ Volume of Cylinder $= \pi r^2 h$
$= \frac{22}{7} \times \frac{7 \times 7 \times 7 \times 7}{2 \times 22 \times 2 \times 22} \times 11$
$= \frac{7 \times 7 \times 7}{8}$
$= 42.875$ cu. cm.

222. (2) Volume of spherical aquarium
$= (11 \times 1.54)$ cu. metre
$= 16.94$ cu. metre

223. (3) Volume of pyramid
$= \frac{1}{3} \times$ area of base $\times$ height
$\Rightarrow 220 = \frac{1}{3} \times 55 \times$ height
$\Rightarrow$ Height $= \frac{220 \times 3}{55}$
$= 12$ metre

224. (4) Volume of wire $= \pi r^2 h$
when $r_1 = \frac{r}{3}$, $h_1 = ?$
$\therefore\ \pi r^2 h = \pi r_1^2\ h_1$
$\Rightarrow r^2 h = \left(\frac{r}{3}\right)^2 \times h_1$
$\Rightarrow h_1 = 9\ h$

225. (2) Volume of prism = Area of base × height

$\Rightarrow 100 = \frac{1}{2} \times x \times 2x \times 25$

$\Rightarrow x^2 = \frac{100}{25} = 4$

$\Rightarrow x = 2$

∴ Smaller sides of triangle = 2 cm and 4 cm

∴ Largest side = $\sqrt{2^2 + 4^2}$

$= \sqrt{4+16}$

$= \sqrt{20} = 2\sqrt{5}$ cm.

[∵ The triangle is right angled.]

226. (3) Let the edge of cube be a units.

Its volume = a^3 cubic units

Radius of sphere = $\frac{a}{2}$ units

Volume of sphere = $\frac{4}{3}\pi\left(\frac{a}{2}\right)^3$

$= \frac{\pi a^3}{6}$ cubic units

∴ Required ratio = $a^3 : \frac{\pi a^3}{6} =$ $6 : \pi$

227. (3) Water stored in tank

$= \frac{12 \times 10 \times 50}{100} = 60$ cu. metre.

= Capacity of tank.

228. (4) Volume of cylinder = $\pi r^2 h$

$= (\pi \times 6 \times 6 \times 56)$ cu. cm.

Volume of hemi-spherical ball =

$\left(\frac{2}{3}\pi \times 0.75 \times 0.75 \times 0.75\right)$ cu. cm.

∴ Total number of balls

$= \frac{\pi \times 6 \times 6 \times 56}{\frac{2}{3} \times \pi \times 0.75 \times 0.75 \times 0.75}$

= 7168

229. (4) Volume of 1 coin = $\pi r^2 h$

$= (\pi \times 0.75 \times 0.75 \times 0.2)$ cu. cm.

Volume of cylinder

$= (\pi \times 3 \times 3 \times 8)$ cu. cm.

∴ Number of coins

$= \frac{\pi \times 3 \times 3 \times 8}{\pi \times 0.75 \times 0.75 \times 0.2}$

$= \frac{3 \times 3 \times 8 \times 100 \times 100 \times 10}{75 \times 75 \times 2}$

= 640

230. (3) Volume of sphere

$= \frac{4}{3}\pi r^3$

Volume of cone = $\frac{1}{3}\pi r^2 h$

According to the question,

$\frac{1}{3}\pi r^2 h = \frac{4}{3}\pi r^3$

$\Rightarrow h = 4r = 4 \times 5 = 20$ cm.

231. (4) $\frac{d_1}{d_2} = \frac{r_1}{r_2} = \frac{3}{2}$

$V_1 = V_2$

$\Rightarrow \pi r_1^2 h_1 = \pi r_2^2 h_2$

$\Rightarrow \frac{h_1}{h_2} = \left(\frac{r_2}{r_1}\right)^2 = \left(\frac{2}{3}\right)^2 = \frac{4}{9}$

= 4 : 9

232. (3) Volume of sand = Volume of cylindrical vessel

$= \pi r^2 h$

$= \pi \times (18)^2 \times 32$ cu.cm.

Volume of conical heap

$= \pi \times 18 \times 18 \times 32$

$\Rightarrow \frac{1}{3}\pi R^2 H = \pi \times 18 \times 18 \times 32$

$\Rightarrow \frac{1}{3} \times R^2 \times 24 = 18 \times 18 \times 32$

$\Rightarrow R^2 = \frac{18 \times 18 \times 32 \times 3}{24} = 1296$

$\Rightarrow R = \sqrt{1296} = 36$ cm.

233. (2) If the rise in water level be h cm., then

$\pi r^2 h = \frac{4}{3}\pi R^3$

where r = radius of cylindrical vessel,

R = radius of solid sphere

$\Rightarrow 4^2 \times h = \frac{4}{3} \times (3)^3$

$\Rightarrow h = \frac{4 \times 3 \times 3}{4 \times 4} = \frac{9}{4}$

= 2.25 cm.

234. (4) Volume of the silver used in hollow hemispherical bowl

$= \frac{2}{3}\pi (R^3 - r^3)$

Where R = external radius

r = internal radius

$= \frac{2}{3}\pi (8^3 - 4^3)$ cu. cm.

$= \frac{2}{3}\pi (512 - 64)$ cu. cm.

$= \frac{2\pi}{3} \times 448$ cu. cm.

∴ Volume of cone = $\frac{1}{3}\pi r_1^2 h$

$= \frac{1}{3}\pi 8^2 \times h$

∴ $\frac{1}{3}\pi \times 8^2 \times h = \frac{2\pi}{3} \times 448$

$\Rightarrow h = \frac{2 \times 448}{8 \times 8} = 14$ cm.

235. (3) According to the question,

$r + h = 20$ cm.

Total surface area of cylinder = $2\pi rh + 2\pi r^2$

$= 2\pi r (h + r)$

∴ $2\pi r \times 20 = 880$

$\Rightarrow \pi r = \frac{880}{40} = 22$

$\Rightarrow \frac{22}{7} \times r = 22$

$\Rightarrow r = \frac{22 \times 7}{22} = 7$ cm.

∴ $r + h = 20$

$\Rightarrow h = 20 - 7 = 13$ cm.

∴ Volume of cylinder = $\pi r^2 h$

$= \frac{22}{7} \times 7 \times 7 \times 13$

= 2002 cu. cm.

236. (1) Radius of solid sphere

= R units

Radius of solid hemisphere

= r units

According to the question,

$4\pi R^2 = 3\pi r^2$

$\Rightarrow 4R^2 = 3r^2$

$\Rightarrow \frac{R^2}{r^2} = \frac{3}{4} \Rightarrow \frac{R}{r} = \frac{\sqrt{3}}{2}$

∴ Ratio of volumes = $\frac{\frac{4}{3}\pi R^3}{\frac{2}{3}\pi r^3} =$

$2\left(\frac{R}{r}\right)^3 = 2\left(\frac{\sqrt{3}}{2}\right)^3 = \frac{3\sqrt{3}}{4} = 3\sqrt{3} : 4$

237. (3) Area of the base of prism

$= \frac{1}{2}$ (sum of parallel sides) × perpendicular distance

$= \frac{1}{2}(25 + 11) \times 16$

$= \frac{1}{2} \times 36 \times 16 = 288$ sq. cm.

∴ Volume of prism = Area of base × height

= 288 × 10

= 2880 cu. cm.

238. (1) Volume of the metal of hollow cylinder = $\pi (R^2 - r^2)\ h$
$= \pi (6.75^2 - 5.25^2) \times 15$
$= \pi (6.75 + 5.25)\ (6.75 - 5.25) \times 15$
$= \pi \times 12 \times 1.5 \times 15$ cu. cm.
If the radius of the base of solid cylinder be r_1 cm, then

$\pi r_1^2 h_1 = \pi \times 12 \times 1.5 \times 15$

$\Rightarrow r_1^2 \times \frac{15}{2} = 12 \times 1.5 \times 15$

$\Rightarrow r_1^2 = 12 \times 1.5 \times 2$

$\Rightarrow r_1^2 = 36 \Rightarrow r_1 = \sqrt{36} = 6$ cm.

239. (3)

Volume of larger cone = $\frac{1}{3}\pi r^2 h$

$\Delta ADE \sim \Delta ABO$

$\therefore \frac{DE}{BO} = \frac{AE}{AO}$

$\Rightarrow \frac{DE}{r} = \frac{\frac{h}{2}}{h} \Rightarrow DE = \frac{r}{2}$

Volume of cone ADF

$= \frac{1}{3}\pi\left(\frac{r}{2}\right)^2 \times \frac{h}{2}$

$= \frac{1}{24}\pi r^2 h$ cu. units

Volume of remaining part

$= \frac{1}{3}\pi r^2 h - \frac{1}{24}\pi r^2 h$

$= \pi r^2 h\left(\frac{1}{3} - \frac{1}{24}\right)$

$= \pi r^2 h\left(\frac{8-1}{24}\right)$

$= \frac{7}{24}\pi r^2 h$ cu. units

$\therefore$ Required ratio

$= \frac{1}{24}\pi r^2 h : \frac{7}{24}\pi r^2 h$

$= 1 : 7$

240. (3) Volume of both spheres = Volume of water raised in the cylinder

$= \pi \times 9^2 \times 4$
$= 324\pi$ cu. cm.
Radius of first sphere = r cm.
Radius of second sphere

$= \frac{r}{2}$ cm.

$\therefore \frac{4}{3}\pi\left(r^3 + \frac{r^3}{8}\right) = 324\pi$

$\Rightarrow \left(\frac{8r^3 + r^3}{8}\right) = \frac{324 \times 3}{4}$

$\Rightarrow \frac{9r^3}{8} = 243$

$\Rightarrow r^3 = \frac{243 \times 8}{9} = 216$

$\therefore r = \sqrt[3]{216} = 6$ cm.

$\therefore$ Radius of second sphere = 3 cm.

241. (4) $\frac{r_1}{r_2} = \frac{3}{2}$; $\frac{h_1}{h_2} = \frac{3}{7}$

$\therefore \frac{V_1}{V_2} = \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2} = \left(\frac{r_1}{r_2}\right)^2 \times \frac{h_1}{h_2}$

$= \left(\frac{3}{2}\right)^2 \times \frac{3}{7}$

$= \frac{9}{4} \times \frac{3}{7} = \frac{27}{28} = 27 : 28$

242. (4) $\frac{d_1}{d_2} = \frac{r_1}{r_2} = \frac{4}{5}$

$\therefore \frac{V_1}{V_2} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2}$

$\Rightarrow \frac{V_1}{V_2} = \left(\frac{r_1}{r_2}\right)^2 \times \frac{h_1}{h_2}$

$\Rightarrow \frac{1}{4} = \left(\frac{4}{5}\right)^2 \times \frac{h_1}{h_2}$

$\Rightarrow \frac{h_1}{h_2} = \frac{1}{4} \times \frac{5 \times 5}{4 \times 4} = \frac{25}{64} = 25:64$

243. (3) Let the internal radius of pipe be r cm.
External radius = R cm = 9 cm.
$\therefore$ Volume of the material of pipe

$= \pi (R^2 - r^2) h$

$\Rightarrow \frac{22}{7}\left(9^2 - r^2\right) \times 14 = 748$

$\Rightarrow (81 - r^2) = \frac{748 \times 7}{22 \times 14} = 17$

$\Rightarrow r^2 = 81 - 17 = 64$

$\Rightarrow r = \sqrt{64} = 8$ cm

$\therefore$ Thickness of pipe
$= 9 - 8 = 1$ cm.

244. (3) Diagonal of cube

$= \sqrt{3} \times$ edge

$\sqrt{3} \times$ edge $= \sqrt{192}$

$\Rightarrow \sqrt{3}x = \sqrt{64 \times 3} = 8\sqrt{3}$

Where x = edge of cube
$\Rightarrow x = 8$ cm
$\therefore$ Volume of cube
$= (8)^3 = 512$ cu.cm.

245. (1) Slant height of cone = l cm.
= 10 cm.
Radius of base = r = 6 cm.

$\therefore h = \sqrt{l^2 - r^2}$

$= \sqrt{10^2 - 6^2} = \sqrt{(10+6)\ (10-6)}$

$= \sqrt{16 \times 4} = 4 \times 2 = 8$ cm.

$\therefore$ Volume of cone $= \frac{1}{3}\pi r^2 h$

$= \left(\frac{1}{3} \times \frac{22}{7} \times 6 \times 6 \times 8\right)$ cu. cm.

$= \frac{6336}{21} = 301.71$ cu. cm.

246. (3) In both cases, volume remains same.
If the radius of new sphere be R units, then

$\frac{4}{3}\pi R^3 = \frac{4}{3}\pi r_1^3 + \frac{4}{3}\pi r_2^3 + \frac{4}{3}\pi r_3^3$

$\Rightarrow R^3 = r_1^3 + r_2^3 + r_3^3$

$\therefore R = \left(r_1^3 + r_2^3 + r_3^3\right)^{\frac{1}{3}}$ units

247. (2) Mass = Volume × density

$\therefore \frac{\text{Mass of sphere A}}{\text{Mass of sphere B}}$

$= \frac{\frac{4}{3}\pi R^3 \times d_1}{\frac{4}{3}\pi r^3 \times d_2}$

$\Rightarrow \frac{8}{27} = \frac{R^3 \times 8}{r^3}$

$\Rightarrow \frac{R^3}{r^3} = \frac{1}{27}$

$\Rightarrow \frac{R}{r} = \sqrt[3]{\frac{1}{27}} = \frac{1}{3} = 1 : 3$

248. (4) Volume of larger ball

$= \frac{4}{3}\pi \times (6)^3$ cu. cm.

Volume of a smaller ball

$= \frac{4}{3}\pi\left(\frac{3}{10}\right)^3$ cu. cm.

$\therefore$ Number of smaller balls

$= \dfrac{\frac{4}{3}\pi \times 6 \times 6 \times 6}{\frac{4}{3}\pi \times \frac{3}{10} \times \frac{3}{10} \times \frac{3}{10}}$

$= \dfrac{6 \times 6 \times 6 \times 1000}{3 \times 3 \times 3}$

$= 8000$

249. (1) Radius of the base of cone = $2r$ units

Radius of the base of cylinder = r units

Height of cone = height of cylinder = h units

$\therefore$ Required ratio

$= \dfrac{\frac{1}{3}\pi(2r)^2 \times h}{\pi r^2 h}$

$= \frac{4}{3}\,\frac{\pi r^2 h}{\pi r^2 h} = \frac{4}{3} : 4 : 3$

250. (1) Area of the base of pyramid = 57 sq. units

Height = 10 units

$\therefore$ Volume of pyramid

$= \frac{1}{3} \times$ Area of base $\times$ height

$= \left(\frac{1}{3} \times 57 \times 10\right)$ cu. units

$= 190$ cu. units

251. (4) Volume of sphere = Volume of cylinder

$\Rightarrow \frac{4}{3}\pi r^3 = \pi r^2 h$

$\Rightarrow 4r = 3h$

$\Rightarrow \frac{h}{r} = \frac{4}{3} = 4 : 3$

252. (2) Volume of cylindrical rod = 44 × volume of solid cube

$\Rightarrow \pi r^2 h = 44 \times (\text{edge})^3$

$\Rightarrow \frac{22}{7} \times 32 \times 32 \times h$

$= 44 \times 8 \times 8 \times 8$

$\Rightarrow h = \dfrac{44 \times 8 \times 8 \times 8 \times 7}{22 \times 32 \times 32}$

$= 7$ cm.

253. (1) Volume of sand in cylindrical vessel

$= \pi r^2 h$

$= \pi \times (4)^2 \times 5$ cu. cm.

$= 80\pi$ cu. cm.

According to the question volume of conical shape

$= 80\pi$ cu. cm.

$\Rightarrow \frac{1}{3}\pi R^2 H = 80\pi$

$\Rightarrow \frac{1}{3} \times 6 \times 6 \times H = 80$

$\Rightarrow 12\,H = 80$

$\Rightarrow H = \frac{80}{12} = 6.67$ cm.

254. (2) $\frac{V_1}{V_2} = \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2} = \left(\frac{r_1}{r_2}\right)^2 \left(\frac{h_1}{h_2}\right)$

$= \left(\frac{2}{3}\right)^2 \left(\frac{5}{3}\right) = \frac{20}{27} = 20 : 27$

255. (1) Volume of larger cube

$= x_1^3 + x_2^3 + x_3^3$

$= (6^3 + 8^3 + 10^3)$ cu. cm.

$= (216 + 512 + 1000)$ cu. cm.

$= 1728$ cu. cm.

$\therefore$ Its edge $= \sqrt[3]{1728}$

$= \sqrt[3]{12 \times 12 \times 12} = 12$ cm.

256. (4) In both cases, volume will remain same.

Volume of sphere $= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi(6)^3$

$= 288\pi$ cu. cm.

If the length of wire be h cm., then

$\Rightarrow \pi R^2 h = 288\pi$

$\Rightarrow (0.2)^2 \times h = 288$

$\Rightarrow h = \frac{288}{0.04} = 7200$ cm.

$= 72$ metre

257. (4) Volume of wire $(V_1) = \pi r^2 h$

Case II,

Volume of wire $(V_2) = \pi\left(\frac{r}{3}\right)^2 h_1$

$\because V_1 = V_2$

$\therefore \pi r^2 h = \frac{\pi r^2 h_1}{9}$

$\Rightarrow h_1 = 9h$

258. (2)

Length of box = 25 – 2 × 2

= 21 cm.

Width of box = 20 – 2 × 2

= 16 cm.

Height of box = 2 cm.

$\therefore$ Volume of box

= (21 × 16 × 2) cu. cm.

= 672 cu. cm.

259. (1) Volume of solid sphere

$= \frac{4}{3}\pi(3)^3$

$= 36\pi$ cu. cm.

Volume of the metal of tube

$= \pi(R^2 - r^2)h$ cu. cm.

where R = 5 cm.

r = in-radius

$\therefore \pi(R^2 - r^2)\,h = 36\pi$

$\Rightarrow (25 - r^2) \times 4 = 36$

$\Rightarrow 25 - r^2 = \frac{36}{4} = 9$

$\Rightarrow r^2 = 25 - 9 = 16$

$\Rightarrow r = \sqrt{16} = 4$ cm.

$\therefore$ Thickness of tube = 5 – 4

= 1 cm.

260. (4) Volume of new single sphere

$= \frac{4}{3}\pi\left(r_1^3 + r_2^3 + r_3^3\right)$

$= \frac{4}{3}\pi\left(3^3 + 4^3 + 5^3\right)$ cu. cm.

$= \frac{4}{3}\pi(27 + 64 + 125)$ cu.cm.

$= \frac{4}{3}\pi \times 216$ cu.cm.

$\therefore \frac{4}{3}\pi R^3 = \frac{4}{3}\pi \times 216$

where R = radius of new sphere

$\Rightarrow R^3 = 216$

$\Rightarrow R = \sqrt[3]{216} = \sqrt[3]{6 \times 6 \times 6} = 6$ cm

$\therefore$ Diameter of new sphere

$= 2 \times 6 = 12$

261. (4) Let the radius of base = r cm

$\therefore h_1 = 3r$ cm.

$h_2 = 4r$ cm.

According to the question,

$\pi r^2 h_2 - \pi r^2 h_1 = 1078$

$\Rightarrow \pi r^2 (h_2 - h_1) = 1078$

$\Rightarrow \frac{22}{7} r^2 (4r - 3r) = 1078$

$\Rightarrow \frac{22}{7} r^3 = 1078$

$\Rightarrow r^3 = \frac{1078 \times 7}{22} = 49 \times 7$

$\therefore r = \sqrt[3]{49 \times 7} = 7$ cm.

TYPE-V

1. (4) Required total area
= Area of four walls + Area of the base
= 2 × 1.25 (6 + 4) + 6 × 4
= 2.5 × 10 + 24 = 49 m^2.

2. (2) Per cent change in surface area

$$= \left[x + y + \frac{xy}{100}\right]$$

$$= \left[15 + (-10) + \frac{15 \times (-10)}{100}\right]$$

$$= \left[15 - 10 - \frac{150}{100}\right] = [15 - 11.5]$$

= 3.5 per cent.
(+ve) sign shows 3.5 per cent increases.

3. (1) Let for the first cylinder,
$r_1 = 3x$
$h_1 = 2y$
For the second cylinder,
$r_2 = 5x$
$h_2 = 3y$

$$\therefore \frac{2\pi r_1 h_1}{2\pi r_2 h_2} = \frac{2\pi \times 3x \times 2y}{2\pi \times 5x \times 3y} = \frac{2}{5}$$

$\Rightarrow$ 2 : 5

4. (2) Volume of the tank = (3 × 5 × 1.54) cu.metre
Volume of water flowing through pipe per second

$$= \pi \times \left(\frac{7}{100}\right)^2 \times 5 \text{ m}^3$$

∴ Required time

$$= \frac{3 \times 5 \times 1.54 \times 100 \times 100 \times 7}{22 \times 7 \times 7 \times 5}$$

= 300 seconds = 5 minutes

5. (1) Area of the curved surface

$$= \frac{1}{3} \times 462 = 154 \text{ sq.cm}$$

$\therefore$ $2\pi rh + 2\pi r^2 = 462$
$\Rightarrow$ $154 + 2\pi r^2 = 462$
$\Rightarrow$ $2\pi r^2 = 462 - 154 = 308$

$$\Rightarrow r^2 = \frac{308}{2\pi} = \frac{308 \times 7}{2 \times 22} = 49$$

$$\Rightarrow r = \sqrt{49} = 7 \text{ cm}$$

6. (1) Lateral surface area of the cylinder = $2\pi rh$

$$= 2 \times \frac{22}{7} \times \frac{7}{2} \times 16$$

= 352 sq.cm.

7. (1) Let the radius of the base be r metre.
then $3 \times 2\pi r^2 = 2 \times 2\pi rh$
$\Rightarrow 3r = 2h$
$\Rightarrow 3r = 2 \times 6 \Rightarrow r = 4$ metre

8. (1) Curved surface of cylinder = 2πrh
Now,

Radius = $\frac{1}{3}r$; height = 6h

Curved surface

$$= 2\pi \times \frac{1}{3} r \times 6h = (2\pi rh) \times 2$$

∴ Increase will be twice.

9. (3) $V = \pi r^2 h$
$\Rightarrow 550 = \pi \times 5x \times 5x \times 7x$

$$\Rightarrow 550 = \frac{22}{7} \times 25 \times 7x^3$$

$$\Rightarrow x^3 = \frac{550}{22 \times 25} = 1 \Rightarrow x = 1$$

∴ Area of curved surface

$$= 2 \times \frac{22}{7} \times 5 \times 7$$

= 220 sq.cm.

10. (3) Curved surface of cylinder = 2πrh = a
Area of base = πr^2 = b
∴ 2πrh = a
$\Rightarrow 4\pi^2 r^2 h^2 = a^2 \Rightarrow 4\pi b h^2 = a^2$

$$\Rightarrow h^2 = \frac{a^2}{4\pi b}$$

$$\Rightarrow h = \frac{a}{2\sqrt{\pi b}} \text{ cm.}$$

11. (3) Length of the largest rod

$$= \sqrt{l^2 + b^2 + h^2}$$

$$= \sqrt{16^2 + 12^2 + \left(\frac{32}{3}\right)^2}$$

$$= \sqrt{400 + \frac{1024}{9}} = \sqrt{\frac{4624}{9}} = \frac{68}{3}$$

$$= 22\frac{2}{3} m$$

12. (3) Let the side of the two cubes are x and y.
According to the question

$$\frac{x^3}{y^3} = \frac{27}{64} = \frac{(3)^3}{(4)^3}, \therefore \frac{x}{y} = \frac{3}{4}$$

We know that surface area of the cube = 6 × (side)^2
∴ Ratio of their surface areas

$$= \frac{6x^2}{6y^2} = \frac{6 \times 3^2}{6 \times 4^2} = \frac{9}{16} = 9 : 16$$

13. (1) The length of the longest rod = The diagonal of the hall

$$= \sqrt{l^2 + b^2 + h^2}$$

$$= \sqrt{10^2 + 6^2 + 4^2}$$

$$= \sqrt{100 + 36 + 16} = \sqrt{152}$$

$$= \sqrt{2 \times 2 \times 38} = 2\sqrt{38} \text{ m}$$

14. (2) We have
2 × volume of cube = Volume of cuboid
$\Rightarrow 2 \times (\text{edge})^3 = 9 \times 8 \times 6$ cu.cm.
$\Rightarrow (\text{edge})^3 = 9 \times 8 \times 3$
$\Rightarrow$ Edge = $\sqrt[3]{3 \times 3 \times 3 \times 2 \times 2 \times 2}$
= 3 × 2 = 6 cm.
∴ Total surface area of the cube
= 6 × (edge)^2
= 6 × 6 × 6 = 216 cm^2.

15. (4) Length of largest bamboo (Diagonal) = $\sqrt{(5)^2 + (4)^2 + (3)^2}$

$$= \sqrt{25 + 16 + 9} = \sqrt{50}$$

$$= \sqrt{25 \times 2} = 5\sqrt{2} \text{ m}$$

16. (3) The required length = Diagonal of the room

$$= \sqrt{12^2 + 9^2 + 8^2}$$

$$= \sqrt{144 + 81 + 64}$$

$$= \sqrt{289} = 17\text{m}$$

17. (4) Surface area of a small cube =6 × (edge)^2 = 6 × 1 = 6 cm^2
Surface area of the large cube = 6 (5)^2 = 6 × 25 cm^2.
∴ Required ratio

$$= \frac{6}{6 \times 25} = \frac{1}{25}$$

or 1 : 25

18. (3) Area of four walls of a room
= 2 (length + breadth) × height
= Perimeter of floor × height
= 18 × 3 = 54 m^2

19. (2) Length of the longest rod

Diagonal = $\sqrt{10^2 + 10^2 + 5^2}$

$$= \sqrt{225} = 15 \text{ metre}$$

20. (2) Area of the four walls of the room
= 2 × height (length × breadth)
= 2 × 3 (4 + 3) = 42 sq. metre
Area of ceiling = 4 × 3
= 12 sq. metre
∴ Total area = 42 + 12
= 54 sq. metre

21. (1) Let the length, breadth and height of the box be x, y and z cm respectively.
∴ $x + y + z = 12$ ...(i)
and $2(xy + yz + zx) = 94$ ...(ii)
∴ $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$
⇒ $144 = x^2 + y^2 + z^2 + 94$
⇒ $x^2 + y^2 + z^2 = 144 - 94 = 50$
∴ Maximum length of stick

$= \sqrt{x^2 + y^2 + z^2}$

$= \sqrt{50} = 5\sqrt{2}$ cm

22. (4) If the length of the edge of cube be x cm, then

diagonal $= \sqrt{3}x$ cm

∴ $\sqrt{3}x = 8\sqrt{3} \Rightarrow x = 8$ cm

∴ Surface area of the cube
$= 6x^2 = 6 \times 8 \times 8 = 384$ sq. cm

23. (3) Let Breadth of room = x metre
Length = $2x$ metre
∴ Area of four walls
= 2 × h ($l + b$)
⇒ $660 = 2 \times 11\ (2x + x)$
$= 22 \times 3x = 66\ x$

$\Rightarrow x = \frac{660}{66} = 10$

∴ Area of floor = $2x^2$
$= 2 \times 10^2 = 200$ sq.metre

24. (3) Maximum length of the pencil

$= \sqrt{8^2 + 6^2 + 2^2}$

$= \sqrt{64 + 36 + 4} = \sqrt{104}$

$= 2\sqrt{26}$ cm

25. (2) Length of the edge of the box

$= \sqrt[3]{3.375}$ metre

$= \sqrt[3]{1.5 \times 1.5 \times 1.5}$ metre

= 1.5 metre

26. (3) Diagonal of the cube

$= 6\sqrt{3}$ cm

∴ $\sqrt{3} \times$ edge $= 6\sqrt{3}$ cm

⇒ Edge = 6 cm

∴ Total surface area : Volume
$= 6 \times 6^2 : 6^3 = 1 : 1$

27. (2) Diagonal of cubical room

$= 35\sqrt{3}$ metre

∴ $\sqrt{3} \times$ edge $= 35\sqrt{3}$

⇒ Edge = 35 metre

⇒ Diameter of sphere

= 35 metre

⇒ Surface area of the sphere
$= 4\pi r^2$

$= 4 \times \frac{22}{7} \times \frac{35 \times 35}{4}$

= 3850 sq. metre

28. (4) Area of the floor

$= \frac{\text{Volume of room}}{\text{Height of room}}$

$= \frac{204}{6} = 34$ sq. m.

29. (2) Area of the base of mountain
$= \pi r^2$

$1.54\ \text{km}^2 = \frac{22}{7} r^2$

$\Rightarrow \frac{1.54 \times 7}{22} = r^2$

$\Rightarrow 0.49 = r^2$

∴ r = 0.7 km

Slant height = 2.5 km

∴ Height of the mountain

$= \sqrt{(2.5)^2 - (0.7)^2}$

$= \sqrt{6.25 - 0.49}$

$= \sqrt{5.76} = 2.4$ km

30. (3) Radius of base (r)
= 19.2 ÷ 2 = 9.6 m
Height (h) = 2.8 m
Slant height

$l = \sqrt{r^2 + h^2}$

$= \sqrt{(9.6)^2 + (2.8)^2}$

$= \sqrt{92.16 + 7.84} = \sqrt{100}$

= 10 m

∴ Required area = curved surface area = πrl

$= \frac{22}{7} \times 9.6 \times 10$ sq.m.

= 301.7 sq.m.

31. (3)

AD = h

$\tan\alpha = \frac{BD}{AD}$

⇒ BD = $h \tan\alpha$

∴ Radius (r) = h tan α

∴ $l = \sqrt{h^2 + r^2}$

$= \sqrt{h^2 + h^2 \tan^2\alpha}$

$= \sqrt{h^2(1 + \tan^2\alpha)}$

$= \sqrt{h^2 \sec^2\alpha} = h \sec\alpha$

∴ Curved Surface area of the circular cone = πrl
$= \pi \times h \tan\alpha \,.\, h \sec\alpha$
$= \pi h^2 \sec\alpha.\ \tan\alpha$

32. (3)

AC = 12 − 3 = 9 cm
OB = 6cm
Δ ACD ~ AOB

$\Rightarrow \frac{AC}{OA} = \frac{CD}{OB}$

$\Rightarrow \frac{9}{12} = \frac{CD}{6}$

$\Rightarrow CD = \frac{9}{12} \times 6 = 4.5cm$

33. (2) Let radius = $4x$ cm and slant height (l) = $7x$ cm

∴ $\pi rl = \frac{22}{7} \times 4x \times 7x = 792$

$\Rightarrow x^2 = \frac{792 \times 7}{22 \times 4 \times 7} = 9$

∴ $x = 3$

∴ Radius = 4 × 3 = 12 cm

34. (2)

Length (ACB) of semi-circular sheet = πr

$= \frac{22}{7} \times 14 = 44$ cm.

Slant height of the cone = 14 cm.

Circumference of the base of the cone = $2\pi r_1 = \frac{44}{7} r_1$

$\Rightarrow 44 = \frac{44}{7} r_1 \Rightarrow r_1 = 7$ cm.

$\therefore h = \sqrt{l^2 - r_1^2} = \sqrt{14^2 - 7^2}$

$= 7\sqrt{3}$ cm.

$= 7 \times 1.732 \approx 12$cm.

35. (1) $\frac{r}{h} = \frac{4}{3} \Rightarrow \frac{r}{4} = \frac{h}{3} = k$

$\Rightarrow r = 4k;\ h = 3k$

$\therefore l = \sqrt{r^2 + h^2} = \sqrt{16k^2 + 9k^2}$

$= \sqrt{25k^2} = 5k$

$\therefore \frac{\text{Curved surface area}}{\text{Total surface area}}$

$= \frac{\pi r l}{\pi r (r + l)}$

$= \frac{l}{r + l} = \frac{5k}{4k + 5k} = \frac{5}{9}$

or 5 : 9

36. (3) Radius of the base $(r_1) = \frac{r}{4}$,

Slant height = r

$\therefore$ Curved surface area = $\pi r_1 l$

$= \frac{\pi r^2}{4}$ cm^2

37. (4) Curved surface area of cone = $\pi r l$

$\therefore \frac{22}{7} \times 16 \times l = \frac{2992}{7}$

$\Rightarrow 22 \times 16 \times l = 2992$

$\Rightarrow l = \frac{2992}{22 \times 16} = 8.5$ metre

38. (2) $\frac{1}{3}\pi r^2 h = 1232$

$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times r^2 \times 24 = 1232$

$\Rightarrow r^2 = \frac{1232 \times 3 \times 7}{22 \times 24} = 49$

$\Rightarrow r = \sqrt{49} = 7$ cm.

$\therefore$ Slant height $(l) = \sqrt{h^2 + r^2}$

$= \sqrt{24^2 + 7^2} = \sqrt{625} = 25$ cm.

$\therefore$ Curved surface of cone = $\pi r l$

$= \frac{22}{7} \times 7 \times 25 = 550$ cm^2

39. (4) Radius of the base of cone = r units

$\therefore$ Volume (v) = $\frac{1}{3}\pi r^2 h$

Curved surface area

$= \pi r \sqrt{h^2 + r^2}$

$\therefore\ 3\pi v h^3 - c^2 h^2 + 9v^2$

$= 3\pi \times \frac{1}{3}\pi r^2 h \times h^3$

$- \pi^2 r^2 (h^2 + r^2) h^2 + 9 \times \frac{1}{9}\pi^2 r^4 h^2$

$= \pi^2 r^2 h^4 - \pi^2 r^2 h^4 - \pi^2 r^4 h^2 + \pi^2 r^4 h^2$

$= 0$

40. (4) Let the radius of first sphere be r cm

and the radius of second sphere = (r + 2) cm

Now, Difference between surface area = 352

$\Rightarrow 4\pi \{(r + 2)^2 - r^2\} = 352$

or,

$4 \times \frac{22}{7}\{(r + 2 - r) + (r + 2 + r)\}$

$= 352$

$\Rightarrow 2 \times 2(r + 1) = \frac{352 \times 7}{4 \times 22}$

$\Rightarrow r + 1 = \frac{352 \times 7}{4 \times 4 \times 22}$

$\Rightarrow r + 1 = 7$

$\therefore r = 7 - 1 = 6$ cm

41. (4) $\frac{\text{Surface area of } A}{\text{Surface area of } B}$

$= \frac{4\pi r_1^2}{4\pi r_2^2} = \frac{r_1^2}{r_2^2}$

Where r_1 and r_2 are radii of spheres A and B respectively.

$= \frac{40 \times 40}{10 \times 10} = \frac{16}{1}$

$\Rightarrow 16 : 1$

42. (4) Volume of the sphere $= \frac{4}{3}\pi r^3$

or $\frac{4}{3}\pi r^3 = \frac{88}{21} \times (14)^3$

or $\frac{4}{3} \times \frac{22}{7} \times r^3 = \frac{4}{3} \times \frac{22}{7} \times (14)^3$

or $r = 14$

The curved surface of the sphere $= 4r\pi^2$

$= 4 \times \frac{22}{7} \times 14 \times 14 = 2464$ cm^2.

43. (2) $4\pi r^2 = 64\pi$ sq.cm.

$\Rightarrow r^2 = 16$

$\Rightarrow r = 4$ cm

$\therefore$ Diameter = 8 cm

44. (2) Let $r_1 = \frac{21}{2}$ cm and

$r_2 = \frac{17.5}{2}$ cm

$\therefore$ Required ratio

$= \frac{4\pi r_1^2}{4\pi r_2^2} = \frac{r_1^2}{r_2^2}$

$= \frac{\left(\frac{21}{2}\right)^2}{\left(\frac{17.5}{2}\right)^2} = \frac{21 \times 21}{17.5 \times 17.5} = 36:25$

45. (3) Here, we can treat the balloon as sphere.

Its circumference = $2\pi r$

$\therefore 2\pi r_1 = 20$ ...(i)

$2\pi r_2 = 25$ ....(ii)

On dividing equation (ii) by (i),

$\Rightarrow \frac{2\pi r_2}{2\pi r_1} = \frac{25}{20} \Rightarrow \frac{r_2}{r_1} = \frac{5}{4}$

$\therefore$ Increase = $r_2 - r_1$

$= \frac{5}{4} r_1 - r_1 = \frac{1}{4} r_1$

$= \frac{1}{4} \times \frac{20}{2\pi} = \frac{5}{2\pi}$ [From (i)]

46. (3) Let the radius of the sphere be r units.

According to the question,

$\frac{4}{3}\pi r^3 = 4\pi r^2 \Rightarrow r = 3$ units

47. (2) Let Height of the cylinder = $2r$,
where r = radius of sphere.
Radius of cylinder = r

$$\therefore \frac{\text{Surface area of sphere}}{\text{Curved surface area of cylinder}}$$

$$= \frac{4\pi r^2}{2\pi r \times 2r} = 1:1$$

48. (3) Total curved surface area of hemisphere = $3\pi r^2$, where r = radius of hemisphere.

$\therefore$ $3\pi r^2 = 1848$

$\Rightarrow 3 \times \frac{22}{7} \times r^2 = 1848$

$\Rightarrow r^2 = \frac{1848 \times 7}{3 \times 22} = 196$

$\Rightarrow r = \sqrt{196} = 14$ cm.

Volume of hemisphere = $\frac{2}{3}\pi r^3$

$= \frac{2}{3} \times \pi \times 14 \times 14 \times 14$ cm^3

$= \frac{5488}{3}\pi$ cm^3

According to the question,
Volume of cone = Volume of hemisphere

$\Rightarrow \frac{1}{3}\pi r^2 h = \frac{5488}{3}\pi$ cm^3

$\Rightarrow r^2 h = 5488$

$\Rightarrow 14 \times 14 \times h = 5488$

$\Rightarrow h = \frac{5488}{14 \times 14} = 28$ cm

49. (4) Required ratio

$$= \frac{4\pi r_1^2}{4\pi r_2^2} = \left(\frac{r_1}{r_2}\right)^2 = \left(\frac{1}{4}\right)^2 = \frac{1}{16}$$

or 1 : 16

50. (3) Volume of the solid metallic sphere = $\frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \pi \times (8)^3$

$= \frac{2048}{3}\pi$ cm^3

Let the radius of the each small sphere be x cm

$\therefore 64 \times \frac{4}{3}\pi x^3 = \frac{2048}{3}\pi$

$\Rightarrow x^3 = \frac{2048}{64 \times 4} = 8$

$\Rightarrow x = \sqrt[3]{8} = 2$ cm

$\therefore$ Required ratio = $4\pi.(8)^2 : 4\pi(2)^2$

= 64 : 4 = 16 : 1

51. (2) S_1 = surface area of sphere = $4\pi r^2$

S_2 = curved surface of the circumscribed cylinder

= $2\pi RH = 2\pi(2r)(2r) = 8\pi r^2$

$\therefore \frac{S_1}{S_2} = \frac{4\pi r^2}{8\pi r^2} = \frac{1}{2}$

$\Rightarrow S_1 = \frac{1}{2}S_2$

52. (1) Let the volume be $8x^3$ and $27x^3$

$\Rightarrow$ Their radius are 2x and 3x

$\therefore$ The ratio of their surface area = $4x^2 : 9x^2 = 4 : 9$

53. (1) $\frac{2}{3}\pi r^3 = 19404$

$\Rightarrow \frac{2}{3} \times \frac{22}{7} \times r^3 = 19404$

$\Rightarrow r^3 = \frac{19404 \times 3 \times 7}{2 \times 22} = 9261$

$\Rightarrow r = \sqrt[3]{21 \times 21 \times 21} = 21$ cm.

$\therefore$ Total surface area = $3\pi r^2$

$= 3 \times \frac{22}{7} \times 21 \times 21$

= 4158 sq. cm.

54. (4) $\frac{4}{3}\pi r^3 = \frac{2}{3}\pi r_1^3$

[r_1 being the radius of hemisphere]

$\Rightarrow 2r^3 = r_1^3 \Rightarrow \frac{r}{r_1} = \frac{1}{2^{\frac{1}{3}}}$

$\therefore$ Required ratio $= \frac{4\pi r^2}{2\pi r_1^2}$

$= 2\left(\frac{r}{r_1}\right)^2 = 2\left(\frac{1}{2^{\frac{1}{3}}}\right)^2$

$= 2 \times 2^{-\frac{2}{3}} : 1 = 2^{\frac{1}{3}} : 1$

55. (3) Original surface area of sphere = $4\pi r^2$

$\Rightarrow$ Surface area of sphere

$= 4\pi(2r)^2 = 16\pi r^2$

$= 4 \times 4\pi r^2 = 4$ (original surface area)

56. (3) Curved surface area of hemisphere

$= 2\pi r^2$

$= 2 \times \frac{22}{7} \times 11 \times 11$

= 760.57 sq.cm.

57. (2) If the radius of hemisphere be r cm, then

$2\pi r^2 + \pi r^2 = 27\pi$

$\Rightarrow 3\pi r^2 = 27\pi$

$\Rightarrow 3r^2 = 27$

$\Rightarrow r^2 = 9$

$\therefore r = \sqrt{9} = 3$ cm

58. (3) Perimeter of triangle

$S = \frac{9 + 12 + 15}{2} = 18$ cm

$\therefore$ Area of triangle

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{18(18-9)(18-12)(18-15)}$

$= \sqrt{18 \times 9 \times 6 \times 3}$

= 54 sq.cm.

$\therefore$ Total surface area of the prism = Perimeter of base × height + 2 × Area of base

= 36 × 5 + 2 × 54 = 288 sq.cm.

59. (3) Volume of right prism = Area of the base × height

$\Rightarrow 10380 = 173 \times h$

$\Rightarrow h = \frac{10380}{173} = 60$ cm

Now, Area of triangle

$= \frac{\sqrt{3}}{4} \times (\text{Side})^2$

$\Rightarrow 173 = \frac{\sqrt{3}}{4} \times (\text{Side})^2$

$\therefore$ Side $= \sqrt{\frac{173 \times 4}{\sqrt{3}}} = \sqrt{\frac{173 \times 4}{1.73}}$

= 20 cm

$\Rightarrow$ Perimeter = 3 × 20 = 60 cm

$\therefore$ Area of the lateral surface

= Perimeter of base × height

= 60 × 60 = 3600 sq.cm.

60. (2)

Height of the triangle

$= \sqrt{15^2 + 8^2}$

$= \sqrt{225 + 64} = \sqrt{289}$

= 17 cm

∴ Area of the lateral surface of pyramid = 4 × Area of triangle

$= 4 \times \frac{1}{2} \times$ base × height

$= 4 \times \frac{1}{2} \times 16 \times 17$ = 544 sq.cm.

61. (1) Let the length of each side of base be x metres, then

$\frac{1}{2} \times$ perimeter of base × slant height = 12

$\Rightarrow \frac{1}{2} \times 4x \times 4 = 12$

$\Rightarrow x = \frac{12}{8} = \frac{3}{2}$ metre

∴ Area of the base $= \frac{9}{4}$ sq. metre

∴ Required ratio $= 12 : \frac{9}{4} = 16 : 3$

62. (4)

AB = $10\sqrt{3}$ cm

BE = $5\sqrt{3}$ cm

AE = $\sqrt{(10\sqrt{3})^2 - (5\sqrt{3})^2}$

$= \sqrt{225} = 15$ cm

OE = $\frac{1}{3} \times 15 = 5$ cm

Let the height of pyramid be h cm, then

Slant height

$= \sqrt{h^2 + 5^2} = \sqrt{h^2 + 25}$

Now, Total surface area = Area of the 3 faces + Area of base

$= 3\left[\frac{1}{2} \text{base} \times \text{slant height}\right] + \text{Area}$ of the base

Total surface area

$= \frac{1}{2} \times$ (perimeter of base) × (slant height) + Area of base [base of all the 3 triangular faces is the edge of the equilateral triangle].

$\Rightarrow 270\sqrt{3} = \frac{1}{2} \times 30\sqrt{3} \times \sqrt{h^2 + 25} + \frac{\sqrt{3}}{4} \times (10\sqrt{3})^2$

$\Rightarrow$

$270\sqrt{3} = 15\sqrt{3}\sqrt{h^2 + 25} + 75\sqrt{3}$

$\Rightarrow 15\sqrt{3}\sqrt{h^2 + 25} = 195\sqrt{3}$

$\Rightarrow \sqrt{h^2 + 25} = 13$

$\Rightarrow h^2 + 25 = 169$

$\Rightarrow h^2 = 169 - 25 = 144$

$\Rightarrow h = \sqrt{144} = 12$ cm

63. (1) Area of the base of prism

$= \frac{\sqrt{3}}{4} \times 6 \times 6 = 9\sqrt{3}$ sq.cm.

∴ Volume = Area of base × height

$\Rightarrow 81\sqrt{3} = 9\sqrt{3} \times$ height

$\Rightarrow$ height $= \frac{81\sqrt{3}}{9\sqrt{3}} = 9$ cm

64. (4)

Side of square base

$= \frac{1}{\sqrt{2}} \times 10\sqrt{2} = 10$ cm

Slant height $= \sqrt{5^2 + 12^2}$

= 13 cm

∴ Area of the lateral surface

$= \frac{1}{2} \times$ perimeter of base × slant height

$= \frac{1}{2} \times 40 \times 13 = 260$ sq. cm.

65. (4) Total surface area = Perimeter of base ×height + 2 × area of base

$= 36 \times 10 + 2 \times \frac{\sqrt{3}}{4} \times 12 \times 12$

$= 360 + 72\sqrt{3}$

$= 72 (5 + \sqrt{3})$ sq. cm

66. (2)

Lateral surface area

$= \frac{1}{2} \times$ perimeter of base × slant height

[∵ Slant height $= \sqrt{8^2 + 15^2}$

$= \sqrt{64 + 225} = \sqrt{289} = 17$ cm]

∴ Required area $= \frac{1}{2} \times 64 \times 17$

= 544 sq.cm.

67. (1) Total surface area = Lateral surface area + 2 Area of base

= Area of base × height + area of base

$\Rightarrow 360 = 30 \times h + \frac{1}{2} \times 5 \times 12$

$\Rightarrow 360 - 30 = 30 \times h$

$\Rightarrow 30h = 330$

$\Rightarrow h = \frac{300}{30} = 10$ cm

68. (2) According to the question
Base of hemisphere
= Base of cone
i.e. radius of hemisphere
= radius of cone
...(i)
and height of hemisphere
= height of cone
...(ii)
We know that height of hemisphere = radius of hemisphere
⇒ height of cone = radius of hemisphere
[From (i)]
⇒ height of cone = radius of cone

[From (ii)]
Now,
Curved surface area of hemisphere = $2\pi r^2$
Curved surface area of cone

$= \pi r\sqrt{r^2 + h^2}$

$= \pi r\sqrt{r^2 + r^2}\,(r = h)$

$= \pi r\sqrt{2r^2} = \pi r \times \sqrt{2}\ r = \sqrt{2}\ \pi\ r^2$

∴ Ratio of curved surface area of hemisphere and cone

$= 2\pi r^2 : \sqrt{2}\pi r^2 = 2 : \sqrt{2} = \sqrt{2} : 1$

69. (4) Let Height of the cylinder = $2r$
Curved surface area of the cylinder
= $2\pi RH$
∴ Required ratio
$= 4\pi r^2 : 2\pi \times r \times 2r = 1 : 1$

70. (2) $\dfrac{\text{Volume of sphere}}{\text{Volume of cylinder}}$

$= \dfrac{\frac{4}{3}\pi r^3}{\pi r^2 h} = 1 \Rightarrow \dfrac{r}{h} = \dfrac{3}{4}$

$\therefore \dfrac{\text{Curved surface area of cylinder}}{\text{Surface area of sphere}}$

$= \dfrac{2\pi rh}{4\pi r^2} = \dfrac{h}{2r} = \dfrac{1}{2} \times \dfrac{4}{3} = \dfrac{2}{3}$

or 2 : 3

71. (1) Total area of the canvas
$= 2\pi rh + \pi rl = \pi r\,(2h + l)$

$= \dfrac{22}{7} \times \dfrac{105}{2}(2 \times 3 + 63)$

$= \dfrac{22}{7} \times \dfrac{105}{2} \times 69$

= 11385 sq.metre

72. (3) Let Radius of the base = r units and height = h units

$\Rightarrow \dfrac{\text{Curved surface of cylinder}}{\text{Curved surface of cone}}$

$= \dfrac{2\pi rh}{\pi rl}$

$\Rightarrow \dfrac{8}{5} = \dfrac{2h}{l}$

$\Rightarrow \dfrac{4}{5} = \dfrac{h}{\sqrt{h^2 + r^2}}$

$\Rightarrow \dfrac{16}{25} = \dfrac{h^2}{h^2 + r^2}$

$\Rightarrow \dfrac{h^2 + r^2}{h^2} = \dfrac{25}{16}$

$\Rightarrow 1 + \dfrac{r^2}{h^2} = \dfrac{25}{16}$

$\Rightarrow \dfrac{r^2}{h^2} = \dfrac{25}{16} - 1 = \dfrac{9}{16}$

$\Rightarrow \dfrac{r}{h} = \dfrac{3}{4}$ or 3 : 4

73. (1) Slant height of cone

$l = \sqrt{6^2 + 8^2}$

$= \sqrt{36 + 64} = \sqrt{100}$

= 10 cm

∴ Curved surface of cylinder : Curved surface of cone
$= 2\pi rh : \pi rl$
$= 2h : l = 16 : 10 = 8 : 5$

74. (3) Radius of cylinder = r units and height = r units
[∵ height of hemisphere = radius]
∴ Required ratio
$= 2\pi r^2 + 2\pi r^2 : 2\pi r^2 + \pi r^2$
= 4 : 3

75. (2)

Length of box = 24 –(2 × 3)
= 18 cm
Width of box = 18 – 2 × 3 = 12 cm
Height of box = 3 cm
∴ Surface area of box
= 18 × 12 + 2 (12 × 3 + 3 × 18)
= 216 + 180 = 396 sq. cm

76. (1) Volume of all three cubes
$= (4^3 + 5^3 + 6^3)$ cu.cm.
= (64 + 125 + 216) cu.cm.
= 405 cu.cm.
∴ Volume of new cube
= 405 – 62
= 343 cu.cm.

∴ Edge of cube = $\sqrt[3]{343}$ = 7 cm.
∴ Surface area = 6×7^2
= 294 sq. cm.

77. (4) Percentage increase

$= \left(50 + 50 + \dfrac{50 \times 50}{100}\right)\% = 125\%$

78. (4) Total surface of the tetrahedron

$= 4 \times \dfrac{\sqrt{3}}{4} \times 12^2$

$= 144\sqrt{3}$ sq.cm.

79. (2)

Total surface area of the toy
$= 2\pi r^2 + \pi rl$

$= \pi r\left(2r + \sqrt{r^2 + h^2}\right)$

$= \dfrac{22}{7} \times 3\left(2 \times 3 + \sqrt{3^2 + 4^2}\right)$

$= \dfrac{22}{7} \times 3\ (6 + 5)$

$= \dfrac{22 \times 3 \times 11}{7} = 103.71$ sq.cm.

80. (2) Length of room = $\sqrt{48}$

$= 4\sqrt{3}$ metre

∴ Diagonal = $\sqrt{3 \times \left(4\sqrt{3}\right)^2}$

$= \sqrt{3 \times 16 \times 3} = 12$ metre

81. (3) Radius of sphere = r units

$\therefore \dfrac{\text{Surface area of sphere}}{\text{Surface area of hemisphere}}$

$= \dfrac{4\pi r^2}{3\pi r^2} = \dfrac{4}{3} = 4 : 3$

82. (3) Surface area of sphere
$= 4\pi r^2$

$\therefore 4 \times \dfrac{22}{7} \times r^2 = 346.5$

$\Rightarrow 4 \times 22 \times r^2 = 346.5 \times 7$

$\Rightarrow r^2 = \dfrac{346.5 \times 7}{4 \times 22} = 27.5625$

$\therefore r = \sqrt{27.5625} = 5.25$ cm

83. (3) Hypotenuse of base

$= \sqrt{5^2 + 12^2}$

$= \sqrt{25+144} = \sqrt{169}$

= 13 cm

∴ Surface area

$= h\,(a + b + c)$

= 10 (5 + 12 + 13) = 300 sq.cm.

Area of base $= \frac{1}{2} \times 5 \times 12$

= 30 sq.cm.

∴ Total surface area of lateral surfaces

= 300 + 30

= 330 sq.cm.

84. (2) Length = $5x$ cm

Breadth = $3x$ cm

Total surface area of parallelopiped

$= 2(l \times b + b \times h + h \times l)$

$= 2(5x \times 3x + 3x \times 6 + 6 \times 5x)$

$= 2(15x^2 + 18x + 30x)$

$= 2\,(15x^2 + 48x)$

$\therefore 2(15x^2 + 48x) = 558$

$\Rightarrow 15x^2 + 48x = \frac{558}{2} = 279$

$\Rightarrow 5x^2 + 16x = 93$

$\Rightarrow 5x^2 + 16x - 93 = 0$

$\Rightarrow 5x^2 + 31x - 15x - 93 = 0$

$\Rightarrow x\,(5x + 31) - 3\,(5x + 31) = 0$

$\Rightarrow (x - 3)\,(5x + 31) = 0$

$\Rightarrow x = 3$

∴ Length = $5x = 5 \times 3 = 15$ cm = 1.5 dm

85. (2) Required area = $2\pi rh$

$= 2 \times \frac{22}{7} \times 3.5 \times 25$

= 550 sq. cm.

86. (3) Let, length = a cm.

breadth = b cm.

height = c cm.

$\therefore a + b + c = 24$ --- (i)

and $\sqrt{a^2 + b^2 + c^2} = 15$

$\Rightarrow a^2 + b^2 + c^2 = 15 \times 15 = 225$ --- (ii)

$\therefore (a + b + c)^2 = a^2 + b^2 + c^2 + 2\,(ab + bc + ca)$

$\Rightarrow 24^2 = 225 + 2\,(ab + bc + ca)$

$\Rightarrow 576 = 225 + 2\,(ab + bc + ca)$

$\Rightarrow 2\,(ab + bc + ca) = 576 - 225$

= 351 sq.cm. = Total surface area

87. (3) Length of parallelopiped

= $3x$ cm

breadth = $4x$ cm and height

= $6x$ cm.

∴ Its volume = 576 cu.cm.

$\Rightarrow 3x \times 4x \times 6x = 576$

$\Rightarrow 72x^3 = 576$

$\Rightarrow x^3 = \frac{576}{72} = 8$

$\Rightarrow x = \sqrt[3]{8} = 2$

∴ Total surface area

$= 2(l \times b + b \times h + h \times l)$

$= 2(3x \times 4x + 4x \times 6x + 6x \times 3x)$

$= 2(12x^2 + 24x^2 + 18x^2)$

$= 108\,x^2$

$= 108 \times 2^2 = 108 \times 4 = 432$ sq. cm.

88. (4)

OB = 3 cm

OA = 4 cm

∴ AB = l

$= \sqrt{3^2 + 4^2} = \sqrt{9+16}$

$= \sqrt{25} = 5$ cm

∴ Total surface area $= \pi rl + \pi r^2$

$= \pi r\,(l + r)$

$= \frac{22}{7} \times 3(5+3)$

$= \frac{22}{7} \times 3 \times 8$

= 75.4 sq.cm.

89. (1) Curved surface area of first cone $= \pi r_1 l_1$

Curved surface area of second cone $= \pi r_2 l_2$

$\pi r_1 l_1 = 2\pi r_2 l_2$

$\Rightarrow r_1 l_1 = 2 r_2 l_2$

$\Rightarrow \frac{r_1}{r_2} = \frac{2\,l_2}{l_1} = \frac{2 \times 2\,l_1}{l_1} = \frac{4}{1} = 4:1$

90. (1) Whole surface of the remaining solid

$= 2\pi rh + \pi r^2 + \pi rl$

where l = slant height of cone.

$l = \sqrt{r^2 + h^2} = \sqrt{3^2 + 4^2}$

$= \sqrt{9+16} = \sqrt{25} = 5$ cm

∴ Required area

$= (2 \times \pi \times 4 \times 3 + \pi \times 3 \times 3 + \pi \times 3 \times 5)$ square cm.

$= (24\pi + 9\pi + 15\pi)$ square cm.

$= 48\pi$ square cm.

91. (4) Let the thickness of wood = x cm.

∴ Area of the inner surface

$= 2\,(9 - 2x)\,(10 - 2x) + 2\,(9 - 2x)\,(7 - 2x) + 2\,(7 - 2x)\,(10 - 2x) = 262$

Putting $x = 1$, the equation is satisfied.

92. (3) Total surface area

$= 4 \times \frac{\sqrt{3}}{4} \times (1)^2 = \sqrt{3}$ sq.cm.

93. (4) Number of paving stones

$= \frac{\text{Area of courtyard}}{\text{Area of a stone}}$

$= \frac{30 \times 17.5}{2.5 \times 2} = 105$

94. (4) Area of the base of conical tent

= 346.5 sq. metre

$\therefore \pi r^2 = 346.5$

$\Rightarrow \frac{22}{7} \times r^2 = 346.5$

$\Rightarrow r^2 = \frac{346.5 \times 7}{22} = 110.25$

$\Rightarrow r = \sqrt{110.25} = 10.5$ metre

∴ Slant height $= \sqrt{h^2 + r^2}$

$= \sqrt{(14)^2 + (10.5)^2}$

$= \sqrt{196 + 110.25}$

$= \sqrt{306.25} = 17.5$ metre

∴ Area of curved surface of the tent $= \pi rl$

$= \frac{22}{7} \times 10.5 \times 17.5$

= 577.5 sq. metre

∴ Length of canvas

$= \frac{577.5}{\frac{75}{100}} = \frac{577.5 \times 100}{75}$

$= \frac{57750}{75} = 770$ metre

95. (4) Let the radius of the base of conical tent be r metre and its height be h metre.

∴ Area of base $= \pi r^2$

$= 16 \times 5 = 80$

.....(i)

Volume $= \frac{1}{3}\,\pi r^2 h$

$= 5 \times 100$ cu. metre

.....(ii)

On dividing equation (ii) by (i),

$\frac{1}{3}\,\frac{\pi r^2 h}{\pi r^2} = \frac{5 \times 100}{80}$

$\Rightarrow \frac{h}{3} = \frac{25}{4}$

$\Rightarrow h = \frac{75}{4} = 18.75$ metre.

96. (4) Whole surface area of a brick
$= 2\ (l \times b + b \times h + h \times l)$
$= 2\ (22.5 \times 10 + 10 \times 7.5 + 7.5 \times 22.5)$
$= 2\ (225 + 75 + 0.75 \times 225)$
$= 2 \times 75\ (3 + 1 + 0.75 \times 3)$
$= 150 \times 6.25$
$= 937.5$ sq. cm.
$\therefore$ Number of bricks
$= \dfrac{9.375 \times 100 \times 100}{937.5} = 100$

97. (3) Length of park $= 3x$ metre (let)
Breadth $= 2x$ metre
Perimeter of park = Distance covered by cyclist
$= \dfrac{12 \times 8}{60} = \dfrac{8}{5}$ km.
$= \left(\dfrac{8}{5} \times 1000\right)$ metre
$= 1600$ metre
According to the question,
$2\ (3x + 2x) = 1600$
$\Rightarrow 10x = 1600 \Rightarrow x = \dfrac{1600}{10} = 160$
$\therefore$ Area of the park $= 3x \times 2x$
$= 6x^2 = 6 \times (160)^2$
$= 153600$ sq. metre

98. (4)

Slant height = BE = $\sqrt{12^2 + 5^2}$
$= \sqrt{144 + 25} = \sqrt{169} = 13$ cm.
$\therefore$ Lateral surface of pyramid
$= \dfrac{1}{2} \times$ perimeter of base $\times$ slant height
$= \dfrac{1}{2} \times 40 \times 13 = 260$ sq. cm.
Area of base $= 10 \times 10$
$= 100$ sq. cm.
$\therefore$ Total surface area
$= (260 + 100)$ sq. cm.
$= 360$ sq. cm.

99. (1)

Diagonal of cube = Diameter of sphere
$= 6\sqrt{3} \times 2 = 12\sqrt{3}$ cm.
$\therefore$ Edge of cube $= \dfrac{12\sqrt{3}}{\sqrt{3}}$
$= 12$ cm.
$\therefore$ Surface area of cube
$= 6 \times (\text{edge})^2$
$= (6 \times 12 \times 12)$ sq. cm.
$= 864$ sq. cm.

100. (4) Curved surface area of hemisphere $= 2\pi r^2$
Curved surface area of cone
$= \pi r l$
$= \pi r \sqrt{r^2 + r^2}$
$[\because h = r]$
$= \sqrt{2}\pi r^2$
$\therefore$ Required ratio
$= 2\pi r^2 : \sqrt{2}\pi r^2 = \sqrt{2} : 1$

101. (3) Curved surface area of cylinder $= 2\pi RH$
$\therefore$ According to the question,
$2\pi r H = 4\pi r h$
$\Rightarrow H = 2h$ units

102. (1) Inner and outer surface areas of the bowl $= 4\pi r^2$
$= 4 \times \dfrac{22}{7} \times 3.5 \times 3.5$
$= 154$ sq. cm.
$\therefore$ Cost of painting
$= 154 \times \dfrac{5}{10}$
= Rs. 77

103. (4) Total surface area of right circular cylinder $= 2\pi rh + 2\pi r^2$
$= 2\pi r\ (h + r)$
$= 2 \times \dfrac{22}{7} \times 7\ (20 + 7)$
$= 2 \times 22 \times 27 = 1188$ sq. cm.

104. (4) Initial radius of sphere $= r$ cm (let).
According to the question,
$4\pi\ (r + 2)^2 - 4\pi r^2 = 352$
$\Rightarrow 4\pi\ ((r + 2)^2 - r^2) = 352$
$\Rightarrow r^2 + 4r + 4 - r^2 = \dfrac{352}{4\pi}$
$= \dfrac{352}{4 \times \dfrac{22}{7}}$
$\Rightarrow 4r + 4 = \dfrac{352 \times 7}{4 \times 22} = 28$
$\Rightarrow 4r = 28 - 4 = 24$
$\Rightarrow r = \dfrac{24}{4} = 6$ cm.

105. (3) Levelled area in one revolution of roller $= 2\pi rh$
$= 2 \times \dfrac{22}{7} \times 42 \times 120$
$= 31680$ sq. cm.
Area levelled in 500 revolutions
$= (31680 \times 500)$ sq. cm.
$= 15840000$ sq. cm.
$= 1584$ sq. metre
$\therefore$ Required cost
= Rs. (1584×1.5)
= Rs. 2376

106. (4) Internal surface area of hemispherical bowl $= 2\pi r^2$
$= (2 \times 3.14 \times 6 \times 6)$ sq.cm.
$= 226.08$ sq.cm.

107. (1) Surface area of sphere
$= 4\pi r^2$
$\Rightarrow 4\pi r^2 = 616$
$\Rightarrow 4 \times \dfrac{22}{7} \times r^2 = 616$
$\Rightarrow r^2 = \dfrac{616 \times 7}{4 \times 22} = 49$
$\Rightarrow r = \sqrt{49} = 7$ cm
$\therefore$ Volume of sphere $= \dfrac{4}{3}\pi r^3$
$= \dfrac{4}{3} \times \dfrac{22}{7} \times 7 \times 7 \times 7$
$= \dfrac{4312}{3} = 1437\dfrac{1}{3}$ cu.cm.

108. (4) Volume of each smaller sphere
$= \dfrac{4}{3}\pi r^3$
$= \dfrac{4}{3}\pi \times (3)^3 = 36\pi$ cu.cm.
If the radius of larger sphere be R cm, then
$\dfrac{4}{3}\pi R^3 = 1000 \times 36\pi$
$\Rightarrow R^3 = \dfrac{1000 \times 36 \times 3}{4}$

$= 1000 \times 3 \times 3 \times 3$

$\therefore R = \sqrt[3]{1000 \times 3 \times 3 \times 3}$

$= 10 \times 3 = 30$ cm.

$\therefore$ Its diameter = (2×30) cm.

= 60 cm

109. (3) According to the question,

$\pi R^2 = 16\pi$

$\Rightarrow R^2 = 16$

$\Rightarrow R = \sqrt{16} = 4$ cm.

$\therefore$ Required area = $\pi (R + r)l$

$= \pi (4 + 2) \times 6$

$= 36\pi$ sq. cm.

110. (2) Radius of first sphere

$= 2r$ cm.

Radius of second sphere

$= r$ cm.

According to the question,

$4\pi (2r)^2 = \frac{4}{3}\pi r^3$

$\Rightarrow 16\pi r^2 = \frac{4}{3}\pi r^3$

$\Rightarrow 12 = r$

$\therefore$ Radius of first sphere

= 24 cm.

111. (1)

Radius of the largest sphere

$= \frac{18}{2} = 9$ cm.

$\therefore$ Area of sphere = $4\pi r^2$

$= 4\pi \times 9 \times 9$

$= 972\pi$ sq. cm.

112. (2) Slant height of pyramid

$= \sqrt{5^2 + 12^2} = \sqrt{25 + 144}$

$= \sqrt{169} = 13$ cm.

Lateral surface area of pyramid

$= \frac{1}{2} \times$ perimeter of base $\times$ slant height

$= \frac{1}{2} \times 4 \times 10 \times 13$

= 260 sq. cm.

Area of base = 10×10

= 100 sq.cm.

$\therefore$ Total surface area

= 260 + 100 = 360 sq.cm.

113. (3) Total surface area of prism

= Perimeter of base $\times$ height + 2 $\times$ area of base

$10 = 4x \times 2 + 2x^2$

where x = side of square

$\Rightarrow x^2 + 4x - 5 = 0$

$\Rightarrow x^2 + 5x - x - 5 = 0$

$\Rightarrow x(x + 5) - 1(x + 5) = 0$

$\Rightarrow (x - 1)(x + 5) = 0$

$\Rightarrow x = 1$ because $x \neq -5$

$\therefore$ Volume of prism

= Area of base $\times$ height

$= 1 \times 1 \times 2 = 2$ cu.cm.

114. (2) Total surface area of prism

$= \frac{151.20}{0.20} = \frac{1512}{2}$

= 756 sq.cm.

Hypotenuse of the triangular base

$= \sqrt{9^2 + 12^2} = \sqrt{81 + 144}$

$= \sqrt{225}$

= 15 cm.

$\therefore$ Perimeter of base = 9 + 12 + 15 = 36 cm.

$\therefore$ Total surface area = Perimeter of base $\times$ height + 2 $\times$ area of base

$\Rightarrow 756 = 36 \times h + 2 \times \frac{1}{2} \times 9 \times 12$

$\Rightarrow 756 = 36h + 108$

$\Rightarrow 36h = 756 - 108 = 648$

$\Rightarrow h = \frac{648}{36} = 18$ cm.

115. (2) Surcface area of cylindrical tunnel $= 2\pi rh$

$= \left(2 \times \pi \times \frac{5}{2} \times 10\right)$ sq.m.

$= 50\pi$ sq.m.

116. (1) Slant height = l units Radius = r units

$\therefore l = \sqrt{r^2 + h^2}$, $V = \frac{1}{3}\pi r^2 h$,

$C = \pi rl$

$\therefore 3\pi Vh^3 - C^2h^2 + 9V^2$

$= 3\pi \times \frac{1}{3}\pi r^2 h \times h^3 - (\pi rl)^2 h^2$

$+9\left(\frac{1}{3}\pi r^2 h\right)^2$

$= \pi^2 r^2 h^4 - \pi^2 r^2 l^2 h^2 + \pi^2 r^4 h^2$

$= \pi^2 r^2 h^4 - \pi^2 r^2 h^2 (r^2 + h^2) + \pi^2 r^4 h^2$

$= \pi^2 r^2 h^4 - \pi^2 r^4 h^2 - \pi^2 r^2 h^4 + \pi^2 r^4 h^2$

$= 0$

117. (4) Area of trapezium

$= \frac{1}{2}$ (sum of parallel sides) $\times$ perpendicular distance

$= \frac{1}{2}(20 + 16) \times 10$

$= \frac{1}{2} \times 36 \times 10 = 180$ sq. metre

118. (2)

Medians intersect at point G.

$\therefore \Delta ABG = \Delta BGC = \Delta AGC$.

GE bisects ΔCGE.

$\therefore \Delta AGE = \Delta CGE$

$\therefore$ Area of ΔCGE

$= \frac{1}{6} \times$ Area of ΔABC

$= \frac{1}{6} \times 36 = 6$ sq. cm.

119. (1) Diagonal of the cuboid

$= \sqrt{l^2 + b^2 + h^2}$

$= \sqrt{5^2 + 4^2 + 3^2}$

$= \sqrt{25 + 16 + 9} = \sqrt{50}$

$= 5\sqrt{2}$ cm.

120. (3) Volume of the earth taken out

$= \pi r^2 h = \pi \times \left(\frac{3}{2}\right)^2 \times 14$

$= \frac{63}{2}\pi$ cubic metre

Ex–radius of embankment

$= \frac{3}{2} + 4 = \frac{11}{2}$ metre

$\therefore$ Volume of embankment

$= \pi(R^2 - r^2) \times h_1$

$= \pi\left(\left(\frac{11}{2}\right)^2 - \left(\frac{3}{2}\right)^2\right) \times h_1$

$= \pi\left(\frac{11}{2} + \frac{3}{2}\right)\left(\frac{11}{2} - \frac{3}{2}\right) \times h_1$

$= \pi \times 7 \times 4\, h_1$

$= 28\pi\, h_1$ cu. metre

$\therefore 28\pi\, h_1 = \frac{63}{2}\pi$

$\Rightarrow h_1 = \frac{63}{2 \times 28} = 1.125$ metre

121. (2) Radius of first sphere
$= 2r$ units (let).
$\therefore$ Radius of second sphere
$= r$ units
Curved surface of first sphere =
$4\pi R^2 = 4\pi\,(2r)^2$
$= 16\pi r^2$ sq. units.
Volume of second sphere
$= \frac{4}{3}\pi r^3$ cu. units
According to the question,
$\frac{4}{3}\pi r^3 = 16\pi r^2$
$\Rightarrow 4r = 16 \times 3$
$\Rightarrow r = \frac{16 \times 3}{4} = 12$ units
$\therefore$ Radius of first sphere
$= 24$ units

122. (3) Slant height of cone (l)
$= \sqrt{r^2 + h^2}$
$= \sqrt{30^2 + 40^2}$
$= \sqrt{900 + 1600}$
$= \sqrt{2500} = 50$ cm.
$\therefore$ Curved surface area of cone = $\pi r l$
$= (\pi \times 30 \times 50)$ sq. cm.
$= 1500\,\pi$ sq. cm.
If the radius of sphere be R cm, then
$4\pi R^2 = 1500\pi$
$\Rightarrow R^2 = \frac{1500}{4} = 375$
$\Rightarrow R = \sqrt{375} = \sqrt{5 \times 5 \times 15}$
$= 5\sqrt{15}$ cm.

123. (1) Total surface area = Lateral surface area + area of base
$\Rightarrow$ 340 = Lateral surface area + 100
$\Rightarrow$ Lateral surface area
$= 340 - 100 = 240$ sq. cm.
Area of each lateral surface
$= 30$ sq. cm.
$\therefore$ Number of lateral surfaces =
$\frac{240}{30} = 8$

124. (3)

$AC = \frac{21}{2}$ metre
$OC = 14$ metre
$\therefore$ Slant height (l)
$= \sqrt{AC^2 + CO^2}$
$= \sqrt{\left(\frac{21}{2}\right)^2 + (14)^2}$
$= \sqrt{\frac{441}{4} + 196}$
$= \sqrt{\frac{441 + 784}{4}} = \sqrt{\frac{1225}{4}}$
$= \frac{35}{2}$ metre
$\therefore$ Curved surface area = $\pi r l$
$= \left(\frac{22}{7} \times \frac{21}{2} \times \frac{35}{2}\right)$ sq. metre
$= 577.5$ sq. metre
$\therefore$ Total expenditure on painting = Rs. (577.5×6)
= Rs. 3465

125. (3) Curved surface area of cylinder = $2\pi rh$
$\Rightarrow 2\pi rh = 1386$
$\Rightarrow 2 \times \frac{22}{7} \times r \times 21 = 1386$
$\Rightarrow 44 \times 3 \times r = 1386$
$\Rightarrow r = \frac{1386}{44 \times 3} = 10.5$ cm.

126. (1) Height of cylinder = 4 cm.
Total surface area = $2\pi r\,(r + h)$
$\therefore 2\pi r\,(r + h) = 8\pi$
$\Rightarrow r\,(r + 4) = 4$
$\Rightarrow r^2 + 4r - 4 = 0$
$\Rightarrow r = \frac{-4 \pm \sqrt{16 + 16}}{2}$
$= \frac{-4 \pm \sqrt{32}}{2}$
$= \frac{-4 \pm 4\sqrt{2}}{2}$
$= -2 + 2\sqrt{2}$
because $r \neq -2 - 2\sqrt{2}$
Note : If $ax^2 + bx + c = 0$, then x
$= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

127. (2) Surface area of milk pot.
$= 2\pi rh + \pi r^2$
$= \pi r\,(2h + r)$
$= \frac{\pi h}{2}\left(2h + \frac{h}{2}\right)$
$= \frac{5\pi h^2}{4}$
$\therefore \frac{5}{4} \times \frac{22}{7} \times h^2 = 616$
$\Rightarrow h^2 = \frac{616 \times 4 \times 7}{5 \times 22} = \frac{28 \times 28}{5}$
$\therefore$ Volume of milk = $\pi r^2 h$
$= \frac{22}{7} \times \frac{h^2}{4} \times h$
$= \frac{22}{28} \times \frac{28 \times 28 \times 28}{5 \times \sqrt{5}}$
$= \frac{22 \times 28 \times 28 \times \sqrt{5}}{25}$
$= \frac{22 \times 28 \times 28 \times 2.23}{25}$
$= 1538.5$ cu. cm.
$= 1.54$ litres
$= 1.53$ litres (Approx.)

128. (3) Volume of copper sphere
$= \frac{4}{3}\pi r^3$
$= \frac{4}{3}\pi\,(21)^3$ cu. cm.
Volume of cylindrical rod
$= \pi R^2 H = \pi R^2 \times 7$ cu. cm.
$\therefore \pi R^2 \times 7 = \frac{4}{3}\pi \times 21 \times 21 \times 21$
$\Rightarrow R^2 = \frac{4}{3} \times \frac{21 \times 21 \times 21}{7}$
$\therefore R = \sqrt{4 \times 21 \times 21} = 2 \times 21$
$= 42$ cm.
Surface area of sphere = $4\pi r^2$
$= 4\pi\,(21)^2$ sq. cm.
Total surface area of the rod
$= 2\pi R\,(R + H)$
$= 2\pi \times 42\,(42 + 7)$
$= 2\pi \times 42 \times 49$ sq. cm.
$\therefore$ Required ratio
$= \frac{2\pi \times 42 \times 49}{4\pi \times 21 \times 21} = 7 : 3$

TYPE-VI

1. (1) Let Circumference of base
$= \pi\, d$
$\Rightarrow \pi d = 6\,\pi \Rightarrow d = 6$ cm
$\therefore$ Height, $h = 6$ cm
Volume of the cylinder,
$V = \frac{\pi d^2 h}{4}$
$= \frac{\pi d^3}{4} = \frac{\pi (6)^3}{4}$ cc $= 54\pi$ cc

2. (1) Required number of tins
$= \frac{\text{Volume of cylindrical drum}}{\text{volume of a tin}}$
$= \frac{22 \times 350 \times 350 \times 240}{7 \times 2 \times 2 \times 25 \times 22 \times 35} = 1200$

3. (2) Volume of raised water in cylindrical beaker

$= \pi r^2 h = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 5.6$

= 215.6 cu.cm.

Volume of a marble $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times (0.7)^3 = \frac{4.312}{3}$ cu.cm.

∴ Number of marbles

$= \frac{215.6}{\frac{4.312}{3}} = \frac{215.6 \times 3}{4.312} = 150$

4. (3) Volume of cylindrical vessel $= \pi r^2 h$

Volume of cone $= \frac{1}{3}\pi r^2 h$

∴ Number of cones $= \frac{\pi r^2 h}{\frac{1}{3}\pi r^2 h} = 3$

5. (3) No. of Cubes

$= \frac{\text{Volume of larger cube}}{\text{Volume of smaller cube}}$

$= \frac{(15)^3}{(3)^3} = \frac{15 \times 15 \times 15}{3 \times 3 \times 3}$

= 5 × 5 × 5 = 125

6. (3) The number of cubes will be least if each cube will be of maximum edge.

∴ Maximum possible length = HCF of 6, 9, 12 = 3

∴ Volume of cube

= 3 × 3 × 3 cm^3

∴ Number of cubes

$= \frac{6 \times 9 \times 12\ cm^3}{3 \times 3 \times 3\ cm^3} = 24$

7. (4) Volume of the box

= (56 × 35 × 28) cm^3

Volume of a soap cake

= (8 × 5 × 4) cm^3

∴ Number of soap cakes

$= \frac{56 \times 35 \times 28}{8 \times 5 \times 4} = 343$

8. (1) Let the cost of carpeting per sq. metre be ₹ 1.

∴ Area of the room

= 120 sq. metre

Let the breadth of the room be x metres.

Then, Length of room

$= \frac{120}{x}$ metres

New cost = 120 – 20 = ₹ 100

Breadth = $(x - 4)$ metres

Then, $\frac{120}{x} \times (x - 4) = 100$

$\Rightarrow \frac{6}{x}(x - 4) = 5$

$\Rightarrow 6x - 24 = 5x$

$\Rightarrow x = 24$

∴ Breadth of the room

= 24 metres

9. (3) Area of the verandah

= (25 + 2 × 3.5) (15 + 2 × 3.5) – 25 × 15

= 32 × 22 – 25 × 15 = 704 – 375

= 329 sq.metre

∴ Cost of flooring = 329 × 27.5

= ₹ 9047.5

10. (2) Volume of bigger cube = 6 × 6 × 6

= 216 cu. cm.

Volume of unit cube

= 1 × 1 × 1 = 1 cu. cm

Number of uncoloured cubes

= 4 × 4 × 4 = 64 [because edge of uncoloured cube = 4 cm]

11. (4) Area of the curved surface = πrl

$l = \sqrt{r^2 + h^2} = \sqrt{(32)^2 + (60)^2}$

$= \sqrt{4624}$ = 68 cm

Area of the curved surface

$= \pi rl = \frac{22}{7} \times 32 \times 68$

∴ Total cost of painting

$= 35 \times \frac{22}{7} \times 32 \times 68 \times \frac{1}{10000}$

= ₹ 23.94 approx.

12. (2) Volume of a right circular cone

$= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times (3)^2 \times 4$

= 12π cm^3

Volume of a solid sphere

$= \frac{4}{3}\pi \times (6)^3 = 288\ \pi\ cm^3$

Let the number of cones be n .

∴ $n \times 12\pi = 288\ \pi$

$\Rightarrow n = \frac{288\pi}{12\pi} = 24$

13. (4) Using Rule 7,

Distance covered by the wheel in one revolution = πd

$= \frac{22}{7} \times 7 = 22$ metre

∴ Number of revolutions

$= \frac{22 \times 1000}{22} = 1000$

14. (1) Volume of bigger ball $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \pi \times 10 \times 10 \times 10$ cu. cm.

Volume of smaller ball

$= \frac{4}{3}\pi (0.5)^3$

∴ Possible number of smaller balls

$= \frac{\frac{4}{3}\pi \times 10 \times 10 \times 10}{\frac{4}{3}\pi \times 0.5 \times 0.5 \times 0.5} = 8000$

15. (1) Volume of rectangular block

= 11 × 10 × 5 = 550 cubic metre

= 550000 cubic dm

Volume of a sphere

$= \frac{4}{3}\pi \times \frac{5}{2} \times \frac{5}{2} \times \frac{5}{2}$ cubic dm.

$\approx \frac{500}{8}$ cubic dm

∴ Required answer

$= \frac{550000 \times 8}{500} = 8800$

16. (4) Let number of balls = n

∴ Volume of n balls = Volume of cone

$\Rightarrow n \times \frac{4}{3}\pi r^3 = \frac{1}{3}\pi R^2 h$

$\Rightarrow n \times \frac{4}{3}(2)^3 = \frac{1}{3} \times (20)^2 \times 10$

$\Rightarrow n = 125$

17. (4) Let the radius of the base of cylinder be r units.

Height = 8r units

Its volume = $\pi r^2 \times 8r$

= $8\pi r^3$ cu.units

Radius of sphere $= \frac{r}{2}$ units

Volume $= \frac{4}{3}\pi\left(\frac{r}{2}\right)^3$

$= \frac{\pi r^3}{6}$ cu.units

$\therefore$ Number of spherical balls

$= \frac{8\pi r^3}{\pi r^3} \times 6 = 48$

18. (1) Volume of the solid cube
= (44 × 44 × 44) cu.cm.

Volume of a bullet = $\frac{4}{3}\pi r^3$

$= \left(\frac{4}{3} \times \frac{22}{7} \times 2 \times 2 \times 2\right)$ cu.cm.

$\therefore$ Number of bullets

$= \frac{44 \times 44 \times 44 \times 3 \times 7}{4 \times 22 \times 2 \times 2 \times 2} = 2541$

19. (4) Volume of cylinder
$= \pi r^2 h = \pi \times 9 \times 5$
$= 45\pi$ cu.cm.

Volume of a cone = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \pi \times \frac{1}{100} \times 1$

$= \frac{\pi}{300}$ cu.cm.

$\therefore$ Number of cones = $\frac{45\pi}{\frac{\pi}{300}}$

= 13500

20. (1) Volume of metallic cone

$= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi \times 30 \times 30 \times 45$ cu.cm.

Volume of a sphere = $\frac{4}{3}\pi R^3$

$= \frac{4}{3}\pi \times 5 \times 5 \times 5$ cu. cm.

$\therefore$ Required number of spheres

$= \frac{\frac{1}{3}\pi \times 30 \times 30 \times 45}{\frac{4}{3}\pi \times 5 \times 5 \times 5} = 81$

21. (1) Volume of water flowing from the pipe in 1 minute
$= \pi \times 0.25 \times 0.25 \times 1000$ cu.cm.
Volume of conical vessel

$= \frac{1}{3}\pi \times 15 \times 15 \times 24$ cu.cm.

$\therefore$ Required time

$= \frac{\pi \times 15 \times 15 \times 24}{3\pi \times 0.25 \times 0.25 \times 1000}$

= 28 minutes 48 seconds

22. (4) Volume of sphere

$= \frac{4}{3}\pi (10.5)^3$ cu.cm.

Volume of a cone

$= \frac{1}{3}\pi (3.5)^2 \times 3$ cu.cm.

$\therefore$ Number of cones

$= \frac{\frac{4}{3}\pi(10.5)^3}{\frac{1}{3}\pi(3.5)^2 \times 3} = 126$

23. (4) Slant height of the tent (l)

$= \sqrt{12^2 + 9^2}$

$= \sqrt{144 + 81} = \sqrt{225}$

= 15 metre

$\therefore$ Curved surface area of the tent = $\pi r l$

= (3.14 × 12 × 15) sq. metre

$\therefore$ Total cost

= ₹ (3.14 × 12 × 15 ×120)

= ₹ 67824

24. (4) Using Rule 10,
Single equivalent decrease for 50% and 50%

$= \left(-50 - 50 + \frac{50 \times 50}{100}\right)\%$

= (– 100 + 25)% = – 75%

Single equivalent percent for – 75% and 50%

$= \left(-75 + 50 - \frac{75 \times 50}{100}\right)\%$

= (– 25 – 37.5)% = – 62.5%

Negative sign shows decrease.

25. (1) Using Rule 10,
Percentage increase

$= \left(x + y + \frac{xy}{100}\right)\%$

$\Rightarrow 0 = \left(10 + y + \frac{10y}{100}\right)$

$\Rightarrow -10 = y + \frac{y}{10}$

$\Rightarrow -10 = \frac{10y + y}{10}$

$\Rightarrow 11y = -100$

$\Rightarrow y = \frac{-100}{11} = -9\frac{1}{11}\%$

Negative sign shows decrease.

OR

Percentage decrease

$= \frac{10}{100 + 10} \times 100$

$= \frac{100}{11} = 9\frac{1}{11}\%$

26. (4) Using Rule 10,
Increase in height = 0%

Volume = $\frac{1}{3}$ area of base × height

$\therefore$ Percentage increase

$= \left(x + y + \frac{xy}{100}\right)\%$

$= \left(100 + 0 + \frac{100 \times 0}{100}\right)\%$

= 100%

27. (4) Using Rule 10,
Required percentage increase

$= \left(x + y + \frac{xy}{100}\right)\%$

$= \left(100 + 100 + \frac{100 \times 100}{100}\right)\%$

= 300%

28. (4) Edge of the original cube = x units

Edge of the new cube = $\frac{3x}{4}$ units

$\therefore$ Required ratio = $\frac{x^3}{\left(\frac{3x}{4}\right)^3}$

$= \frac{4^3}{3^3} = \frac{64}{27}$

29. (2) Percentage decrease

$= \frac{10}{100 + 10} \times 100$

$= \frac{100}{11} = 9\frac{1}{11}\%$

30. (4) Effective percentage change

$= \left(x + y + \frac{xy}{100}\right)\%$

$= \left(-25 + 25 - \frac{25 \times 25}{100}\right)\%$

$= -6.25\%$

Negative sign shows decrease.

31. (4) Radius of the base of cylindrical pillar = r metre (let)

$\therefore\ 2\pi r = 8.8$

$\Rightarrow 2 \times \frac{22}{7} \times r = 8.8$

$\Rightarrow r = \frac{8.8 \times 7}{2 \times 22} = 1.4$ metre.

Again,

$2\pi rh = 17.6$

$\Rightarrow 8.8 \times h = 17.6$

$\Rightarrow h = \frac{17.6}{8.8} = 2$ metre

$\therefore$ Volume of concrete $= \pi r^2 h$

$= \left(\frac{22}{7} \times 1.4 \times 1.4 \times 2\right)$ cu. metre

$= 12.32$ cu. metre

32. (2) Total number of cubes

$= 160 + 56 = 216$

Edge of cube $= \sqrt[3]{216} = 6$ units

Number of cubes without exposure

$= (6 - 2)^3 = 64$

These cubes will be inside the big cube.

Remaining cubes $= 160 - 64 = 96$

Again number of cubes with one face outside

$= 6 \times (4 \times 4) = 96$

$\therefore$ Required percent

$= \frac{96}{216} \times 100$

$= 44.44\%$

33. (3) Volume of cone $= \frac{1}{3}\pi r^2 h$

Single equivalent increase in radius

$= \left(20 + 20 + \frac{20 \times 20}{100}\right)\%$

$= 44\%$

Single equivalent percentage effect for 44% and 20%

$= \left(44 + 20 + \frac{44 \times 20}{100}\right)\%$

$= (64 + 8.8)\%$

$= 72.8\%$ = Increase in volume

34. (3) Percentage increase in surface area of sphere

$= \left(20 + 20 + \frac{20 \times 20}{100}\right)\%$

$= 44\%$

35. (4) Required percentage decrease $= \frac{4}{(100 + 4)} \times 100$

$= \frac{400}{104} = \frac{50}{13} = 3\frac{11}{13}\%$

36. (1) Volume of concial vessel

$= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi \times (5)^2 \times 8$

$= \frac{200\pi}{3}$ cu. cm. = Volume of water

Volume of 25% of water

$= \frac{1}{4} \times \frac{200\pi}{3} = \frac{50\pi}{3}$ cu. cm.

$\therefore$ Volume of ball $= \frac{4}{3}\pi R^3$

$= \frac{4}{3}\pi \times \left(\frac{1}{2}\right)^3$ cu. cm.

$= \frac{\pi}{6}$ cu. cm.

$\therefore$ Number of balls $= \frac{\frac{50\pi}{3}}{\frac{\pi}{6}}$

$= \frac{50\pi}{3} \times \frac{6}{\pi} = 100$

37. (4) Volume of cone

$= \frac{1}{3}\pi r^2 h$

$\therefore$ Resultant increase in radius^2

$= \left(20 + 20 + \frac{20 \times 20}{100}\right)\%$

$= 44\%$

Resultant increase in r^2 and h

$= \left(44 + 20 + \frac{44 \times 20}{100}\right)\%$

$= (64 + 8.8)\% = 72.8\%$

TYPE-VII

1. (3) $\theta = \frac{s}{r}$

$\Rightarrow s = r\theta$

$\Rightarrow s = r_1\theta_1 = r_2\theta_2$

$\Rightarrow \frac{r_1}{r_2} = \frac{\theta_2}{\theta_2} = \frac{75}{60} = \frac{5}{4}$ or 5 : 4

2. (1)

Let the side of ΔABC be x.

O is the point in the interior of ΔABC.

OD, OE, OF are perpendiculars.

$\therefore$ Clearly

$\Delta OAB + \Delta OBC + \Delta OAC = \Delta ABC$

$\Rightarrow \frac{1}{2}x \times p_3 + \frac{1}{2}x \times p_1 + \frac{1}{2}x \times p_2 = \frac{\sqrt{3}}{4}x^2$

$\Rightarrow \frac{1}{2}x(p_3 + p_1 + p_2) = \frac{\sqrt{3}}{4}x^2$

$\Rightarrow p_1 + p_2 + p_3 = \frac{\sqrt{3}}{2}x$

$\Rightarrow x = \frac{2}{\sqrt{3}}(p_1 + p_2 + p_3)$

3. (2) Let the sides of triangle be $3x$, $4x$ and $5x$. Here,

$(3x)^2 + (4x)^2 = (5x)^2$

$\therefore$ The triangle is right angled.

Hence, the largest angle = 90°

4. (3) Let ABC be equilateral triangle of side a cm and P be a point inside it.

From the figure,

Area of Δ APB + Area of Δ PBC + Area of Δ APC = Area of Δ ABC

$\Rightarrow \frac{1}{2} \times a \times 6 + \frac{1}{2} \times a \times 7 + \frac{1}{2} \times a \times 8 = \frac{\sqrt{3}}{4}a^2$

$\Rightarrow \frac{1}{2}a(6+7+8) = \frac{\sqrt{3}}{4}a^2$

$\Rightarrow \frac{21a}{2} = \frac{\sqrt{3}}{4}a^2$

$\Rightarrow a = \frac{21}{2} \times \frac{4}{\sqrt{3}} = 14\sqrt{3}$ cm.

5. (2)

In ΔABC,

$AC = \sqrt{12^2 + 5^2} = \sqrt{144 + 25}$

$= \sqrt{169} = 13$

Let AO = x. Then

OC = $13 - x$

$OB^2 = 5^2 - x^2 = 25 - x^2$ ....(i)

$OB^2 = 12^2 - (13 - x)^2$

$= 144 - 169 - x^2 + 26x$ ....(ii)

From (i) and (ii),

$25 - x^2 = -25 - x^2 + 26x$

$\Rightarrow 26x = 50$

$\Rightarrow x = \frac{50}{26} = \frac{25}{13}$

$\therefore OB^2 = 25 - x^2$

$= 25 - \left(\frac{25}{13}\right)^2$

$\therefore OB^2 = 25 - x^2 = 25 - \left(\frac{25}{13}\right)^2$

$OB^2 = 25\left(1 - \frac{25}{169}\right) = 25 \times \frac{144}{169}$

$OB = \sqrt{\frac{25 \times 144}{169}} = \frac{5 \times 12}{13} = \frac{60}{13}$

$= 4\frac{8}{13}$ cm

6. (1)

From Δ ABC

$\sin 30° = \frac{AB}{AC}$

$\Rightarrow \frac{1}{2} = \frac{AB}{AC}$

$\Rightarrow AB = \frac{1}{2}AC = \frac{1}{2} \times 10 = 5$ cm

$\therefore BC = \sqrt{AC^2 - AB^2} = \sqrt{10^2 - 5^2}$

$= \sqrt{100 - 25} = \sqrt{75} = 5\sqrt{3}$ cm

$\therefore$ Area of Δ ABC

$= \frac{1}{2} \times AB \times BC$

$= \frac{1}{2} \times 5 \times 5\sqrt{3} = \frac{25\sqrt{3}}{2}$ cm²

7. (3)

AE ⊥ BC

$\therefore$ BE = EC = 5 cm

AC = 10 cm

$AE = \sqrt{10^2 - 5^2}$

$= \sqrt{100 - 25} = \sqrt{75} = 5\sqrt{3}$ cm

DE = DC – EC

$= \frac{2}{3} \times 10 - 5 = \frac{5}{3}$ cm

$\therefore AD = \sqrt{\left(\frac{5}{3}\right)^2 + \left(5\sqrt{3}\right)^2}$

$= \sqrt{\frac{25}{9} + 75} = \sqrt{\frac{25 + 675}{9}}$

$= \sqrt{\frac{700}{9}} = \frac{10\sqrt{7}}{3}$ cm

8. (3) Smallest side of the triangle = x cm (let)

$\therefore$ Second side of triangle

$= 40 - 17 - x = 23 - x$

Semi-perimeter = $s = \frac{40}{2} = 20$

$\therefore \sqrt{s(s-a)(s-b)(s-c)} = 60$

$\Rightarrow \sqrt{20(20-17)(20-x)(20-23+x)}$

$= 60$

$\Rightarrow (20 - x)(x - 3) = 60$

$\Rightarrow 20x - 60 - x^2 + 3x = 60$

$\Rightarrow x^2 - 23x + 120 = 0$

$\Rightarrow x^2 - 15x - 8x + 120 = 0$

$\Rightarrow x(x - 15) - 8(x - 15) = 0$

$\Rightarrow (x - 8)(x - 15) = 0$

$\Rightarrow x = 8$ or 15

$\Rightarrow$ Smallest side = 8 cm

9. (3) Both the triangles are equi-angular.

$\Rightarrow$ These are similar triangles.

$\therefore$ Ratio of their height

= Square root of ratio of their area = 1 : 2

10. (1) We know that if all the sides of a parallelogram are equal, it is called a rhombus.

Area = Base × Height

= 6.5 × 10 = 65 cm²

Let the diagonals of the rhombus be d_1 and d_2.

$\therefore$ Area = $\frac{1}{2} d_1 d_2$

$\Rightarrow 65 = \frac{1}{2} \times 26 \times d_2$

$\Rightarrow d_2 = \frac{2 \times 65}{26} \Rightarrow d_2 = 5$

Hence, other diagonal of rhombus = 5 cm.

11. (1)

Let AB = BC = CD = DA = 10 cm

∠ BAD = ∠ BCD = 60°

$\therefore$ ∠ABC = ∠ADC = 120°

and ∠ CBD = ∠ CDB = 60°

$\therefore$ BD = 10cm

12. (2) Area of the parallelogram

= Base × Height

= 15 × 12 = 180 sq.cm.

$\therefore$ 180 = 18 × height

$\Rightarrow$ Height = 10 cm

13. (3)

Area of the parallelogram
= Base × Height
= 24 × 10 = 240 sq.cm.
If the required distance be x cm, then
240 = 16 × x

$\Rightarrow x = \frac{240}{16} = 15$ cm

14. (4) Area of parallelogram
= base × height
= 27 × 12 = 324 sq. cm.
Again,
324 = 36 × h

$\Rightarrow h = \frac{324}{36} = 9$ cm

15. (1) BO = 4 units; OC = 3 units
$\angle BOC = 90°$

$\therefore$ BC = $\sqrt{4^2 + 3^2}$ = 5 units
$\therefore$ BC^2 = 25 sq. units

16. (1)

$\angle BAD = 60°$
$\therefore \angle BAO = 30°$
$\angle ABO = 60°$

$\therefore \sin 60° = \frac{OA}{AB}$

$\Rightarrow \frac{\sqrt{3}}{2} \times 8 = OA$

$\Rightarrow OA = 4\sqrt{3}$

$\therefore AC = 8\sqrt{3}$ cm

17. (3) Side of rhombus

$= \sqrt{\left(\frac{d_1}{2}\right)^2 + \left(\sqrt{\frac{d_2}{2}}\right)^2}$

$= \sqrt{6^2 + 8^2} = 10$ cm

18. (3) Let the number of sides of the regular polygon be n, then

$\therefore \left(\frac{2n-4}{n}\right) \times 90$

$= 8 \times \frac{4 \times 90°}{n} + 18$

$\Rightarrow \left(\frac{2n-4}{n}\right) \times 5 = \frac{160}{n} + 1$

$\Rightarrow 10 = n - 20 = 160 + n$
$\Rightarrow 10n - n = 180$
$\Rightarrow 9n = 180$
$\Rightarrow n = 20$

19. (4) Number of sides of polygon

$= \frac{360}{72} = 5$

$\therefore$ Sum of interior angles
= $(2n - 4) \times 90°$
= $(2 \times 5 - 4) \times 90° = 540°$

20. (4) Volume of water drawn from cylinder

$= \pi r^2 h = \frac{22}{7} \times \frac{35}{2} \times \frac{35}{2} \times h$

$\therefore \frac{22}{7} \times \frac{35}{2} \times \frac{35}{2} \times h = 11000 cm^3$

$\therefore h = \frac{11000 \times 7 \times 2 \times 2}{22 \times 35 \times 35}$

$= \frac{80}{7} = 11\frac{3}{7}$ cm.

21. (2) When a right circular cylinder is formed by rolling a rectangular paper along its length, the circumference of base is equal to length of paper.

$\therefore 2\pi r = 12 \Rightarrow r = \frac{12}{2\pi} = \frac{6}{\pi}$ cm

22. (2) Slant height of cone (l)

$= \sqrt{r^2 + h^2}$

$= \sqrt{2^2 + (2\sqrt{3})^2}$

$= \sqrt{4 + 12} = \sqrt{16} = 4$ cm

23. (3) Radius of sector = Slant height of cone

$= \sqrt{h^2 + r^2}$

$= \sqrt{6^2 + 8^2} = \sqrt{36 + 64}$

$= \sqrt{100} = 10$ cm

24. (3) Volume of cone

$= \frac{1}{3}\pi r^2 h$

$= \frac{\pi}{3} \times 1.6 \times 1.6 \times 3.6$

= π × 1.6 × 1.6 × 1.2 cu.cm.

$\therefore \frac{1}{3} \times \pi \times 1.2 \times 1.2 \times H$

(H is height of new cone)
= π × 1.6 × 1.6 × 1.2

$\Rightarrow H = \frac{1.6 \times 1.6 \times 3}{1.2} = 6.4$ cm

25. (4) Volume of copper sphere

$= \frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 3 \times 3 \times 3$

$= \frac{36 \times 22}{7}$ cm^3

Radius of the wire = 0.1 cm
The wire can be treated as a solid cylinder.
Let its length be h cm.

$\therefore \pi \times (0.1)^2 \times h = \frac{36 \times 22}{7}$

$\Rightarrow h = 36 \times \frac{22}{7} \times \frac{7}{22} \times \frac{1}{0.01}$

= 3600 cm = 36 m.
$\therefore$ Length of the wire
= 36 metres.

26. (1) $S = 4\pi r^2$, $V = \frac{4}{3}\pi r^3$

$\therefore \frac{S^3}{V^2} = \frac{64\pi^3 r^6}{\frac{16}{9}\pi^2 r^6}$

$= \frac{64\pi \times 9}{16} = 36\pi$

27. (4) Let Height of glass = h cm

then Radius = $\frac{h}{2}$ cm

Volume of glass = volume of 32000 drops

$\therefore \frac{1}{3}\pi\left(\frac{h}{2}\right)^2 \times h$

$= \frac{4}{3}\pi\left(\frac{1}{20}\right)^3 \times 32000$

$\Rightarrow \frac{h^3}{4} = 4 \times \frac{1}{8000} \times 32000$

$\Rightarrow h^3 = 4^3 \Rightarrow h = 4$ cm

28. (3) Walls are 5 cm thick.

$\therefore$ Internal length

= (330 – 2 × 5) cm = 320 cm.

Let the thickness of bottom be x

Breadth = (260 – 10)cm = 250 cm

Height = (110 – x) cm

Here, the cistern is assumed to be open and x is the thickness of bottom.

$\therefore$ 320 × 250 × (110 – x)

= 8000 litres

$\Rightarrow$ 320 × 250 × (110 – x)

= 8000 × 1000 cm^3

$\Rightarrow (110 - x) = \frac{8000000}{320 \times 250}$

$\Rightarrow$ 110 – x = 100

$\Rightarrow$ x = 10 cm or 1 dm.

29. (4)

Δ ADE ~ Δ ABC

$\therefore \frac{AD}{AB} = \frac{DE}{BC} = \frac{1}{2}$

AD = AB ; DE = $\frac{1}{2}$ BC

$\therefore$Required ratio

$$= \frac{\frac{1}{3}\pi (DE)^2 \times AD}{\frac{1}{3}\pi BC^2 \times AB - \frac{1}{3}\pi (DE)^2 \times AD}$$

$$= \frac{DE^2 \times AD}{BC^2 \times AB - DE^2 \times AD}$$

$$= \frac{\frac{1}{4}BC^2 \times \frac{1}{2}AB}{BC^2 \times AB - \frac{1}{4}BC^2 \times \frac{AB}{2}}$$

$$= \frac{\frac{1}{8}}{1 - \frac{1}{8}} = 1 : 7$$

30. (4) We know that

Circumference = 2πr

$= 2 \times \frac{22}{7} \times 5 = \frac{220}{7}$

Area = πr^2 $= \frac{22}{7} \times 25 = \frac{550}{7}$

$\Rightarrow$ Required %

$= \frac{550}{7} \times \frac{7}{220} \times 100 = 250\%$

31. (4) We know that

The area of circle = πr^2

$= \frac{\pi D^2}{4}$

[where D : diameter of circle]

and Circumference of circle

= 2πr = πD

Now, according to question,

$\frac{\pi D^2}{4} = \pi D$

$D^2 = 4D$

$D^2 - 4D = 0$

$\Rightarrow D(D - 4) = 0$

$\Rightarrow D = 4$

32. (1)

AD = DB = 15 cm[$\because$ AB = 30 cm]

OD = 8 cm

OA = $\sqrt{15^2 + 8^2}$

$= \sqrt{225 + 64} = \sqrt{289}$

= 17cm

33. (3)

$\because \frac{OC}{OD} = \frac{2}{1}$

$\Rightarrow \frac{8}{OD} = \frac{2}{1} \Rightarrow$ OD = 4 cm

In-radius = 4 cm

34. (3)

Area of equilateral triangle ABC

$= \frac{\sqrt{3}}{4} \times \left(4\sqrt{3}\right)^2 = \frac{48\sqrt{3}}{4}$

$= 12\sqrt{3}$ cm^2

Again, AD is the height and O is the centre of the circle

$\therefore$ Area of Δ ABC

$= \frac{1}{2} \times$ BC × AD

$\Rightarrow 12\sqrt{3} = \frac{1}{2} \times 4\sqrt{3} \times$ AD

$\Rightarrow$ AD = $\frac{12\sqrt{3}}{2\sqrt{3}} = 6$

$\therefore$ OD = $\frac{1}{3}$AD = 2 cm

$\therefore$ OB = $\sqrt{BD^2 + OD^2}$

$= \sqrt{\left(2\sqrt{3}\right)^2 + 2^2} = \sqrt{16} = 4$ cm.

$\therefore$ Side of square = 2 × OB

= 2 × 4 = 8 cm.

$\therefore$ Diagonal of square

$= \sqrt{2} \times$ Side = $8\sqrt{2}$ cm

35. (2) Radius of the circumcircle

$= \frac{2}{3} \times 4\sqrt{3}$ cm $= 2r$ cm

Radius of the in circle

$= \frac{1}{3} \times 4\sqrt{3}$ cm = r cm

$\therefore$ Required ratio = $\pi (2r)^2 : \pi r^2$
= 4 : 1

36. (3)

Side of square

$= \frac{1}{\sqrt{2}} \times 12\sqrt{2} = 12$ cm

$\therefore$ Radius of circle

$= \frac{12}{2} = 6$ cm

AB = $2x$ cm

$\therefore$ FH = x cm

$\therefore$ From ΔOFH,

$\cos 30° = \frac{FH}{OF}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{x}{6}$

$\Rightarrow x = \frac{6 \times \sqrt{3}}{2} = 3\sqrt{3}$

$\therefore$ Length of side = $6\sqrt{3}$ cm

37. (3) $9^2 + 12^2 = 15^2$

$\therefore$ The triangle is right angled

AB = 9, BC = 12 cm

OD = OE = OF = x cm

AD = AF = $9 - x$

EC = CF = $12 - x$

$\therefore$ AC = AF + FC

$= 9 - x + 12 - x = 15$

$\Rightarrow 21 - 2x = 15$

$\Rightarrow 2x = 21 - 15 = 6$

$\Rightarrow x = \frac{6}{2} = 3$ cm

38. (1)

Radius of circum-circle

$= \frac{\text{Diagonal}}{2} = \frac{\sqrt{2} \times \text{Side}}{2} = \frac{\text{Side}}{\sqrt{2}}$

Radius of in-circle = $\frac{\text{Side}}{2}$

$\therefore$ Ratio = $\frac{\text{Side}}{2} : \frac{\text{Side}}{\sqrt{2}}$ = $1 : \sqrt{2}$

39. (4) Let the length and breadth of rectangle be x and y m. respectively.

According to the question,

$2(x + y) = 160$

$\Rightarrow x + y = \frac{160}{2} = 80$ m ...(i)

Perimeter of square = 160 m

$\therefore$ Side of square = $\frac{160}{4} = 40$ m

Now,

Area of rectangle = xy

Area of square = 40 × 40
= 1600 m^2

Then,

$1600 - xy = 100$

$\Rightarrow xy = 1600 - 100 = 1500$ ..(ii)

Now,

$(x - y)^2 = (x + y)^2 - 4xy$

$= (80)^2 - 4 \times 1500$

$= 6400 - 6000 = 400$

$\Rightarrow x - y = \sqrt{400} = 20$ ...(iii)

From equations (i) and (iii),

$2x = 100$

$\Rightarrow x = \frac{100}{2} = 50$ m.

40. (4) Volume of the cylinder= $\pi r^2 h$

$= \frac{\pi d^2 h}{4}$ cubic units

$\left[\because r = \frac{d}{2}\right]$

Volume of sphere = $\frac{4}{3}\pi\left(\frac{d}{2}\right)^3$

$= \frac{\pi}{6} d^3$ cubic units

According to the question,

$\frac{\pi}{6} d^3 = \frac{\pi d^2 h}{4}$

$\Rightarrow \frac{d}{6} = \frac{h}{4} \Rightarrow 4d = 6h$

$\Rightarrow 2d = 3h$

41. (4) Volume of sphere = $\frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi \times 9 \times 9 \times 9$

$= 972\pi$ cu.cm.

Volume of cone = $\frac{1}{3}\pi R^2 H$

$= \frac{1}{3}\pi \times 9 \times 9 \times 9$

$= 243\pi$ cu.cm.

$\therefore$ Percentage of wood wasted

$= \frac{(972\pi - 243\pi)}{972\pi} \times 100$

= 75%

Method 2 :

Quicker Approach

In both cases

$\because r = 9$, h = 9cm

$\therefore$ Volume of sphere = $\frac{4}{3}\pi r^3$

and Volume of cone = $\frac{1}{3}\pi r^3$

Wasted wood = πr^3

$\therefore$ Required percentage

$= \frac{\pi r^3}{\frac{4}{3}\pi r^3} \times 100$

$= \frac{3}{4} \times 100 = 75\%$

42. (2)

ABDE will be a trapezium

AB = 4 units

DE $= \frac{1}{2}$ AB = 2 units

FB = 1 unit, BD = 2 units.

$\Rightarrow$ DF $= \sqrt{2^2 - 1^2} = \sqrt{3}$ units

$\therefore$ Area of ABDE

$= \frac{1}{2}$ (AB + DE) × DF

$= \frac{1}{2}$ (4 + 2) × $\sqrt{3}$

$= 3\sqrt{3}$ sq. units

43. (2) Length of parallelopiped = 12 cm.

breadth = 6 cm.

height = 6 cm.

$\therefore$ Total surface area

= 2 (12 × 6 + 6 × 6 + 12 × 6) sq.cm.

= 2 (72 + 36 + 72) sq.cm.

= 360 sq.cm.

44. (4) Volume of sphere $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \pi \times 9 \times 9 \times 9$

$= 972\pi$ cu. cm

Let the radius of wire be R cm, then

$\pi R^2 \times 10800 = 972\pi$

$\Rightarrow R^2 = \frac{972}{10800} = 0.09$

$\Rightarrow R = \sqrt{0.09} = 0.3$ cm

$\therefore$ Diameter = 2 × 0.3 = 0.6 cm

45. (2) Volume of water flowed in an hour

= 2000 × 40 × 3 cubic metre

= 240000 cubic metre

$\therefore$ Volume of water flowed in 1 minute

$= \frac{240000}{60} = 4000$ cubic metre

= 4000000 litre

46. (2) Water flowed in 1 hour through the pipe

$= \frac{22}{7} \times \frac{10 \times 10 \times 3000}{10000}$ m^3

$= \frac{660}{7}$ m^3

Volume of circular/cylindrical cistern

$= \frac{22}{7} \times 5 \times 5 \times 2 = \frac{1100}{7}$ m^3

$\therefore$ Required time $= \frac{\frac{1100}{7}}{\frac{660}{7}} = \frac{5}{3}$ hours

or 1 hour $\frac{2}{3} \times 60$ minutes

or 1 hour 40 minutes

47. (2) Let amount of rainfall be 'x'

$20 \times 20 \times x = \frac{22}{7} \times 1^2 \times 3.5$

$\Rightarrow x = \frac{22 \times 3.5}{7 \times 22 \times 20}$

= 0.025 metre = 2.5 cm

48. (2) Volume of rain water = Area of base × height

$= 1000000 \times \frac{2}{100}$

= 20000 cu. metre

Water stored in pool

= 10000 cu. metre

$\therefore$ Required water level

$= \frac{10000}{1000}$ = 10 metre

49. (4) Let the sides of the parallelopiped be $2x$, $4x$ and $8x$ units respectively and the edge of cube be y units.

$\therefore 2x \times 4x \times 8x = y^3$

$\Rightarrow 8 \times 8\, x^3 = y^3$

Taking cube roots,

$\Rightarrow 4x = y$ .....(i)

Surface area of parallelopiped

$= 2\,(2x \times 4x + 4x \times 8x + 8x \times 2x)$

$= 2\,(8x^2 + 32x^2 + 16x^2)$

$= 112x^2$ sq. units.

Surface area of cube

$= 6y^2$ sq. units.

$\therefore$ Required ratio

$= \frac{112x^2}{6y^2} = \frac{112x^2}{6 \times 16x^2}$

$= \frac{7}{6}$ or 7 : 6

50. (3) Let the third side of the rectangular parallelopiped be x cm, then

$2\,(x \times 1 + 1 \times 2 + 2 \times x) = 22$

$\Rightarrow 3x + 2 = 11$

$\Rightarrow 3x = 11 - 2 = 9$

$\Rightarrow x = \frac{9}{3} = 3$ cm

Diagonal $= \sqrt{l^2 + b^2 + h^2}$

$= \sqrt{3^2 + 2^2 + 1^2}$

$= \sqrt{9 + 4 + 1}$

$= \sqrt{14}$ cm

51. (2) Volume of earth taken out

$= \pi r^2 h$

$= \frac{22}{7} \times 2 \times 2 \times 56 = 704$ m^3

Volume of the ditch

= 48×16.5×4 m^3 = 3168 m^3

Part of the ditch filled

$= \frac{704}{3168} = \frac{2}{9}$

52. (2) Radius of circle = x cm.

Side of square = y cm.

Side of equilateral triangle = z cm.

Circumference of circle = Perimeter of square = Perimeter of equilateral triangle

$\Rightarrow 2\,\pi\, x = 4\, y = 3\, z$

$\Rightarrow x = \frac{4y}{2\pi} = \frac{2y}{\pi}$

$z = \frac{4y}{3}$

Area of circle 'C' $= \pi\, x^2$

$= \pi \times \frac{4}{\pi^2} y^2 = \frac{4}{\pi} y^2 > y^2$

Area of square 'S' $= y^2$

Area of triangle 'T' $= \frac{\sqrt{3}}{4} z^2$

$= \frac{\sqrt{3}}{4} \times \frac{4 \times 4}{3 \times 3} y^2$

$= \frac{4}{3\sqrt{3}} y^2 < y^2$

$\therefore$ T < S < C

53. (1) Area of base = Area of Δ ABD + Area of Δ BCD

In, Δ ABD

BD = $\sqrt{AB^2 + AD^2} = \sqrt{9^2 + 12^2}$

$= \sqrt{81 + 144} = \sqrt{225} = 15$ cm

Area of Δ ABD

$= \frac{1}{2} \times AB \times AD$

$= \frac{1}{2} \times 9 \times 12$

= 54 sq. cm

For Δ BCD,

Semi-perimeter (s) = $\frac{13 + 14 + 15}{2}$

$= \frac{42}{2} = 21$

$\therefore$ Area of Δ BCD

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{21(21-13)(21-14)(21-15)}$

$= \sqrt{21 \times 8 \times 7 \times 6}$

= 21 × 4 = 84 sq. cm

Area of quadrilateral ABCD

= 54 + 84 = 138 sq, cm

$\therefore$ Height of prism

$= \frac{\text{Volume}}{\text{Area of base}} = \frac{2070}{138}$

= 15 cm

Perimeter of base

= (9 + 14 + 13 +12) cm

= 48 cm

$\therefore$ Area of lateral surfaces

= perimeter × height

= 48 × 15 = 720 sq. cm.

54. (2)

AC = $\sqrt{AB^2 + BC^2}$

$= \sqrt{30^2 + 16^2}$

$= \sqrt{900 + 256} = \sqrt{1156}$

= 34 metre

Distance travelled by elephant = 34 – 4 = 30 metre

$\therefore$ Speed of elephant = $\frac{30}{15}$

= 2 m/sec.

55. (4) Distance covered in one revolution = Circumference of circular field = 2 πr

Again, speed of horse

= 66 metre/second

Time = $\frac{5}{2}$ seconds

$\therefore$ Distance covered = 66 × $\frac{5}{2}$

= 165 metre

$\therefore$ 2 π r = 165

$\Rightarrow 2 \times \frac{22}{7} \times r = 165$

$\Rightarrow r = \frac{165 \times 7}{2 \times 22} = 26.25$ metre

56. (3) Number of revolutions of rear wheel

= m (let)

Distance covered by front wheel in 1 revolution

= π × diameter

= $2\pi x$ cm.

Distance covered by rear wheel in 1 revolution = $2\pi y$ cm

$\therefore 2\pi x \times n = 2\pi y \times m$

$\Rightarrow m = \frac{nx}{y}$

57. (2) Distance covered by wheel in 1 revolution = π × diameter

$= \frac{22}{7} \times 56 = 176$ cm

Total distance = 2.2 km

= (2.2 × 1000 ×100) cm

= 220000 cm

$\therefore$ Number of revolutions

$= \frac{220000}{176} = 1250$

58. (1)

AC = 10 cm.

AO = OC = 5 cm.

$\angle$ AOB = 90°

AB = 13 cm.

From Δ AOB,

$\therefore$ OB

$= \sqrt{AB^2 - OA^2} = \sqrt{13^2 - 5^2}$

$= \sqrt{169 - 25} = \sqrt{144}$

= 12 cm.

$\therefore$ BD = 2OB = 2 × 12

= 24 cm.

59. (4)

BC = 2" ; $\angle$ODB = 90°

BD = 6" = Radius of wheel

60. (4) According to the Euler's formula,

V + F – E = 2

$\Rightarrow$ 12 + F – 30 = 2

$\Rightarrow$ F – 18 = 2

$\Rightarrow$ F = 18 + 2 = 20

❑❑❑

TEST YOURSELF

1. A sphere of radius r is inscribed in a right circular cone whose slant height equals twice the radius of the base a. What is the relation between r and a ?

(1) $r = \frac{a}{\sqrt{2}}$ (2) $r = \frac{a}{3}$

(3) $r = \frac{a}{\sqrt{3}}$ (4) $3r = 2a$

2. When the length of rectangle is decreased by 10ft. and the breadth is increased by 5 feet, the rectangle becomes a square and its area is reduced by 210 square feet. Find the area of the rectangle.

(1) 2440 square feet

(2) 2340 square feet

(3) 2444 square feet

(4) 2540 square feet

3. ABCD is a parallelogram. P and Q are the mid-points of BC and CD respectively. What is the ratio between the area of ΔAPQ to that of the parallelogram ABCD ?

(1) 3 : 7 (2) 3 : 8

(3) 3 : 5 (4) 4 : 9

4. A solid sphere of diameter 6 cms is melted and shaped as a hollow cylinder of outer radius 5 cms and height 4 cms. What is the thickness of the cylinder ?

(1) 2 cm (2) 2.5 cm

(3) 9 cm (4) 1 cm

5. The sum of length, breadth and height of a rectangular parallelopiped is 20 cm. and its whole surface area is 264 sq. cm. Find the area of the square whose side is equal to the length of the diagonal of the parallelopiped.

(1) 136 square cm.

(2) 120 square cm.

(3) 125 square cm.

(4) 100 square cm.

6. Find the ratio of the areas of squares circumscribed about and inscribed in the same circle.

(1) 1 : 3 (2) 2 : 1

(3) $\sqrt{2}$: 1 (4) 1 : $\sqrt{2}$

7. A cube and a sphere have equal surface areas. Find the ratio of their volumes.

(1) $\pi : \sqrt{6}$ (2) $\sqrt{\pi} : \sqrt{6}$

(3) $\sqrt{\pi} : 6$ (4) None of these

8. The outer and inner radii of a hollow metallic cylinder of height 24 cms. are respectively 6.75 cms. and 5.25 cms. It is melted to form a solid sphere. Find the surface area of the sphere.

(1) $\pi \times (12)^{\frac{2}{3}}$ sq. cm

(2) $\pi \times 36 \times (12)^{\frac{2}{3}}$ sq. cm

(3) 1220 sq. cm

(4) $\pi \times 36 \times (12)^{\frac{1}{3}}$ sq. cm

9. A right pyramid stands on a square base of diagonal $10\sqrt{2}$ cm. If the height of the pyramid is 12 cm, the area (in cm^2) of its slant surface is

(1) 520 (2) 420

(3) 360 (4) 260

10. If the altitude of a right prism is 10 cm and its base is an equilateral triangle of side 12 cm, then its total surface area (in cm^2) is

(1) $(5 + 3\sqrt{3})$ (2) $36\sqrt{3}$

(3) 360 (4) $72(5+\sqrt{3})$

11. In ΔABC, D, E and F are the mid-points of sides BC, CA and AB respectively. What is the area of quadrilateral BDEF ?

(1) $\frac{1}{3}$ rd of area of Δ ABC

(2) Half of the area of Δ ABC

(3) $\frac{1}{4}$ th of the area of Δ ABC

(4) None of these

12. ABCD is a trapezium in which AB || DC and AB = 2DC. Then what is the ratio between the areas of ΔAOB and ΔCOD respectively ?

(1) 4 : 1 (2) 1 : 3

(3) 2 : 1 (4) 3 : 1

13. The area of a triangle formed by $y = x$, $x = 6$ and $y = 0$ is :

(1) 36 sq. units (2) 18 sq. units

(3) 9 sq. units (4) 72 sq. units

14. The radius of a circle is so increased that its circumference increases by 5%. The area of the circle then increases by:

(1) 12.5% (2) 10.25%

(3) 10.5% (4) None of these

15. A lawn is in the form of a rectangle having its breadth and length respectively in the ratio 2 : 3. The area of the lawn is 600 sq. metres. Find the length of the lawn

(1) 20m (2) 30m

(3) 25m (4) None of these

16. The breadth of a rectangular plot is decreased by 20 per cent. By what percent should the length be increased to keep the area same?

(1) 25 (2) 20

(3) 30 (4) None of these

17. A cow is grazing in a pasture bordered by two fences more than ten feet long that meet at an angle of 60°. If the cow is tethered by a ten foot rope to the post where the fences meet, it can graze an area of:

(1) 20π sq. feet (2) $\frac{50\pi}{3}$ sq. feet

(3) $\frac{5\pi}{3}$ sq. feet (4) None of these

18. CD is a ⊥ dropped from C. If the area of Δ ADC is 'a', then the area of Δ BDC is :

(1) $(30 - a)$ sq. units
(2) $(60 - a)$ sq. units

(3) $\left(a + \frac{12}{5}a\right)$ sq. units

(4) None of these

19. The radius of each circle is 'a'. Then the area of the shaded portion is :

(1) $a^2\left(\sqrt{3} - \frac{\pi}{2}\right)$ sq. units

(2) $a\left(\pi a^2 - \sqrt{3}\right)$ sq. units

(3) $\left(a^2 - \frac{\pi}{2}\right)\sqrt{3}$ sq. units

(4) None of these

20. If the radius of a circle is increased by 20% then how much will its area be increased by ?

(1) 40% (2) 44%
(3) 50% (4) None of these

21. 66 cubic centimetres of silver is drawn into a wire 1 mm in diameter. The length of the wire in metres will be :

(1) 84 (2) 128
(3) 116 (4) None of these

SHORT ANSWERS

1. (3)	**2.** (3)	**3.** (2)	**4.** (4)
5. (1)	**6.** (2)	**7.** (2)	**8.** (2)
9. (4)	**10.** (4)	**11.** (2)	**12.** (1)
13. (2)	**14.** (2)	**15.** (2)	**16.** (1)
17. (2)	**18.** (1)	**19.** (1)	**20.** (2)
21. (1)			

EXPLANATIONS

1. (3)

AB = $2a$
BD = a

AD = $\sqrt{4a^2 - a^2}$

= $\sqrt{3a^2} = \sqrt{3}a$

∠AFO = 90°
OD = r

AO = $\sqrt{3}a - r$

sin BAD = $\frac{a}{2a} = \frac{1}{2}$

∠BAD = 30°
sin 30°

= $\frac{OF}{AO} \Rightarrow \frac{1}{2} = \frac{r}{AO} = \frac{r}{\sqrt{3}a - r}$

$\Rightarrow 2r = \sqrt{3}a - r$

$\Rightarrow 3r = \sqrt{3}a$

$\Rightarrow r = \frac{a}{\sqrt{3}}$

2. (3) Let the length and breadth of rectangle be x and y feet respectively.
Area of rectangle = xy
Again, $x - 10 = y + 5$ = side of square
$\Rightarrow x = y + 15$ ....(i)
Again, $xy - (y + 5)^2 = 210$
$\Rightarrow y(y + 15) - (y^2 + 10y + 25) = 210$
$\Rightarrow y^2 + 15y - y^2 - 10y - 25 = 210$
$\Rightarrow 5y = 235$
$\Rightarrow y = 47$ feet
$\therefore x = y + 5 = 52$ feet
Area of rectangle = 52 × 47
= 2444 sq. feet

3. (2)

In Δ BCD,

PQ ∥ BD and PQ = $\frac{1}{2}$ BD

$\Rightarrow ar(\Delta CPQ) = \frac{1}{4}\ ar(BDC)$

$\Rightarrow ar(\Delta CPQ)$

$= \frac{1}{8}\ ar(\|^{gm} ABCD)$

$[\because \frac{1}{2}ar\ (\|^{gm} ABCD = ar(\Delta BCD)]$

BP = $\frac{1}{2}$BC

$\therefore$ ar (Δ ABP) = $\frac{1}{4}$ ($\|^{gm}$ ABCD)

Similarly, ar (Δ AQD)

= $\frac{1}{4}$ ($\|^{gm}$ ABCD)

$\therefore ar$ (Δ APQ) = ar ($\|^{gm}$ ABCD – [ar Δ ABP + ar (Δ AQD) + ar (Δ CPQ)]

= ar ($\|^{gm}$ ABCD) – $\left(\frac{1}{4} + \frac{1}{4} + \frac{1}{8}\right)$ ar ($\|^{gm}$ ABCD)

$= \left(1 - \frac{5}{8}\right)$ ar ($\|^{gm}$ ABCD)

$= \frac{3}{8}$ ar ($\|^{gm}$ ABCD)

4. (4) Volume of sphere $= \frac{4}{3}\pi r^3 =$

$\frac{4}{3}\pi \times (3)^3$ cu.cm.

Let the thickness of cylinder be x cm.

$\therefore$ Its internal radius

$= (5 - x)$ cm

Now, volume of cylinder

$= \frac{4}{3}\pi \times 27$

$\Rightarrow \pi \{(5)^2 - (5 - x)^2\} \times 4$

$= \frac{4}{3}\pi \times 27$

$\Rightarrow 25 - (25 + x^2 - 10x) = 9$

$\Rightarrow x^2 - 10x + 9 = 0$

$\Rightarrow x^2 - 9x - x + 9 = 0$

$\Rightarrow x(x - 9) - 1(x - 9) = 0$

$\Rightarrow (x - 1)(x - 9) = 0$

$\Rightarrow x = 1$ because $x \neq 9$

5. (1) Let the length, breadth and height of the parallelopiped be a, b and c cm respectively.

$\therefore a + b + c = 20$

$2(ab + bc + ca) = 264$

$\therefore (a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$\Rightarrow 400 = a^2 + b^2 + c^2 + 264$

$\Rightarrow a^2 + b^2 + c^2 = 400 - 264$

$= 136$ sq. cm.

Area of square

$= \left(\sqrt{a^2 + b^2 + c^2}\right)^2 = 136$ sq. cm.

6. (2)

Let the diameter of circle be d units.

$\therefore$ Diagonal of the inscribed square $= d$

Its area $= \frac{1}{2}d^2$ sq. units.

Side of the circumscribed square $= d$ units

$\therefore$ Its area $= d^2$ sq. units

Required ratio

$= d^2 : \frac{1}{2}d^2 = 2 : 1$

7. (2) Let the edge of cube be x units and radius of sphere be y units.

$\therefore$ Surface area of cube = surface area of sphere

$\Rightarrow 6x^2 = 4\pi y^2$

$\Rightarrow \frac{x^2}{y^2} = \frac{4\pi}{6} = \frac{2\pi}{3}$

$\Rightarrow \frac{x}{y} = \sqrt{\frac{2\pi}{3}} \Rightarrow x : y = \sqrt{2\pi} : \sqrt{3}$

$\Rightarrow$ Volume of cube : Volume of sphere

$= x^3 : \frac{4}{3}\pi y^3 = 3x^3 : 4\pi y^3$

$= 3 \times 2\pi\sqrt{2\pi} : 4\pi \times 3 \times \sqrt{3}$

$= \sqrt{2\pi} : 2\sqrt{3}$

$= \sqrt{\pi} : \sqrt{6}$

8. (2) Volume of metallic cylinder

$= \pi\left(r_2^2 - r_1^2\right) \times h$

$= \pi(6.75^2 - 5.25^2) \times 24$

$= \pi \times 12 \times 1.5 \times 24$ cu.cm.

$\therefore$ Volume of sphere

$= \pi \times 12 \times 1.5 \times 24$

$\Rightarrow \frac{4}{3}\pi r^3 = \pi \times 12 \times 1.5 \times 24$

$\Rightarrow r^3 = \frac{12 \times 1.5 \times 24 \times 3}{4}$

$= 12 \times 3 \times 3 \times 3$

$\therefore r = \sqrt[3]{12 \times 3 \times 3 \times 3}$

$= 3\sqrt[3]{12}$

$\therefore$ Surface area $= 4\pi r^2$

$= 4 \times \pi \times \left(3\sqrt[3]{12}\right)^2$

$= 4 \times \pi \times 9\ (12)^{\frac{2}{3}}$

$= \pi \times 36\ (12)^{\frac{2}{3}}$ sq.cm.

9. (4)

Side of square base

$= \frac{1}{\sqrt{2}} \times 10\sqrt{2} = 10$ cm

Slant height $= \sqrt{5^2 + 12^2}$

$= 13$ cm

$\therefore$ Area of the lateral surface

$= \frac{1}{2} \times$ perimeter of base $\times$ slant height

$= \frac{1}{2} \times 40 \times 13 = 260$ sq. cm.

10. (4) Total surface area = Perimeter of base $\times$height + 2 $\times$ area of base

$= 36 \times 10 + 2 \times \frac{\sqrt{3}}{4} \times 12 \times 12$

$= 360 + 72\sqrt{3}$

$= 72(5 + \sqrt{3})$ sq. cm

11. (2)

D, E are the mid-points on BC and AC respectively.

$\therefore$ DE || BA $\Rightarrow$ DE || BF

Similarly, FE || BD

$\therefore$ BDEF is a parallelogram.

Similarly, DCEF and AFDE are parallelograms.

$\therefore$ Δ BDF = Δ DEF

Δ DCE = Δ DEF

and Δ AFE = Δ DEF

$\therefore$ $\Delta BDF = \Delta DCE = \Delta AFE = \Delta DEF$

$\Rightarrow \Delta DEF = \frac{1}{4}\Delta ABC$

$\therefore$ Quadrilateral BDEF $= 2 \times \Delta DEF$

$\Rightarrow$ Quadrilateral BDEF

$= 2 \times \frac{1}{4}\Delta ABC$

$= \frac{1}{2}\Delta ABC$

12. (1)

In Δ AOB and Δ COD,

$\angle AOB = \angle COD$ and $\angle OAB = \angle OCD$

By AA-similarly theorem,

Δ AOB ~ Δ COD

$\therefore \frac{\Delta AOB}{\Delta COD} = \frac{AB^2}{DC^2}$

$= \frac{(2DC)^2}{DC^2} = \frac{4}{1}$

13. (2)

Co-ordinates of point B = (6, 6)

as $y = x$ and $x = 6$

$\therefore$ OA = 6 and AB = 6

$\therefore$ Area of ΔOAB

$= \frac{1}{2} \times OA \times AB$

$= \frac{1}{2} \times 6 \times 6 = 18$ sq. units

14. (2) Increase in radius of circle = Increase in circumference of circle = 5%

$\therefore$ Increase in area

$= \left(5 + 5 + \frac{5 \times 5}{100}\right)\% = 10.25\%$

15. (2) $2x \times 3x = 600$

$\Rightarrow 6x^2 = 600 \Rightarrow x^2 = 100$

$\Rightarrow x = 10$

$\therefore$ Length = 3 × 10 = 30 metre

16. (1) $0 = x - 20 - \frac{20x}{100}$

$\left[\text{Net effect} = \left(x + y + \frac{xy}{100}\right)\%\right]$

$\Rightarrow x - 20 - \frac{x}{5} = 0$

$\Rightarrow 5x - 100 - x = 0$

$\Rightarrow 4x = 100 \Rightarrow x = 25\%$

17. (2) Required region

$= \frac{60°}{360°} \times \pi r^2$

$= \frac{1}{6} \times \pi \times 10 \times 10$

$= \frac{50\pi}{3}$ sq.feet

18. (1)

$5^2 + 12^2 = 13^2$

ΔABC is a right angled triangle.

$\Delta ADC + \Delta BDC = \Delta ABC$

$\Rightarrow a + \Delta BDC = \frac{1}{2} \times 5 \times 12 = 30$

$\Rightarrow \Delta BDC = (30 - a)$ sq. units.

19. (1)

AB = BC = CA = $2a$

Area of $\Delta ABC = \frac{\sqrt{3}}{4} \times (2a)^2$

$= \sqrt{3}a^2$

Area of three sectors

$= 3 \times \frac{60}{360} \times \pi a^2 = \frac{\pi a^2}{2}$

$\therefore$ Area of shaded region

$= \sqrt{3}a^2 - \frac{\pi a^2}{2}$

$= a^2\left(\sqrt{3} - \frac{\pi}{2}\right)$ sq.units

20. (2) Required increase

$= \left(20 + 20 + \frac{20 \times 20}{100}\right)\%$

$= 44\%$

21. (1) If the length of wire be h cm, then

$\pi r^2 h = 66$

$\Rightarrow \frac{22}{7}\left(\frac{1}{20}\right)^2 \times h = 66$

$\Rightarrow h = \frac{66 \times 400 \times 7}{22}$

= 8400 cm

= 84 metre

21 STATISTICS AND DATA INTERPRETATION

Data Interpretation (DI) is an important section today in all competitive examinations especially in objective type examinations. In most examinations a large number of questions are asked on Data Interpretation/Data Analysis. A good score in DI consolidates performance altogether. Sound knowledge of quantitative techniques and skills are pre-requisites for a good performance. It tests one's ability to analyse and interpret data presented numerically in various forms. Questions are asked on the data given/ shown in the diagram. The *thumb rules* are to read the problem fast but carefully, comprehend and interpret it simultaneously. Once the data are well grasped, the questions that follow in the set take very little time for solution.

Data may be presented in the form of tables, graphs or diagrams. Tables consist of precise numerical figures whereas diagrams give only an approximate idea. However, diagrams and graphs have the advantage of showing trends in the data. While there is no clear line of demarcation between diagrams and graphs, we may note the following distinction between them :

(*a*) A graph represents a mathematical relationship whereas a diagram does not.

(*b*) Diagrams do not add anything to the data while graphs are useful in statistical analysis.

(*c*) Graphs are considered more appropriate than diagrams for presenting frequency distribution and time series.

In our everyday life we come across graphs, tables and other types of numerical data in newspapers, magazines, periodicals, journals, information bulletins etc. These data may relate to the cost of living, cricket average, profits of a company, temperature of cities, expenditure in various sectors of a five-year plan and so on.

The term "data" means "information". However, the dictionary meaning of the term "data" is "given facts." Data may be of two types : Primary data an d Secondary data.

PRESENTATION OF DATA

As soon as the work related to collection of data is over, the investigator has to find ways to condense them in a tabular form in order to study their salient features and utilise them in a convenient way to serve the purpose for which they were collected. Such an arrangement of data collected is called **Presentation of Data.**

The raw data can be arranged in any one of the following ways :

(a) Serial order or alphabetical order

(b) Ascending order

(c) Descending order

Marks	No. of Students
10	1
20	1
32	2
36	2
40	3
50	4
56	1
60	5
70	2
80	2
88	1
92	1
Total	**25**

The table given above shows the number of students securing a particular number of marks. For exmaple, 5 students secured 60 marks each, 4 students secured 50 marks each and so on. The quantity that we measure from observation to observation is called a **Variate**. For example, in this illustration, the marks obtained are called **variates.** The number of students securing a particular marks is called the **Frequency** of the **variate**. The table given above is, thus, called the **Frequency Distribution Table for ungrouped data**.

The presentation of data can be further condensed into **Classes** or **Groups,** to bring out certain salient features of the data. In this type of presentation of data all observations are divided into groups. These groups are called **Classes** or **Class Intervals.**

Let us present the above data into classes as follows :

Marks	No. of Students (Frequency)
1 - 10	1
11 - 20	1
21 - 30	—
31 - 40	7
41 - 50	4
51 - 60	6
61 - 70	2
71 - 80	2
81 - 90	1
91 - 100	1
Total	**25**

This is called the **Frequency Distribution Table** or **Frequency Table for grouped data**. The class 1-10 means the marks obtained between 1 and 10 including both 1 and 10. The number of observations falling in a particular class is called the **Frequency of that Class** or **Class Frequency**. Thus, the class 31-40 has frequency 7 and the class 51-60 has 6 as class frequency. Frequency Table

is a better way of presentation of data as compared to the earlier ones since simply by looking at it we can draw the conclusion that majority of the students obtained marks in the range 31-60. In other words, the group of students under consideration is an average group.

The above table shows the number of students obtaining marks between the **lower limit** and the **upper limit** of the various class intervals. The lower limit of the first class interval is 1 and the upper limit is 10. The number of students who have secured marks in this class interval, i.e., from 1 to 10, is 1. Similarly, the number of students securing marks from 31 to 40 is 7.

While classifying according to class-interval like this, we use the following technical terms :

(i) Class limits : The limiting values of the boundary of the classes into which the given data are classified are called class-limits. The smaller limit of every class is called the lower limit and the higher limit is called the upper limit.

(ii) Class-interval : The group constituted by the two limits is called class-interval.

(iii) Width of the class-interval : The difference between the lower and upper limits of any class is called the class interval.

(iv) Mid-value : The mean of upper and lower limits is called the mid-value of the class-interval.

$$\text{Mid-value} = \frac{\left(\begin{array}{c}\text{Upper class limit} + \\ \text{Lower class limit}\end{array}\right)}{2} \text{ or, } \frac{\left(\begin{array}{c}\text{True upper limit} + \\ \text{True lower limit}\end{array}\right)}{2}$$

(v) Frequency of the class-interval : The number of observations falling within a particular class-interval is called its frequency.

Methods of Classification according to Class-Intervals :

(i) Exclusive Method : In this method the upper limit of one class is equal to the lower limit of the next class. Any item equal to the upper limit of any class is excluded from that class but included in the subsequent class. For example, if a student has secured 40 marks in the above example, then his marks have been taken in the class-interval 40-50 and not in the class-interval 30-40.

(ii) Inclusive Method : In this method any item equal to the upper limit of any class is included in that particular class and therefore it is known as inclusive method.

TABLES

Table is often used to present a set of numerical data. It helps the person to make comparisons and draw quick conclusions. It provides the reader greater objectivity in the data. Tabular presentation makes complicated information easier to understand. Its another advantage is that one can see all the information at a glance.

Tabular presentation usually consists of a table title followed by, columns and rows containing data. While looking at the table, carefully read the table title and headings/nomenclature of the columns and the rows. The table title gives a general idea of the type and objective of the data presented. The column and row nomenclatures indicate the specific kind of information contained in them respectively.

We present below an example of tabular presentation of annual expenditure of 5 families during the last 4 years.

Annual Expenditure of 5 families *(in Rs. Thousands)*

Years → / Families ↓	2005	2006	2007	2008
A	35	50	55	60
B	50	55	60	70
C	40	60	65	75
D	30	40	45	50
E	45	50	70	80

MEANING OF TABULATION

Tabulation is one of the most important devices for the presentation of the data in a condensed and comprehensive form. It attempts to furnish the maximum information contained in the data in a minimum possible space without minimising the quality and usefulness of the data.

A statistical table is the logical listing of related quantitative data in vertical columns and horizontal rows of numbers with sufficient explanatory and qualifying words, phrases and statements in the form of titles, headings and notes to make clear the full meaning of data and their origin. Thus, a table is a systematic presentation of statistical data in horizontal rows and vertical columns according to some salient features.

MERITS OF TABULATION

(i) Tabulation is the next stage after collection and compilation of the data.

(ii) It simplifies the data.

(iii) It gives a general idea of trend and pattern within the data

(vi) It provides a gateway for further statistical analysis and interpretation.

(v) In tabulation comparable data are kept close, so that a comparable study of these data becomes easy.

(vi) It makes the data suitable for further Diagramatic and Graphic representation.

(vii) It saves time and space, as maximum information is expressed in a small space without repetition.

PARTS OF A TABLE

Though the various parts of a table depend on the nature of the data and purpose of the investigation, the following features generally, form the parts of a statistical table :

(i) Table Number : Usually placed at the top of the table either in the centre above the title or on the side of the title, it serves to identify the table for future reference.

(ii) Heading or Title : Every table is provided with a suitable title, which usually appears at the top of the table. It is brief, simple, unambiguous, complete and self-explanatory, so that a first hand idea of the data set can be obtained from it.

A title describes the nature of the data, the place of relation, the time period and the source of the data.

(iii) Head Note : It is a sort of a supplement to the title. If required, it is given just below the title to provide additional information regarding the contents of the table. The head note is usually enclosed in brackets. For example, the units of measurement are usually expressed as head note as '*in kilometres*', '*in crores*', '*in Rupees*'; etc.

(iv) Columns and Rows : Columns are vertical arrangements, whereas rows are horizontal arrangements. The number of rows and columns is suitably taken keeping in view the data under consideration.

(v) Captions : Captions are the designations for vertical columns. They are placed in the middle of the columns. They briefly express the contents of the columns.

(vi) Stubs : Stubs are the designations for horizontal rows. They are placed to the left of the rows. They briefly express the contents of the rows.

(vii) Body : The data when arranged according to the designations given in the rows and columns, form the body of the table. It contains the numerical data to be presented to the readers. In order to increase the utility of the table, totals are genrally given for each separate category either against the rows or below the columns.

(viii) Foot Note : If some additional information regarding the data is required for their complete description, foot notes are used for this purpose. As the name suggests, they are placed at the bottom of the table.

(ix) Source Note : The source of collection of data is mentioned below the foot note so that it must be known from where these have been taken. The source note is used if the data are of secondary nature.

TYPES OF TABLES

Statistical tables are formed on the basis of purpose, originality and construction. Keeping in view the present pattern of questions asked in competitive exams of today, we will limit ourselves to the study of tabulation on the basis of construction.

This type of tabulation can be divided into two categories, namely :

(i) Simple Tables

(ii) Complex Tables

(i) Simple Tables : In a simple table, only one attribute (quality) or speciality of the data is presented.

(ii) Complex Tables : In a complex table, more than one attribute or characteristic of the data are presented.

The complex tables are of three types :

(a) Two-way Tables

(b) Three-way Tables

(c) Manifold Tables

(a) Two-Way Tables : They furnish information about two inter-related characteristics of a particular phenomenon. In these tables, caption or stub is classified into two sub-headings.

(b) Three-Way Tables : They furnish information regarding three-inter-related characteristics of a particular phenomenon.

(c) Manifold Tables : A manifold table gives the information of a large number of inter-related characteristics of a given phenomenon. For example, the distribution of employees in State Bank according to gender (sex) age-group, year and grades of salary is a manifold table.

Now we are fully acquainted with various types of tables and their contents. While interpreting the data given in tabular form we come across different mathematical tools of analysis namely, percentage, ratio and average etc. Now we will briefly introduce to each of these tools.

Percentage : It is a fraction whose denominator is 100 and the numerator of such a fraction is termed as rate per cent. Thus the term per cent means for every hundred. It should be noted that in common parlance, per cent and percentage are used interchangeably.

Percentage as an Operator

1. Let us discuss x% of y.

This operation can be broken into two parts :

(i) $x\% = \dfrac{x}{100}$

(ii) 'of' means multiplication and hence can be replaced by multiplication sign '×'.

$\therefore$ x% of y means $\dfrac{x}{100} \times y = \dfrac{xy}{100}$

Let x% of $y = z$

$$\frac{xy}{100} = z$$

This equality involves 3 variables x, y, and z. If the value of any two variables out of the three are known, the value of the third variable can be easily determined.

2. Per cent change (Increase or Decrease)

$$\text{Per cent change} = \frac{\text{Final value} - \text{Initial value}}{\text{Initial value}} \times 100$$

or,

$$\text{Per cent change} = \left(\frac{\text{Final value}}{\text{Initial value}} - 1\right) \times 100$$

It is to be remembered that change per cent is always calculated with respect to the initial value. Hence, it is the initial value which is taken as reference value for finding % change.

$$\therefore \text{ \% change } = \frac{\text{Difference between two quantities}}{\text{Reference Value}} \times 100$$

Further, change involves both increase as well as decrease. Therefore, we should follow the sign convention given below :

Sign convention :+ for increase and – for decrease

Ratio : A ratio is a comparison of two quantities by division. In other words, ratio of two quantities represents the number of times one quantity contains another quantity of the same kind. Since ratio is an abstract number, the two quantities that are being compared must be expressed in the same unit. Thus, production of rice in tonnes can be compared with consumption of rice in tonnes. We cannot compare the production of rice in tonnes and production of cotton in bales.

Averages : The inherent inability of the human mind to grasp in its entirety a large body of numerical data compel us to seek relatively few constants that will adequately describe the data. Average is one such constant. These are the typical values around which other items of the distribution congregate. They give us the gist of huge numerical data. Here, we will describe only arithmetic average or mean.

The average or mean of a number of quantities of the same kind is their sum divided by the number of those quantities.

Let x_1, x_2, x_3, ..., x_n be the n values of x. Their average is denoted by $\bar{x}$ and is given by

$$\bar{x} = \frac{\text{Sum of observations}}{\text{Total number of observations}}$$

$$\text{or, } \bar{x} = \frac{x_1 + x_2 + x_3 + \ldots\ldots + x_n}{x_n}$$

LINE GRAPHS

Line Graphs are more obvious, precise and accurate than the diagrams and can be effectively used for further statistical analysis, viz., to study slopes, rates of change and for future inference. They can be used to study the relationship between the variates under study. Line Graphs are drawn on 'graph-paper'.

Construction of Line Graphs : Line Graphs are drawn on a special paper called 'graph paper' which has a net work of horizontal and vertical lines forming squares, In the graph paper two straight lines are drawn at right angles, intersecting each other at a point O (say) known as origin. The horizontal line is known as X-axis and is usually denoted by XOX′. The vertical line is known as the Y-axis and is usually denoted by YOY′. In this way the graph is divided into four parts called quadrants. In practice, only the first quadrant is used unless negative quantities are to be displayed. The distances measured to the right of origin along X-axis are taken as positve where as the distances measured to the left of origin along X-axis are taken as negative. Along the Y-axis, the distances measured above the origin are taken as positive where as the distances measured below the origin are taken as negative. Any pair of the values of variables is represented by an ordered pair (x, y) where x generally represents the value of independent variable (x-coordinate) and y represents the value of dependent variable (y-coordinate).

Line graphs are used to show how a quantity i.e., dependent variable changes with change in independent variables. Very often the quantity is measured as time changes.

ADVANTAGES OF GRAPHS

1. Graphs are visual aids that give a bird's eye view of numerical data.
2. Graphs, being attractive, leave a much lasting impression on mind.
3. In the construction of graph, generally, a graph paper is used which helps us to learn the mathematical relationship between the two variables.
4. Graphs are clear, precise and accurate and help statisticians in the study of slopes, rates of change and estimation.
5. Graphs reveal the trends and also exhibit the way in which the trends change.

BAR DIAGRAM

BAR DIAGRAMS are one of the simplest and the most common devices used for the presentation of statistical data. They consist of a number of equidistant rectangular bars, one for each category of the data in which the magnitudes are represented by the length or height of the rectangles, whereas width of rectangles are arbitrary and immaterial. The following points should be takes into consideration while drawing bar diagrams :

(i) All the bars drawn in a diagram are generally of uniform width which depends on the number of bars to be constructed and the availability of space.

(ii) To make the bar diagram attractive and graceful, uniform space is given between different bars.

(iii) As the height of the rectangles are taken proportional to the magnitude of observations the scale is selected keeping in view the magnitude of the greatest observation.

(iv) All the bars are constructed on the same base line.

(v) Bars drawn may be vertical or horizontal.

(vi) Vertical bars are generally arranged from left to right.

(vii) Horizontal bars are generally arranged from top to bottom.

(viii) Generally, the figures represented by the bars are written at the top in case of vertical bars and at the right end in case of horizontal bars. It facilitates a reader to draw a precise idea of the value.

(ix) A suitable title is given at the top of the diagram which indicates the subject matter and various other facts depicted in the bar diagram.

(x) Sometimes, footnotes are given at the left hand bottom of bar diagram to explain certain facts, not mentioned in the title.

(xi) A brief index is also given at the right hand top of bar diagram which explains the various types of shades, colours or designs used while constructing bar diagrams.

TYPES OF BAR DIAGRAM

The various types of bar diagrams which are most commonly used are mentioned below :

1. Simple Bar Diagram
2. Sub-divided Bar Diagram
3. Percentage Bar Diagram
4. Multiple Bar Diagram

1. SIMPLE BAR DIAGRAM

Simple bar diagram is the simplest and the easiest of the bar diagrams. It is used to represent only one dependent variable. The values of observations are shown by means of bars which are of equal width but of varying heights. As discussed earlier the magnitudes of variables are represented by the heights of the rectangles.

2. SUB-DIVIDED BAR DIAGRAM

A simple bar diagram can represent only one characteristic at a time. For example, the total number of students studying in a University for the last ten years can easily be expressed by simple bar diagram, but it cannot show the faculty wise distribution of students. This limitation of bar diagram is overcome by subdivided bar diagrams. These are used to represent the breakdown of the total into its component parts. First of all, a bar representing a total is drawn. Then it is divided into different segments, each segment representing a given component of the total. Different colours, shades, designs etc. are used to distinguish the various components. An index is given to represent the various components. To facilitate comparisons, the order of the various components in the different bars is same.

3. PERCENTAGE BAR DIAGRAM

Sub-divided bar diagram presented graphically on percentage basis is termed percentage bar diagram. They are specially useful for the diagramatic representation of the relative changes in the data. A percentage bar diagram is used to highlight the relative importance of the different component parts to the whole. Here all totals are taken as 100 and are represented by bars of same length. The component parts are expressed as percentages of totals. The other rules regarding index, shade or colour, thickness are the same as in simple or multiple bar diagrams. The absolute changes in the component parts or total are not shown in the diagram.

4. MULTIPLE BAR DIAGRAM

When a combination of inter-related variables are to be presented graphically, multiple bar diagrams are used. These are extended forms of simple bar diagrams. Here, many aspects of the given data are presented simultaneously and as such are very useful for direct comparison between two or more phenomena by representing them with separate bars of different shades or colours. Here an index is given to explain the shades and colours used. The bars for different characteristics/ phenomena for a particular year are drawn adjacent to each other. Proper and equal spacing is given between different sets of the bars.

HISTOGRAM

It consists of a set of continuous bars drawn adjacent to each other. It is generally used to represent frequency distribution among different class intervals of the data presented in tabular form. Areas of bars are proportional to the corresponding class frequencies.

Cumulative graphs : These are usually bar or line graphs where the height or length of the bar or line is divided proportionately among various quantities represented in the graph. The representation of quantities may be done in terms of either percentage of the total or in absolute figures. Thus, a cumulative graph may be conveniently used for making comparisons. These are also called sub-divided graphs.

CIRCLE GRAPHS OR PIE-CHART

A pie-diagram is a pictorial representation of the numerical data by non-intersecting adjacent sectors of the circle such that area of each sector is proportional to the magnitude of the data represented by the sector.

Just as sub-divided and percentage bars are used to represent the total magnitude and its different components, the circle representing the total may be divided into different segments representing certain proportion or percentage of the different components/parts to the total. Such a sub-divided circle diagram is called pie-diagram because the entire graph looks like a pie and the components resemble slices cut from a pie.

Some Important Points

(*i*) Different sectors of a pie-chart represent various component parts.

(*ii*) Each of the component values is expressed either as a percentage or fractional ratio of the respective total or as sectoral angle of the respective total.

(*iii*) Since the total angle at the centre of the circle is 360º, the total magnitude of the various components is taken to be equal to 360º. In other words, 360° is taken as 100% and vice versa.

(*iv*) Since 1 per cent of the total value is equal to $\frac{360}{100}$ = 3.6º, the percentage of the component parts can be converted to degrees by multiplying each of the them by 3.6.

(*v*) The degrees represented by the various component parts of a given magnitude can be obtained without computing their percentage to the total value as follows :

Degree of the any component part

$$= \frac{\text{Component value}}{\text{Total value}} \times 360°$$

In DI section of the question paper, the target should be to attempt all questions as skipping them would amount to losing precious scoring opportunities. There are two approaches to arrive at the solution. One is to work on the data to arrive at the correct answer. The other one is the Elimination method which requires working backwards by eliminating the wrong choices. Though the elimation method is more time consuming, it may still be preferred where direct solution involves enormous calculation.

At times, examiners pose rather difficult data sets at the beginning of the sections. These are intended to be 'SPEED BRAKERS' which take away much of precious time. Therefore, as a rule, scan the whole section quickly before actually attempting the questions and start with easier part of the section.

In some exams, data are presented in more than one table or graph. The objective is to test not only quantitative skills but also corelational and analytical ability. Recently, in some exams the questions in this section are being framed in caselet (paragraph) form, beginning with probability and reasoning questions. It is left to the reader to study the case, sort out requisite data and arrange it in a suitable form for meaningful interpretation. It is best to arrange data with rough sketch to hasten comprehension.

Important Tips : These will help in saving time, reducing mistakes and finding solution easily.

1. Read the table title, nomenclatures of columns and rows.
2. Get a general picture of the information by looking at the entire table or graph.
3. Simplify the questions being asked. Break down lengthy questions into smaller parts.
4. Use only the information given for finding solutions. Select the appropriate data for answering a question.
5. Eliminate impossible choices.
6. Avoid lengthy calculations.
7. Try to interpret through trends of the data in the graph. Whenever possible, try to answer the questions by visualizing rather than by computing.
8. Don't go for exact calculation, unless necessarily required.
9. Approximate evaluation and comparision greatly simplifies solution.
10. Where calculation is required, prefer approximate values at the first stage.
    Go for exact calculation where values are close and require exact answer.
11. Be careful to use proper units.
12. Make correct use of your knowledge of basic mathematical rules, principles and formulae.
13. Don't confuse in decimals and percentages. For example, 0.5% = 0.005.
14. Use pencil or straight edge of the answer sheet to read the graph and find approximate values.
15. Focus your answer on the question actually asked and not on what the question should be in your opinion.
16. Never do anything that is unnecessary.
17. Last, but not the least, make sure that the answer is sensible and reasonable.

Thumb Rules for Simplification :

1. Round off the figures atleast at first stage of calculation or elimination.
2. Remembers, 50%, = $\frac{1}{2}$, 25% = $\frac{1}{4}$, 75% = $\frac{3}{4}$

   20% = $\frac{1}{5}$, 40% = $\frac{2}{5}$, 60% = $\frac{3}{5}$

   80% = $\frac{4}{5}$
3. To get 10% value, leave the unit digit of the number or round it off.
   Similarly, to get 1% value, leave the two extreme right digits followed by suitable rounding off.
4. 5% is taken either as half of 10%. or five times of 1%.
5. Similarly, 2 %, 3%, 4%, 6% etc. are evaluated in terms of 1%.

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

Directions (1-5) : Read the following pie-chart to answer the questions given below it.

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

Per cent of money spent by a family on various items during 1998

1. If the total amount spent during the year 1998 was ₹ 46000/-, the amount spent on food, was :

(1) ₹ 2000/-

(2) ₹ 10580/-

(3) ₹ 23000/-

(4) ₹ 2300/-

2. If the total amount spent was ₹ 46000/-, how much was spent on clothing and housing together?

(1) ₹ 11500/- (2) ₹1150/-

(3) ₹ 10000/- (4) ₹15000/-

3. The ratio of the total amount of money spent on housing to that spent on education was :

(1) 5 : 2 (2) 2 : 5

(3) 4 : 5 (4) 5 : 4

4. Graph shows that the maximum amount was spent on:

(1) Food (2) Housing

(3) Clothing (4) Others

5. If the total expenditure of the family for the year 1998 was ₹ 46000/-, the family saved during the year.

(1) ₹ 1500/-

(2) ₹ 15000/-

(3) ₹ 6900/-

(4) ₹ 3067/- approx.

Directions (6-10) : The following questions are based on the pie-chart given below. Study the pie-chart and answer the questions.

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

The percentage expenses on various items during book production and sale.

6. The central angle for the sector on "Paper-Cost" is

(1) $22\frac{1}{2}^\circ$ (2) 16°

(3) 54.8° (4) 36°

7. If the 'Printing-Cost' is ₹ 17500, the royalty paid is

(1) ₹ 8750 (2) ₹ 7500

(3) ₹ 3150 (4) ₹ 6300

8. If the "miscellaneous expenses" are ₹ 6000. How much more are "binding and cutting charges" than "Royalty" ?

(1) ₹ 6000

(2) ₹ 5500

(3) ₹ 4500

(4) ₹10500

9. The central angle corresponding to the sector on "Printing Cost" is more than that of "Advertisement Charges " by :

(1) 72° (2) 61.2°

(3) 60° (4) 54.8°

10. The "Paper Cost" is approximately what per cent of "Printing Cost" ?

(1) 20.3% (2) 28.6%

(3) 30% (4) 32.5%

Directions (11-15) : The pie chart drawn below shows the expenses of a family on various items and its savings during the year 2001. Study the graph and answer the questions.

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

Percent of money spent on various items and savings by a family during 2001

11. Maximum expenditure of the family was on

(1) Food

(2) Housing

(3) Education of children

(4) Other items

12. The total savings of the family for the year were equal to the expenditure on

(1) Food

(2) Clothing

(3) Housing

(4) Other items including transport

13. What per cent of the income was spent on transport and other items together ?

(1) 25% (2) 20%

(3) 30% (4) 32%

14. If the total income of the family was ₹ 1,00,000, how much money was spent on the education of the children?

(1) ₹10000 (2) ₹12000

(3) ₹ 15000 (4) ₹ 23000

15. If the total income for the year was ₹ 1,00,000, the difference of the expenses (in rupees) between housing and transport was

(1) ₹ 15000 (2) ₹ 12000

(3) ₹ 7000 (4) ₹ 10000

Directions (16-20) : The Pie chart given here represents the domestic expenditure of a family in per cent. Study the chart and answer the following questions if the total monthly income of the family is ₹ 33,650.

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

A : Expenditure on food

B : Expenditure on house-rent

C: Expenditure on entertainment

D : Expenditure on education and maintenance of children

E: Medical and miscellaneous expenditure

F : Deductions towards provident fund

16. The house rent per month is :

(1) ₹ 6000 (2) ₹ 6152

(3) ₹ 6057 (4) ₹ 6048

17. The annual savings in the form of provident fund would be

(1) ₹ 48,456 (2) ₹ 48,540

(3) ₹ 44,856 (4) ₹ 45,480

18. After provident fund deductions and payment of house rent, the total monthly income of the family remains

(1) ₹ 23,545 (2) ₹ 24,435

(3) ₹ 23,555 (4) ₹25, 355

19. The total amount per month, the family spends on food and entertainment combined together, is :

(1) ₹ 11,432 (2) ₹ 11,441

(3) ₹ 12,315 (4) ₹ 12,443

20. Had there been no children in the family what would have been the total savings of the family including that provident fund ?

(1) ₹ 12,667.50

(2) ₹ 12,625.50

(3) ₹ 11,727.50

(4) ₹ 11,777.50

Directions (21-24) : The pie graph given here shows the break-up of the cost of construction of a house.

Assuming that the total cost of construction is ₹ 6,00,000, answer the questions.

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

Break-up of the cost of construction of a house

21. The amount spent on cement is

(1) ₹ 2,00,000 (2) ₹ 1,60,000

(3) ₹ 1,20,000 (4) ₹ 1,00,000

22. The amount spent on labour exceeds the amount spent on steel by

(1) 5 per cent of the total cost.

(2) 10 per cent of the total cost.

(3) 12 per cent of the total cost.

(4) 15 per cent of the total cost.

23. The amount spent on cement, steel and supervision is what percent of the total cost of construction?

(1) 40% (2) 45%

(3) 50% (4) 55%

24. The amount spent on labour exceeds the amount spent on supervision by

(1) ₹ 2,00,000 (2) ₹ 1,60,000

(3) ₹ 1,20,000 (4) ₹ 60,000

Directions (25–28) : The pie chart given here shows the breakup of the cost of construction of a house on various heads. Study the chart and answer the questions.

(SSC CPO S.I. Exam. 09.11.2008)

25. If the total cost of construction of the house is ₹ 15,00,000, how much amount of money was spent on labour ?

(1) ₹ 90,000 (2) ₹ 2,50,000

(3) ₹ 3,60,000 (4) ₹ 3,75,000

26. The total expenditure incurred on bricks, steel and cement is what per cent of the total cost of construction ?

(1) 50% (2) 54%

(3) 72% (4) 75%

27. Expenditure incurred on timber is what per cent of the expenditure on cement ?

(1) 36% (2) 50%

(3) 72% (4) 18%

28. Out of the total cost (₹ 15,00,000) of construction how much amount of money was spent on labour and supervision combined together ?

(1) ₹ 1,44,000 (2) ₹ 3,00,000

(3) ₹ 6,00,000 (4) ₹ 7,50,000

Directions (29–31) : The pie chart, given here, represents the number of valid votes obtained by four students who contested election for school leadership. The total number of valid votes polled was 720.

Observe the chart and answer the questions based on it.

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

29. What was the minimum number of votes obtained by any candidate ?
(1) 100 (2) 110
(3) 120 (4) 130

30. Who was the winner ?
(1) Sivaraman (2) Paramjeet
(3) Yasin (4) Vishwanath

31. By how many votes did the winner defeat his nearest rival ?
(1) 40 (2) 45
(3) 48 (4) 50

Directions (32–34) : The pie chart, given here, shows the amount of money spent on various sports by a school administration in a particular year.

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

Observe the pie chart and answer the questions based on this graph.

32. If the money spent on football was ₹ 9,000 how much more money was spent on hockey than on football ?
(1) ₹ 11,000 (2) ₹ 11,500
(3) ₹ 12,000 (4) ₹ 12,500

33. If the money spent on football was ₹ 9,000, what amount was spent on Cricket ?
(1) ₹ 31,000 (2) ₹ 31,500
(3) ₹ 32,000 (4) ₹ 32,500

34. If the money spent on football is ₹ 9,000, then what was the total amount spent on all sports ?
(1) ₹ 73,000 (2) ₹ 72,800
(3) ₹ 72,500 (4) ₹ 72,000

Directions (35-37) : The pie charts, given here show some automobile parts manufactured by an automobile company at its Pune and Nagpur plants in the year 2009.

Study the pie charts and answer the questions

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

Pune Plant **Nagpur Plant**

35. If the Nagpur plant produced 8,00,000 tyres, then the number of horns produced by it was
(1) 12,000 (2) 18,500
(3) 75,000 (4) 60,000

36. How many percent more tubes were produced at the Pune plant than those produced at the Nagpur plant ?
(1) 14% (2) 12%
(3) 8% (4) 3%

37. The ratio of number of horns produced at Nagpur plant to that produced at Pune plant is
(1) 3 : 7 (2) 10 : 3
(3) 7 : 3 (4) 7 : 10

Directions (38–41) : The pie chart given below shows the spendings of a family on various heads during a month. Study the graph and answer the following questions.

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

38. If the total income of the family is ₹25,000, then the amount spent on Rent and Food together is
(1) ₹ 17,250 (2) ₹ 14, 750
(3) ₹ 11, 250 (4) ₹ 8, 500

39. What is the ratio of the expenses on Education to the expenses on Food?
(1) 1 : 3 (2) 3 : 1
(3) 3 : 5 (4) 5 : 3

40. Expenditure on Rent is what percent of expenditure on Fuel?
(1) 135% (2) 156%
(3) 167% (4) 172%

41. Which three expenditures together have a central angle of 108°?
(1) Fuel, Clothing and Others
(2) Fuel, Education and Others
(3) Clothing , Rent and Others
(4) Education, Rent and Others

Directions (42-45) : The pie-chart given below shows the marks obtained by a student in an examination. If the total marks obtained by him in the examination were 540, answer the questions given below based on this pie chart.

(SSC Data Entry Operator Exam. 31.08.2008)

42. In which subject, did the student obtain 105 marks?
(1) Maths (2) Social studies
(3) Science (4) Hindi

43. What is the central angle corresponding of Science?
(1) 40° (2) 80°
(3) 75° (4) 60°

44. How many more marks were obtained by the student in Maths than those in Hindi?
(1) 30 (2) 20
(3) 10 (4) 40

45. How many marks were obtained by the student in Science?
(1) 130 (2) 120
(3) 125 (4) 140

Directions (46–49) : The pie-chart given here shows expenditures incurred by a family on various items and their savings, which amounts to ₹ 8,000 in a month.

Study the chart and answer the questions based on the pie-chart

(SSC Data Entry Operator Exam. 02.08.2009)

46. How much expenditure is incurred on education ?
(1) ₹ 3,000 (2) ₹ 5,000
(3) ₹ 4,000 (4) ₹ 7,000

47. The ratio of the expenditure on food to the savings is
(1) 3 : 2 (2) 2 : 1
(3) 4 : 3 (4) 3 : 4

48. What is the total expenditure of the family for the month ?
(1) ₹ 40,000 (2) ₹ 48,000
(3) ₹ 45,000 (4) ₹ 50,000

49. How much more amount is spent on food than on housing ?
(1) ₹ 1,000 (2) ₹ 3,000
(3) ₹ 2,000 (4) ₹ 2,500

Directions (50–53) : The pie-chart, given here, shows various expenses of a publisher in the production and sale of a book. Study the chart and answer questions based on it.

(SSC CHSL DEO & LDC Exam. 27.11.2010)

50. If the printing cost is ₹ 17,500, the 'Royalty' paid is :
(1) ₹8,750 (2) ₹7,500
(3) ₹6,300 (4) ₹3,130

51. The measure of central angle for the section 'printing cost' is :
(1) 126° (2) 70°
(3) 63° (4) 35°

52. Miscellaneous expenses are what percent of paper cost ?
(1) 4% (2) 10%
(3) 40% (4) 44%

53. The difference between the measure of central angles of sector for binding charges and advertisement charges is :
(1) 180° (2) 90°
(3) 18° (4) 0°

Directions (54–57) : The pie-chart, given here, shows the land distribution of a village.

Study the pie-chart and answer the questions based on it.

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

54. The ratio of the waste land to the cultivated land is
(1) 4 : 3 (2) 3 : 2
(3) 2 : 1 (4) 3 : 1

55. What percent of total land is used for cultivation ?
(1) 24% (2) 25%
(3) 50% (4) 90%

56. If the total area of the village is 7200 acres, the total area of the wet land is
(1) 1028 acres (2) 5040 acres
(3) 3600 acres (4) 1400 acres

57. The land used for roads is what percent of the inhabited land ?
(1) $66\frac{2}{3}\%$ (2) 48%
(3) $33\frac{1}{3}\%$ (4) 30%

Directions (58–62) : The following pie-chart shows the number of students who failed in different subjects in an examination. Examine the chart and answer the following questions. The total number of students who have failed is 500.

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

58. The number of students failed in science is less than the number of students failed in all other subjects by :
(1) 170 (2) 140
(3) 180 (4) 160

59. The central angle of the sector for the students who have failed in mathematics is :
(1) 30° (2) 100°
(3) 105.2° (4) 108°

60. Total number of students who did not qualify in Mathematics and Language and Science, is :
(1) 460 (2) 490
(3) 480 (4) 470

61. Number of students who failed in mathematics is less than the students who did not qualify in languages by :
(1) 20 (2) 40
(3) 30 (4) 50

62. The percentage of students who have failed in mathematics and language is :
(1) 65.5% (2) 60%
(3) 66% (4) 62%

Directions (63–67) : The pie-chart given below shows the number of students enrolled in a school in different activities. Total number of students in the school is 1200. Study the chart and answer the questions.

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

63. How many students are enrolled in N.C.C. activities ?
(1) 180 (2) 120
(3) 72 (4) 240

64. What is the total number of students enrolled in Debating Club and HRD Club ?
(1) 144 (2) 216
(3) 288 (4) 72

65. The number of students enrolled in Eco-club is what per cent of those enrolled in Redcross activities ?
(1) 94.24% (2) 95.45%
(3) 82.45% (4) 104.76%

66. What is the ratio of number of students enrolled in Scout and Redcross activities together to those enrolled in Debating Club activities ?
(1) 3 : 1 (2) 4 : 1
(3) 1 : 4 (4) 1 : 3

67. Which two clubs have the enrolment in the ratio of 2 : 1 ?
(1) Eco club, HRD club
(2) Eco club, N.C.C.
(3) HRD club, Eco club
(4) Debating club, Eco club

Directions (68-72) : The following pie-chart represents the result of 600 successful students in various subjects at an examination. Study the chart and answer question

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

68. The ratio of students who passed in Bengali, to the students who passed in History is
(1) 1 : 2 (2) 2 : 1
(3) 3 : 4 (4) 3 : 5

69. The number of students passed in Bengali is greater than the number of students passed in History by
(1) 150 (2) 60
(3) 120 (4) 100

70. The percentage of students who passed in English is
(1) 15% (2) 20%
(3) 5% (4) 12%

71. The number of students passed in English is less than the number of students passed in Mathematics by
(1) 50 (2) 60
(3) 90 (4) 75

72. The highest number of students passed in a subject in percentage
(1) 20% (2) 25%
(3) 40% (4) 35%

Directions (73–77) : The following Pie Chart shows the export of different foodgrains from India in 2010. Study the chart and answer the questions :

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

73. Of the total export of foodgrains, the percentage of crop B exported is
(1) 15% (2) 20%
(3) 18% (4) 10%

74. If a total of 1.5 million quintals of crop F was exported, the amount of total foodgrains exported (in million) quintals was
(1) 8.7 (2) 12
(3) 10.8 (4) 9.6

75. The three crops which combine to contribute to exactly 50% of the total export of foodgrains are
(1) A, F and others
(2) B, C and F
(3) A, B and C
(4) C, F and others

76. If a total of 1.5 million quintals of crop F was exported, then the total quantity of D and E that was exported (in million quintals) was
(1) 1.2 (2) 1.5
(3) 4.5 (4) 6.5

77. If the revenue from 1 quintal of crop A is thrice that from 1 quintal of crop C, then the ratio of the total revenues of A and C is
(1) 1 : 6 (2) 2 : 3
(3) 3 : 2 (4) 6 : 1

Directions (78–82) : Following is the pie-chart showing the spendings of a family on various items in a particular year

Study the pie chart and answer questions.

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

78. The ratio of the total amount spent for food and medicine is
(1) 1 : 2 (2) 3 : 1
(3) 12 : 5 (4) 11 : 5

79. If the total amount spent on the family during the year was ₹50,000, how much they spent for buying clothes ?
(1) ₹6,250 (2) ₹6,500
(3) ₹7,250 (4) ₹7,500

80. If the total amount spent on the family during the year was ₹35,000, the amount spent for study of children and food together was
(1) ₹19,250 (2) ₹19,500
(3) ₹19,750 (4) ₹19,850

81. Angle of the pie chart representing the expenditure on entertainment is
(1) 15° (2) 10°
(3) 36° (4) $12\frac{1}{2}°$

82. If the difference in the amount spent for buying clothes and house maintenance was ₹1,500, how much they spent for house maintenance ?
(1) ₹ 5,000 (2) ₹ 6,000
(3) ₹ 7,000 (4) ₹ 8,000

Directions (83–87) : The following pie-diagram shows the expenditure incurred on the preparation of a book by a publisher, under different heads. Study the pie-diagram and answer the following questions.

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

83. Angle of the pie-chart representing expenditure incurred on paying royalty is
(1) 27° (2) 36°
(3) 15° (4) 54°

84. If the expenditure on printing and binding of one book is ₹110, then the cost of production of the book is (in ₹)
(1) 250 (2) 200
(3) 110 (4) 550

85. If cost of publishing a book is ₹ 200, then printing cost is (in ₹)
(1) 40 (2) 60
(3) 20 (4) 50

86. Which two expenditures together will form an angle of 108° at the centre of the pie-diagram ?
(1) A and D (2) A and C
(3) A and B (4) A and E

87. The number of heads on which the expenditure on a book is more than the average is
(1) 3 (2) 2
(3) 4 (4) None of these

Directions (88-92) : The following pie-chart shows the expenditure incurred on the construction of a house in a city. Study the chart and answer the following questions.

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

88. The mean of the expenditure is on
(1) Brick (2) Cement
(3) Steel (4) Labour

89. The ratio of expenditure on Steel, Cement and Bricks is
(1) 2 : 4 : 3 (2) 4 : 2 : 3
(3) 3 : 2 : 4 (4) 4 : 3 : 2

90. The highest expenditure in percentage is
(1) 40% (2) 30%
(3) 45% (4) 60%

91. What part of expenditure on labour is in respect of total expenditure ?
(1) $\frac{3}{10}$ part (2) $\frac{5}{8}$ part
(3) $\frac{1}{4}$ part (4) $\frac{7}{18}$ part

92. Of the total expenditure the percentage of expenditure on steel and bricks together is
(1) 90% (2) 20%
(3) 25% (4) 30%

Directions (93-97) : The following pie-chart shows the preference of musical instruments of 60,000 people surveyed over whole India. Examine the chart and answer the questions.

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

93. If 2100 people be less from the number of people who prefer Flute, the percentage of people who prefer Flute would have been :
(1) 9.5% (2) 6.5%
(3) 7.5% (4) 8.5%

94. The total number of people who prefer either Sarod or Guitar, is greater than the total number of people who prefer either Violin or Sitar by :
(1) 1200 (2) 1600
(3) 1100 (4) 1400

95. The number of people who prefer the musical instrument Sarod is :
(1) 7400 (2) 8400
(3) 6400 (4) 8600

96. If $16\frac{2}{3}$% of the people who prefer Piano, would go with the people who prefer Flute, the percentage of people who prefer Flute would have been
(1) 13.5% (2) 14.5%
(3) 15.5% (4) 12.5%

97. The number of people who prefer Guitar is greater than the total number of people who prefer either Flute or Piano by :
(1) 1200 (2) 1100
(3) 1300 (4) 1400

Directions (98-102) : Circle graph given below shows the expenditure incurred in bringing out a book by a publisher. Study the graph and answer the question.

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

98. The central angle of the sector for the cost of the paper is :
(1) 22.5° (2) 16°
(3) 54.8° (4) 57.6°

99. Royalty on the book is less than the Advertisement charges by :
(1) 3% (2) 25%
(3) 20% (4) $16\frac{2}{3}$%

100. If 5500 copies are published, Miscellaneous expenditures amounts to ₹1848 and publisher's profit is 25%, then marked price of each copy is
(1) ₹ 12.50 (2) ₹ 10.50
(3) ₹ 10 (4) ₹ 8.40

101. If the cost of printing is ₹ 17,500, the Royalty is :
(1) ₹ 8750 (2) ₹ 6300
(3) ₹ 7500 (4) ₹ 3150

102. It the Miscellaneous charges is ₹ 6,000, the Advertisement charges are :
(1) ₹ 27,000 (2) ₹ 90,000
(3) ₹ 12,000 (4) ₹ 1,333.33

Directions (103–107) : The pie-chart given below represents the number of students using different transport to a school in which total number of students is 2160.

Answer the questions based on the following diagram.

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

103. The number of students who come to school by car is
(1) 70 (2) 290
(3) 420 (4) 480

104. The ratio of the number of students who come to school by car to the number of students who come to school by bus is
(1) 21 : 24 (2) 21 : 27
(3) 36 : 27 (4) 36 : 21

105. The total number of students coming to school either by walking or by bus is
(1) 480 (2) 540
(3) 1020 (4) 170

106. The number of students who don't come to school by train is
(1) 720 (2) 1020
(3) 2040 (4) 1440

107. The number of students coming to school by bus exceeds the number of students coming to school walking, by
(1) 10% (2) 12.5%
(3) 11% (4) 11.5%

Directions (108-110) : In the following questions, the pie-chart shows the number of students admitted in different faculties of a college. Study the chart and answer the questions.

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

108. How many students are more in commerce than in law if 1000 students are in science?
(1) 200 (2) 2000
(3) 500 (4) 20

109. If 1000 students are admitted in science, what is the ratio of students in science and arts?
(1) 6 : 5 (2) 7 : 5
(3) 7 : 6 (4) 5 : 6

110. If 1000 students are admitted in science, what is the total number of students?
(1) 180 (2) 1800
(3) 3600 (4) 360

Directions (111-114) : In the following questions, study the two pie-charts and answer the questions.

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

April month's salary : ₹ 24000

A – Education
B – Savings
C – Grocery
D – Electricity and Phone Bills
E – Miscellaneous

May month's salary : ₹ 25000

111. What is the percent increase in Education in May month than April month ?
(1) 9.56% (2) 12.35%
(3) 20% (4) 10.82%

112. The ratio of amount spent for savings in April month's salary and miscellaneous in May month's salary is :
(1) 216 : 25 (2) 217 : 26
(3) 205 : 13 (4) 235 : 50

113. From the salary of May, the amount spent on Grocery and Electricity are:
(1) ₹ 6250, ₹ 3360
(2) ₹ 960, ₹ 5040
(3) ₹ 3500, ₹ 2250
(4) ₹ 2160, ₹ 480

114. The average amount spent on Education, Grocery and Savings from April month's salary is:
(1) ₹ 5800 (2) ₹ 6000
(3) ₹ 6325 (4) ₹ 5520

Directions (115–118) : The Pie Chart shows the expenditure of a country on various sports during a particular year. Study the graph and answer the questions.

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

115. If the total amount spent on cricket and hockey together is ₹ 80,000, the total amount spent on sports is
(1) ₹ 1,00,000
(2) ₹ 2,00,000
(3) ₹ 2,50,000
(4) ₹ 3,00,000

116. How much per cent more is spent on Hockey than that on Golf ?
(1) 27% (2) 35%
(3) 37.5% (4) 75%

117. How much per cent less is spent on football than that on cricket ?
(1) $22\frac{2}{9}\%$ (2) 27%
(3) $33\frac{1}{3}\%$ (4) $37\frac{1}{2}\%$

118. Study the graph & answer the question

In a certain country, allocations to various sectors of the yearly budget per ₹ 1000 crores are represented by this pie-diagram. The expenditure (in ₹) on Agriculture is

(1) 250 crores (2) 150 crores
(3) 300 crores (4) 200 crores

(SSC Graduate Level Tier-I Exam. 21.04.2013)

Directions (119–120) : Following figure is Pie-chart representing item-wise cost of manufacturing certain product. Study the chart and answer the questions.

(SSC Graduate Level Tier-I Exam. 19.05.2013)

119. Total manufacturing cost is ₹ 96,000. Then, cost of labour is

(1) ₹ 30,720 (2) ₹ 38,400
(3) ₹ 11,520 (4) ₹ 15,000

120. The difference of cost of material and direct expenses is

(1) ₹ 26,000 (2) ₹ 10,000
(3) ₹ 26,500 (4) ₹ 26,880

Directions (121–124) : The following pie-chart shows the marks scored by a student in different subjects - viz. Physics (Ph), Chemistry (Ch), Mathematics (M), Social Science (SS) and English (E) in an examination. Assuming that total marks obtained for the examination is 810. Answer the questions given below.

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

121. The difference of marks between Physics and Chemistry is same as that between

(1) Chemistry and Social Science
(2) Physics and English
(3) Mathematics and English
(4) English and Social Science

122. The marks obtained in Mathematics and Chemistry exceed the marks obtained in Physics and Social Science by

(1) 50 (2) 30
(3) 40 (4) 45

123. The subject in which the student obtained 135 marks is

(1) English
(2) Physics
(3) Chemistry
(4) Mathematics

124. The marks obtained in English, Physics and Social Science exceed the marks obtained in Mathematics and Chemistry by

(1) $11\frac{1}{9}\%$ (2) 10%

(3) $10\frac{1}{9}\%$ (4) 11%

Direction (125) : The annual agricultural production (in tonnes) of an Indian State is given in the pie chart. The total production is 9000 tonnes. Read the pie chart and answer the question.

(SSC Graduate Level Tier-II Exam. 29.09.2013)

(in tonnes)

125. What is the annual production of wheat?

(1) 2750 tonnes
(2) 3000 tonnes
(3) 3540 tonnes
(4) 3500 tonnes

Directions (126-127) : Various expenditures incurred by a publishing company for publishing a book in 2011 are given below. Study the chart and answer the questions.

(SSC CHSL DEO& LDC Exam. 20.10.2013)

126. Price of a book is 20% above cost price. If the marked price is ₹ 180, then the cost of paper for a single copy (in ₹) is

(1) 44.25 (2) 36
(3) 22.50 (4) 42

127. Royalty of a book is less than the printing cost by

(1) 25% (2) 5%

(3) $33\frac{1}{3}\%$ (4) 20%

Directions (128-131) : The adjoining pie-chart shows the proportional expenditure on various items of Amar's family. If monthly income of Amar is ₹ 48,000, answer the questions.

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

128. Had his income be ₹ 40,000 how much would be spent on food ?
(1) ₹ 14,960 (2) ₹ 1,360
(3) ₹ 8,160 (4) ₹ 6,800

129. If 10% of miscellaneous expenditure is earmarked for clothing, how much amount is spent on clothes ?
(1) ₹ 14,400 (2) ₹ 1,440
(3) ₹ 2,880 (4) ₹ 15,840

130. How much does he save per month ?
(1) ₹ 7,200 (2) ₹ 14,400
(3) ₹ 3,840 (4) ₹ 2,400

131. How much does he spend more on rent than on transport and education taken together ?
(1) ₹ 2,400 (2) ₹ 9,600
(3) ₹ 4,800 (4) ₹ 12,000

Directions (132-134) : Pie-charts show the expenses on various heads in construction of a house. Study the pie-chart.

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014) (Ist Sitting)

1991

2001

132. What percentage of the total amount is being spent on cement in 1991 ?
(1) 18% (2) 30%
(3) 48% (4) 60%

133. The percentage increase in the amount spent on labour from 1991 to 2001, given that the total amount spent on the construction of the house is ₹3,60, 000 in 1991 and ₹8,64,000, in 2001 is
(1) $3\frac{1}{9}\%$ (2) $43\frac{1}{3}\%$
(3) $41\frac{2}{3}\%$ (4) $2\frac{2}{9}\%$

134. If the total cost of constructing the house is ₹3,60,000 in 1991 and ₹8,64,000, in 2001, what is the amount spent on Steel in 1991 and 2001 ?
(1) ₹ 2,16,000, ₹ 4,32,000
(2) ₹ 60,000, ₹ 84,000
(3) ₹ 80,000, ₹ 2,10,000
(4) ₹ 50,000, ₹ 1,44,000

Directions (135-138) : The pie chart given below represents the modes of transport for 1400 officers of the Staff Selection Commission, Kolkata. Study the chart and answer the following questions.

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014) (IInd Sitting)

135. The ratio of two-wheelers and cars being used as modes of transport is
(1) 4 : 7 (2) 7 : 5
(3) 5 : 7 (4) 3 : 5

136. Write down the difference :
(officers availing train – officers availaing car)
(1) 210 (2) 462
(3) 562 (4) 452

137. The number of officers who go to office by Metro Rail is
(1) 142 (2) 132
(3) 112 (4) 122

138. The number of officers who go to office by car is
(1) 394 (2) 304
(3) 214 (4) 294

139. The following pie - chart shows the monthly expenditure of a family on food, clothing, rent, miscellaneous expenses and savings. What is the central angle for savings ?

(1) 54° (2) 56°
(3) 50° (4) 52°

(SSC CGL Tier-I Exam. 26.10.2014)

140. The pie - chart gives the expenditure (in percentage) on various items and savings of a family during a month. Monthly savings of the family is ₹ 3, 000. On which item is the expenditure maximum and how much is it ?

(1) Others, ₹ 2,000
(2) Food, ₹ 3,000
(3) Others, ₹ 5,000
(4) Food, ₹ 5,000

(SSC CGL Tier-I Exam. 26.10.2014)

Directions (141-144) : Study the pie-chart and table given below and answer the questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

Details of percentage of employees working in various departments in an organization and number of males among them.

Total number of employees = 800.

Department	No. of Males
Production	245
HR	12
IT	74
Marketing	165
Accounts	93

141. The respective ratio between the number of females working in HR department to the total number of employees working in the HR department is
(1) 7 : 10 (2) 8 : 17
(3) 8 : 19 (4) 5 : 7

142. The percentage of the number of male employees working in Marketing department to the total number of employees in Marketing department is
(1) 84% (2) 86%
(3) 88% (4) 91%

143. The percentage of females working in IT department to the total number of employees working in the organization is
(1) 10.25% (2) 10.75%
(3) 15.25% (4) 15.75%

144. The ratio of number of males in Marketing department to the number of females working in that department is
(1) 52 : 7 (2) 52 : 9
(3) 55 : 7 (4) 55 : 9

Directions (145-149) : The following pie-chart shows the monthly expenditure of a family on food, house rent, clothing, education, fuel and miscellaneous. Study the pie-chart and answer the questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

145. If the expenditure for food is ₹ 9000, then the expenditure for education is
(1) ₹ 5000 (2) ₹ 5200
(3) ₹ 5400 (4) ₹ 6000

146. The central angle of the sector for the expenditure on fuel (in degrees) is
(1) 50.4 (2) 54
(3) 57.6 (4) 72

147. If the expenditure on fuel is ₹ 3000, the total expenditure excluding expenditure on house rent and education is
(1) ₹ 11600 (2) ₹ 12000
(3) ₹ 12400 (4) ₹ 12500

148. If the percentage of expenditure on food is x% of the total percentage of expenditure on clothing, education and fuel, then x equals
(1) 66 (2) $66\frac{1}{3}$
(3) $66\frac{2}{3}$ (4) 67

149. Total percentage of expenditure on house rent, clothing and fuel is greater than the percentage of expenditure on food by
(1) 16 (2) 17
(3) 18 (4) 20

Directions (150 – 153) : The following graph represents the transport used by children. Study the graph and answer the given questions.

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

150. What is the measure of the angle at the centre representing people walking ?
(1) 144° (2) 48°
(3) 36° (4) 72°

151. What is the percentage of children using scooter ?
(1) 20% (2) $33\frac{1}{3}$%
(3) 15% (4) 40%

152. If 10 students come by car, how many come by bus ?
(1) 60 (2) 50
(3) 30 (4) 100

153. If 180 students come walking to school what is the strength of the school ?
(1) 540 (2) 450
(3) 360 (4) 600

Directions (154 – 156) : In an Institution there are 800 students. Students use different modes of transport for going to the institution and return. The given pie diagram represents the requisite data. Study the diagram carefully and answer the questions.

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

154. The number of students who travel in public bus is
(1) 150 (2) 120
(3) 130 (4) 125

155. The number of students who do not use institute bus is
(1) 330 (2) 350
(3) 480 (4) 320

156. The number of students who go to institute on foot is
(1) 160 (2) 170
(3) 120 (4) 106

Directions (157–161) : The expenses of a country for a particular year is given in Pie–Chart. Read the Pie–Chart and answer the questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) (TF No. 8037731)

157. If the total amount spent by the Government during the year was ₹ 1,00,000 crores, then the amount spent on Health and Education together was

(1) ₹ 25,000 crore
(2) ₹ 20,000 crore
(3) ₹ 30,000 crore
(4) ₹ 15,000 crore

158. If the total amount spent by the Government during the year was ₹ 3,00,000 crores, the amount spent on state development exceeds that on sports by

(1) ₹ 30,000 crore
(2) ₹ 45,000 crore
(3) ₹ 35,000 crore
(4) ₹ 25,000 crore

159. The percent of less money spent on non plan than that on defence is

(1) 15% (2) 5%
(3) 12% (4) 10%

160. The percent of excess money spent on Others than that on Sports is

(1) 26% (2) 25%
(3) 27% (4) 28%

161. The percent of the total spending that is spent on health is

(1) 15% (2) 20%
(3) 25% (4) 30%

Directions (162 – 166) : Study the following graph carefully and answer the given questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

Percentage of different types of employees in a company in two consecutive years.

Total Number of employees = 42980

1997

Total Number of employees = 48640

1998

162. In 1997 the total number of which of the following types of pairs of employees was approximately equal to A type of employees in 1998 ?

(1) C and D (2) D and E
(3) B and C (4) A and C

163. From 1997 to 1998 in the case of which of the following types of employees the change was maximum ?

(1) B (2) A
(3) C (4) D

164. What was the approximate difference in the number of B type of employees during 1997 and 1998 ?

(1) 2285 (2) 2325
(3) 2620 (4) 2085

165. If the number of D type employees in 1998 was 5000, what would have been its approximate percentage in the company ?

(1) 10 (2) 14
(3) 12 (4) 16

166. The number of A type employees in 1998 was approximately what percent of the number of A type employees in 1997 ?

(1) 140 (2) 115
(3) 95 (4) 125

Directions (167 – 169) : The following pie-chart shows the sources of funds (In Rs. crores) to be collected by the National Highways Authority of India (NHAI) for its Phase II projects. Study the pie-chart and answer the following **Three** questions :

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

167. If the toll is to be collected through an outsourced agency by allowing a maximum 10% commission, how much amount should be permitted to be collected by the outsourced agency, so that the project is supported with Rs. 4,910 crores ?

(1) Rs. 6,213 crores
(2) Rs. 5,827 crores
(3) Rs. 5,401 crores
(4) Rs. 5,316 crores

168. If NHAI could receive a total of Rs. 9,695 crores as External Assistance, by what percent (approximately) should it increase the Market Borrowing to arrange for the shortage of funds ?

(1) 4.5% (2) 7.5%
(3) 6% (4) 8%

169. The central angle corresponding to Market Borrowing is

(1) 52° (2) 137.8°
(3) 187.2° (4) 192.4°

Directions (170 – 172) : The pie-chart given below shows expenditure incurred by a family on various items and their savings. Study the chart and answer the questions based on the pie-chart

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

170. The ratio of expenditure on food to savings is :
(1) 3 : 2 (2) 10 : 9
(3) 3 : 1 (4) 2 : 1

171. If the expenditure on education is ₹1600 more than that on housing, then the expenditure on food is :
(1) ₹ 12000 (2) ₹ 6000
(3) ₹ 3333 (4) ₹ 7000

172. If the monthly income is ₹ 36000, then the yearly savings is :
(1) ₹ 70000 (2) ₹ 72000
(3) ₹ 60000 (4) ₹ 74000

Directions (173–175) : The income of a state under different heads is given in the following pie–chart. Study the chart and answer the questions.

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

173. If the income from the market tax in a year be ₹ 165 crores then the total income from other sources is (in ₹ crore)
(1) 325 (2) 335
(3) 365 (4) 345

174. If the total income in a year be ₹ 733 crores then the income (in ₹ crores) from 'Income tax' and 'Excise duty' is :
(1) 329.85 (2) 331.50
(3) 331.45 (4) 329.80

175. The central angle of the sector representing income tax is :
(1) 126° (2) 135°
(3) 150° (4) 119°

Directions (176–178) : The pie–chart shows the proposed outlay for different sectors during a Five–Year plan of Government of India. Total outlay is Rs. 40,000 crores. By reading the pie–chart answer the following three questions.

(SSC CGL Tier-I Re-Exam, 30.08.2015)

176. What is the proposed outlay for Education?
(1) Rs. 6000 crores
(2) Rs. 8000 crores
(3) Rs. 9000 crores
(4) Rs. 7000 crores

177. If the proposed outlay of Irrigation is x% of the proposed outlay of Agriculture, then x is equal to
(1) 50% (2) 15%
(3) 25% (4) 75%

178. What is the ratio between the proposed outlay of Irrigation and Communication?
(1) 9 : 8 (2) 3 : 2
(3) 9 : 5 (4) 6 : 5

Directions (179–180) : The following pie-chart shows the market share of four companies S, T, U and V. Total market is worth Rs. 72 crores. Study the pie-chart and answer the questions.

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

179. The company having maximum market share is
(1) T (2) U
(3) S (4) V

180. The difference of market shares of companies V and U is
(1) Rs. 8 crores (2) Rs. 9 crores
(3) Rs. 6 crores (4) Rs. 4 crores

Directions (181–185) : The pie chart shows how the school funds is spent under different heads in a certain school. Using the pie chart answer the questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

Misc. Miscellaneous

181. What percentage of the total expense is spent on library?
(1) 24.3 (2) 24
(3) 20 (4) 16.6

182. Which head uses 25% of the funds?
(1) Sports
(2) Misc
(3) Library
(3) Art and Craft

183. Which heads have the same amount of expenditure?
(1) Library and Science
(2) Sports and Science
(3) Science and Misc (4) Misc and Library

184. Which head has the maximum expenditure?
(1) Art and Craft
(2) Sports
(3) Library
(4) Science

185. What is the ratio of expenditure on sports to that on art and craft?
(1) 1 : 1 (2) 4 : 3
(3) 1 : 4 (4) 2 : 1

Directions (186 – 189) : Study the Pie chart carefully and answer the questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

Students of a College

186. Percentage of students who are not members of any club is :
(1) 5% (2) 8%
(3) 10% (4) 6%

187. Number of students who are members of cricket club only :
(1) 35 (2) 40
(3) 42 (4) 41

188. Ratio of members of cricket club only and football club only respectively is :
(1) 1 : 3 (2) 2 : 1
(3) 1 : 2 (4) 3 : 1

189. The number of students who are members of both the clubs is :
(1) 500 (2) 650
(3) 550 (4) 600

Directions (190–193) : Study the pie chart and answer the given questions.

The total expenditure of a company for a particular month is Rs. 60000. The various heads of expenditure I to IV are indicated in a pie chart given below. These heads are :

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

I. Raw materials
II. Conveyance
III. Electricity
IV. Overhead expenses

190. Total expenditure on conveyance is :
(1) Rs. 12,000 (2) Rs. 15,000
(3) Rs. 20,000 (4) Rs. 10,000

191. What percentage of total expenditure is on electricity?
(1) 23% (2) 25%
(3) 30% (4) 20%

192. What is the amount spent on overhead expenses?
(1) Rs. 12,000 (2) Rs. 15,000
(3) Rs. 18,000 (4) Rs. 10,000

193. What percentage of total expenditure is on raw materials?
(1) 25% (2) 30%
(3) 60% (4) 23%

Directions (194-197) : The following pie-chart shows the percentage distribution of the expenditure incurred in publishing a book. Read the pie-chart and answer the questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

Various Expenditure (in percentage) incurred in publishing a book

194. Royalty on the book is less than the printing cost by :
(1) 20% (2) 5%
(3) 25% (3) $33\frac{1}{3}$

195. The central angle of the sector corresponding to the expenditure incurred on Royalty is :
(1) 15° (2) 48°
(3) 54° (4) 24°

196. If 5500 copies are published and the transportation cost on them amount to Rs. 82500 then the selling price of the book so that the publisher can earn a profit of 25% is :
(1) Rs. 191.50 (2) Rs. 187.50
(3) Rs. 180 (4) Rs. 175

197. If for a certain quantity of books, the publisher has to pay Rs. 30600 as printing cost, then the amount of royalty cost to be paid for these books is :
(1) Rs. 21200 (2) Rs. 19450
(3) Rs. 22950 (4) Rs. 26150

Directions (198–201) : The Expenditure of a family in a month is represented by a Pie-chart. Read it carefully to answer the questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

198. The total money spent on clothes and miscellaneous is :
(1) None of the options
(2) Rs. 900 (3) Rs. 3600
(4) Rs. 2000

199. The percentage of money spent on food compared to house rent is
(1) 25% (2) 12.5%
(3) 50% (4) None of these

200. The ratio of the amount spent on food and clothes is
(1) 4 : 1 (2) 4 : 5
(3) 5 : 1 (4) 2 : 5

201. If the total amount spent is Rs. 7,200, find the amount spent on food :
(1) Rs. 1500 (2) Rs. 6000
(3) Rs. 4500 (4) Rs. 3000

Directions (202–206) : The following pie–chart shows the monthly expenditure of a family on various items. If the family spends Rs. 825 on clothing, answer the questions.

(SSC CGL Tier-II Online Exam.01.12.2016)

202. What is the total monthly income of the family ?
(1) Rs. 8025 (2) Rs. 8250
(3) Rs. 8520 (4) Rs. 8052

203. What per cent of the total income does the family save ?
(1) 15% (2) 50%
(3) 20% (4) 25%

204. What is the ratio of expenses on food and miscellaneous ?
(1) 3 : 4 (2) 2 : 3
(3) 3 : 2 (4) 2 : 5

205. What is the average of expenses on clothing and rent?
(1) Rs. 1443.75
(2) Rs. 1344.57
(3) Rs. 1574.34
(4) Rs. 1734.45

206. The ratio of average of expenses on food, clothing and miscellaneous items to the average of expenses on savings and rent is
(1) 3 : 2 (2) 1 : 3
(3) 2 : 1 (4) 1 : 1

Directions (207–211) : The following pie chart shows the export of automobiles of India to the 10 countries given below in 2014. The 10 countries imported 47.8% of the total export of India. Observe the chart given below and answer the following question :

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

207. Which country is the fifth largest importer of Automobiles from India?
(1) United Kingdom
(2) Sri Lanka
(3) Bangladesh
(4) Turkey

208. The number of automobile exported to United States is roughly equal to the combined export to which two countries?
(1) Sri Lanka Turkey
(2) Sri Lanka Bangladesh
(3) Mexico UAE
(4) United Kingdom Turkey

209. What is the difference in the value of exports between the 3rd and the 7th largest importer?
(1) 419.6 million
(2) 308.4 million
(3) 57 million
(4) 128.7 million

210. What is the average of imports of the countries UAE, Bangladesh, and Sri Lanka?
(1) 580.5 million
(2) 618.6 million
(3) 473.7 million
(4) 540.8 million

211. What is the corresponding angle to the exports for Turkey?
(1) 14.4° (2) 15.2°
(3) 12.5° (4) 17°7

Directions (212–215) : The following pie-chart shows the study – time of different subjects of a student in a day. Study the pie–chart and answer the following questions

(SSC CHSL (10+2) Tier-I (CBE) Exam. 08.09.2016) (Ist Sitting)

212. The time spent to study history and chemistry is 4 hours 30 minutes, Then the student studied physics for
(1) 1 hour 30 minutes
(2) 2.9 hours (approx.)
(3) 2 hours
(4) 3 hours

213. If the student studied chemistry for 3 hours, then he/she studied geography for
(1) 1 hour
(2) 2 hours
(3) 1 hour 30 minutes
(4) 2 hours 30 minutes

214. If the student studied 10 hours in a day, then he/she studied mathematics for
(1) 3 hours (2) $\frac{10}{3}$ hours
(3) $\frac{1}{3}$ hour (4) $\frac{3}{10}$ hour

215. Instead of 10%, if the student spends 15% to study other subjects and the time is taken from the time scheduled to study mathematics and if he/she used to study 20 hours per day, then the difference of time for studying mathematics per day is :
(1) 30 minutes
(2) 45 minutes
(3) 1 hour
(4) 1 hour 30 minutes

Directions (216–220) : The Pie-chart shows the result of a survey among 119060 people concerning the use of tobacco. Study the Pie-chart and answer the questions.

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

216. Let P be the percentage of people using Cigarettes, Pipe and Bidi as their smoking means and Q be the percentage of people using other means as their smoking habits. Then P is more than Q by :
(1) 25% (2) 10%
(3) 85% (4) 75%

217. The number of people smoking Cigarettes is :
(1) 53905 (2) 59305
(3) 59530 (4) 11906

218. The number of people preferring Bidi is :
(1) 29790 (2) 29765
(3) 35718 (4) 37185

219. The number of Cigarette smoking people is greater than the number of Pipe smoking people by :
(1) 29765 (2) 47624
(3) 11906 (4) 59530

220. The percentage of people under survey, who do not have any smoking habit is :
(1) 5.2% (2) 5%
(3) 10% (4) 7.5%

Directions (221 – 225) : The numbers of different colleges in India in different years is given in the graph below. Percent distribution of different colleges in year 1980 and 1990 is shown in pie chart

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

Medical
Management
Engineering
General

221. What is the difference in number of engineering colleges in 80°s and 90's.
(1) 13000 (2) 10000
(3) 15000
(4) None of these

222. The difference in number of management colleges in 1980 to 1990 is :
(1) 3600 (2) 3000
(3) 5600 (4) 1500

223. What is the % increment in the number of colleges from 1960 to 1980 ?
(1) 300% (2) 700%
(3) 750% (4) 800%

224. By what percent is the number of medical colleges in 1980 less than that in 1980 ?
(1) 25% (2) 30%
(3) 32% (4) 20%

225. What is the average number of colleges for the given years ?
(1) 30000 (2) 31000
(3) 29000 (4) 32000

Directions (226–229) : The pie-chart shows the percentage of literate and illiterate males and females in a state. Study the diagram and answer the following questions.

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (Ist Sitting)

226. If the total number is 35000, then the difference between the number of literate males and that of literate females is
(1) 3500 (2) 3700
(3) 400 (4) 4500

227. The difference of central angles corresponding to illiterate male and illiterate female is
(1) 12.2° (2) 13.4°
(3) 11.2° (4) 14.4°

228. If the difference between the two categories of people are represented by 36° in the diagram, then these categories are
(1) literate males and literate females
(2) literate males and illiterate males
(3) illiterate males and literate females
(4) illiterate males and illiterate females

229. If two categories together have a central angle of 169.2°, then these categories are
(1) literate females and illiterate females
(2) literate males and illiterate females
(3) illiterate males and illiterate females
(4) illiterate males and literate females

Directions (230–233) : Study the pie chart given below and answer the following questions.

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (Ist Sitting)

230. If the miscellaneous charges are Rs. 6000, then the advertisement charges are
(1) Rs. 12000
(2) Rs. 27000
(3) Rs. 90000
(4) Rs. 25000

231. The central angle of printing charge is x more than that of advertisement charges. Then the value of x is
(1) 72° (2) 61.2°
(3) 60° (4) 54.8°

232. What should be the central angle of the sector 'cost of paper' ?
(1) 22.5° (2) 54.8°
(3) 36° (4) 16°

233. The ratio between royalty and binders' charges is
(1) 5 : 6 (2) 5 : 8
(3) 6 : 5 (4) 8 : 13

Directions (234–237) : Study the following pie chart carefully and answer the questions. The pie chart represents the percentage of people involved in various occupations.

(SSC CGL Tier-I (CBE) Exam. 03.09.2016) (IInd Sitting)

Total number of people = 20000

234. How many more people are involved in service than in trade?
(1) 3660 (2) 2660
(3) 1660 (4) 660

235. The ratio of the people involved in service to that in industry is
(1) 1 : 2 (2) 2 : 3
(3) 3 : 4 (4) 3 : 2

236. The sectoral angle made by the people involved in service in the given pie-chart is
(1) 36° (2) 90°
(3) 72° (4) 108°

237. The difference between the maximum number of people involved and minimum number of people involved in various professions is
(1) 2640 (2) 3640
(3) 6320 (4) 5320

Directions (238–241) : Given here is a pie chart showing the cost of gold in 2010, 2011, 2012 and 2013. Study the chart and answer the following questions.

(SSC CGL Tier-I (CBE) Exam. 04.09.2016) (Ist Sitting)

238. If the price of gold in 2013 is Rs. 31,500 per 10 gram, then the price of gold in 2011 per 10 gram is
(1) Rs. 17000 (2) Rs. 17500
(3) Rs. 18000 (4) Rs. 18500

239. The ratio of the price of gold in the two years 2010 and 2013 is
(1) 1 : 2 (2) 1 : 3
(3) 1 : 4 (4) 1 : 5

240. The percentage increase in the price of gold from the year 2011 to 2013 is
(1) 50% (2) 60%
(3) 70% (4) 80%

241. The ratio of percentage increases in price of gold from 2011 to 2012 and 2012 to 2013 is
(1) 6 : 5 (2) 7 : 5
(3) 8 : 5 (4) 9 : 5

Directions (242–245) : The pie chart drawn below shows the spendings of a country on various sports during a particular year. Study the pie chart and answer the questions.

(SSC CGL Tier-I (CBE) Exam. 06.09.2016) (Ist Sitting)

242. The ratio of the amount spent on football, basketball and cricket to that spent on tennis, hockey and golf is
(1) 5:7 (2) 7:5
(3) 15:1 (4) 3:20

243. If the total amount spent on sports during the year was Rs. 1,20,00,000, how much was spent on basketball ?
(1) Rs. 950000
(2) Rs. 10,00,000
(3) Rs. 12,00,000
(4) Rs. 15,00,000

244. Total central angle showing the money spent on hockey, football and other during the year was
(1) 104° (2) 244°
(3) 96° (4) 144°

245. If the money spent on cricket during the year was Rs. 20,00,000, then the money spent on tennis was :
(1) Rs. 8,00,000
(2) Rs. 10,00,000
(3) Rs. 80,00,000
(4) Rs. 40,00,000

Directions (246–249) : The following pie chart shows proportion of population of seven villages in 2009. Study the pie chart and answer the questions that follow :

(SSC CGL Tier-I (CBE) Exam. 07.09.2016) (Ist Sitting)

Village	%of population Below Poverty Line
X	38
Y	52
Z	42
R	51
S	49
T	46
V	58

246. If the below poverty line population of the village 'X' is 12160, then the population of village 'S' is
(1) 18500 (2) 20500
(3) 22000 (4) 20000

247. The ratio of the below poverty line population of village 'T' to that of the below poverty line population of village 'Z' is
(1) 11:23 (2) 13:11
(3) 23:11 (4) 11:13

248. If the population of the village 'R' is 32000, then the below poverty line population of village 'Y' is
(1) 14100 (2) 15600
(3) 16500 (4) 17000

249. In 2010, the population of 'Y' and 'V' increases by 10% each and the percentage of population below poverty line remains unchanged for all the villages. If in 2009, the population of village Y was 30,000, then the below poverty line population of village 'V' in 2010 is _____
(1) 11250 (2) 12760
(3) 13140 (4) 13780

Directions (250–254) : Read the following pie–charts carefully to answer the questions.

(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

Distribution of sales of Hindi and English news papers in five localities A, B, C, D and E.

Hindi News Papers

English News Papers

250. What is the difference between the total sale of English newspapers and the total sale of Hindi newspapers in all the localities together.?
(1) 7500 (2) 5600
(3) 6500 (4) 5700

251. What is the central angle corresponding to the sale of Hindi newspapers in locality E?
(1) 80° (2) 90°
(3) 60° (4) 108°

252. What is the approximate sum of the ratios of sales of English and Hindi newspapers in all localities ?
(1) 51 (2) 50
(3) 32 (4) 47

253. What is the ratio of average number of English newspapers from the localities B, C and E to the average number of Hindi newspapers from the localities A and D ?
(1) 10 : 19 (2) 19 : 10
(3) 16 : 33 (4) 9 : 11

254. What is the ratio of the average number of sale of English newspapers in localities B and D together to the average sale of Hindi newspapers in all the localities ?
(1) 25 : 32 (2) 40 : 33
(3) 33 : 40 (4) 43 : 33

Directions (255–258) : The pie-chart shows Distribution of Special Children Population during the year 1994-96. Study the pie-chart and answer the following questions.

(SSC CGL Tier-I (CBE) Exam. 28.08.2016 (IST Sitting)

255. Find the approximate percentage distribution of children with auditory disorder.
(1) 43.7% (2) 42.7%
(3) 41.7% (4) 40.7%

256. What is the average number of cases in different types of special children during the year 1994-96?
(1) 417 (2) 413
(3) 433 (4) 465

257. Find the ratio between articulatory disorder and speech disorder cases.
(1) 21 : 55 (2) 55 : 21
(3) 55 : 12 (4) 12 : 55

258. What is the respective ratio between language disorder and the average of the remaining disorder cases?
(1) 219 : 119 (2) 119 : 219
(3) 919 : 419 (4) 729 : 529

Directions (259–262) : This is a pie-chart for the data on A, B, O, AB blood groups of 150 donors. Observe the pie-chart and answer the questions.

(SSC CGL Tier-I (CBE) Exam. 31.08.2016 (IIIrd Sitting)

259. The number of donors having blood group 'O' is :
(1) 50 (2) 42
(3) 30 (4) 34

260. The number of persons having either blood group 'A' or blood group 'B' is :
(1) 84 (2) 96
(3) 78 (4) 54

261. What is the percentage of donors having blood group 'AB'?
(1) 61% (2) 26%
(3) 16% (4) 36%

262. The ratio of donors having blood group 'A' to the average of the donors having blood group 'O', 'B' and 'AB' is :
(1) 4 : 3 (2) 4 : 5
(3) 5 : 4 (4) 3 : 4

Directions (263-266) : In the given pie-chart, the comparative study of the production of Rice, Wheat, Sugar and Tea of a country is given. Study the pie-chart and answer the following questions.

(SSC CGL Tier-I (CBE) Exam. 01.09.2016 (IIIrd Sitting)

263. From this diagram, the ratio of sum of wheat and sugar production to difference in production of rice and tea is
(1) 4 : 5 (2) 5 : 4
(3) 6 : 1 (4) 1 : 6

264. The production of rice and tea is more/greater than production of wheat by
(1) 50% (2) 100%
(3) 75% (4) 66.6%

265. The central angle of percentage of wheat is
(1) 48° (2) 98°
(3) 110° (4) 108°

266. The total production of rice, wheat, sugar and tea (in kgs) is 500000 kgs. The production of rice in the country is
(1) 175000 kg (2) 395000 kg
(3) 275000 kg (4) 27500 kg

Directions (267–210) : Study the following pie-chart and answer the questions.

(SSC CGL Tier-I (CBE)
Exam. 02.09.2016 (IInd Sitting)

Budget estimated by a family for their monthly expenses.
Total salary
= Rs. 32000 per month

267. The budget estimated by the family on clothing and grocery together is :
(1) Rs. 8950 (2) Rs. 8960
(3) Rs. 8850 (4) Rs. 8860

268. Due to sudden marriage, the family incurs miscellaneous expenditure of Rs. 3040 in total. Then the increase in the amount under this head from that budgeted is :
(1) Rs. 810 (2) Rs. 1738
(3) Rs. 234 (4) Rs. 800

269. The difference in the amount estimated by the family on electricity and call bill is :
(1) Rs. 4560 (2) Rs. 4470
(3) Rs. 4168 (4) Rs. 4160

270. The family actually spent Rs. 4672 on grocery. Then the difference in the amount budgeted and spent on grocery is :
(1) Rs.1528 (2) Rs.1728
(3) Rs.1278 (4) Rs.1628

Directions (271–274) : The given pie-chart shows the spendings of a country on various sports during a year. Study the graph and answer the following questions.

(SSC CGL Tier-I (CBE)
Exam. 03.09.2016 (IIIrd Sitting)

271. If the total amount spent on sports during the year was Rs. 15,000,000, the amount spent on cricket and hockey together was
(1) Rs. 6000000
(2) Rs. 5000000
(3) Rs. 3750000
(4) Rs. 7500000

272. If the total amount spent on sports during the year was Rs. 12,000,000, how much was spent on basket ball ?
(1) Rs. 1250000
(2) Rs. 1000000
(3) Rs. 1200000
(4) Rs. 1500000

273. The respective ratio of the total amount spent on football to that spent on hockey was
(1) 1 : 15 (2) 1 : 1
(3) 15 : 1 (4) 3 : 2

274. What is the central angle for the tennis?
(1) 36° (2) 63°
(3) 33° (4) 66°

Directions (275–278) : The pie–chart, given here shows monthly expenses on various heads and savings of the family of Mr. Rao. Study the chart and answer the questions based on it.

(SSC CGL Tier-I (CBE)
Exam. 06.09.2016 (IInd Sitting)

275. The amount spent on food exceeds the total amount spent on education and clothing by
(1) $12\frac{1}{2}\%$ (2) 25%
(3) $33\frac{1}{3}\%$ (4) 50%

276. What per cent of his income does Mr. Rao save ?
(1) 25% (2) 30%
(3) $33\frac{1}{3}\%$ (4) 36%

277. If the total income of Mr. Rao is Rs.72000, how much house rent does he pay ?
(1) Rs.5400 (2) Rs. 9000
(3) Rs.10800 (4) Rs.12000

278. What per cent of his income , does Mr. Rao spend on clothing , transport and entertainment combined together ?
(1) $33\frac{1}{2}\%$ (2) 27%
(3) 25% (4) $12\frac{1}{2}\%$

Directions (279–282) : Study the pie-chart and answer the questions. The pie-chart given below shows the expenditure incurred in bringing out a book by a publisher.

(SSC CGL Tier-I (CBE)
Exam. 07.09.2016 (IIIrd Sitting)

279. What is the central angle showing the cost of paper?
(1) 16° (2) 32°
(3) 38.9° (4) 57.6°

280. If the cost of printing is Rs. 16,800 , the royalty is :
(1) Rs. 2400 (2) Rs. 3200
(3) Rs. 4800 (4) Rs. 8400

281. Royalty on the book is less than canvassing expenditure by
(1) 25% (2) 50%
(3) 24% (4) 12%

282. If miscellaneous expenditures amount to Rs. 12000, the expenditure on canvassing will be
(1) Rs. 80000
(2) Rs. 144000
(3) Rs. 468000
(4) Rs. 405000

Directions (283–286) : The pie-chart given below shows the usage of materials in the construction of a house. Study the chart and answers the questions :

(SSC CGL Tier-I (CBE)
Exam. 08.09.2016 (IIIrd Sitting)

283. The percentage of steel used in the construction of house is
(1) 10% (2) 12%
(3) 20% (4) 36%

284. The ratio of cement and bricks used in the construction is :
(1) 3 : 4 (2) 2 : 3
(3) 4 : 3 (4) 2 : 5

285. If the cost of cement is Rs. 5000, then the labour cost is :
(1) Rs. 5500 (2) Rs. 6250
(3) Rs. 9000 (4) Rs. 4000

286. The average of percentages of steel, cement and miscellaneous items used in the construction is :
(1) 10% (2) 25%
(3) 20% (4) 35%

Directions (287–290) : The following pie diagram gives the marks scored by a student in different subjects – English, Hindi, Mathematics, Science and Social Science in an examination. Assuming that the total marks obtained for the examination are 540, answer the questions.

(SSC CGL Tier-I (CBE)
Exam. 11.09.2016 (IInd Sitting)

287. The marks scored in English , Science and Social science exceed the marks scored in Hindi and Mathematics by
(1) 10% (2) $10\frac{1}{9}\%$
(3) 25% (4) $11\frac{1}{9}\%$

288. The subject in which the student scored 105 marks is
(1) English (2) Hindi
(3) Mathematics
(4) Science

289. The difference of marks between English and Science is the same as between
(1) Science and English
(2) Hindi and Social science
(3) English and Hindi
(4) Mathematics and Social science

290. The marks scored in Hindi and Mathematics exceed the marks scored in English and Social science by
(1) 30 (2) 40
(3) 60 (4) 75

Directions (291–294) : The pie graph indicates the break-up of the cost of construction of a house. Assuming that the total cost of construction is Rs. 6,00,000, answer the following questions.

(SSC CGL Tier-I (CBE)
Exam. 27.10.2016 (Ist Sitting)

291. The amount spent on timber is :
(1) Rs. 60,000
(2) Rs. 2,00,000
(3) Rs. 30,000
(4) Rs. 50,000

292. The amount spent on labour exceeds the amount spent on supervision by :
(1) Rs. 1,00,000
(2) Rs. 1,20,000
(3) Rs. 60,000
(4) Rs. 30,000

293. The amount spent on labour exceeds the amount spent on steel by :
(1) 10% of the total cost
(2) 11% of the total cost
(3) 13% of the total cost
(4) 9% of the total cost

294. The percentage of the total cost of construction spent on cement, steel and supervision is :
(1) 50% (2) 55%
(3) 60% (4) 65%

Directions (295-298) : The following pie-chart shows the monthly expenditure of a man on various items. If he spends Rs. 16,000 per month, answer the following questions.

(SSC CGL Tier-I (CBE)
Exam. 27.10.2016 (Ist Sitting)

295. If miscellaneous expenses be x% of the total expense, then value of x is:
(1) 22.5 (2) 37.5
(3) 36 (4) 30

296. The ratio of expenses on food and rent is :
(1) 5 : 3 (2) 3 : 5
(3) 4 : 3 (4) 3 : 4

297. The amount he spends on education is:
(1) Rs. 1,200 (2) Rs. 1,600
(3) Rs. 1,800 (4) Rs. 2,000

298. How much more does he spend on rent as compared to education ?
(1) Rs. 2,400 (2) Rs. 1,800
(3) Rs. 3,600 (4) Rs. 2,000

TYPE–II

Directions (1–5) : The graph given here shows the annual premiums of an insurance company, charged for an insurance of ₹ 1000 for individuals of different age-groups. Study the graph and answer each of the following questions :

(SSC CPO S.I.Exam. 07.09.2003)

Scale $\begin{cases} \text{along O X} \rightarrow \text{1 small div = 1 year} \\ \text{along O Y} \rightarrow \text{1 small div = 50 paise} \end{cases}$

1. The annual premium for a man aged 26 years for an insurance of ₹ 1000 is
(1) ₹ 46 (2) ₹ 44
(3) ₹ 45.7 (4) ₹ 45.25

2. What is the age of a person whose premium is ₹ 44.60 for an insurance of ₹ 1000 ?
(1) 23 years
(2) $23\frac{1}{2}$ years
(3) 24 years
(4) 45 years

3. The premium for a man aged 22 years for an insurance of ₹ 10,000 is
(1) ₹ 435 (2) ₹ 440
(3) ₹ 43.75 (4) ₹ 437.50

4. What percent of the premium is increased if a man aged 30 years is insured for ₹ 1000 instead of a man aged 23 years ?
(1) 4.75%
(2) 5.68%
(3) 6.24%
(4) 6%

5. Each of two persons aged 21 years and 23 years is insured for ₹ 1,00,000. The difference between their annual premiums will be
(1) ₹ 100 (2) ₹ 50
(3) ₹ 25 (4) ₹ 20

Directons (6-9) : The graph given here shows a car following the linear path with uniform speed. Study the graph and answer the questions.

(SSC CPO S.I. Exam. 03.09.2006)

6. The speed of the car is
(1) 12 km/hr
(2) 6 km/hr
(3) 18 km/hr
(4) 24 km/hr

7. The speed of the car (in metres per minute) is
(1) 60 (2) 100
(3) 600 (4) 1000

8. The distance travelled by the car in 4.5 hours is
(1) 27 km
(2) 30 km
(3) 36 km
(4) 40 km

9. The car covers a distance of 15 kilometres in
(1) 3 hours
(2) 2 hours
(3) 1.5 hours
(4) 2.5 hours

Directions (10-13) : A motorist and a scooterist made a journey of 120 km at the same time and from the same place. The graph shows the progress of the journey made by each person. Study the graph and answer the questions.

FCI Assistant Grade-III
Exam.05.02.2012 (Paper-I)
East Zone (IInd Sitting)

10. At what time did the motorist meet the scooterist ?
(1) 10.30 am (2) 10.45 am
(3) 10.15 am (4) 10.20 am

11. What was the speed of the scooterist during the journey ? (in kmph)
(1) 45 (2) 48
(3) 42 (4) 46

12. The scooterist completes the journey in (hours) :
(1) 3 (2) 2
(3) $2\frac{1}{2}$ (4) $3\frac{1}{2}$

13. How far, from the start, did the motorist meet the scooterist ? (in km)
(1) 75 (2) 70
(3) 90 (4) 80

Directions (14–17) : A graph showing the price of rice in India during the year 2000 to 2003 is given below. Study the graph carefully and answer the questions.

(SSC Delhi Police S.I.(SI) Exam. 19.08.2012)

14. For the month of May, the graph shows that the price of rice was the lowest in the year

(1) 2000 (2) 2001
(3) 2002 (4) 2003

15. The range of price for a year is the difference between the maximum and the minimum prices for that year. The graph shows that this range of price was the greatest for the year

(1) 2000 (2) 2001
(3) 2002 (4) 2003

16. The month in which the price of rice were equal for the year 2000 and 2001 was

(1) September (2) August
(3) June (4) November

17. The maximum difference in price between any two years was in the month of

(1) January (2) November
(3) March (4) December

18. A class is divided into 3 equal groups and the class is given 5 tests in Maths. Average score of the groups and the tests is given below. The average score of the entire class in Test II is

Average scores of the groups in the first five Mental Maths tests

(1) 13 (2) 13.5
(3) 10 (4) 12.5

(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

19. The following graph represents the maximum and minimum temperature recorded every day in a certain week. The day on which the difference between the maximum and minimum temperature was maximum is

● Maximum temperature
○ Minimum temperature

(1) Wednesday (2) Saturday
(3) Sunday (4) Monday

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

Directions (20–21) : The graph given below shows the daily income of 50 workers in a factory. Study the graph and answer the questions.

(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

20. What percentage of the factory workers earn between ₹ 150 and ₹ 180 ?

(1) 6% (2) 16%
(3) 12% (4) 20%

21. The median wages in the factory is

(1) ₹ 140 (2) ₹ 138
(3) ₹ 150 (4) ₹ 160

Directions (22–23) : Study the following graph and answer the questions.

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

22. Find the percentage decrease in income from 2001 to 2002.

(1) 50% (2) 33%
(3) $37\frac{1}{2}$ %
(4) Data inadequate

23. If the income shows positive growth every year throughout the period (2000 - 2005), then in how many years the expenditure shows a positive growth ?

(1) 5 (2) 3
(3) 4 (4) 2

24. The adjoining diagram is frequency polygon for the scores of students in a test. What is the total number of students appeared in the test ?

(1) 180 (2) 200
(3) 250 (4) 150

(SSC Graduate Level Tier-I Exam. 21.04.2013)

25. Given is a line graph showing the number of accidents in a city during the first 6 months of 1999.

The decrease % of accidents from May to June is

(1) $15\frac{3}{8}$% (2) $15\frac{1}{8}$%
(3) $15\frac{5}{8}$% (4) $15\frac{7}{8}$%

(SSC Graduate Level Tier-II Exam. 29.09.2013

Directions (26-27) : Study the following graph and answer the questions.

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

26. If the imports of company X in 2007 were increased by 40%, what would be the ratio of exports to the increased imports ?
(1) 1.25 (2) 1.75
(3) 0.25 (4) 0.75

27. In 2005, the exports of company X were double that of company Y in that year. If the imports of company X during the year were ₹ 180 crores, what was the amount (in crore ₹) of imports of company Y during the year ?
(1) 212 (2) 210
(3) 315 (4) 282

Directions (28 -31) : The marks obtained by 273 examinees are shown by the frequency polygon. Given that mean marks is 59.5. Study the frequency polygon and answer the given questions.

(SSC CHSL DEO & LDC Exam. 16.11.2014)

28. The number of examinees getting more than average marks is
(1) 72 (2) 105
(3) 152 (4) 164

29. Percentage of the students who get above 80% marks is
(1) 9.81 (2) 10.53
(3) 11.28 (4) 11.72

30. Percentage of the students who got marks above 60% and below 80% is
(1) 43.95 (2) 48.39
(3) 51.06 (4) 56.84

31. If 40 is the pass marks, percentage of students failed is
(1) 14.56 (2) 15.84
(3) 16.11 (4) 17.25

Directions (32 - 35) : In the following questions, the Graph shows the demand and production of different companies. Study the graph and answer the questions.

(SSC CGL Tier-I Exam, 09.08.2015
(IInd Sitting) TF No. 4239378)

32. The demand of company B is what percentage of the production of company F ?
(1) 60% (2) 70%
(3) 80% (4) 50%

33. What is the difference between the average demand and the average production of the companies (in lakh tonnes)? [Approximately]
(1) 200
(2) 325
(3) 275
(4) 250

34. The production of company A is approximately what percent of the demand of company C ?
(1) 50%
(2) 65%
(3) 60%
(4) 55%

35. What is the ratio of the companies having more demand than production to those having more production than demand ?
(1) 2 : 3
(2) 1 : 2
(3) 3 : 2
(4) 2 : 1

Directions (36–40) : The following graph shows production (in thousands) of two types (P and Q) of vehicles by a factory over the years 2009 to 2014. Study the graph and answer the given questions.

(SSC CGL Tier-II Exam,
25.10.2015, TF No. 1099685)

36. In how many of the given years, was the production of Type P vehicles of the company more than the average production of this type vehicles in the given years?

(1) 3 (2) 4

(3) 2 (4) 5

37. Approximate percentage decrease in production of Type Q vehicles from 2010 to 2011 is

(1) 10.1 (2) 16.7

(3) 14.3 (4) 12.5

38. The total production of Type P vehicles in the years 2009 and 2011 is what percent of total production of Type Q vehicles in 2010 and 2014?

(1) 75

(2) 69.25

(3) 80

(4) 81.25

39. The ratio of total production of Type P vehicles to total production of type Q vehicles over the years is

(1) 48 : 41

(2) 5 : 8

(3) 8 : 5

(4) 41 : 48

40. The production of Type Q vehicles in 2010 was approximately what percent of Type P vehicles in 2014?

(1) 60 (2) 45.5

(3) 54.5 (4) 75

Directions (41–43) : Observe the graph below and answer the following question.

(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

Fuel prices over last 10 years

41. What is the approximate percentage difference in average price of Petrol in 2004 and in 2014?

(1) 98%

(2) 100%

(3) 102%

(4) 105%

42. In which year the difference between average prices of petrol and Diesel is minimum?

(1) 2005 (2) 2009

(3) 2014 (4) 2004

43. What is the average of diesel prices over the years 2006–2012?

(1) 36.47

(2) 37.34

(3) 35.67

(4) 38.77

Directions (44–48) : Study the following line chart carefully and answer the questions given below it. The following line chart represents the number of employees recruited in different years in a company.

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

44. What was the ratio of number of employees recruited in the year 2011 to that in the year 2013?

(1) 2 : 3
(2) 9 : 10
(3) 10 : 9
(4) 5 : 9

45. The number of employees recruited in the year 2012 was what percent of the number employees recruited in the year 2014 ?
(1) 50%
(2) 60%
(3) 62.5%
(4) 70%

46. If the total number of employees before the year 2010 was 640, then the total number of employees after 2014 was :
(1) 820
(2) 835
(3) 815
(4) 845

47. If the number of employees before 2010 was 640, what was percentage increase in 2010?
(1) 5%
(2) 5.5%
(3) 4%
(4) 4.5%

48. The number of employees recruited in 2015 was 40% more than that recruited in 2014. How many employees were recruited in 2015?
(1) 56
(2) 16
(3) 64
(4) 60

TYPE-III

Directions (1-5) : The bar graph given below shows the spending of family income on various items and savings during 1993. Observe the graph and answer the following questions :

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

Family Income spent during 1993 (In percentage)

1. The per cent of income spent on food is :
(1) 5% (2) 10%
(3) 12.5% (4) 20%

2. The per cent of income spent on clothing exceeds that on savings by :
(1) 12.5% (2) 2.5%
(3) 10% (4) 22.5%

3. If the total income of the family during 1993 was ₹ 100000, the savings of the family in 1993 was :
(1) ₹ 1,750
(2) ₹ 20,000
(3) ₹12,500
(4) ₹ 50,000

4. The total expenses of the family on transport is equal to those spent on :
(1) savings
(2) clothing
(3) food
(4) others

5. The savings of the family is more than that of expenditure incurred on :
(1) housing
(2) clothing
(3) transport
(4) others

Directions (6–10) : Study the bar diagram given below carefully and answer the following questions based on it.

(SSC CPO S.I. Exam. 05.09.2004)

Birth rates in different countries

6. The birth-rate of which country is 25% more than that of Germany?
(1) India
(2) China
(3) England
(4) New Zealand

7. The birth rate of India is what per cent of the birth-rate of England?
(1) 165%
(2) 155%
(3) 140%
(4) 100%

8. The birth-rate of China is how many times the birth-rate of Germany?
(1) 0.4
(2) 5.2
(3) 4.0
(4) 2.5

9. What is the ratio of birth-rate of India to that of Sweden ?
(1) 5 : 11
(2) 11 : 5
(3) 2 : 1
(4) 1 : 2

10. By how much per cent is the birth-rate of England less than the birth-rate of New Zealand?
(1) 30%
(2) $33\frac{1}{3}\%$
(3) 45%
(4) 50%

Directions (11–14) : The Bar Graph given here shows the population (in crores) of India in various census years. Observe the graph and answer the question based on it.

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

11. The per cent increase in population from 1971 to 1981 is
(1) 24.8% (2) 20%
(3) 16.7% (4) 22.9%

12. In which census year, the per cent increase in population is highest as compared to that in the previous census year ?
(1) 1951 (2) 1961
(3) 1971 (4) 1981

13. In which census year, the per cent increase in population is least as compared to that in the previous census year ?
(1) 1961 (2) 1951
(3) 1971 (4) 1941

14. Per year increase in population from the year 1931 to 1981 is
(1) 8100000 (2) 7600000
(3) 8900000 (4) 6700000

Directions (15-17) : The bar graph, given here, shows the number of tickets sold by 6 students A, B. C, D, E and F during a fair.
Observe the graph and answer questions based on it

(SSC (South Zone) Investigator Exam. 12.09.2010)

15. Total number of tickets sold by A, B and C is
(1) 45 (2) 44
(3) 42 (4) 40

16. The least number of tickets were sold by
(1) B (2) F
(3) A (4) D

17. Total number of tickets sold by D, E and F is
(1) 47 (2) 46
(3) 45 (4) 44

Directions (18 – 20) : Given here is a bar graph showing the number of cycles produced in a factory during five consecutive weeks.

Observe the graph and answer the questions based on this graph.

(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

Graph showing the number of cycles produced in a factory in 5 consecutive weeks

18. The number of cycles produced during third and fourth weeks together is
(1) 1060 (2) 1980
(3) 920 (4) 1900

19. The number of cycles produced in the 5th week is
(1) 1400 (2) 1300
(3) 1440 (4) 1600

20. Total number of cycles produced in five consecutive weeks is
(1) 5520 (2) 1600
(3) 7200 (4) 7000

Directions (21-24) : Study the following graph and answer the questions given below it.

(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

Production of salt by a company (in 1000 tonnes) over the years

21. What was the percentage decline in the production of salt from 2003 to 2004 ?
(1) 64.2% (2) 180%
(3) 62.4% (4) 107%

22. The average production of 2004 and 2005 was exactly equal to the average production of which of the following pair of years?
(1) 2006, 2007 (2) 2005, 2006
(3) 2002, 2006 (4) 2001, 2005

23. What was the percentage increase in production of salt in 2008 compared to that of 2001?
(1) 55.5% (2) 125%
(3) 150% (4) 220%

24. In how many of the given years was the production of salt more than the average production of the given years?
(1) 1 (2) 2
(3) 3 (4) 4

Directions (25–28) : Study the following graph and answer the questions based on it.

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

Production of fertilizers by a company (in 10000 tonnes over the years 1995-2002)

25. What was the percentage decline in the production of fertilizers from 1997 to 1998 ?

(1) $33\frac{1}{3}\%$ (2) 30%

(3) 25% (4) 20%

26. In how many years was the production of fertilizers more than the average production of the given years ?

(1) 1 (2) 2

(3) 3 (4) 4

27. In which year was the percentage increase in production as compared to the previous year, the maximum ?

(1) 2002 (2) 2001

(3) 1996 (4) 1997

28. The ratio of total production of fertilizers in the year 1996 and 1997 to that of total production in the year 1995, 1998 and 2000 is

(1) 5 : 6 (2) 6 : 5

(3) 20 : 29 (4) 13 : 24

Directions (29-30) : Given here is a graph showing the number of workers with their daily payment by a workshop. Study the graph and answer questions based on this graph.

(SSC CISF Constable (GD) Exam. 05.06.2011)

29. The number of workers whose daily payment is ₹ 20 is

(1) 9 (2) 16

(3) 20 (4) 4

30. The total daily payment made to the group which contains 9 workers is (in ₹)

(1) 400 (2) 315

(3) 480 (4) 135

Directions (31–35) : Read the following graph and answer questions

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

Trade Deficit of a Country (in Crores of Rupees)

31. The deficit in 1993-94 was roughly how many times the deficit in 1990-91 ?

(1) 1.4 (2) 1.5

(3) 2.5 (4) 0.5

32. Percentage increase in deficit in 1993-94 as compared to deficit in 1989-90 was

(1) 200% (2) 150%

(3) 100% (4) 2100%

33. In which of the following years, the percent increase of deficit was highest over its preceding year?

(1) 1992-93 (2) 1990-91

(3) 1993-94 (4) 1988-89

34. The ratio of the number of years, in which the trade deficit is above the average deficit, to those years in which the trade deficit is below the average deficit, is

(1) 3 : 5 (2) 5 : 3

(3) 4 : 4 (4) 3 : 4

35. The deficit in 1992-93 was approximately how many percent of the average deficit?

(1) 150% (2) 140%

(3) 125% (4) 90%

Directions (36-40) : The following bar graph shows the production of fertilizers (in lakh tonnes) by a company, in six consecutive years. Study the graph and answer the questions.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

36. The difference of the average production of fertilizers in the first three years and the average production in the last three years (in lakh tonnes) is

(1) $2\frac{1}{3}$ (2) $8\frac{1}{3}$

(3) $4\frac{1}{6}$ (4) $3\frac{1}{3}$

37. The ratio of the total production of fertilizers in the year 1995, 1997 and 1999 to the total production in the remaining three years is

(1) 44 : 45 (2) 48 : 43

(3) 44 : 47 (4) 46 : 45

38. The total production of fertilizers in the year 1998 and 2000 is $x\%$ of the total production in the years 1997 and 1999. Then x is equal to

(1) $103\frac{1}{3}$ (2) $79\frac{7}{17}$

(3) $96\frac{24}{31}$ (4) $125\frac{25}{27}$

39. The year in which the production of fertilizers is nearest to the average production of all the six years, is

(1) 1999 (2) 1998

(3) 1995 (4) 2000

40. Perecentage increase in production of fertilizers for a year with respect to its previous year was maximum in the year

(1) 1996 (2) 1997

(3) 1999 (4) 2000

Directions (41–45) : Sales of books (in thousands) from six branches (B1, B2, B3, B4, B5, B6) of a publishing company are given below. Study the graph and answer the following questions.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

41. The average sales of the branches B1 and B4 is equal to the average sales of the branches
(1) B3 and B5 (2) B3 and B6
(3) B5 and B6 (4) B2 and B5

42. The number of branches in which sales of books are below the average level is
(1) 2 (2) 3
(3) 1 (4) 4

43. If the sale of books from the branch B2 increases by 30% and that from the branch B4 decreases by 10%, the approximate sale from all the six branches will
(1) increase by 1·33%
(2) decrease by 1·67%
(3) remain same
(4) decrease by 1·33%

44. If each branch can increase the sale of books by 2%, then the total number of books (in thousands) sold by the company will be
(1) 305 (2) 306
(3) 310 (4) 315

45. If all the six branches are divided into three groups such that each group has equal performance on selling books, then the minimum difference of the number of books (in thousands) sold by the two members of any group is
(1) 20 (2) 10
(3) 15 (4) 5

Directions (46–49) : The following bar diagram, represents the use of different modes of travel to school by students in a certain locality of the town. Study the graph and answer the questions.

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

46. How many students are coming from that locality ?
(1) 500 (2) 600
(3) 560 (4) 660

47. How many students use Bicycle and Rickshaw combined ?
(1) 240 (2) 340
(3) 140 (4) 440

48. What is the percentage of students using Bus from that locality ?
(1) $22\frac{14}{33}\%$ (2) $18\frac{2}{3}\%$
(3) $22\frac{8}{11}\%$ (4) 22%

49. What is the ratio of the students using their means of transport as Car with those using Rickshaw ?
(1) 7 : 2 (2) 8 : 3
(3) 2 : 7 (4) 3 : 8

Directions (50–54) : The following Bar chart shows the sales of a company XYZ (in ₹ Crore). Study the chart and answer the following questions.

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

50. Total sales in 2nd and 3rd years together is :
(1) ₹ 2688 crores
(2) ₹ 2888 crores
(3) ₹ 2788 crores
(4) ₹ 2488 crores

51. The 2nd highest sale is in the year :
(1) 10 (2) 9
(3) 8 (4) 7

52. The 2nd least sale is in year :
(1) 2 (2) 3
(3) 6 (4) 4

53. The mean of the highest and the lowest sale (in ₹ Crore) is :
(1) ₹ 4922.5 (2) ₹ 4827
(3) ₹ 4365 (4) ₹ 4922

54. The sale in the year 4 is less than the sale in the year 8, by
(1) ₹ 3608 crores
(2) ₹ 3504 crores
(3) ₹ 3127 crores
(4) ₹ 3427 crores

Directions (55-59) : The bar graph given below shows the total number of students in six sections of a class VI of a certain school. Using this graph, answer the question.

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

55. Which two sections have the same number of students ?
(1) Sec A and Sec E
(2) Sec A and Sec F
(3) Sec C and Sec D
(4) Sec B and Sec F

56. What is the ratio of the number of students in section A to that in section C ?
(1) 34 : 35 (2) 32 : 35
(3) 31 : 35 (4) 34 : 31

57. What is the total number of students in class VI ?
(1) 200 (2) 209
(3) 199 (4) 179

58. The ratio of the students in section B and section C is
(1) 31 : 34 (2) 34 : 35
(3) 35 : 31 (4) 31 : 35

59. The percentage of students in section C out of the total students in class VI is approximately
(1) 17.58% (2) 16.08%
(3) 16.58% (4) 15.57%

Directions (60–64) : The following bar diagram analys the sale of a company from 2000 to 2005, Examine the diagram and answer the questions.

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

60. The sales in 2004 are what percentage of those in 2002?
(1) 40% (2) 4%
(3) 110% (4) 1.1%

61. In which year did the sales show the least decrease to that of the preceding year ?
(1) 2004 (2) 2001
(3) 2003 (4) 2005

62. By what amount are the sales in 2003 more than those in 2001 ?
(1) ₹ one hundred
(2) ₹ ten thousand
(3) ₹ one lakh
(4) ₹ ten lakhs

63. The sales in 2001 are how many times those of 2002 ?
(1) 8 times (2) 0.8 times
(3) 2.5 times (4) 3 times

64. In which year did the sales show the least percent increase to that of the preceding year ?
(1) 2000 (2) 2002
(3) 2003 (4) 2004

Directions (65–68) : The graph shows the production of wheat in different years of a particular State. Study the graph and answer questions.

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

65. The year in which the production reached maximum is
(1) 1995 (2) 1997
(3) 1999 (4) 2000

66. The percentage increase in production of wheat from 1997-1998 is
(1) 100% (2) 150%
(3) 90% (4) 120%

67. The year which had the percentage of decrease vis-a-vis its previous year in production as $13\frac{1}{3}$ % is
(1) 1996-97 (2) 1995-96
(3) 1999-2000 (4) 2000-01

68. The total production from the year 1995 to 1998 (in quintals) is
(1) 3000 (2) 3100
(3) 3200 (4) 3300

Directions (69–70) : The bar diagram below shows the production of potatoes (in quintals) from the year 2000 to 2006. Study the diagram and answer the following questions.

(SSC Multi-Tasking Staff Exam. 10.03.2013)

69. Considering the average production during this period, the number of years in which the production is above average is :
(1) 1 (2) 2
(3) 3 (4) 4

70. During this period, the highest rate of decline in production is:
(1) 24.4% (2) 28.22%
(3) 33.64% (4) 35.32%

71.

The above bar graph show the marks obtained by a student in an examination. What is the average marks obtained by the student ?
(1) 55 (2) 56
(3) 57 (4) 58

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

72.

Study the bar graph carefully and answer the following question.

Which type of family is the most common ?

(1) 2 members (2) 3 members
(3) 4 members (4) 5 members

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

73.

Study the above bar graph showing the production of food grains (in million tons).

What is the ratio between the maximum production and the minimum production during the given period ?

(1) 1 : 2 (2) 2 : 3
(3) 3 : 4 (4) 5 : 2

(SSC Graduate Level Tier-I Exam. 21.04.2013)

Directions (74-75) : The bar graph shows the marks obtained by a student in an examination out of 100 marks in each subject. Study the graph and answer the questions.

(SSC (CHSL DEO & LDC Exam. 20.10.2013)

74. The ratio of the marks of Maths and History is

(1) 6 : 5 (2) 8 : 5
(3) 3 : 4 (4) 4 : 3

75. The average marks of Hindi and English is

(1) 65 (2) 50
(3) 55 (4) 60

Directions (76-78) : The distribution of fruit consumption in a sample of 72 seventeen - year - old girls is given in the graph below. Study the graph and answer the questions.

(SSC CGL Tier-I Exam. 26.10.2014)

Distribution of fruit consumption

76. How many of these girls ate fewer than two servings per day ?

(1) 15 (2) 40
(3) 25
(4) None of these

77. What percent of these girls ate six or more servings per day ?

(1) 12.5% (2) 13%
(3) 10% (4) 11%

78. How many of these girls ate more than two servings but less than six servings per day ?

(1) 26 (2) 18
(3) 23 (4) 38

Directions (79 – 83) : The bar-graph given below shows the percentage distribution of total expenditures of a company under various expense heads during 2013. Study the graph and answer the given questions.

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

79. The expenditure on the interest on loans is what percent more than the expenditure on transport ?

(1) 5% (2) 10%
(3) 20% (4) 40%

80. The ratio of the total expenditure on infrastructure and transport to the total expenditure on taxes and interest on loans is

(1) 5 : 4 (2) 8 : 7
(3) 9 : 7 (4) 13 : 11

81. If the expenditure on advertisement is ₹ 2.10 crores, then the difference between the expenditures on transport and taxes is
(1) ₹ 25 lakhs (2) ₹ 35 lakhs
(3) ₹ 65 lakhs (4) ₹ 95 lakhs

82. If the total amount of expenditure of the company is N times the expenditure on research and development, then the value of N is
(1) 5 (2) 18
(3) 20 (4) 27

83. If the interest on loans amounts ot ₹ 2.45 crores, then the total amount of expenditure on advertisement, taxes and research and developments is
(1) ₹ 2.4 crores (2) ₹ 4.2 crores
(3) ₹ 5.4 crores (4) ₹ 7 crores

Directions (84–87) : The bar graph shows the percentage distribution of the total expenditures of a company under various expense heads during 2005. Study the bar graph and answer the following **four** questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

84. If the expenditure on advertisement is Rs. 2.10 crores, then the difference between the expenditure on transport and taxes is equal to
(1) Rs. 65 lakhs (2) Rs. 1.25 lakhs
(3) Rs. 35 lakhs (4) Rs. 95 lakhs

85. The ratio of the total expenditure on infrastructure and transport to the total expenditure on taxes and interest on loans is
(1) 5 : 4 (2) 13 : 11
(3) 9 : 7 (4) 8 : 7

86. If the interest on loans amounted to Rs. 2.45 crores, then the total amount of expenditure on advertisement, taxes and research and development is equal to
(1) Rs. 3 crores
(2) Rs. 5.4 crores
(3) Rs. 4.2 crores
(4) Rs. 7 crores

87. The expenditure on the interest on loans is by what percent more than the expenditure on transport ?
(1) 20% (2) 40%
(3) 5% (4) 10%

Directions (88–91) : The following table shows the worldwide production of steel in 1920–1927. Study the table and answer the questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

Year	1920	1921	1922	1923	1924	1925	1926	1927
Production (In million tons)	71.30	43.51	67.66	76.23	77.23	88.93	91.75	100.17

88. The difference of the production of steel in the year 1923 and 1924 is x% of 1927. Then the value of x is approximately
(1) 0.01 (2) 0.1
(3) 0.001 (4) 1

89. The ratio of production of steel in the year 1924 and 1925 to that of 1923 and 1927 is
(1) 2005 : 2077
(2) 2077 : 2205
(3) 2205 : 2007
(4) 2205 : 2077

90. The number of years during which the company has its production less than the average production during 1920–1927 is approximately
(1) 6 (2) 4
(3) 3 (4) 2

91. The average production of steel is (in million tonnes)
(1) 76.09 (2) 74.07
(3) 77.10 (4) 75.13

Directions (92–96) : Sutdy the following bar graph and answer the questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

92. The number of years, the production of fertilizers was more than average production of the given years is :
(1) 4 (2) 2
(3) 1 (4) 3

93. The average production of 1996 and 1997 is exactly equal to the average production of the years
(1) 1995 and 2001
(2) 1995 and 1999
(3) 1999 and 2000
(4) 2000 and 2001

94. The percentage increase in production of fertilizers in 2002 compared to that in 1995 is :
(1) 220% (2) 180%
(3) 240% (4) 200%

95. The percentage increase in production as compared to previous year is maximum in year :
(1) 1999 (2) 1996
(3) 1997 (4) 2002

96. The percentage decline in the production of fertilizers from 1997 to 1998 is :
(1) 26 % (2) 25%
(3) 27.5% (4) 23%

Directions (97–100) : Study the Bar diagram carefully and answer the questions.

(SSC CGL Tier-I (CBE) Exam.10.09.2016)

The Bar diagram shows the trends of foreign direct investment (FDI) into India from all over the World (in Rs. crores).

97. The sum of FDI of 1992 and 1993 is
(1) Rs. 15.58 crores
(2) Rs. 15.85 crores
(3) Rs. 15.22 crores
(4) Rs. 15.65 crores

98. The year which exhibited the 2nd highest growth percentage in FDI in India over the period shown is
(1) 1993
(2) 1994
(3) 1997
(4) 1996

99. The ratio of investment in 1997 to the average investment is
(1) 2 : 1
(2) 1 : 2
(3) 1 : 1
(4) 3 : 1

100. The absolute difference in FDI to India between 1996 and 1997 is
(1) Rs. 7.29 crores
(2) Rs. 7.13 crores
(3) Rs. 7.16 crores
(4) Rs. 7.22 crores

Directions (101–104) : The graph shows the production of food grains of a country in different years. Study the graph and answer the questions.

(SSC CGL Tier-I (CBE) Exam.11.09.2016) (Ist Sitting)

101. The sum of the production of food grains in the years 1982 and 1984 is equal to that in the year :
(1) 1980 (2) 1981
(3) 1983 (4) 1985

102. The difference between the production of food grains in the years 1981 and 1985 is
(1) 500 tonnes (2) 1000 tonnes
(3) 5000 tonnes (4) 10000 tonnes

103. The percentage increase in production from 1984 to 1985 was
(1) 15 (2) 30
(3) 50 (4) 100

104. The two consecutive years in which rate of change of production of food grains is minimum are
(1) 1980 and 1981
(2) 1982 and 1983
(3) 1984 and 1985
(4) 1983 and 1984

Directions (105–108) : Following table gives details about the percentage change of the population in a particular town for given years. Go through the chart given and answer the questions that follow :

(SSC CPO Exam. 06.06.2016)

(Ist Sitting)

105. How many years witnessed a decrease in population across all the given years ?
(1) 1 (2) 2
(3) 3 (4) 0

106. Which year out of these 8 years has the highest population ?
(1) 2008 (2) 2005
(3) 2010 (4) 2011

107. What was the population of the town in year 2009 ?
(1) 3 (2) 5
(3) 4
(4) Can not be determined

108. What was the percentage increase in population of the town from 2005 to 2008 ?
(1) 19%
(2) 33.33%
(3) 22.6%
(4) Can not be determined

Directions (109–112) : Study the following bar-diagram carefully and answer the questions. The bar graph given below shows the foreign exchange reserves of a country (in million US $) from 1991-1992 to 1998 - 1999.

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (Ist Sitting)

109. The ratio of the number of years, in which the foreign exchange reserves are above the average reserves, to those in which the reserves are below the average reserves is
(1) 2 : 6 (2) 3 : 4
(3) 3 : 5 (4) 4 : 4

110. The foreign exchange reserves in 1996-97 were **approximately** what per cent of the average foreign exchange reserves over the period under review ?
(1) 95% (2) 110%
(3) 115% (4) 124%

111. The percentage increase in the foreign exchange reserves in 1997-98 over 1993-94 is
(1) 100 (2) 150
(3) 200 (4) 120

112. Ratio of the sum of foreign exchange reserves during the years 1991-92, 1992-93, 1993-94 to that during the years 1995-96, 1996-97, 1997-98 is
(1) 31 : 35 (2) 35 : 31
(3) 37 : 52 (4) 52 : 37

Directions (113–116) : Study the bar-graph given below which shows the per cent distribution of total expenditures of a company under various expenses and answer the questions.

(SSC CGL Tier-I (CBE) Exam. 28.08.2016) (IInd Sitting)

113. The expenditure on the interest on loans is more than the expenditure on transport by
(1) 5% (2) 10%
(3) 40% (4) 30%

114. If the interest on loans amounted to Rs. 2.45 crores, then the total amount of expenditure on advertisement, taxes and research and development is :
(1) Rs. 7 crores
(2) Rs. 4.2 crores
(3) Rs. 5.4 crores
(4) Rs. 3 crores

115. The ratio of the total expenditure on infrastructure and transport to the total expenditure on taxes and interest on loans is :
(1) 5 : 4 (2) 8 : 7
(3) 9 : 7 (4) 13 : 11

116. If the total expenditure of the company is Rs. 20 crores, then the ratio of expenditure on transport to that on salary is
(1) 5 : 4 (2) 4 : 5
(3) 5 : 8 (4) 8 : 5

Directions (117–120) : The bar-chart is showing the number of accidents in a city during the first six month of a year. Examine the bar chart and answer the following questions.

(SSC CGL Tier-I (CBE) Exam. 01.09.2016) (IInd Sitting)

117. What is the percentage of accidents in the month of April to the total accidents in the city ?
(1) 15% (2) 20%
(3) 22% (4) 24%

118. Compared to the month of January, what is the percentage of decrease in accidents in the month of February?
(1) 25 (2) 24
(3) 30 (4) 27

119. By what number, is the number of accidents that occurred in April is greater than the average number of accidents that occurred during the 6 months period ?
(1) 13.17 (2) 8
(3) 9 (4) 11

120. Percentage of decrease in the number of accidents from May to June is :
(1) $15\frac{4}{7}\%$ (2) $27\frac{3}{7}\%$
(3) $22\frac{6}{7}\%$ (4) $18\frac{5}{7}\%$

Directions (121-124) : The following bar graph shows the production of table fans in a factory during one week. Study the bar graph and answer the given questions.

(SSC CGL Tier-I (CBE)
Exam. 29.08.2016 (IST Sitting)

121. The maximum production exceeds the minimum production by :
(1) 400 (2) 420
(3) 500 (4) 540

122. The average production of table fans in that week is :
(1) 370 (2) 280
(3) 300 (4) 250

123. The ratio of the total production of table fans in the factory from Monday to Wednesday to that from Thursday to Saturday is :
(1) 19 : 26 (2) 26 : 19
(3) 29 : 16 (4) 16 : 29

124. The average production of table fans on Monday and Tuesday exceeds the average production of table fans during the week by
(1) 150 fans (2) 100 fans
(3) 140 fans (4) 200 fans

Directions (125–128) : The bar diagram shows the monthly expenditure of a company. Study the graph and answer the questions.

(SSC CGL Tier-I (CBE)
Exam. 30.08.2016 (IIIrd Sitting)

125. The percentage of money spent on miscellaneous is
(1) $7\frac{2}{17}$ (2) $17\frac{2}{7}$
(3) $11\frac{1}{9}$ (4) $9\frac{1}{11}$

126. The fraction of money spent on refreshment is :
(1) $13\frac{1}{2}$ (2) $\frac{2}{27}$
(3) $\frac{1}{10}$ (4) 10

127. The total monthly expenditure of the company is :
(1) Rs. 153 lakhs
(2) Rs. 315 lakhs
(3) Rs. 135 lakhs
(4) Rs. 531 lakhs

128. The ratio between expenditure on transport and employee salary on monthly basis is :
(1) 1 : 4 (2) 4 : 3
(3) 3 : 4 (4) 4 : 1

Directions (129–132) : The bar graph given indicates the income of a firm. Study the graph and answer the questions given.

(SSC CGL Tier-I (CBE)
Exam. 09.09.2016 (IIIrd Sitting)

129. Which period shows a steady increase of income ?
(1) March to May
(2) February to April
(3) February to May
(4) Insufficient data to predict

130. During which month, the ratio of the income to that of the previous month is the largest?
(1) February
(2) March
(3) April
(4) May

131. The income in May is how many times to that of February?
(1) 3.25
(2) 4
(3) 3.5
(4) 5

132. The average monthly income of the firm (in lakh rupees) is :
(1) 7.6
(2) 6
(3) 8.8
(4) None of these

Directions (133–136) : Study the bar diagram and answer the following questions.

The bar diagram shows the number of bicycles parked in the parking space of a hall at various points of time.

(SSC CGL Tier-I (CBE)
Exam. 10.09.2016 (IInd Sitting)

133. The charges for parking is Re. 1 per hour. What will be the total collection from 9 am to 7 pm?
(1) Rs. 625 (2) Rs. 635
(3) Rs. 685 (4) Rs. 695

134. What is the percentage decrease in the number of parked cycles between 7 pm and 8 pm? (in whole number)
(1) 30 (2) 38
(3) 42 (4) 45

135. What is the average number of parked cycles as seen from the graph ?
(1) 40 (2) 45
(3) 55 (4) 60

136. How many times, as mentioned in the graph, is the number of parked cycles above average ?
(1) 3 (2) 4
(3) 5 (4) 6

Directions (137–140) : A bar graph showing the heights of six mountain peaks is given below. Study the bar graph and answer the questions.

(SSC CGL Tier-I (CBE) Exam. 11.09.2016 (IIIrd Sitting)

137. The average height of all the peaks (in metre) is
(1) 7601.5 (2) 7600
(3) 7599.5 (4) 7610

138. Which peak is the second highest ?
(1) B (2) C
(3) A (4) E

139. What is the respective ratio of the heights of the highest peak and the lowest peak?
(1) 22 : 15 (2) 15 : 22
(3) 20 : 13 (4) 13 : 22

140. When the heights of the given peaks are written in ascending order, what is the average of the middle two peaks?
(1) 7950 m (2) 7560 m
(3) 7650 m (4) 7850 m

TYPE-IV

Directions (1–5) : The following is a horizontal bar diagram showing the accidents in which two-wheelers are involved with other objects. Study the diagram and answer the questions.

OBJECTS HIT

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

1. The difference in percentage between the accidents involving two-wheelers and two-wheelers and two-wheelers and other objects is respectively.
(1) 77% more (2) 77% less
(3) 54% more (4) 54% less

2. 60% of the accidents are involved due to
(1) cars, buses, tanker lorry and pedestrians
(2) cars, tanker lorry, bicycles and stationary vehicles
(3) two-wheelers, cars, buses and stationary vehicles
(4) two-wheelers, cars, buses and tanker lorry

3. If the data of the bar diagram is represented by a pie-chart, and the angle of a sector of the pie-chart is 36°, then this sector represents the accidents involving
(1) pedestrians (2) bicycles
(3) buses
(4) stationary vehicles

4. The percentage of accidents in which pedestrians and cyclists are involved is
(1) 24% (2) 6%
(3) 60% (4) 20.4%

5. The percentage by which the accidents involving buses is less than the accidents involving tanker lorry is
(1) 6% (2) 4%
(3) 40% (4) 28%

Directions (6–9) : The bar graph given here shows the number of job-seekers of a state in various years at different stages of education.

Study the graph carefully and answer the questions based on it.

(SSC CPO Sub-Inspector Exam. 16.12.2007)

Job-Seekers in Various Years

6. In which year was the number of Graduate job-seekers the same as that of Senior Secondary job-seekers ?

(1) 1973 (2) 1974
(3) 1975 (4) 1976

7. In comparison to the year 1973, how many more job-seekers in all, were there in the year 1977?

(1) 700 (2) 1700
(3) 2375 (4) 2150

8. In which year, was the number of Matriculate job-seekers maximum ?

(1) 1973 (2) 1975
(3) 1972 (4) 1977

9. The number of job-seekers, having their qualification as Senior Secondary, in the year 1974 was :

(1) 525 (2) 800
(3) 1050 (4) 1875

Directions (10–14) : The bar chart given below shows the percentage distribution of the production of various models of a mobile manufacturing company in 2007 and 2008. The total production in 2007 was 35 lakh mobile phones and in 2008 the production was 44 lakh. Study the chart and answer the following questions.

(SSC Graduate Level Tier-II Exam.16.09.2012)

Percentage of six different types of mobiles manufactured by a company over two years

10. Total number of mobiles of models A, B and E manufactured in 2007 was

(1) 24,50,000 (2) 22,75,000
(3) 21,00,000 (4) 19,25,000

11. For which models was the percentage variation in production from 2007 to 2008 the maximum ?

(1) B and C (2) C and D
(3) D and E (4) A and B

12. What was the difference in the number of B type mobiles produced in 2007 and 2008 ?

(1) 3,55,000 (2) 2,70,000
(3) 2,25,000 (4) 1,75,000

13. If the percentage production of A type mobiles in 2008 was same as that in 2007, then the number of A type mobiles produced in 2008 would have been

(1) 14,00,000 (2) 13,20,000
(3) 11,70,000 (4) 10,50,000

14. If 85% of the D type mobiles produced in each year were sold by the company, how many D type mobiles remained unsold ?

(1) 76,500 (2) 93,500
(3) 1,18,500 (4) 1,22,500

Directions (15 –19) : The sub divided bar diagram given below depicts H.S. Students of a school for three years. Study the diagram and answer the questions.

(SSC Graduate Level Tier-I Exam. 19.05.2013)

15. The percentage passed in 1st division in 2008 was

(1) 27% (2) 32%
(3) $15\frac{3}{8}\%$ (4) $11\frac{13}{17}\%$

16. The pass percentage in 2008 was

(1) 67% (2) 73%
(3) $79\frac{2}{3}\%$ (4) $82\frac{6}{17}\%$

17. In which year the school had the best result for H.S. in respect of percentage of pass candidates ?

(1) 2008 (2) 2009
(3) 2010
(4) The percentage of pass candidates are same for the three years.

18. The number of students passed with 3rd division in the year 2008 was

(1) 50 (2) 60
(3) 70 (4) 80

19. The percentage of the students passed with 2nd division in the year 2010 was

(1) 30% (2) 40%
(3) 50% (4) 60%

Directions (20-22) : Study the diagram and answer the questions.

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

20. If the total annual expenditure of family B is ₹ 10,000 then money spent on clothes during the year is

(1) ₹ 600 (2) ₹ 6000
(3) ₹ 1500 (4) ₹ 200

21. What fraction of the total expenditure is spent on Education in family A ?

(1) $\frac{2}{3}$ (2) $\frac{9}{13}$
(3) $\frac{1}{5}$ (4) $\frac{13}{20}$

22. If the total annual expenditure of family A is ₹ 30,000 then money spent on food, clothes and house-rents is.

(1) ₹ 18,000 (2) ₹ 21,000
(3) ₹ 15,000 (4) ₹ 18,500

Directions (23-26) : The sub divided bar diagram given below depicts the result of Class XII students of a school for three years. Study the diagram and answer the questions given below :

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014) (Ist Sitting)

23. The percentage of students passed with Second class in the year 2000 is

(1) $33\frac{1}{4}\%$ (2) $32\frac{1}{4}\%$
(3) $30\frac{1}{4}\%$ (4) $31\frac{1}{4}\%$

24. The percentage of students passed with First class in the year 2001 is

(1) 50% (2) 45%
(3) 60% (4) 65%

25. The number of students passed with Third class in the year 2002 is

(1) 130 (2) 10
(3) 140 (4) 20

26. The number of students passed with Second class in the year 2002 is

(1) 80 (2) 130
(3) 50 (4) 100

Directions (27-29) : The production figures of a perfume manufacturer are given in the form of percentage in sub-divided bar diagram. Study the diagram and answer the questions.

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014) (IInd Sitting)

27. What is the ratio of percentage production of rose perfume during 1995 to that during the year 1997 ?

(1) 4 : 3 (2) 3 : 2
(3) 2 : 3 (4) 5 ; 4

28. What is the percentage of production of sandal perfume during the year 1995 over that during 1997 ?

(1) 100% (2) 1%
(3) 0% (4) 50%

29. What is the production of jasmine perfume in the year 1997? Given that during the year 1997 total perfumed production was 5000 units.

(1) 1200 (2) 2500
(3) 2000 (4) 1500

Directions (30 – 33) : The sub-divided bar diagram given below depicts the result of B.Com. students of a college for 3 years. Study the graph and answer the given questions.

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

30. How many percent of students passed in first division in 2007?

(1) $15\frac{15}{19}\%$ (2) $11\frac{13}{17}\%$
(3) $16\frac{2}{3}\%$ (4) $12\frac{1}{2}\%$

31. What was the pass percentage in 2008 ?

(1) $33\frac{1}{3}\%$ (2) $82\frac{6}{17}\%$
(3) 75% (4) 78%

32. What was the number of third divisions in 2006 ?
(1) 60 (2) 140
(3) 59 (4) 120

33. In which year, did the college have the best result for B. Com ?
(1) 2007 and 2008
(2) 2008
(3) 2007
(4) 2006

Directions (34–36) : Study the following bar graph carefully to answer the questions.

(SSC CGL Tier-I (CBE) Exam. 27.08.2016) (IInd Sitting)

The following bar chart shows the yield per acre of six countries in the South Asia (In quintals)

	India	Pakistan	Sri Lanka	Bhutan	Bangladesh	Indonesia
Yield per acre	200	160	120	82	120	130

34. The yield per acre of India is what percent more than that of Pakistan?
(1) 25% (2) 50%
(3) 75% (4) 100%

35. If the yield per acre is arranged in ascending order, then what is the difference between the yield per acre of first three countries and last three countries?
(1) 168 quintals
(2) 172 quintals
(3) 182 quintals
(4) 190 quintals

36. The yield per acre produced by Bangladesh is what percent of the total yield per acre produced by all countries?
(1) 14% (2) 13.5%
(3) 14.8% (4) 16%

Directions (37–40) : The bar graph given below shows the per acre yield (in kg) of different countries. Study the graph carefully and answer the questions.

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (Ist Sitting)

37. The average yield of the given countries is
(1) $132\frac{1}{3}$ kg (2) $133\frac{1}{3}$ kg
(3) $134\frac{1}{3}$ kg (4) $135\frac{1}{3}$ kg

38. By how much percent is India's per acre yield more than that of Pakistan's?
(1) 20% (2) 25%
(3) $33\frac{1}{3}\%$ (4) 35%

39. Sri Lanka's yield (approximately) is what percent of total yield of all the countries?
(1) 17.8%
(2) 16.2%
(3) 18.2%
(4) 15.4%

40. Writing the yields of all countries in ascending order, the difference between the sum of yields of first three countries to that of last three countries is
(1) 200 kg.
(2) 212 kg.
(3) 172 kg.
(4) 162 kg.

Directions (41–43) : Study the following bar–diagram carefully and answer the questions.

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

Foreign exchange reserves	2006	2007	2008	2009	2010	2011	2012	2013
	2640	3720	2520	3360	3120	4320	5040	3120

41. The foreign exchange reserve in 2012 was how many times that in 2009?
(1) 0.7 (2) 1.2
(3) 1.4 (4) 1.5

42. What was the percentage increase in the foreign reserves in 2012 over 2008?
(1) 100 (2) 150
(3) 200 (4) 620

43. The ratio of the number of years, in which the foreign exchange reserves are above the average reserves, to those in which reserves are below the average reserves, is
(1) 2 : 6 (2) 3 : 4
(3) 3 : 5 (4) 1 : 1

Directions (44–47) : Study the bar diagram carefully and answer the following questions.

(SSC CGL Tier-I (CBE) Exam. 02.09.2016) (IInd Sitting)

Export (in Billion Rupees) of gems and jewellery in the year 19911992 is given.

44. The ratio of the sum of the exports to the bottom six countries to the total exports to all the given countries in 1991 – 1992 is approximately :
(1) $\frac{1}{6}$ (2) $\frac{1}{5}$
(3) $\frac{1}{8}$ (4) $\frac{2}{9}$

45. The country to which twice the export is nearly equal to the average exports in 1991–92 is
(1) U.K (2) Thailand
(3) Israel (4) UAE

46. The ratio of the total exports to Japan, Belgium and Hongkong to the export to rest of the countries in 1991–92 is nearly :
(1) 35 : 34 (2) 35 : 69
(3) 69 : 35 (4) 35 : 35

47. The export to Hongkong is approximately how many times the exports to Germany ?
(1) 8 (2) 9
(3) 10 (4) 11

TYPE-V

Directions (1-5) : The following questions are based on the bar graph. Read the graph and answer the questions.

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

1. What is the percentage increase in the gross traffic receipts in 1995-96 as compared to 1993-94?
(1) 33.9% (2) 41.5%
(3) 20.7% (4) 17%

2. If profit ≈ gross traffic receipts—total expenditure, then in 1996-97, what percentage of gross traffic receipts is the profit made?
(1) 5.9% (2) 6.4%
(3) 7.2% (4) 8%

3. In which year was the profit as a percentage of gross traffic receipts the highest?
(1) 1997-98 (2) 1996-97
(3) 1995-96 (4) 1994-95

4. In order to make a profit of 10%. What should have been the gross traffic receipts (in ₹ crores) in 1994-95, total expenditure remaining the same?

(1) 5,667 (2) 5,876
(3) 6,444 (4) 7,667

5. By what amount (in ₹ crores) has the expenditure increased over the period 1993-94 to 1997-98?

(1) 4,100 (2) 3,900
(3) 3,850 (4) 3,700

Directions (6-10) : The following graph gives Sales, Expense and Capital of a company for a period of five years 1994 to 1998. Read the graph and answer the following questions.

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

Profit = Sales – Expense

6. What has been the simple average growth rate per annum of expense between 1994 and 1998 ?

(1) 25% (2) $33\frac{1}{3}\%$
(3) 40% (4) 130%

7. In which year was the Sales to Expense ratio the lowest?

(1) 1994 (2) 1996
(3) 1997 (4) 1998

8. What was the average per annum increase in sales (in ₹ cr.) from 1994 to 1998 ?

(1) 50 (2) 60
(3) 80 (4) 100

9. In which year was the ratio of profit to capital the highest?

(1) 1998 (2) 1995
(3) 1996 (4) 1997

10. In which year was the ratio of sales to capital the lowest ?

(1) 1998 (2) 1997
(3) 1996 (4) 1995

Directions (11-14) : Given here is a multiple bar diagram depicting the changes in the students strength of a college in four faculties from 1990 – 91 to 1992 – 93. Study the diagram and answer the questions.

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

11. In which faculty was there a regular decrease in students' strength?

(1) Arts (2) Science
(3) Commerce (4) Law

12. The percentage of students in Science faculty in 1990 – 91 was

(1) 26.9% (2) 27.8%
(3) 29.6% (4) 30.2%

13. The total students strength in 1991 – 92 was how many times that of Commerce students in the same year ?

(1) 3 (2) 4
(3) 5 (4) 6

14. What was the percent increase in Science students from the year 1990 – 91 to 1992 – 93 ?

(1) 50% (2) $66\frac{2}{3}\%$
(3) 75% (4) 150%

Directions (15–18) : Study the following graph and answer the questions. Number on the top of a bar is the number of TVs.

(SSC CPO S.I. Exam. 06.09.2009)

Demand and Production of Colour T.Vs of five Companies for January 2006

15. What is the ratio of the companies having more demand than production to the companies having more production than demand ?

(1) 2 : 3 (2) 4 : 1
(3) 2 : 2 (4) 3 : 2

16. What is the difference between average demand and average production of the five companies taken together ?

(1) 1400 (2) 400
(3) 280 (4) 138

17. Demand of company D is approximately what per cent of demand of company E ?

(1) 12% (2) 20%
(3) 24% (4) 30%

18. What is the ratio of average demand to average production of companies B and D ?

(1) 1 : 5 (2) 2 : 5
(3) 3 : 5 (4) 4 : 5

Directions (19–22) : The following graph shows the production of cotton bales of 100 kg each (in lakhs) by different states A, B, C, D and E over the years. Study the graph and answer the following Questions.

(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

19. The production of State C in 2003-2004 is how many times its production in 2005-2006 ?

(1) 2.5 (2) 1.85
(3) 1.5 (4) 0.4

20. In which State(s) is there a steady increase in the production of cotton during the given period ?

(1) A and B (2) B and D
(3) A and C (4) D and E

21. How many kg of cotton was produced by State C during the given period ?
(1) 32,00,00,000 kg
(2) 42,50,00,000 kg
(3) 33,00,00,000 kg
(4) 35,00,00,000 kg

22. The number of States for which the production of cotton in 2005-2006 is less than or equal to the preceding year is
(1) 3 (2) 2
(3) 1
(4) There is no such State

Directions (23–26) : The following graph shows the production of wheat flour (in 1000 tonnes) by three companies *X*, *Y* and *Z* over the years. Study the graph and answer the questions.

(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

23. What is the difference between the production of company Z in 2004 and company *Y* in 2000 (in thousand tonnes) ?
(1) 100 (2) 200
(3) 20 (4) 2

24. What is the ratio of the average production of company *X* in the period 2002-2004 to the average production of company *Y* in the same period ?
(1) 1 : 1 (2) 15 :17
(3) 23 : 25 (4) 27 : 29

25. What is the percentage increase in the production of company *Y* from 2002 to 2003?
(1) $14\frac{2}{7}\%$ (2) $16\frac{6}{7}\%$
(3) 25% (4) 40%

26. The average production for five years was maximum for which company (s) ?
(1) X and Z both
(2) Y (3) Z
(4) X and Y both

Directions (27-31) : Study the following bar graph and answer the questions.

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

Gross Profit and Net Profit of a company (in lakhs of rupees) for the years 1994-1997:

27. The year in which the gross profit is double the net profit
(1) 1997 (2) 1995
(3) 1996 (4) 1994

28. The percentage of net profit of 1995 as compared to the gross profit in that year is
(1) 25.5% (2) 35.5%
(3) 37.5% (4) 42.5%

29. The difference of average gross profit and average net profit calculated for four years is
(1) ₹ 18.75 lakhs
(2) ₹ 19.75 lakhs
(3) ₹ 20.5 lakhs
(4) ₹ 22.5 lakhs

30. The ratio of gross profit to net profit in a year was greatest in the year
(1) 1994 (2) 1995
(3) 1996 (4) 1997

31. For the entire four years as shown, the ratio of total gross profit to total net profit is
(1) 13 : 4 (2) 11 : 6
(3) 11 : 5 (4) 9 : 4

Directions (32-35) : The bar graph, given here, shows the demand and production of colour televisions of five companies for Diwali season in the year 2009. Study the graph carefully and answer the questions based on the graph.

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

Demand and Production of Colour Televisions of Five Companies.

32. The ratio of the demand and production of colour televisions of company E is :
(1) 3 : 2 (2) 2 : 3
(3) 2 : 1 (4) 1 : 2

33. The demand of colour televisions of company B is appoximately what per cent of that of company C ?
(1) 60% (2) 25%
(3) 24% (4) 6%

34. The production of colour televisions of company D is how many times that of company A ?
(1) 1.9 (2) 1.8
(3) 1.5 (4) 2.3

35. The ratio of companies having more demand than production of colour televisions to those having more production than demand is :
(1) 2 : 3 (2) 4 : 1
(3) 1 :4 (4) 3 : 2

Directions (36-40) : Read the graph and answer the following questions.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

Income and Expenditure of a company over the years (in lakhs of rupees)

36. What is the difference in profit between 1983 and 1984 (in lakhs of rupees) ?
(1) No profit (2) 5
(3) 10 (4) 15

37. The number of years in which the income is more than the average income of the given years is
(1) One (2) Two
(3) Three (4) Four

38. The ratio of the average income of all the years to the average profit is
(1) 24 : 13 (2) 48 : 17
(3) 12 : 7 (4) 6 : 5

39. Percentage increase in profit in 1986 over 1982 is
(1) 150% (2) 120%
(3) 100% (4) 80%

40. The total income exceeds the total expenditure over the years 1982 to 1986 by
(1) 85 lakhs (2) 105 lakhs
(3) 115 lakhs (4) 120 lakhs

Directions (41-45) : The bar diagram given below shows the productions (in the unit of thousand pieces) of three types of biscuits by a company in the five consecutive years. Study the diagram and answer the following questions.

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

41. The percentage drop in the number of glucose biscuits manufactured from 1994 to 1995 is
(1) 10% (2) 15%
(3) 25% (4) 20%

42. The difference (in the unit of thousand pieces) between the total number of cream cracker biscuits manufactured in the years 1993, 1995 and 1997 and the total number of the biscuits of same type in the years 1994 and 1996 is
(1) 15 (2) 25
(3) 30 (4) 20

43. Total production of all the three types of biscuits was the least in the year
(1) 1993 (2) 1997
(3) 1996 (4) 1995

44. The production of all the three types of biscuits was maximum in the year
(1) 1995 (2) 1994
(3) 1996 (4) 1993

45. The ratio of production of glucose biscuits and total production of biscuits in that year was maximum in
(1) 1994 (2) 1993
(3) 1996 (4) 1997

Directions (46–50) : Read the graph and answer the following questions.

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

Demand and production of computers of a company for five months of 2007.

(Scale : 1 unit = 1 cm)

46. Which month has least demand of computers relative to production ?
(1) January (2) April
(3) May (4) February

47. What per cent of the demand of computers for the month of March is the demand of computers for the month of February ?
(1) 5% (2) 10%
(3) 7.5% (4) 15%

48. The production of computers in April is approximately how many times that of production in January ?
(1) 2.2 (2) 1.8
(3) 1.4 (4) 2.6

49. What is the difference between average demand and average production of computers of the five months taken together ?
(1) 400 (2) 700
(3) 540 (4) 260

50. What is the ratio of the month having more demand than production to those having more production than demand ?
(1) 4 : 1 (2) 2 : 3
(3) 3 : 2 (4) 1 : 4

Directions (51–54) : The following diagram shows the percentage of population of Hindus, Sikhs and Muslims with respect to total population in a town during 2005 to 2008. Study the diagram and answer the questions :

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

51. If the total population in 2007 was 80 lakh, then the number of Hindus in 2007 was (in lakh)
(1) 25 (2) 16
(3) 18 (4) 20

52. Percentage decrease in Hindu population from 2005 to 2008 is
(1) 50% (2) 40%
(3) 25% (4) 15%

53. Difference of percentage of population of Hindus in 2005 and 2008 is
(1) 20% (2) 15%
(3) 25% (4) 30%

54. If the total number of Hindus in 2008 was 12 lakh, the number of Muslims in 2008 was (in lakh)
(1) 18 (2) 12
(3) 24 (4) 16

55. Given below is a graph which shows the different occupations of men and women. The occupation that has larger proportion of women compared to the other three jobs is

(1) Clerical (2) Teaching
(3) Medical (4) Legal

(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

On-line Shopping
BOOKS AND MAGAZINES of Kiran Prakashan
Get books and magazines of Kiran Prakashan at your doorstep easily, log on our website :
www.kiranprakashan.com

Directions (56–59) : Bar-chart showing the Sales of Books (in 1000) from six-branches B_1 B_2, B_3, B_4, B_5 and B_6 of a Publishing Company in 2000 and 2001 is given below. Study the chart and answer the questions.

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

56. Total sales of branch B_6 for both the years is what percent of the total sales of branch B_3 for both the years?
(1) 71.11% (2) 73.17%
(3) 68.54% (4) 77.26%

57. What is the ratio of the total sales of branch B_2 for both the years to the totai sales of branch B_4 for both years ?
(1) 2 : 3 (2) 3 : 5
(3) 5 : 7 (4) 7 : 9

58. What percent of the average sales of branches B_1, B_2 and B_3 in 2001 is the average sales of branches B_1, B_3 and B_6 in 2000 ?
(1) 87.5% (2) 75%
(3) 77.5% (4) 85%

59. What is the average sale of books from all the branches for the year 2000?
(1) 70 (2) 80
(3) 70.5 (4) 80.5

Directions (60-64) : A health drink company prepares the drink of three different flavours P, Q, R. The production of three flavours over a period of six years has been expressed on bar graph provided below. Study the graph and answer the questions.

(SSC Graduate Level Tier-I Exam. 21.04.2013) & (SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

(Production of 3 different flavours of health drinks of a company in 6 years (in Lakh) bottles)

60. In which of the following years the percentage of rise or fall in production from the previous year is maximum for the flavour of Q?
(1) 2007 (2) 2009
(3) 2010 (4) 2006

61. The percentage of the total production of flavour R in 2007 and 2008 with respect to the production of flavour P in 2005 and 2006 is :
(1) 102.25% (2) 115.35%
(3) 133.33% (4) 97.67%

62. The average annual production of which flavour was maximum in the given period ?
(1) P and Q both
(2) Q only
(3) P and R both
(4) P only

63. What was the approximate decline in the production of flavour R in 2010 as compared to the production of 2008 in percentage ?

(1) 43.33% (2) 33.33%
(3) 30.33% (4) 53.33%

64. What is the difference between the average production of flavour Q in 2008, 2009 and 2010 from that of flavour P in 2005, 2006 and 2007 (in lakh bottles) ?

(1) 50 (2) 0.5
(3) 5.5 (4) 5

Directions (65–66) : In the following questions, a graphical representation of income and expenditure of 5 persons during the month of January has been given. Read the graph and answer the questions.

(SSC Constable (GD) Exam. 12.05.2013)

65. What is the average income of five persons per month ?

(1) ₹ 5775 (2) ₹ 6000
(3) ₹ 6150 (4) ₹ 6250

66. What is the income range of the persons ?

(1) ₹ 3000 (2) ₹ 3250
(3) ₹ 3750 (4) ₹ 4500

Directions (67–69) : The following bar diagram shows the percentage of Hindus, Sikhs and Muslims in a state during the years from 2004 to 2007. Examine the bar diagram and answer the following questions.

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

67. The ratio between the Hindu and Sikh population in 2004 was

(1) 3 : 5 (2) 1 : 2
(3) 2 : 3 (4) 3 : 4

68. If the total population of the state in 2004 was 5 lakhs, then the Hindu and Muslim population in that year was

(1) 200000 (2) 275000
(3) 250000 (4) 225000

69. If the total population of the state in 2005 was 5 million, then the Hindu population was [1 million = 10,00,000]

(1) 2000000 (2) 1250000
(3) 1500000 (4) 1750000

Directions (70–72) : Shown below is the multiple bar diagram depicting the changes in the roll strength of a college in four faculties from 2001-02 to 2003-04.

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

Study the above bar diagram and answer the questions.

70. The percentage of students in Science faculty in 2001- 2002 is

(1) 30.2% (2) 26.9%
(3) 27.8% (4) 29.6%

71. The percentage of students in Law faculty in 2003-04 is

(1) 14.8% (2) 18.5%
(3) 15.6% (4) 16.7%

72. Percentage of increase in Science students in 2003-04 over 2001-2002 is

(1) 75% (2) 50%
(3) 150% (4) $66\frac{2}{3}\%$

Directions (73-77) : Study the following multiple bar graph carefully and answer the questions

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

Survey of the number of working and non-working women over the years.

73. The number of non-working women in the year 2010 was approximately (correct up to an integer) what per cent of total number of working as well as non-working women in that year ?

(1) 23% (2) 25%
(3) 29% (4) 31%

74. What is the ratio of numbers of working women to the non-working women in the year 2009 ?

(1) 7 : 4 (2) 4 : 7
(3) 2 : 3 (4) 3 : 2

75. What is the ratio of the number of women working in the year 2006 to the number of women working in the year 2010 ?
(1) 5 : 17 (2) 17 : 5
(3) 17 : 10 (4) 10 : 17

76. In which year was the difference between the number of working and non-working women the highest?
(1) 2007 (2) 2008
(3) 2009 (4) 2010

77. In which year or years, the difference between the number of working and non-working women the lowest ?
(1) 2006 and 2007
(2) 2007 and 2008
(3) Only 2006
(4) Only 2007

78. The average Kharif production of the given years is

Production of pulses in Rabi and Kharif season (in million tonnes)

(1) 4 million tonnes
(2) 5 million tonnes
(3) 4.5 million tonnes
(4) 5.5 million tonnes

(SSC Graduate Level Tier-II Exam. 29.09.2013

Directions (79-80) : Study the following graph and answer the given questions

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

79. In which year, there has been a maximum percentage increase in the amount invested in raw materials as compared to the previous year ?
(1) 1996 (2) 1997
(3) 1998 (4) 1999

80. What was the difference between the average amount invested in raw materials during the given period and the average value of sales of finished goods during this period ?
(1) ₹ 62.5 lakhs (2) ₹ 68.5 lakhs
(3) ₹ 71.5 lakhs (4) ₹ 77.5 lakhs

Directions (81-82) : Student's strength of a college in Arts, Science and Commerce from 2004-05 to 2007-08 sessions are shown in the following bar graph. Study the graph and answer the questions.

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

81. The ratio of average number of students in Arts to the average number of students in Commerce is
(1) 12 : 5 (2) 10 : 7
(3) 7 : 4 (4) 48 : 35

82. The % increase in Science students in 2007-08 over 2006-07 was
(1) 10.1% (2) 11.1%
(3) 16.7% (4) 18.2%

Directions (83-87) : Read the bar graph given below and answer the questions.

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

83. Which of the above states is least producer of wheat ?
(1) Maharashtra (2) W.B.
(3) M.P. (4) Haryana

84. Which of the above states is the largest producer of rice ?
(1) U.P. (2) W.B.
(3) M.P. (4) Haryana

85. What fraction of rice is produced by Haryana of the total production of rice by all the above States?
(1) $\frac{1}{8}$ (2) $\frac{1}{12}$
(3) $\frac{1}{4}$ (4) $\frac{1}{6}$

86. In which of the above states the total production of rice and wheat is the least ?
(1) W.B. (2) M.P.
(3) Maharashtra (4) Haryana

87. Which of the above States is the largest producer of wheat ?
(1) M.P. (2) Haryana
(3) Maharashtra (4) U.P.

Directions (88–92) : Study the graph and answer the following questions.

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

Demand and Production of Colour T.V. sets of five companies A, B, C, D and E for October 2006

88. What percent of the demand of company C is that of the company B ?
(1) 14% (2) 20%
(3) 24% (4) 26%

89. What is the difference between average demand and average production of the companies taken together ?
(1) 1400 (2) 400
(3) 280 (4) 138

90. The average production of the companies A, B, C and that of the companies D, E are in the ratio :
(1) 85 : 147 (2) 86 : 147
(3) 86 : 149 (4) 87 : 149

91. What is the ratio of companies having more demand than production to those having more production than demand ?
(1) 2 : 3 (2) 4 : 1
(3) 1:4 (4) 3 : 2

92. How many times of the production of company A is that of the company D ?
(1) 1.4 (2) 1.5
(3) 1.8 (4) 2.5

Directions (93–94) : The following Bar Diagram depicts figures for some agricultural imports from January-May, 2008. Answer (as closely as possible) the questions using the date provided here

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

Agricultural Imports - January to May

93. What is the average cost of potato import in February and March?
(1) ₹ 3,960 (2) ₹ 5,960
(3) ₹ 1,280 (4) ₹ 4,440

94. What was the total cost (in ₹) of wheat import in March?
(1) ₹ 3,212 (2) ₹ 5,616
(3) ₹ 7,042 (4) ₹ 2,224

Directions (95-98) : The graph shows the result of 10th class students of a school for 4 years. Study the graph and answer the questions :

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

95. The number of students appeared for the 10th class exam in the year 2002 is
(1) 180 (2) 195
(3) 200 (4) 120

96. The percentage increase of first class in the year 2003 over the year 2002 is approximately
(1) 12% (2) 0%
(3) 10% (4) 9%

97. The year in which the maximum number of students appeared for the 10th class exam is
(1) 2001 (2) 2002
(3) 2003 (4) 2000

98. The ratio of students who scored second class to the total students appeared in the year 2000 is
(1) 3 : 16 (2) 4 : 17
(3) 5 : 16 (4) 11 : 16

Directions (99-104) : Study the graph and answer the questions.

(SSC CGL Tier-I Exam. 19.10.2014) (Ist Sitting)

99. In which year the sale of cool-sip is minimum ?
(1) 1990 (2) 1992
(3) 1993 (4) None of the above

100. In case of which soft drink was the average annual sale maximum during the period 1988-1993 ?
(1) Pep-up only
(2) Pep-up and Dew-drop
(3) Cool-sip only
(4) Cool-sip and Pep-up

101. What was the approximate percent drop in the sale of Pep-up in 1990 over its sale in 1989 ?
(1) 5 (2) 14
(3) 12 (4) 20

102. What was the approximate percent increase in sales of Cool-sip in 1990 over its sales in 1989 ?
(1) 100 (2) 50
(3) 171 (4) 150

103. In which year sale of Dew-drop is maximum ?
(1) 1988 (2) 1992
(3) 1989 (4) 1993

104. In case of which soft drink was the average annual sale minimum during the period 1988-1993 ?
(1) Pep-up only
(2) Cool-sip only
(3) Dew-drop only
(4) Dew-drop and Cool-sip

Directions (105-108) : Study the following graph which shows income and expenditure of a company over the years and answer the questions.

(SSC CGL Tier-I Exam. 19.10.2014)

105. The difference in profit (in Rs. crores) of the company during 2007 and 2008 is
(1) 5 (2) 10
(3) 15 (4) 20

106. In how many years was the expenditure of the company more than the average expenditure of the given years ?
(1) 4 (2) 3
(3) 2 (4) 1

107. The percentage increase in income of the company from 2007 to 2008 is
(1) 30 (2) 25
(3) $33\frac{1}{3}$ (4) $42\frac{6}{7}$

108. Ratio of total income to total expenditure of the company over the years is
(1) 21 : 25 (2) 25 : 21
(3) 26 : 21 (4) 25 : 22

Directions (109–113) : A watch company produces four different products. The sale of these products in lakhs during 2005 and 2010 are shown in the following bar diagram. Study the graph and answer the questions.

(SSC CGL Tier-II Exam. 21.09.2014)

109. The sales in percentage of wrist watch in 2010 more than the sales of table clock in 2010 was nearly by
(1) 26.7% (2) 27.7%
(3) 28.7% (4) 21.7%

110. The ratio of sales of stop watch in 2010 to the sale of table clock in 2005 is
(1) 6 : 19 (2) 7 : 6
(3) 19 : 6 (4) 7 : 19

111. The sales of table clock in 2005 was less than the sales of wall clock in 2005 is nearly by
(1) 70.05% (2) 69.05%
(3) 68.05% (4) 62.05%

112. During the period 2005-2010 the minimum rate of increase in sales is in the product of
(1) Wrist watch (2) Table clock
(3) Stop watch (4) Wall clock

113. The sales have increased by nearly 135% from 2005 to 2010 in the product of
(1) Table clock (2) Wrist watch
(3) Stop watch (4) Wall clock

Directions (114-118) : Study the bar diagram and answer the following questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

Demand and Production of colour TVs of five companies A, B, C, D and E.

(Number on the top of a bar is the number of colour

114. The ratio of the number of companies having more demand than production to the companies having more production than demand, is
(1) 2 : 3 (2) 4 : 1
(3) 1 : 1 (4) 3 : 2

115. The difference between average demand and average production of the five companies taken together is
(1) 1400 (2) 400
(3) 280 (4) 138

116. The percentage of the demand of company D as compared to the demand of company E is
(1) 12 (2) 24
(3) 20 (4) 30

117. The ratio of average demand to average production of companies B and D is
(1) 1 : 5 (2) 2 : 5
(3) 3 : 5 (4) 4 : 5

118. The ratio of demand and production is maximum in factory
(1) E (2) C
(3) A (4) D

Directions (119-122) : Study the graph carefully and answer the following questions.

(SSC CHSL DEO & LDC Exam. 02.11.2014) (IInd Sitting)

119. The production of State D in 1993–94 is how many times its production in 1994–95 ?
(1) 1.33 (2) 0.75
(3) 0.56 (4) 1.77

120. Which of the following statement is false ?
(1) State A and E showed the same production in 1993–94.
(2) There was no improvement in the production of cotton in state B during 1994–95.
(3) State A has produced maximum cotton during the given period.
(4) Production of state C and D together is equal to that of state B during 1993–94.

121. How many states showing below average production in 1992–93 showed above average production in 1993–94 ?
(1) 4 (2) 2
(3) 3 (4) 1

122. What is the average production of the four states in the year 1994–95 taken together ?
(1) 12.3 (2) 14.6
(3) 15.6 (4) 16.3

Directions (123-127) : The subjectwise number of applicants for the year 2008 and 2009 in a college is given in the following chart. Study the graph and answer the questions. (SSC CHSL DEO & LDC Exam. 02.11.2014) (IInd Sitting)

123. The subject for which growing of demand is maximum is
(1) Chemistry
(2) Mathematics
(3) Computer
(4) Biotechnology

124. The subject for which growing of demand is minimum is
(1) Statistics
(2) Zoology
(3) Botany
(4) Microbiology

125. The number of Chemistry seeking applicants increased by
(1) 17.26 %
(2) 18.89 %
(3) 19.25 %
(4) 21.08 %

126. The number of Physics seeking applicants increased by
(1) 17.26 %
(2) 18.89 %
(3) 19.25 %
(4) 21.08 %

127. The number of Mathematics seeking applicants increased by
(1) 17.26 %
(2) 18.89 %
(3) 19.25 %
(4) 21.08 %

CLEAR YOU DOUBTS
If you have any confusion/doubt regarding the published articles and other materials in the books and magazines of KIRAN PRAKASHAN, share it with us on
KIRAN PRAKASHAN
problems@kiranprakashan.com

Directions (128 – 131) : Sales of Books (in thousand numbers) from Six Branches – B1, B2, B3, B4, B5 and B6 of a publishing Company in 2000 and 2001. Study the graph and answer the questions.
(SSC CHSL DEO & LDC Exam. 9.11.2014)

128. Total sale of branches B1, B3 and B5 together for both the years (in thousand) is

(1) 250 (2) 310
(3) 435 (4) 560

129. Find the ratio of the total sales of branch B2 for both years to the total sales of branch B4 for both years.

(1) 2 : 3 (2) 3 : 5
(3) 4 : 5 (4) 7 : 9

130. The average sale of branches B1, B3 and B6 in 2000 is what percent of the average sale of branches B1, B2 and B3 in 2000 ?

(1) 87.5 (2) 75
(3) 77.5 (4) 82.5

131. Find the percentage increase in the sales of books of branch B3 in the year 2001 than the branch B2.

(1) 69.2 (2) 50.8
(3) 40.9 (4) 65.7

Directions (132 - 136) : Study the bar diagram and answer the questions.

(SSC CHSL DEO & LDC Exam. 16.11.2014)

Total number of boys and girls in five different departments of a college

132. The percentage of the girls from Biology Department compared to the total number of girls from all the other Departments together is

(1) $37\frac{1}{2}$ (2) 37
(3) $36\frac{1}{2}$ (4) $35\frac{1}{2}$

133. The difference between the total number of boys and the total number of girls from all the Departments together is

(1) 540 (2) 520
(3) 460 (4) 440

134. The average number of boys from all the departments together is

(1) 123 (2) 132
(3) 134 (4) 142

135. The percentage of the boys from Biology Department compared to the total number of boys from all the Departments together is

(1) $33\frac{1}{2}$ (2) 50
(3) $33\frac{1}{3}$ (4) 30

136. The respective ratio of number of girls from Philosophy Department to the number of girls from Psychology Department is

(1) 7 : 11 (2) 11 : 7
(3) 7 : 10 (4) 6 : 11

Directions (137 – 141) : Study the double bar graph given below and answer the questions.

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

: No. of students participating in the school exhibition in the year 2013

: No. of students participating in the cultural events of school in the year 2013 of a particular school

137. The class having maximum number of participants in exhibition is

(1) Class IX (2) Class VIII
(3) Class VII (4) Class VI

138. The average of the number of students participating in cultural events is

(1) 48.75 (2) 52.5
(3) 45 (4) 50

139. The average of the number of students participating in exhibition is

(1) 48.75 (2) 52.5
(3) 45 (4) 50

140. The ratio of the participants in exhibition of class IX with the total participants of class IX is

(1) 5 : 7 (2) 5 : 14
(3) 1 : 4 (4) 3 : 5

141. The percentage of students of class VIII participating in cultural event out of total participants of cultural event is

(1) 30% (2) 25%
(3) 35% (4) 40%

Directions (142-145) : The following bar chart represents the number of first year B. Com. students of St Xavier's College using different companies' smart phones. Study bar chart and answer the questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

The bar chart representing the number of students using different smart phones.

142. The ratio of the number of boys to the number of girls using the smart phones of Samsung and Sony together is
(1) 12 : 13 (2) 13 : 12
(3) 14 : 11 (4) 11 : 14

143. What percentage of boys are using the smart phones of Samsung ?
(1) 16.52% (2) 17.52%
(3) 18.52% (4) 15.52%

144. What percentage of girls are using the smart phones of Nokia ?
(1) 33.58% (2) 32.58%
(3) 30.58% (4) 31.58%

145. The difference between the total number of students using smart phones of Samsung combined together and the total number of students using smart phones of Sony taken together is
(1) 20 (2) 60
(3) 80 (4) 40

Directions (146–149) : Study the following graph which shows income and expenditure of a company over the years 2005 – 2009 and answer the questions.

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

146. The difference in profit (Rs. in crores) of the company during 2006 and 2007 is
(1) 10 (2) 15
(3) 20 (4) 25

147. In how many years was the income of the company less than the average income of the given years ?
(1) 4 (2) 3
(3) 2 (4) 1

148. The percentage increase in expenditure of the company from 2007 to 2008 is
(1) 20 (2) 25
(3) 30 (4) 35

149. Profit of the company was maximum in the year
(1) 2009 (2) 2008
(3) 2006 (4) 2005

Directions (150 - 154) : In the following bar diagram sales of books (in thousand numbers) from six branches – B1, B2, B3, B4, B5 and B6 of a publishing company in 2009 and 2010 have been shown. Study the graph and answer the questions.

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting (TF No. 545 QP 6)

150. The ratio of the total sales of branch B2 for both the years to the total sales of branch B4 for both the years is
(1) 7 : 9 (2) 2 : 3
(3) 4 : 5 (4) 3 : 5

151. Total sales of branch B6 for both the years is x per cent of the total sales of branch B3 for both the years. The value of x is
(1) 68.54% (2) 73.17%
(3) 71.11% (4) 75.55%

152. x% of the average sales of branches B1, B2 and B3 in 2010 is the average sales of branches B1, B3 and B6 in 2009. The value of x is
(1) 77.5% (2) 87.5%
(3) 82.5% (4) 75%

153. The average sales of all the branches for the year 2009 is
(1) 73 (2) 83
(3) 80 (4) 88

154. Total sales of branches B1, B3 and B5 together for both the years is

(1) 250 (2) 310
(3) 435 (4) 560

Directions (155 – 158) : Study the bar diagram and answer the given questions.

(SSC CGL Tier-II Exam. 12.04.2015 (TF No. 567 TL 9)

155. Ratio of highest and lowest marks obtained in first term among all the subjects is

(1) 7 : 9 (2) 9 : 7
(3) 10 : 7 (4) 7 : 10

156. Average marks obtained by the students for all subjects in second term is

(1) 65 (2) 73
(3) 62 (4) 72

Directions (157–161): Study the following graph which shows the production (in thousand) of different items, and answer the questions.

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) (TF No. 789 TH 7)

157. The total number of all products produced by the company in the year 2006 and 2008 together is

(1) 107500 (2) 105700
(3) 10750 (4) 1075

158. The average number of pendrives produced by the company over all the years together is

(1) 1700 (2) 170000
(3) 17000 (4) 85000

159. The difference between the total number of CD and pen-drives produced by the company together in the year 2008 and the number of keyboards produced by the company in the year 2006 is

(1) 3500 (2) 35000
(3) 4000 (4) 40000

160. The ratio between the number of keyboards produced by the company in the year 2006, 2007 and 2008 respectively is

(1) 1 : 2 : 3 (2) 3 : 4 : 5
(3) 3 : 6 : 4 (4) 3 : 4 : 6

161. The respective ratio between the number of CDs produced by the company in the year 2009 and the number of keyboards produced by the company in the year 2005 is

(1) 9 : 10 (2) 11 : 10
(3) 10 : 9 (4) 10 : 11

Directions (162–165) : Study the bar diagram and answer the questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) (TF No. 8037731)

162. Percentage fall in value from 2000 to 2001 is

(1) 25% (2) 50%
(3) 75% (4) 40%

163. The difference between the bags exported in 1999 and 2000 was

(1) 1,00,000,00
(2) 1,50,000,00
(3) 50,000,00
(4) 2,00,000,00

164. Value per bag was minimum in the year

(1) 2001 (2) 1999
(3) 1996 (4) 1997

165. The approximate percentage increase in quantity from 1997 to 1998 was

(1) 26.9% (2) 27.8%
(3) 26.5% (4) 27.3%

Directions (166–169) : Study the following bar diagram carefully and answer the following questions.

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

The number of the production of electronic items (TVs and LCDs) in a factory during the period from 2009 to 2013.

166. The total number of products of electronic items is maximum in the year

(1) 2009 (2) 2010
(3) 2011 (4) 2013

167. The ratio of production of LCDs in the year 2011 and 2013 is

(1) 3 : 4 (2) 4 : 3
(3) 2 : 3 (4) 1 : 4

168. The difference between averages of production of TVs and LCDs from 2009 to 2012 is

(1) 600 (2) 700
(3) 800 (4) 900

169. The ratio of production of TVs in the years 2009 and 2010 is

(1) 7 : 6 (2) 6 : 7
(3) 2 : 3 (4) 3 : 2

Directions (170 – 173) : Given here is a multiple bar diagram of the scores of four players in two innings. Study the diagram and answer the questions.

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

170. The average runs of two innings of the player who scored highest in average are :
(1) 70 (2) 80
(3) 85 (4) 75

171. The average runs in two innings of the player who has scored minimum in the second innings are:
(1) 30 (2) 60
(3) 50 (4) 40

172. The total scores in the first innings contributed by the four players is :
(1) 190 (2) 210
(3) 220 (4) 200

173. The average score in second innings contributed by the four players is :
(1) 40 (2) 50
(3) 30 (4) 60

Directions (174–177) : Study the following bar–diagram and answer the questions.

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

Electricity units consumed by a family in two consecutive years during July to November.

174. In how many months in 2012, the consumption of electric units was more than the average units consumption in that year ?
(1) 4 (2) 5
(3) 2 (4) 3

175. The average electric consumption by the family during these 5 months in 2013 is
(1) 470 units (2) 400 units
(3) 440 units (4) 450 units

176. The maximum difference in the units consumption between these two years has been found in the month of
(1) August (2) July
(3) October (4) November

177. The total units consumption in the year 2013 during these 5 months, in respect of the same in the previous year has been
(1) increased by 2.27%
(2) decreased by 2.27%
(3) found unaltered
(4) increased by 2.22%

Directions (178–181): Study the following bar diagram carefully and answer the four questions.

(SSC CGL Tier-I Re-Exam, 30.08.2015)

Production of buses of company A and company B over the given years.

178. In which year for the company A the percentage increase of production of buses with respect to the previous year is maximum?
(1) 2010 (2) 2012
(3) 2011 (4) 2013

179. The average production (in thousand) of the company B over the years 2009, 2011, 2012 is
(1) 87.33 (2) 80.67
(3) 90.33 (4) 84

180. The average production (in thousand) of company A over the years 2010, 2011, 2012, 2013 is
(1) 74 (2) 81.25
(3) 85.5 (4) 81

181. The ratio of the average production of company A in 2009 and 2010 to the average production of company B in the same years is
(1) 147 : 170 (2) 81 : 95
(3) 67 : 76 (4) 85 : 99

Directions (182 – 186) : Study the bar chart given below and answer the following questions :

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

182. In 2001, the approximate percentage of profit/loss of all the five companies taken together is equal to
(1) 6.88% loss (2) 4.65% profit
(3) 6.48% profit (4) 4% loss

183. If the income of compnay Q in 2001 was 10% more than that in 2000 and the company had earned a profit of 20% in 2000, then its expenditure in 2000 (in crores Rs.) was :
(1) 34.34 (2) 28.28
(3) 29.09 (4) 32.32

184. The company earning the maximum percentage of profit in the year 2001 is :
(1) Q (2) M
(3) N (4) P

185. The companies M and N together had a percentage of profit/loss of :
(1) No loss and no profit
(2) 12% loss (3) 10% loss
(4) 10% profit

186. For company R, if the expenditure had increased by 20% in the year 2001 from the year 2000 and the company had earned profit of 10% in 2000, the company's income in 2000 was (in crore Rs.) :
(1) 41.67 (2) 35.75
(3) 37.25 (4) 38.5

Directions (187–191) : The following chart represents Demand and Production for 5 companies ABCDE. On the basis of the graph answer the questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

187. If company A desires to meet the demand by purchasing surplus production of company, then the most suitable company is :
(1) C (2) D
(3) E (4) B

188. If x% of demand for company C equals demand for company B, then x equals
(1) 24 (2) 20
(3) 60 (4) 4

189. If the production of company D is h times of the production of company A. Then h equals :
(1) 1.5 (2) 2.5
(3) 1.2 (4) 1.8

190. The difference between average demand and average production of the five companies taken together is :
(1) 400 (2) 280
(3) 130 (4) 620

191. The ratio of the number of companies having more demand than production to those having more production than demand is :
(1) 4 : 1 (2) 2 : 2
(3) 3 : 2 (4) 2 : 3

Directions (192-196) : The bar graph provided below gives the data of the production of paper (in lakh tonnes) by three different companies X, Y and Z over the years. Study the bar chart and answer the following questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

	1996	1997	1998	1999	2000
X	30	45	25	50	40
Y	25	35	35	40	50
Z	35	40	45	35	35

192. The percentage of production of company Z to the production of company Y is maximum in :
(1) 2000 (2) 1996
(3) 1999 (4) 1998

193. The ration of the average production of company X in the period 1998-2000 to the average production of company Y in the same period is :
(1) 27 : 29 (2) 23 : 25
(3) 25 : 26 (4) 24 : 27

194. The average production for five years is maximum for which company?
(1) X and Z (2) X
(3) Z (4) Y

195. The percentage increase in the production of company Y from 1996 to 1999 is :
(1) 60% (2) 50%
(3) 55% (4) 40%

196. The difference between the production of company Z in 1998 and company Y in 1996 is :
(1) 25,00,000 tonnes
(2) 10,00,000 tonnes
(3) 15,00,000 tonnes
(4) 20,00,000 tonnes

Directions (197–200) : A constituency is divided in four regions A, B, C and D. Two candidates X and Y contested the last election from that constituency. The adjoining graph gives the break–up of voting in the four regions. Study the graph and answer the following questions.

(SSC CGL Tier-I (CBE) Exam. 09.09.2016) (Ist Sitting)

197. Approximately how much percent of voters voted in favour of X?
(1) 45.4 (2) 47.5
(3) 50 (4) 225

198. Approximately how much percent of voters did not caste their votes?
(1) 4.9 (2) 4.5
(3) 0.23 (4) 23

199. In region B, Y gets A% more votes than X. Find the value of A.
(1) 24% (2) 21%
(3) 19% (4) 15%

200. Nearly what percentage of his total votes did X receive from region B?
(1) 30 (2) 31
(3) 32 (4) 35

Directions (201–204) : The data given in Bar diagram relate to the department wise admission of 320 students to B.Sc. (Honours) first year classes of a certain college in the given five subjects. Study the graph and answer the questions.

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 20.03.2016) (IInd Sitting)

201. The subject in which the difference in the number of male and female students is minimum in :
(1) Economics (2) Physics
(3) Statistics (4) Chemistry

202. The difference of the choice of the subject between male and female students is maximum for the subject.
(1) Physics (2) Statistics
(3) Economics (4) Chemistry

203. The total number of male students who got admitted in Mathematics and Economics as compared to the total number of female students getting admission in Mathematics and Economics is :
(1) less by 17%
(2) more by 4.2%
(3) more by 14.8%
(4) more by 12.8%

204. The subject which the female students are finding difficult as compared to other subjects is :
(1) Statistics
(2) Economics
(3) Mathematics
(4) Chemistry

Direction (205) : Study the following bar graph showing the percentage of children who can read at first grade level, grouped by their grade level in an Indian state.

(SSC CAPFs (CPO) SI & ASI, Delhi Police Exam. 05.06.2016) (Ist Sitting)

For example, in 2008, 82% of the children from Standard 3 could read a text from Standard 1. Now answer the following question based on this graph.

205. In the year 2010, what is the approximate value of average of all Std 1, 2, 3, 4, 5 children who could read the Std 1 text?

(1) 49.2% (2) 57%

(3) 33% (4) Data Insufficient

Direction (206–209) : The following figure shows the number of students (in thousands) admitted and passed out per year in a college during years 2000 to 2004. Study the figure and answer the questions.

(SSC CGL Tier-I (CBE) Exam. 29.08.2016) (IInd Sitting)

206. The percent increase in the number of students admitted in the year 2003 over that in 2001 is

(1) 133.3 (2) 33.3

(3) 40.3 (4) 66.7

207. During 2000 to 2003, the ratio of the total number of the students passed out to the total number of students admitted is

(1) $\frac{17}{23}$ (2) $\frac{17}{6}$

(3) $\frac{11}{23}$ (4) $\frac{5}{7}$

208. In which of the two years, the pass percentage of students was between 60 and 70 ?

(1) 2000 and 2001

(2) 2003 and 2004

(3) 2001 and 2002

(4) None of these

209. The ratio of the number of students admitted in the year 2002 to the average of the number of students passed out in the years 2003 and 2004. is

(1) 7 : 8 (2) 8 : 9

(3) 9 : 8 (4) 8 : 7

Directions (210–213) : Study the bar diagram and answer the following questions.

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (Ist Sitting)

210. Average marks obtained in Physics for two terms is

(1) 80.5 (2) 82.5

(3) 72.5 (4) 83.5

211. Difference of marks obtained in both the terms by the students is maximum in

(1) English

(2) Physics

(3) Biology

(4) Mathematics

212. What is the percentage of marks obtained in Chemistry for both the terms ?

(1) 76.5 (2) 56.7

(3) 75.6 (4) 67.5

213. The ratio of the average of the marks obtained in Biology for two terms to the average of the marks obtained in English and Mathematics for first term only is

(1) 43:92 (2) 39:42

(3) 29:34 (4) 23:94

Directions (214–217) : Study the following Bar graph and answer the questions. The Bar Graph gives the annual rates of inflation in percentages for 1975 and 1987.

(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

214. From 1975 to 1987 , inflation rate increased in the third world countries approximately by
(1) 10% (2) 20%
(3) 30% (4) 36%

215. The change in rate of inflation was least in which of the following ?
(1) Developed Nations
(2) United Kigdom
(3) World (4) Third world

216. Comparing the figures for USA vis-a-vis the developed nations, it can be concluded that.
(1) USA had better control on inflation
(2) Developed nations had better control on inflation
(3) The inflation rate continues to be the same for USA and developed nations
(4) No conclusions can be drawn

217. In the year 1987 , the inflation rate in the third world countries vis-a-vis the world jumped approximately by
(1) 135% (2) 126%
(3) 122% (4) 200%

Directions (218–221) : The Bar graphs represents the number of road accidents due to bus and car during the years 2008 2013. Study the graph and answer the questions.

(SSC CGL Tier-I (CBE) Exam. 31.08.2016) (IInd Sitting)

218. The total number of road accidents in the year 2009, 2011 and 2013 combined together is
(1) 180000
(2) 110000
(3) 70000
(4) 160000

219. The respective ratio of the road accidents due to bus in the year 2008 to that by car in the year 2012 is
(1) 2 : 1
(2) 1 : 2
(3) 2 : 3
(4) 3 : 4

220. The respective ratio between the accidents by cars in the year 2012, 2010 and 2008 is
(1) 2 : 5 : 4
(2) 4 : 5 : 4
(3) 4 : 3 : 2
(4) 4 : 5 : 2

221. The ratio of the averages of the road accidents due to buses to that by cars in the year 2008, 2011 and 2013 is
(1) 4 : 5
(2) 5 : 4
(3) 5 : 1
(4) 1 : 4

Directions (222–225) : Study the following bar graph carefully and answer the questions.

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

222. In 1990, how many more students were enrolled at State University than at Central University?
(1) 1505 students
(2) 1650 students
(3) 2000 students
(4) 1980 students

223. Total enrolments in both State University and Central University during the year 1980, 1990 and 2000 is
(1) 80000
(2) 66000
(3) 70000
(4) 76000

224. The ratio of the total enrolments in the year 1980 and 2000 at the State University and Central University is
(1) 4 : 5
(2) 2 : 3
(3) 6 : 5
(4) 5 : 6

225. The tuition fee at State University in the year 2000 was Rs.6500 per enrolment. What was the total revenue collected from the tuition fee at State University during that year?
(1) Rs.80,000,000
(2) Rs.78,000,000
(3) Rs.65,000,000
(4) Rs.56,000,000

Directions (226–229) : Shown below is the multiple bar diagram depicting the changes in the student's strength of a college in four faculties from 1990–91 to 1992– 93. (Scale 1 cm = 100)

(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

Read Every Month
RENU GENERAL KNOWLEDGE
& WORLD VISION
(Hindi & English Medium)

226. A regular decrease in student's strength was in the faculty of
(1) Arts (2) Science
(3) Commerce (4) Law

227. How much per cent was the increase in science students in 1992–93 over 1990–91?
(1) 50% (2) 150%
(3) $66\frac{2}{3}\%$ (4) 75%

228. The respective ratio of the number of commerce students to the number of law students from 1990–91 to 1992–93 is :
(1) 6 : 7 (2) 7 : 6
(3) 14 : 1 (4) 2 : 8

229. During which year the strength of arts faculty was minimum ?
(1) 1990–91 (2) 1991–92
(3) 1992–93 (4) None of these

Directions (230-233) : The bar graph shows the number of males and females (in crores) in India during 1951–1991. Read the graph and answer the following questions

(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IIIrd Sitting)

230. What was the approximate percentage of female population in India during 1991 ?
(1) 48.23 (2) 48.02
(3) 48.03 (4) 48.33

231. What was the approximate number of males in India in 1971 per thousands females ?
(1) 913 (2) 1075
(3) 1077 (4) 1175

232. What is the ratio of the number of females in India in 1961 per thousand males to the number of males in India in 1991 per thousand females?
(1) 943 : 1077 (2) 1077 : 943
(3) 1073 : 913 (4) 913 : 1073

233. Assuming that the rate of increase in the total population in India during 1991-2001 remains the same as that was during the period 1981-1991, estimate the total population in India in 2001.
(1) 105.62 crores
(2) 106.25 crores
(3) 106.52 crores
(4) 105.26 crores

Directions (234-237) : Student strengths of a college in Arts, Science and Commerce from 2004-2005 to 2007-2008 session are shown in the following bar graph. Study the graph and answer the questions that follow.

(SSC CGL Tier-I (CBE) Exam. 08.09.2016 (IInd Sitting)

234. The ratio of average number of students in Science to the average number of students in Commerce is :
(1) 10 : 7 (2) 7 : 4
(3) 12 : 5 (4) 48 : 35

235. The increase in the number of Arts students in 2007-2008 session over that in 2005-2006 session is :
(1) 25% (2) 21.42%
(3) 27.27% (4) 37.5%

236. Approximate percentage of students in Science stream during the session 2006-2007 is :
(1) 42.31% (2) 40.91%
(3) 41.26% (4) 31.42%

237. Percentage increase in total number of students in 2007-2008 session over that in 2004-2005 session is approximately
(1) 29.71 (2) 25.65
(3) 10.56 (4) 20.83

Directions (238–242) : The following bar-diagram shows total number of males and females in five different organisations. Study it carefully to answer the questions.

(SSC CGL Tier-II (CBE) Exam. 12.01.2017)

238. What is the difference between the total number of females and the total number of males from all the organisations together?
(1) 2005 (2) 2050
(3) 2500 (4) 2055

239. By how much percentage is the average number of females from all the organisations together is more than the number of males in organisation 'D'?
(1) 30% (2) 38%
(3) 40% (4) 45%

240. What is the ratio of the number of females from the organisations B and C to the number of males from the organisations D and E?
(1) 12 : 11 (2) 12 : 15
(3) 11 : 15 (4) 15 : 11

241. Males from organisations A and B together form what per cent of total number of males from organisations C, D and E together?
(1) 78.04% (2) 87.44%
(3) 47.08% (4) 74.08%

242. What is the ratio of average number of females from the organisations A, B and C to the average number of males from the organisations C, D and E?
(1) 42 : 41 (2) 41 : 42
(3) 40 : 41 (4) 41 : 40

TYPE-VI

Directions (1–5) : The histogram shows the marks obtained by 45 students of a class. Look at the histogram and answer the questions.

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

1. How many students have obtained marks 50 and above ?
(1) 9 (2) 10
(3) 11 (4) 16

2. If the pass mark be 30, what is the number of failures ?
(1) 2 (2) 6
(3) 18 (4) 20

3. If the pass mark be 30, what is the percentage of successful students ?
(1) 75% (2) 60%
(3) 50% (4) 40%

4. How many students have obtained marks less than 10 ?
(1) 2 (2) 10
(3) 1 (4) 4

5. How many students have obtained 30 or more marks but less than 40 ?
(1) 3 (2) 4
(3) 5 (4) 6

Directions (6–10) : Study the following histogram and answer the questions.

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

6. The total number of persons in the age group of 15 years to 45 years is :
(1) 450 (2) 800
(3) 1000 (4) 500

7. The number of persons in the age group 20 – 30 years is :
(1) 475 (2) 400
(3) 300 (4) 700

8. The ratio of the number of persons between the age group of 20 – 25 and 30 – 35 is :
(1) 1 : 3 (2) 2 : 1
(3) 10 : 3 (4) 6 : 1

9. The ratio of maximum population in an age group to the total number of persons under study is :
(1) 4 : 5 (2) 9 : 10
(3) 9 : 20 (4) 2 : 5

10. The percentage of population under study which is in the age group of 40 – 45 is :
(1) 2.5% (2) 3.5%
(3) 1.5% (4) 5%

Directions (11–14) : Study the bar-graph and answer the following questions.

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

Bar-graph showing the wages of workers in a factory
Monthly wages in Rupees

11. The total number of workers in the factory is
(1) 42 (2) 48
(3) 50 (4) 46

12. The ratio of the number of workers placed in the lowest wage group to that of the workers in the highest wage group is
(1) 3 : 7 (2) 8 : 9
(3) 3 : 4 (4) 2 : 3

13. The total amount of money (approximately) needed to pay the monthly wages of all the workers is
(1) ₹ 69,100 (2) ₹ 71,600
(3) ₹ 70,500 (4) ₹ 69,500

14. In which wage group, is the amount of money needed to pay the monthly wages the highest ?
(1) 1400 –1500 (2) 1500 –1600
(3) 1700 –1800 (4) None of these

Directions (15-16) : The Histogram shown the marks of 50 students in an examination. Examine the diagram and answer the questions. [Marks are given in integers only].

(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

15. How many students obtained more than 39 but below 60?
(1) 8 (2) 6
(3) 10 (4) 12

16. What per cent of students did obtain marks above 60?
(1) 60% (2) 80%
(3) 70% (4) 75%

Directions (17-20) : Study the following Histogram and answer the following questions.

(SSC Graduate Level Tier-I Exam. 21.04.2013)

17. The total number of students involved in the data is
(1) 33 (2) 32
(3) 43 (4) 42

18. The maximum number of students got the marks in the interval of
(1) 10 – 20 (2) 20 – 30
(3) 30 – 40 (4) 40 – 50

19. The least number of students got the marks in the interval
(1) 40 – 50 (2) 20 – 30
(3) 10 – 20 (4) 0 – 10

20. The ratio of the students obtaining marks in the first and the last interval is
(1) 5 : 4 (2) 6 : 5
(3) 4 : 5 (4) 3 : 4

Directions (21– 24) : Study the graph carefully and answer the questions.

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

The graph shows production of an item (in tonnes) during certain years

21. The production in 2006-07 in comparison to the production in 2002-03 increased by
(1) 150% (2) 110%
(3) 120% (4) 125%

22. The production decreased from 2004-05 to 2005-06 by
(1) $11\frac{1}{9}\%$ (2) $8\frac{1}{9}\%$
(3) $9\frac{1}{9}\%$ (4) $10\frac{1}{9}\%$

23. The year in which production increased the lowest as compared to the previous year is
(1) 2007 – 08 (2) 2003 – 04
(3) 2004 – 05 (4) 2006 – 07

24. The production from 2003 – 04 to 2007 – 08 increased by
(1) 125% (2) 50%
(3) 75% (4) 100%

Direction (25) : Study the histogram of weight distribution of different men and answer question based on it.

25. Average number of men per interval who participated in this survey is
(1) 200 (2) 180
(3) 214 (4) 194
(SSC Graduate Level Tier-II Exam. 29.09.2013

Directions (26-30) : The histogram, given below, shows the number of families of a locality having various daily incomes, as obtained by a survey. Observe the graph and answer the questions based on it.
(SSC SAS Exam. 26.06.2010 (Paper-1)

26. In all, how many families were surveyed ?
(1) 235 (2) 220
(3) 200 (4) 195

27. The number of families, whose daily incomes are ₹ 800 or above, is
(1) 50 (2) 55
(3) 65 (4) 80

28. The number of families, whose daily incomes are below ₹ 200, is
(1) 25 (2) 20
(3) 15 (4) 10

29. The number of families, whose daily incomes are between ₹ 500 and ₹ 800, is
(1) 35 (2) 40
(3) 45 (4) 55

30. What per cent of families have their daily incomes less than ₹ 500 ?
(1) 90% (2) 45%
(3) 30% (4) 20%

Directions (31-33) : Following histogram depicts the range of heights of students in a class of 60 students. Study the same and answer the questions.
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

31. The number of students having height more than 150 cms is
(1) 25 (2) 8
(3) 38 (4) 13

32. The number of students with their heights between 130 to 150 cms is
(1) 8 (2) 6
(3) 14 (4) 22

33. Group which contains maximum number of students is
(1) 130 – 140 (2) 150 – 160
(3) 140 – 150 (4) 160 – 170

Directions (34 – 38) : The diagram shows the age-distribution of the patients admitted to a hospital on a particular day. Study the diagram and answer the questions.
(SSC CHSL DEO & LDC Exam. 9.11.2014)

34. Number of patients of age between 55 years to 60 years, who got admitted to the hospital on that day is
(1) 6 (2) 4
(3) 24 (4) 8

35. Total number of patients of age more than 55 years, who got admitted to the hospital is
(1) 4 (2) 7
(3) 9 (4) 10

36. Number of patients of age more than 40 years and less than 55 years, who got admitted to the hospital on that day is
(1) 20 (2) 30
(3) 15 (4) 12

37. Percentage of patients of age less than 45 years, who got admitted to the hospital on that day is approximately equal to
(1) 14% (2) 20%
(3) 37% (4) 62%

38. About 11% of the patients who got admitted to the hospital on that particular day were of age
(1) either between 35 years and 40 years or between 55 years and 60 years
(2) between 60 years and 65 years
(3) between 35 years and 40 years
(4) between 35 years and 40 years and between 55 years and 60 years.

Directions (39 – 43) : Study the following histogram of wage distribution of different number of workers and answer the given questions.
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting (TF No. 333 LO 2)

39. Number of workers who earn more than Rs. 950 is
(1) 40 (2) 31
(3) 26 (4) 16

40. Number of workers who earn less than Rs. 950 is
(1) 23 (2) 26
(3) 16 (4) 31

41. Total number of workers surveyed is
(1) 44 (2) 40
(3) 49 (4) 39

42. The number of workers earning more than Rs. 940 but less than Rs. 960 is
(1) 15 (2) 16
(3) 23 (4) 26

43. The percentage of workers who earn between Rs. 950 to Rs. 960 is
(1) 25.5% (2) 20.4% (3) 17.6% (4) 13.25%

Directions (44–47) : Study the following histogram of marks in mathematics (out of 50) of students in a class and answer the following questions.

(SSC CGL Tier-I (CBE) Exam. 07.09.2016 (IInd Sitting)

44. If the pass marks in maths is 31, the number of students who failed in maths is :
(1) 10 (2) 15
(3) 20 (4) 25

45. The total number of students in the class is :
(1) 120 (2) 125
(3) 130 (4) 135

46. The percentage of number of passed students is (31 is the pass marks)
(1) $85\frac{8}{9}\%$ (2) $86\frac{8}{9}\%$
(3) $87\frac{8}{9}\%$ (4) $88\frac{8}{9}\%$

47. If the students have got the marks out of 50 and if A+ grade has been declared for above 90%, then the number of students who have got A+ grade is :
(1) 10 (2) 20
(3) 30 (4) 40

Directions (48–51) : Study the following histogram of data related to literate people of different age groups and answer the questions given below.

(SSC CGL Tier-I (CBE) Exam. 09.09.2016 (IInd Sitting)

48. Total number of literate people in the age group 15 to 45 years is
(1) 2800
(2) 3700
(3) 4050
(4) 2350

49. The number of literate people in the age group of 20 to 35 years is
(1) 2050
(2) 1250
(3) 2150
(4) 1700

50. The percentage of the literate people in the age group 30 to 45 years is
(1) 39%
(2) 33.33%
(3) 46.25%
(4) 66.66%

51. The respective ratio of literate people in the age group of 20 to 35 years to that in the age group of 30 to 45 years is
(1) 40 : 20 (2) 27 : 41
(3) 41 : 27 (4) 42 : 26

Directions (52–55) : Study the histogram of marks (in Mathematics) distribution of 50 students of class IX and answer the following questions.

(SSC CGL Tier-I (CBE)
Exam. 10.09.2016 (IIIrd Sitting)

52. The number of students who have secured marks less than 60 is :
(1) 12 (2) 15
(3) 33 (4) 7

53. The average marks of the students are
(1) 53.2 (2) 45.5
(3) 60.2 (4) 55.5

54. The number of students who have scored between 39 and 80 is :
(1) 22 (2) 18
(3) 37 (4) 15

55. The percentage of students who have secured marks more than 59 is:
(1) 13 (2) 17
(3) 34 (4) 26

Directions (56–57) : In each of the following questions, the following histogram shows the relationship between the marks obtained by the students and the number of students in an examination. Study the histogram and answer the questions.

(SSC Multi-Tasking Staff Exam. 30.04.2017)

56. The percentage of students who obtained 40 marks or less is
(1) 25
(2) less than 25, but not 15
(3) more than 24
(4) 15

57. The ratio of the number of students who obtained 60 or more marks to that of students who obtained 60 or less marks is
(1) 15 : 16 (2) 15 : 19
(3) 14 : 17 (4) 16 : 15

TYPE-VII

Directions (1-5) : A survery of film watching habits of people living in five cities P, Q, R, S and T is summarised below in a table. The coulmn I in the table gives percentage of film-watchers in each city who see only one film a week. The column II gives the total number of film-watchers who see two or more films per week.

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

Read the table and answer the following questions.

City	I	II
P	60	24,000
Q	20	30,000
R	85	24,000
S	55	27,000
T	75	80,000

1. How many film-watchers in city R see only one film in a week ?
(1) 24850 (2) 36000
(3) 136000 (4) 160000

2. Which city has the highest number of film watchers who see only one film in a week?
(1) P (2) R
(3) S (4) T

3. A city with the lowest number of film-watchers is :
(1) P (2) Q
(3) R (4) S

4. The highest number of film-watchers in any given city is :
(1) Q (2) R
(3) S (4) T

5. The total number of all film-watchers in the five cities who see only one film in a week is
(1) 113000 (2) 425200
(3) 452500 (4) 500000

Directions (6-10) : The table given here shows production of five types of cars by a company in the year 1989 to 1994. Study the table and answer questions.

(SSC CGL Prelim Exam. 27.02.2000 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting)

PRODUCTION OF CARS BY A COMPANY

Year→ Type↓	1989	1990	1991	1992	1993	1994	Total
P	8	20	16	17	21	6	88
Q	16	10	14	12	12	14	78
R	21	17	16	15	13	8	90
S	4	6	10	16	20	31	87
T	25	18	19	30	14	27	133
Total	74	71	75	90	80	86	476

6. In which year the production of cars of all types taken together was **approximately** equal to the average of the total production during the period?
(1) 1989 (2) 1991
(3) 1993 (4) 1994

7. In which year the total production of cars of types P and Q together was equal to the total production of cars of types R and S together?
(1) 1990 (2) 1991
(3) 1994
(4) None of the above

8. During the period 1989-94, in which type of cars was a continuous increase in production?
(1) P (2) Q
(3) R (4) S

9. The production of which type of car was 25% of the total production of all types of cars during 1993?
(1) S (2) R
(3) Q (4) P

10. The percent increased in total production of all types of cars in 1992 to that in 1991 was :
(1) 15% (2) 20%
(3) 25% (4) 30%

Directions (11-15) : Following table gives the population of a locality from 1988 to 1992. Read the table and answer the questions.

(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting & ssc chsl deo Exam. 02-11-2014)

Years	Men	or Women	Children	Total	Increase (+) decrease (–) over preceding year
1988	65104	60387	—	146947	—
1989	70391	62516	—	—	+ (11630)
1990	—	63143	20314	153922	—
1991	69395	—	21560	—	– (5337)
1992	71274	659935	23789	16098	—

11. The number of children in 1988 is :
(1) 31236 (2) 125491
(3) 14546 (4) 21456

12. The total population in 1989 is :
(1) 144537 (2) 158577
(3) 146947 (4) 149637

13. Number of children in 1989 is :
(1) 25670 (2) 14040
(3) 13970 (4) 15702

14. Number of women in 1991 is :
(1) 57630 (2) 56740
(3) 52297 (4) 62957

15. Increase or decrease of population in 1992 over 1991 is :
(1) – (12413) (2) + (12413)
(3) + 155661 (4) + 7086

Directions (16-20) : Study the table carefully and answer the questions given below.

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

Yearly production (in thousands) of scooters in different factories.

Factory	1985	1986	1987	1988	1989
P	20	15	24	13	17
Q	16	23	41	20	15
R	14	21	30	16	12
S	25	17	15	12	22
T	40	32	39	41	35
Total	115	108	149	102	101

16. In which year, the production of scooters of all factories was equal to the yearly average number of scooters produced during 1985-89 ?
(1) 1985 (2) 1986
(3) 1987 (4) 1988

17. Which factory/factories showed a decrease of 25% in the production of scooters in 1989 as compared to 1988 ?
(1) P (2) S
(3) Q and R (4) P and T

18. The ratio of the production of scooters by factory P to that by factory T in 1985 is
(1) 2 : 3 (2) 1 : 2
(3) 3 : 2 (4) 2 : 1

19. In which year, the total production of scooters was maximum ?
(1) 1989 (2) 1986
(3) 1987 (4) 1985

20. In which year the total production of scooters of all factories was 20% of the total production of scooters during 1985-1989 ?
(1) 1988 (2) 1985
(3) 1986 (4) 1989

Directions (21-24) : Study the following table and answer the questions based on it :

(SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

(In lakhs of ₹)

XYZ Co. Pvt. Ltd.			
Year	**Total Sales**	**Gross Profit**	**Net Profit**
1990	351.6	155.5	54.2
1991	407.9	134.3	42.6
1992	380.1	149.9	38.9
1993	439.7	160.5	50.3
1994	485.9	203.3	65.8

21. In which year the difference between the total sales and the gross profit is the least ?
(1) 1990 (2) 1991
(3) 1992 (4) 1993

22. The total sales in 1993 is **approximately** what per cent of the total sales of 1990 ?
(1) 75% (2) 85%
(3) 110% (4) 125%

23. Which years show increase in all categories simultaneously i.e., total sales, gross profit and net profit as compared to the previous year?
(1) 1993 and 1994 both
(2) 1994 and 1992 both
(3) 1992 and 1993 both
(4) 1990 and 1991 both

24. The per cent increase in the gross profit was the maximum in which year as compared to the previous one ?
(1) 1991 (2) 1992
(3) 1993 (4) 1994

Directions (25-28) : Study the table and answer the questions:

(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting)

The table given below shows the highest and average marks of a class in four subjects in four years. The maximum marks in each subject are 100.

Year	**SUBJECTS**							
	English		Maths		Science		Social Science	
	Highest	Average	Highest	Average	Highest	Average	Highest	Average
1993	80	70	94	60	89	70	65	55
1994	82	65	85	62	95	64	66	58
1995	71	56	92	68	97	68	68	48
1996	75	52	91	64	92	75	77	58

25. What is the overall average of marks in the four subjects in the year 1995 ?
(1) 63 (2) 64
(3) 65 (4) 60

26. Supposing that there were 40 students in science in the year 1995, how much total of marks did they receive combined together?
(1) 2800 (2) 2720
(3) 2560 (4) 3000

27. In which year, the difference between the highest and the average marks in Mathematics was maximum ?

(1) 1995 (2) 1993
(3) 1994 (4) 1996

28. In which year, the difference between the highest and average marks in Social Science was the least ?
(1) 1996 (2) 1995
(3) 1994 (4) 1993

Directions (29–32) : The table given below depicts the export of a commodity through four ports in the years 1998 and 1999.

Study the table and answer the questions.

(SSC CGL Prelim Exam. 27.07.2008 (Ist Sitting)

Port	Export in 1998 (in crore rupees)	Export in 1999 (in crore rupees)
A	57	61
B	148	160
C	229	234
D	146	150

29. The percentage increase in the export of the commodity from the year 1998 to 1999 was the highest from which port ?
(1) A (2) B
(3) C (4) D

30. What was the change in the aggregate export of the commodity in the year 1999 as compared to the year 1998 ?
(1) Nearly 4.3% increase
(2) Nearly 4.3% decrease
(3) Nearly 0.04% increase
(4) Nearly 0.04% decrease

31. What was the average increase in the export of the commodity from the ports in the year 1999 as compared to the year 1998 ?
(1) ₹ 82500000
(2) ₹ 80000000
(3) ₹ 75000000
(4) ₹ 62500000

32. The percentage increase in the export of the commodity from the year 1998 to 1999 was the lowest from which port ?
(1) A (2) B
(3) C (4) D

Directions (33-36) : A survey of movie going habits of city dwellers from 5 cities A, B, C, D and E is given below. The first column gives the percentage of viewers in each city who watch less than two movies a week. The second column gives the total number of viewers who view two or more movies per week. Study the table and answer the questions.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

City	I	II
A	60	2400
B	20	3000
C	85	2400
D	55	2700
E	75	8000

33. How many vieweres in city C watch less than two movies a week ?
(1) 2040 (2) 13600
(3) 16000 (4) 3600

34. The city with the lowest number of movie watchers is
(1) City E (2) City D
(3) City B (4) City C

35. The highest number of movie watchers in any given city (in the survey) is
(1) 36000 (2) 32000
(3) 6000 (4) 16000

36. Which two cities have the same number of movie watchers ?
(1) C and E (2) C and D
(3) A and B (4) D and A

Directions (37–40) : Number of toys of five types (A to E) manufactured over the years (in thousands) is given below. Study the table and answer the following questions.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

Type / Year	A	B	C	D	E
2002	200	150	78	90	65
2003	150	80	100	105	70
2004	180	175	92	110	85
2005	195	160	120	125	75
2006	220	185	130	135	80

37. The approximate percentage increase in production of D type of toys from 2003 to 2005 was
(1) 5% (2) 19%
(3) 29% (4) 25%

38. The percentage drop in production of A type of toys from 2002 to 2004 was
(1) 10% (2) 20%
(3) 25% (4) 30%

39. The approximate percentage increase of the production of all types of toys from 2005 to 2006 was
(1) 9% (2) 10%
(3) 11% (4) 12%

40. The difference of the average number of toys (in thousands) of the type B and C, manufactured over the years, was
(1) 52 (2) 66
(3) 68 (4) 72

Directions (41-44) : Study the following table which shows the number of students appeared and passed in different streams in a University and answer the questions given below it

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

	Engineering		Medical		Management		Commerce	
Year	App eared	Pass	App eared	Pass	App eared	Pass	App eared	Pass
2001	324	289	469	246	96	69	1467	1310
2002	356	312	430	364	74	62	1246	1129
2003	284	212	384	326	124	102	1387	1176
2004	310	246	395	298	106	92	1180	1074
2005	426	382	424	382	92	74	1562	1326
2006	380	286	466	405	78	63	1374	1207

41. Approximately what per cent of students appearing in medical, passed in 2003 ?
(1) 75% (2) 85%
(3) 78% (4) 88%

42. Approximately what per cent of total students appearing in 2004, appeared in commerce stream?
(1) 55.3% (2) 64.4%
(3) 52.5% (4) 59.3%

43. The number of students appearing in all streams was minimum in the year
(1) 2002 (2) 2003
(3) 2004 (4) 2006

44. The number of students passing in all streams was maximum in the year.
(1) 2001 (2) 2005
(3) 2006 (4) 2004

Directions (45–48) : The following table shows the production of food grains (in million tonnes) in a State for the period 1988 to 1992. Read the table and answer the following questions.

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

Year	Production in million tonnes				Total
	Wheat	Rice	Maize	Other Cereals	
1988	580	170	150	350	1250
1989	600	220	234	400	1454
1990	560	240	228	420	1448
1991	680	300	380	460	1820
1992	860	260	340	500	1960
Total	3280	1190	1332	2130	7932

45. During 1990, the percentage of decrease in production of maize as against the previous year was:
(1) 2.63% (2) 2.56%
(3) 2.71% (4) 2.47%

46. In 1991, the increase in production over the previous year was maximum for :
(1) Wheat (2) Rice
(3) Maize (4) Other Cereals

47. The increase in the production of other cereals (over the previous year) was minimum during the year :
(1) 1989 (2) 1990
(3) 1991 (4) 1992

48. During 1992, the percentage of increase in the production of wheat, over the previous year was:
(1) 26.47% (2) 20.92%
(3) 23.67% (4) 18.74%

49. Different choices made by a group of 200 students are given below in percentage. The number of students who have taken neither Science nor Commerce is

Percentage of Students in different streams	
Name of Streams	***Intake Ratio***
Science	29%
Arts	29%
Commerce	31%
Home Science	6%
Others	5%

(1) 80 (2) 120
(3) 60 (4) 40

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

Directions (50) : The table given below shows production of five types of cars by a company from the year 1998 to 2003. Study the table and answer the question.

Years / Types	1998	1999	2000	2001	2002	2003	Total
P	10	18	16	15	11	18	88
Q	14	12	13	12	11	14	76
R	16	20	14	13	15	12	90
S	5	8	12	14	20	31	90
T	26	18	24	20	23	21	132
Total	71	76	79	74	80	96	476

In which year the production of cars of all types taken together was approximately equal to the average of the total production during the period:
(1) 1999 (2) 2000
(3) 2002 (4) 1998

(SSC Graduate Level Tier-I Exam. 21.04.2013)

Directions (51–52) : The following table gives the result of a survey based on newspaper reading habits. Study the table and answer the questions.

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

Income Group (Salary/ Income per month)	Does not read news-papers	Reads news-papers published in regional languages only	Reads only English paper	Reads both in regional and English languages
Below ₹ 5,000	162	271	123	52
₹ 5,000 – ₹ 10,000	13	285	206	82
Above ₹ 10,000	21	209	325	187

51. The number of people who read only English newspapers.
(1) 975 (2) 654
(3) 1086 (4) 221

52. The total number of people surveyed are
(1) 2040 (2) 1086
(3) 12961 (4) 1936

Directions (53-56) : The following table shows the productions of foodgrains (in million tons) in a state for the period 1999 - 2000 to 2003 - 2004. Read the table and answer the questions.

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

Production (in million tons)				
Year	Wheat	Rice	Barley	Other cereals
1999-2000	680	270	250	450
2000-2001	800	420	440	300
2001-2002	680	350	320	460
2002-2003	720	400	380	500
2003-2004	820	560	410	690

53. In 2002 – 2003, the percentage increase in the production of barley as compared to the previous year was :
(1) 14.20% (2) 17.85%
(3) 18.75% (4) 7.90%

54. During the period 1999 - 2000 to 2003 – 2004, x per cent of the total production is production of wheat. The value of x is about :
(1) 12.6 (2) 37.4
(3) 37.8 (4) 20.2

55. In the year 2003 – 2004, the increase in production was maximum over the previous year for :
(1) Rice
(2) Barley
(3) Other cereals
(4) Wheat

56. The difference of average production of rice and the average production of barley over the years is (in million tonnes) :
(1) 50 (2) 60
(3) 80 (4) 40

Directions (57-60) : The following questions are based on the table given below which represents the distance (in km) travelled by two persons A and B in the same direction :

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

Hour	Distance Travelled (in Km)	
	A	B
1st	20	25
2nd	30	40
3rd	20	35
4th	15	25
5th	25	35
6th	15	10
7th	25	25
8th	35	15
9th	20	25
10th	30	45

57. B's average speed (km/hour) during the first four hours is
(1) 21.25 (2) 22
(3) 31.25 (4) 32

58. The ratio of A's speed during the first five hours and the last five hours is
(1) 25 : 22 (2) 22 : 25
(3) 15 : 22 (4) 20 : 21

59. What is the distance (in km) between A and B at the end of 8th hour?
(1) 30 (2) 25
(3) 15 (4) 12

60. The distance between A and B is maximum at the end of
(1) 2 hours (2) 3 hours
(3) 4 hours (4) 5 hours

Directions (61–64) : Study the following table and answer the questions given below.

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

Annual income of five schools. (Figures in '000 rupees)

Source of Income	Schools				
	A	B	C	D	E
Tuition Fee.	120	60	210	90	120
Term Fee	24	12	45	24	30
Donation	54	21	60	51	60
Grants	60	54	120	42	55
Miscellaneous	12	3	15	3	15
Total	270	150	450	210	280

61. For school E, what per cent of the income from miscellaneous is the income from donation ?
(1) 25% (2) 40%
(3) $\frac{1}{4}$% (4) 400%

62. Which school has the highest percentage of income from tuition fee out of its total income ?
(1) A (2) B
(3) C (4) D

63. In case of how many schools, is the income by way of tuition fee, is less than four times of term fee ?
(1) 0 (2) 1
(3) 2 (4) 3

64. Which school has the lowest ratio of income by way of grants and tuition fee ?
(1) E (2) B
(3) C (4) D

Directions (65-69) : Refer to the following table. Read the table and answer the questions.

(SSC CGL Prelim Exam.: 24.02.2002 (Second Sitting)

Food Grains Production in a country in 1999 (in lakh tons)

State	Rice	Wheat	Jowar	Pulses	Others
P	45	103	—	27	29
Q	48	86	73	19	15
R	59	32	67	14	31
S	41	37	59	21	15
T	37	22	41	13	11
U	68	15	12	—	18
V	57	8	7	12	10
W	38	28	31	22	45

65. Which State had the highest grain production ?
(1) P (2) Q
(3) R (4) S

66. What was the proportion of rice production to wheat production in the country ?
(1) 1 : 1 (2) 0.8 : 1
(3) 1.2 : 1 (4) 2 : 1

67. Jowar was the most important food grain in the State/States :
(1) Q, R, S (2) Q
(3) R, S (4) R, S, T

68. State P alone accounted for approximately what percentage of wheat production in the country ?
(1) 73% (2) 50%
(3) 41% (4) 30%

69. If the average per hectare yield of rice in the country was 30 tons, then the area (approx.) under rice cultivation during the year was approx. (in lakh hectares)
(1) 1.5 (2) 8
(3) 13 (4) 40

Directions (70-74) : Read the following table and answer the questions below it:

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005) (IInd Sitting)

Loans Disbursed by Four Banks in crores of ₹ during the years

Rupees (In crores)

Banks	Years 1995	1996	1997	1998
A	18	23	45	30
B	27	33	18	41
C	29	29	22	17
D	13	19	28	32
Total	87	104	113	120

70. In which year the disbursement of loans by all the banks combined together was nearest to the average disbursement of loans over the years ?
(1) 1995 (2) 1996
(3) 1997 (4) 1998

71. What was the percentage increase of disbursement of loans of all banks together from 1997 to 1998 ?
(1) 6% (2) $6\frac{22}{113}$%
(3) $6\frac{11}{113}$% (4) $7\frac{11}{113}$%

72. In which year was the total disbursement of loans of banks A and B exactly equal to the total disbursement of loans of banks C and D ?
(1) 1995 (2) 1996
(3) 1998 (4) None of these

73. In which of the following banks, there was a continued increase in loan disbursement throughout the years ?
(1) A (2) B
(3) C (4) D

74. In which bank was the loan disbursement more than 30% of the disbursement of all banks combined together in 1998 ?
(1) A (2) B
(3) C (4) D

Directions (75-79) : A table showing the percentage of the total population of a State by age groups for the year 1991 is given below. Answer the questions given below it.

(SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting)

Age group (in years)	Per cent
up to 15	30.00
16 – 25	17.75
26 – 35	17.25
36 – 45	14.50
46 – 55	14.25
56 – 65	5.12
66 & above	1.13
Total	**100.00**

75. Which age group accounts for the maximum population in the State?
(1) 16 – 25 (2) 26 – 35
(3) 36 – 45 (4) 56 – 65

76. Out of every 4200 persons, the number of persons below 26 years is :
(1) 2006 approx.
(2) 1260 approx.
(3) 746 approx.
(4) 515 approx.

77. There are 200 million people below 36 years. How many millions (approx.) people are in the age group 56 – 65 ?
(1) 30.07 (2) 15.75
(3) 12.72 (4) 59.30

78. If there are 10 millions people in the age group 56 years and above, what is the difference between the number of people in the age group 16 – 25 and 46 – 55 ?
(1) 6.8 millions
(2) 5.6 millions
(3) 28.4 millions
(4) 34.7 millions

79. If the difference between the number of people in the age groups (46 – 55) and (26 – 35) is 11.75 millions, then the total population of the State is approximately :
(1) 360.23 millions
(2) 391.67 millions
(3) 400 millions
(4) 460.67 millions

Directions (80-81) : Study the following table and answer the questions.

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

Year	Percentage of Candidates Qualified under discipline					Total Number of Candidates qualified
	Arts	Science	Commerce	Agriculture	Engineering	
2006	24	40	19	09	08	780
2007	15	42	18	13	12	650
2008	20	45	20	08	07	500
2009	15	45	16	14	10	620
2010	19	35	15	19	12	900
2011	18	42	14	12	14	850

80. The decrease in the number of candidates qualified under Arts discipline from 2010 to 2011 was
(1) 11 (2) 18
(3) 42 (4) 69

81. The difference in the average number of candidates qualified in Science discipline per year from 2006 to 2008 and the average number of candidates qualified in the same discipline from 2009 to 2011 was
(1) 47 (2) 57
(3) 74 (4) 141

Directions (82-83) : Study the table and answer the questions.

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

Height (in cm)	Number of girls
less than 140	4
less than 145	11
less than 150	29
less than 155	40
less than 160	46
less than 165	51

82. The number of girls whose height is above 150 cm is
(1) 22 (2) 29
(3) 86 (4) 97

83. Average height (in cm) of the girls whose heights are 155cm and above is about
(1) 158.7 (2) 159.8
(3) 160.4 (4) 162.6

Directions (84–85) : The table shows the percentage of total population of a city in different age groups. Study the table and answer the questions.

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

Age group	Percent
Up to 15	20.00
16 – 25	18.25
26 – 35	16.75
36 – 45	16.25
46 – 55	15.00
56 – 65	12.50
66 and above	1.25

84. If there are 22 million people below 36 years, then the number of people (in millions) in the age group (56 – 65) is
(1) 5 (2) 5.5
(3) 3 (4) 3.5

85. If the difference between the number of people in the age groups (46 – 55) and (16 – 25) is 0.975 million, then the total population (in millions) of the city is
(1) 27 (2) 30
(3) 22 (4) 25

Directions (86-88) : The following table gives zonewise survey report of the people of a country who take coffee. Study the table and answer the questions.

(SSC CGL Tier-I Exam. 19.10.2014)

Take coffee	Zone			
	North	East	West	South
More than 3 times a day	410	310	700	1450
1 to 3 times a day	1220	830	1250	1120
Twice a week	1640	710	950	420
Only once a week	620	540	530	350
Never	950	430	620	50

86. The percentage of people of south zone who take coffee at least once a day is close to
(1) 33.51 (2) 42.72
(3) 75.81 (4) 80.82

87. The percentage of people from non-west zone who take coffee 'only once a week' is approximately
(1) 11 (2) 12
(3) 13 (4) 14

88. The ratio of the total number of people surveyed who take coffee more than 3 times a day to the total number of people who do not take coffee at all is
(1) 1 : 1.4 (2) 1.4 : 1
(3) 1.5 : 1 (4) 1 : 1.1

Directions (89–91) : Study the following table and answer the questions.

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

School	No. of students scoring marks less than 50%	Percentage of students scoring marks more than 50%	No. of students appeared
A	240	55	600
B	220	40	400
C	300	20	375
D	280	10	350
E	210	25	300

89. The ratio of the total number of students scoring marks less than 50% to that of scoring marks exactly 50% is
(1) 50 : 3
(2) 25 : 2
(3) 25 : 4
(4) 35 : 2

90. Which school has the highest number of students scoring exactly 50% marks ?
(1) D
(2) E
(3) B
(4) A

91. The total number of students scoring 50% or more marks is
(1) 1250 (2) 875
(3) 775 (4) 675

Directions (92 - 95) : The following questions are based on the table given below which shows production of the number of scooters by a company during the first half of 1992. Study the table and answer the questions.

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

Production of Scooters by a Company during first half of 1992

Month / Type	January	February	March	April	May	June
X	25	25	18	40	20	15
Y	25	27	50	45	30	20
Z	25	27	15	25	30	20
T	25	26	25	0	30	35
Total	100	105	108	110	110	90

92. In which month, was the production of all types of scooters the lowest ?
(1) January (2) February (3) March (4) June

93. In which month, did the company produce equal number of all types of scooters ?
(1) January (2) March
(3) May (4) June

94. The total number of scooters produced by the company, during the first half of 1992 is
(1) 90 (2) 143
(3) 623 (4) 197

95. In which two months, was the number of scooters produced by the company the same ?
(1) January, February
(2) April, May
(3) January, March
(4) January, May

Directions : (96–100) : The table given below shows the statistics of top 10 scoresrs in IPL 2016. Few entries are missing in the table. Here INN, AVG, and SR stands for innings played, batting average, and batting strike rate respectively. Based on the table answer the following question :

(SSC CPO SI & ASI, Online Exam. 06.06.2016) (IInd Sitting)

(Strike rate = Runs/ balls faced × 100) (AVG = Runs/ INN - NOT OUT)

Player	INN	Runs	Not Out	Balls Faced	AVG	SR	4s	6s
Virat Kohli	12	752	3	508		148.03	60	28
AB de Villiers	12	597	2	344	59.7	173.55	51	32
David Wamer	12	567	2		56.7	155.77		23
Ajinkya Rahane	13	461		364	46.1		50	9
Rohit Sharma	13	459	3	351	45.9	130.77	45	
GautamGambhir	12	449	2	360	44.9	124.72	50	5
Shikhar Dhawan	12	402		352	50.25	114.2		4
Quinton de Kock	11	385	1	266	38.5		47	12
Murali Vijay	12	378	1	315	34.36		44	6
Ambati Rayudu	12	334	1	278	30.36	120.14	28	12

96. How many total balls were faced by Warner ?
(1) 331 (2) 364
(3) 423 (4) 286

97. Approoximately by what percent strike rate of Rahane is greater/ lower than strike rate of Kock ?
(1) 12% greater (2) 12% lower
(3) 10% greater (4) 10% lower

98. How many runs were scored by hitting sixes taking all the players together ?
(1) 780 (2) 880
(3) 786 (4) 886

99. By what percent approximately is the batting average of Virat Kohli more than that of Gautam Gambhir ?
(1) 80 (2) 85
(3) 75 (4) 70

100. What is the difference between the strike rate of Murali Vijay and that of Rohit Sharma ?

(1) 10.77 (2) 12.75 (3) 30.77 (4) 15.35

Directions (101–105) : Study the table and answer the questions.

The number of 5 types of cycles manufactured by a company over the years is given below :

(SSC CGL Tier-I (CBE) Exam. 03.09.2016 (IInd Sitting)

Years	Types of Cycles (in 1000)				
	A	B	C	D	E
1997	200	150	78	90	65
1998	150	180	100	105	70
1999	180	175	92	110	85
2000	195	160	120	125	75
2001	220	185	130	135	80

101. What was the approximate percentage of increase in production of 'D' type of the cycle from 1998 to 2000?

(1) 10 (2) 19
(3) 15 (4) 17

102. In the case of which type of cycles was total production of the given 5 years the maximum ?

(1) A (2) B
(3) C (4) D

103. What was the percentage drop in production of A type cycle from 1997 to 1999?

(1) 10 (2) 25
(3) 20 (4) 15

104. The production of E type of cycle in 2001 was what per cent of production of B type in 2000?

(1) 40 (2) 50
(3) 45 (4) 25

105. Refer the following data table and answer the following question.

	Cumulative production
January	590
February	1240
March	1940
April	2610
May	3050
June	3420

How many cars were manufactured in the months of April and May?

(1) 810 (2) 1370
(3) 5660 (4) 1110

(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

106. Refer the following data table and answer the following question.

Day of the week	Distance jogged (in kms)
Monday	3
Tuesday	2
Wednesday	2.5
Thursday	5
Friday	1
Saturday	2.5
Sunday	4

If 400 calories are burnt by jogging 5 km, how many calories were burnt in the given week?

(1) 1650 calories
(2) 1550 calories
(3) 1500 calories
(4) 1600 calories

(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

107. Refer the following data table and answer the following question.

Items Raw	Yearly Expense in Rs. lakhs
Materias	11
Labour	7
Rent	5
Interest	3
Taxes	3

Expenditure on raw materials and taxes is what percent of total expenses?

(1) 55.53 per cent
(2) 41.03 per cent
(3) 33.78 per cent
(4) 48.28 per cent

(SSC CHSL (10+2) Tier-I (CBE) Exam. 15.01.2017) (IInd Sitting)

108. Refer the bleow data table and answer the following Question.

	Cumulative production
January	480
February	1050
March	1630
April	1970
May	2670
June	3330

The polygon shows cumulative production of cars manufactured in the month starting from January. How many cars were manufactured in the months of April and May ?

(1) 1040 (2) 1360
(3) 920 (4) 4640

(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

109. Refer the below data table and answer the following Question.

Day of the week	Distance jogged (in kms)
Monday	2.5
Tuesday	4
Wednesday	2.5
Thursday	3.5
Friday	0.5
Saturday	2.5
Sunday	1.5

If 400 calories are burnt by jogging 5km, how many calories were burnt in the given week ?

(1) 1410 calories
(2) 1360 calories
(3) 1310 calories
(4) 1260 calories

(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

110. Refer the below data table and answer the following Question.

Items	Yearly Expense in Rs. lakhs
Raw Materials	12
Labour	6
Rent	3
Interest	4
Taxes	3

Raw Materials and Interest are what per cent of total expenses ?

(1) 49.89 per cent
(2) 42.64 per cent
(3) 64.39 per cent
(4) 57.14 per cent

(SSC CHSL (10+2) Tier-I (CBE) Exam. 16.01.2017) (IInd Sitting)

TYPE-VIII

Directions (1 - 3) : Study the following frequency polygon and answer the questions.

Given a line graph showing the number of students passed in Higher Secondary Examination in a school over the years 2008 to 2013.

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

1. The average of passed students in the years 2008, 2009, 2012 approximately is
   (1) 134.32
   (2) 134.41
   (3) 134.56
   (4) 134.67
2. The increase in percentage of passed students from 2008 to 2011 approximately is
   (1) 55%
   (2) 50.5%
   (3) 54.5%
   (4) 53.05%
3. The decrease in percentage of passed students from 2011 to 2012 approximately is
   (1) 8.25% (2) 8.27%
   (3) 8.24% (4) 8.22%

Directions (4 – 5) : Study the following data and answer the questions.

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

The score of students of a class are given as follows :

IQ Score	80-90	90-100	100-110	110-120	120-130	130-140
No. of Students	6	9	16	13	4	2

4. Number of students whose IQ score is 140 is
   (1) undeterminable from given data
   (2) 2
   (3) 1 (4) 0
5. The number of students whose IQ score is 100 and more is
   (1) 29 (2) 35
   (3) 36 (4) 46
6. In the following table year wise ratio of number of taxable and non-taxable products produced by a company has been shown. The total production of the company increases by 10% every year.

Year	Taxable : Non-Taxable
2010	5 : 3
2011	4 : 1
2012	2 : 3
2013	4 : 5
2014	5 : 4

Find the ratio of taxable products produced in year 2011 and 2012 and non-taxable products produced in years 2011 and 2012.
   (1) 3 : 2 (2) 62 : 43
   (3) 43 : 62 (4) 2 : 3

(SSC CPO Exam. 06.06.2016) (Ist Sitting)

SHORT ANSWERS

TYPE-I

1. (2)	**2.** (1)	**3.** (4)	**4.** (1)
5. (3)	**6.** (4)	**7.** (2)	**8.** (3)
9. (2)	**10.** (2)	**11.** (1)	**12.** (3)
13. (1)	**14.** (2)	**15.** (4)	**16.** (3)
17. (1)	**18.** (3)	**19.** (2)	**20.** (4)
21. (3)	**22.** (2)	**23.** (3)	**24.** (4)
25. (4)	**26.** (1)	**27.** (2)	**28.** (3)
29. (3)	**30.** (1)	**31.** (1)	**32.** (1)
33. (3)	**34.** (4)	**35.** (3)	**36.** (2)
37. (1)	**38.** (2)	**39.** (1)	**40.** (2)
41. (2)	**42.** (4)	**43.** (2)	**44.** (1)
45. (2)	**46.** (3)	**47.** (2)	**48.** (1)
49. (3)	**50.** (2)	**51.** (1)	**52.** (3)
53. (4)	**54.** (1)	**55.** (2)	**56.** (4)
57. (3)	**58.** (3)	**59.** (4)	**60.** (2)
61. (3)	**62.** (3)	**63.** (1)	**64.** (3)
65. (4)	**66.** (1)	**67.** (1)	**68.** (2)
69. (3)	**70.** (1)	**71.** (2)	**72.** (3)
73. (2)	**74.** (2)	**75.** (3)	**76.** (1)
77. (4)	**78.** (3)	**79.** (1)	**80.** (1)
81. (3)	**82.** (2)	**83.** (4)	**84.** (2)
85. (4)	**86.** (1)	**87.** (2)	**88.** (2)
89. (1)	**90.** (2)	**91.** (3)	**92.** (3)
93. (3)	**94.** (1)	**95.** (2)	**96.** (4)
97. (1)	**98.** (4)	**99.** (4)	**100.** (2)
101. (3)	**102.** (1)	**103.** (3)	**104.** (2)
105. (3)	**106.** (4)	**107.** (2)	**108.** (1)
109. (4)	**110.** (3)	**111.** (4)	**112.** (1)
113. (3)	**114.** (4)	**115.** (2)	**116.** (4)
117. (3)	**118.** (4)	**119.** (1)	**120.** (4)
121. (1)	**122.** (4)	**123.** (1)	**124.** (1)
125. (1)	**126.** (3)	**127.** (1)	**128.** (4)
129. (2)	**130.** (3)	**131.** (1)	**132.** (2)
133. (*)	**134.** (4)	**135.** (3)	**136.** (1)
137. (3)	**138.** (4)	**139.** (1)	**140.** (4)
141. (1)	**142.** (2)	**143.** (2)	**144.** (4)
145. (3)	**146.** (2)	**147.** (3)	**148.** (3)
149. (2)	**150.** (1)	**151.** (1)	**152.** (2)
153. (2)	**154.** (2)	**155.** (4)	**156.** (1)
157. (1)	**158.** (1)	**159.** (*)	**160.** (*)
161. (1)	**162.** (1)	**163.** (1)	**164.** (1)
165. (1)	**166.** (4)	**167.** (3)	**168.** (3)
169. (3)	**170.** (4)	**171.** (1)	**172.** (2)
173. (2)	**174.** (1)	**175.** (1)	**176.** (2)
177. (1)	**178.** (4)	**179.** (4)	**180.** (4)
181. (4)	**182.** (4)	**183.** (1)	**184.** (2)
185. (2)	**186.** (1)	**187.** (2)	**188.** (1)
189. (4)	**190.** (2)	**191.** (4)	**192.** (3)
193. (1)	**194.** (3)	**195.** (3)	**196.** (2)
197. (3)	**198.** (1)	**199.** (1)	**200.** (3)
201. (4)	**202.** (2)	**203.** (1)	**204.** (3)
205. (1)	**206.** (4)	**207.** (2)	**208.** (4)
209. (2)	**210.** (4)	**211.** (1)	**212.** (4)
213. (2)	**214.** (1)	**215.** (3)	**216.** (4)
217. (3)	**218.** (2)	**219.** (2)	**220.** (2)
221. (1)	**222.** (3)	**223.** (1)	**224.** (1)
225. (2)	**226.** (1)	**227.** (4)	**228.** (1)
229. (1)	**230.** (2)	**231.** (2)	**232.** (3)
233. (1)	**234.** (2)	**235.** (2)	**236.** (3)
237. (4)	**238.** (2)	**239.** (2)	**240.** (4)
241. (2)	**242.** (2)	**243.** (4)	**244.** (4)
245. (1)	**246.** (3)	**247.** (3)	**248.** (2)

249. (2)	**250.** (3)	**251.** (2)	**252.** (1)
253. (3)	**254.** (1)	**255.** (3)	**256.** (1)
257. (4)	**258.** (1)	**259.** (2)	**260.** (1)
261. (3)	**262.** (4)	**263.** (1)	**264.** (2)
265. (4)	**266.** (3)	**267.** (2)	**268.** (4)
269. (4)	**270.** (2)	**271.** (1)	**272.** (4)
273. (2)	**274.** (1)	**275.** (*)	**276.** (2)
277. (3)	**278.** (4)	**279.** (4)	**280.** (3)
281. (2)	**282.** (2)	**283.** (1)	**284.** (3)
285. (2)	**286.** (3)	**287.** (3)	**288.** (2)
289. (4)	**290.** (3)	**291.** (1)	**292.** (3)
293. (1)	**294.** (1)	**295.** (4)	**296.** (1)
297. (2)	**298.** (4)		

TYPE-II

1. (3)	**2.** (3)	**3.** (4)	**4.** (2)
5. (2)	**6.** (2)	**7.** (2)	**8.** (1)
9. (4)	**10.** (1)	**11.** (2)	**12.** (3)
13. (4)	**14.** (4)	**15.** (1)	**16.** (3)
17. (4)	**18.** (4)	**19.** (2)	**20.** (2)
21. (4)	**22.** (4)	**23.** (4)	**24.** (1)
25. (3)	**26.** (1)	**27.** (2)	**28.** (3)
29. (4)	**30.** (1)	**31.** (3)	**32.** (2)
33. (3)	**34.** (4)	**35.** (2)	**36.** (1)
37. (2)	**38.** (3)	**39.** (1)	**40.** (3)
41. (3)	**42.** (3)	**43.** (1)	**44.** (2)
45. (3)	**46.** (2)	**47.** (2)	**48.** (1)

TYPE-III

1. (4)	**2.** (2)	**3.** (3)	**4.** (3)
5. (1)	**6.** (3)	**7.** (1)	**8.** (4)
9. (2)	**10.** (2)	**11.** (1)	**12.** (4)
13. (2)	**14.** (1)	**15.** (2)	**16.** (4)
17. (3)	**18.** (2)	**19.** (3)	**20.** (1)
21. (1)	**22.** (3)	**23.** (2)	**24.** (3)
25. (3)	**26.** (4)	**27.** (3)	**28.** (1)
29. (3)	**30.** (2)	**31.** (2)	**32.** (3)
33. (4)	**34.** (1)	**35.** (3)	**36.** (2)
37. (3)	**38.** (1)	**39.** (4)	**40.** (4)
41. (1)	**42.** (2)	**43.** (1)	**44.** (2)
45. (2)	**46.** (4)	**47.** (2)	**48.** (3)
49. (4)	**50.** (2)	**51.** (1)	**52.** (2)
53. (2)	**54.** (2)	**55.** (2)	**56.** (4)
57. (3)	**58.** (3)	**59.** (4)	**60.** (3)
61. (2)	**62.** (3)	**63.** (2)	**64.** (4)
65. (3)	**66.** (1)	**67.** (3)	**68.** (4)
69. (3)	**70.** (3)	**71.** (2)	**72.** (2)
73. (4)	**74.** (4)	**75.** (3)	**76.** (3)
77. (1)	**78.** (3)	**79.** (4)	**80.** (4)
81. (2)	**82.** (3)	**83.** (2)	**84.** (3)
85. (2)	**86.** (3)	**87.** (2)	**88.** (4)
89. (2)	**90.** (2)	**91.** (3)	**92.** (1)
93. (1)	**94.** (1)	**95.** (2)	**96.** (2)
97. (2)	**98.** (4)	**99.** (1)	**100.** (2)
101. (2)	**102.** (3)	**103.** (4)	**104.** (1)
105. (4)	**106.** (4)	**107.** (4)	**108.** (3)
109. (3)	**110.** (4)	**111.** (1)	**112.** (3)
113. (3)	**114.** (2)	**115.** (4)	**116.** (3)
117. (4)	**118.** (2)	**119.** (1)	**120.** (3)
121. (2)	**122.** (3)	**213.** (3)	**124.** (2)
125. (3)	**126.** (2)	**127.** (3)	**128.** (1)
129. (1)	**130.** (2)	**131.** (1)	**132.** (3)
133. (4)	**134.** (4)	**135.** (4)	**136.** (4)
137. (2)	**138.** (2)	**139.** (1)	**140.** (4)

TYPE-IV

1. (4)	**2.** (3)	**3.** (4)	**4.** (1)
5. (2)	**6.** (2)	**7.** (3)	**8.** (4)
9. (2)	**10.** (3)	**11.** (4)	**12.** (1)
13. (2)	**14.** (3)	**15.** (4)	**16.** (4)
17. (1)	**18.** (2)	**19.** (1)	**20.** (3)
21. (3)	**22.** (1)	**23.** (4)	**24.** (1)
25. (2)	**26.** (3)	**27.** (2)	**28.** (1)
29. (4)	**30.** (1)	**31.** (3)	**32.** (1)
33. (3)	**34.** (1)	**35.** (1)	**36.** (3)
37. (4)	**38.** (2)	**39.** (2)	**40.** (3)
41. (4)	**42.** (1)	**43.** (3)	**44.** (1)
45. (4)	**46.** (1)	**47.** (3)	

TYPE-V

1. (2)	**2.** (1)	**3.** (3)	**4.** (3)
5. (4)	**6.** (1)	**7.** (2)	**8.** (3)
9. (2)	**10.** (3)	**11.** (1)	**12.** (3)
13. (4)	**14.** (1)	**15.** (4)	**16.** (3)
17. (3)	**18.** (2)	**19.** (4)	**20.** (3)
21. (1)	**22.** (2)	**23.** (1)	**24.** (3)
25. (1)	**26.** (1)	**27.** (1)	**28.** (3)
29. (4)	**30.** (1)	**31.** (3)	**32.** (1)
33. (3)	**34.** (2)	**35.** (4)	**36.** (3)
37. (3)	**38.** (2)	**39.** (1)	**40.** (1)
41. (3)	**42.** (2)	**43.** (1)	**44.** (1)
45. (2)	**46.** (4)	**47.** (1)	**48.** (1)
49. (4)	**50.** (3)	**51.** (4)	**52.** (1)
53. (2)	**54.** (4)	**55.** (1)	**56.** (2)
57. (4)	**58.** (1)	**59.** (2)	**60.** (1)
61. (3)	**62.** (2)	**63.** (2)	**64.** (4)
65. (3)	**66.** (4)	**67.** (3)	**68.** (2)
69. (4)	**70.** (4)	**71.** (3)	**72.** (2)
73. (3)	**74.** (1)	**75.** (4)	**76.** (4)
77. (1)	**78.** (1)	**79.** (1)	**80.** (4)
81. (1)	**82.** (2)	**83.** (2)	**84.** (2)
85. (2)	**86.** (3)	**87.** (4)	**88.** (3)
89. (3)	**90.** (2)	**91.** (4)	**92.** (3)
93. (1)	**94.** (2)	**95.** (2)	**96.** (2)
97. (1)	**98.** (3)	**99.** (4)	**100.** (1)
101. (2)	**102.** (*)	**103.** (2)	**104.** (4)
105. (1)	**106.** (3)	**107.** (3)	**108.** (2)
109. (3)	**110.** (4)	**111.** (2)	**112.** (4)
113. (1)	**114.** (4)	**115.** (3)	**116.** (2)
117. (2)	**118.** (1)	**119.** (2)	**120.** (3)
121. (4)	**122.** (2)	**123.** (2)	**124.** (3)
125. (2)	**126.** (1)	**127.** (3)	**128.** (4)
129. (4)	**130.** (1)	**131.** (1)	**132.** (1)
133. (4)	**134.** (2)	**135.** (3)	**136.** (1)
137. (1)	**138.** (3)	**139.** (2)	**140.** (1)
141. (2)	**142.** (2)	**143.** (3)	**144.** (4)
145. (3)	**146.** (2)	**147.** (3)	**148.** (2)
149. (3)	**150.** (1)	**151.** (2)	**152.** (2)
153. (3)	**154.** (4)	**155.** (3)	**156.** (4)
157. (1)	**158.** (3)	**159.** (4)	**160.** (3)
161. (1)	**162.** (*)	**163.** (1)	**164.** (3)
165. (*)	**166.** (3)	**167.** (1)	**168.** (4)
169. (3)	**170.** (1)	**171.** (4)	**172.** (2)
173. (1)	**174.** (3)	**175.** (*)	**176.** (4)
177. (*)	**178.** (2)	**179.** (1)	**180.** (2)
181. (3)	**182.** (*)	**183.** (*)	**184.** (1)
185. (1)	**186.** (*)	**187.** (2)	**188.** (1)
189. (4)	**190.** (2)	**191.** (3)	**192.** (2)
193. (2)	**194.** (1)	**195.** (1)	**196.** (4)
197. (2)	**198.** (1)	**199.** (2)	**200.** (3)
201. (3)	**202.** (4)	**203.** (3)	**204.** (4)
205. (4)	**206.** (2)	**207.** (4)	**208.** (1)
209. (2)	**210.** (2)	**211.** (3)	**212.** (4)
213. (3)	**214.** (4)	**215.** (3)	**216.** (1)
217. (2)	**218.** (1)	**219.** (4)	**220.** (2)
221. (2)	**222.** (3)	**223.** (3)	**224.** (4)
225. (2)	**226.** (1)	**227.** (1)	**228.** (2)
229. (3)	**230.** (1)	**231.** (3)	**232.** (*)
233. (2)	**234.** (2)	**235.** (3)	**236.** (*)
237. (4)	**238.** (3)	**239.** (3)	**240.** (4)
241. (1)	**242.** (*)		

TYPE-VI

1. (4)	**2.** (3)	**3.** (2)	**4.** (1)
5. (1)	**6.** (3)	**7.** (2)	**8.** (3)
9. (2)	**10.** (4)	**11.** (3)	**12.** (1)
13. (2)	**14.** (1)	**15.** (3)	**16.** (3)
17. (1)	**18.** (2)	**19.** (4)	**20.** (3)
21. (1)	**22.** (1)	**23.** (1)	**24.** (4)
25. (3)	**26.** (3)	**27.** (2)	**28.** (1)
29. (4)	**30.** (2)	**31.** (3)	**32.** (3)
33. (2)	**34.** (2)	**35.** (4)	**36.** (1)
37. (3)	**38.** (4)	**39.** (3)	**40.** (1)
41. (3)	**42.** (1)	**43.** (2)	**44.** (2)
45. (4)	**46.** (4)	**47.** (1)	**48.** (2)
49. (1)	**50.** (2)	**51.** (3)	**52.** (3)
53. (1)	**54.** (1)	**55.** (3)	**56.** (3)
57. (4)			

TYPE-VII

1. (3)	**2.** (4)	**3.** (2)	**4.** (4)
5. (3)	**6.** (3)	**7.** (4)	**8.** (4)
9. (1)	**10.** (2)	**11.** (4)	**12.** (2)
13. (1)	**14.** (1)	**15.** (2)	**16.** (1)
17. (3)	**18.** (2)	**19.** (3)	**20.** (2)
21. (1)	**22.** (4)	**23.** (1)	**24.** (4)
25. (4)	**26.** (2)	**27.** (2)	**28.** (3)
29. (2)	**30.** (1)	**31.** (4)	**32.** (3)
33. (2)	**34.** (3)	**35.** (2)	**36.** (4)
37. (2)	**38.** (1)	**39.** (3)	**40.** (2)
41. (2)	**42.** (4)	**43.** (3)	**44.** (2)
45. (2)	**46.** (3)	**47.** (1)	**48.** (1)
49. (1)	**50.** (2)	**51.** (2)	**52.** (4)
53. (3)	**54.** (2)	**55.** (1)	**56.** (4)
57. (3)	**58.** (2)	**59.** (2)	**60.** (4)
61. (4)	**62.** (3)	**63.** (2)	**64.** (1)
65. (2)	**66.** (3)	**67.** (1)	**68.** (4)
69. (3)	**70.** (2)	**71.** (2)	**72.** (4)
73. (4)	**74.** (2)	**75.** (1)	**76.** (1)
77. (2)	**78.** (2)	**79.** (2)	**80.** (2)
81. (1)	**82.** (1)	**83.** (2)	**84.** (1)
85. (2)	**86.** (3)	**87.** (4)	**88.** (2)
89. (3)	**90.** (3)	**91.** (4)	**92.** (4)
93. (1)	**94.** (3)	**95.** (2)	**96.** (2)
97. (2)	**98.** (3)	**99.** (2)	**100.** (1)
101. (2)	**102.** (1)	**103.** (1)	**104.** (2)
105. (4)	**106.** (4)	**107.** (4)	**108.** (1)
109. (2)	**110.** (4)		

TYPE-VIII

1. (4)	**2.** (3)	**3.** (3)	**4.** (1)
5. (2)	**6.** (2)		

EXPLANATIONS

TYPE-I

1. (2) Total amount spent
= ₹ 46,000
Amount spent on food
= 23% of 46,000

$= \frac{23}{100} \times 46{,}000$ = ₹ 10580

2. (1) Total amount spent
= ₹ 46,000
Amount spent clothing and housing together
= (10% + 15%) of ₹ 46000

$= \frac{25}{100} \times 46000$ = ₹ 11500

3. (4) $\frac{\text{Expenditure on Housing}}{\text{Expenditure on Education}}$

$= \frac{15\%}{12\%} = \frac{15}{12} = \frac{5}{4} = 5:4$

4. (1) Maximum expenditure is 23% and it is on Food.

5. (3) Total expenditure
= ₹ 46,000
Amount saved
= 15% of ₹ 46000

$= \frac{15}{100} \times$ ₹ 46000 = ₹ 6900

6. (4) 100% = 360°

$\therefore$ 1% $= \frac{360°}{100}$

$\therefore$ 10% $= \frac{360° \times 10}{100} = 36°$

7. (2) 35% total cost = ₹ 17500
$\therefore$ 15% of total cost

$=$ ₹ $\frac{17500 \times 15}{35}$ = ₹ 7500

8. (3) Difference in per cent cost of 'binding and cutting charges' and 'royalty'
= (18 – 15)% = 3%
Now, $\because$ 4% of total cost
= ₹ 6000
$\therefore$ 3% of total cost

$=$ ₹ $\frac{6000 \times 3}{4}$ = ₹ 4500

9. (2) Difference in per cent expenses on printing cost and advertisement charges
= (35 – 18)% = 17%
Now, 1 % = 3.6°
$\therefore$ 17% = 3.6° × 17 = 61.2°

10. (2) The required per cent

$= \frac{10 \times 100}{35} = 28.6\%$ (approx.)

11. (1) Maximum expenditure of the family is on food, i.e., 23%.

12. (3) $\because$ Expenditure on housing
= Savings = 15%

13. (1) % Expenditure on transport and other items = (20 + 5)%
= 25%

14. (2) Expenditure on the education of children
= 12% of ₹ 100000

$=$ ₹ $\frac{12 \times 100000}{100}$

= ₹ 12000

15. (4) The percentage difference in expenditure on housing and transport = (15 – 5)% = 10%
The required difference
= 10% of ₹ 100000
= ₹ 10000

16. (3) House rent per month

= 18% of ₹ 33650

$=$ ₹ $\frac{18 \times 33650}{100}$ = ₹ 6057

17. (1) Annual provident fund savings
= 12% of (₹ 33650 × 12)

$=$ ₹ $\frac{12 \times 33650 \times 12}{100}$ = ₹ 48456

18. (3) Remaining monthly income
= [100 – (12 + 18)]% of ₹ 33650

$=$ ₹ $\frac{70 \times 33650}{100}$ = ₹ 23555

19. (2) Amount spent on food and entertainment together
= 34% of ₹ 33650
$= ₹\ \frac{34 \times 33650}{100} = ₹\ 11441$

20. (4) Expenditure on children = 23%
Provident fund savings
= 12%
For no children, total savings = 35%
∴ Required savings
= 35% of ₹ 33650
$= ₹\ \frac{35 \times 33650}{100} = ₹\ 11777.50$

21. (3) Amount spent on cement
$= \left(\frac{100}{360} \times 72\right)\%$ of 600000
$= \frac{20}{100} \times 600000 = ₹\ 1,20,000$

22. (2) Difference (%)
$= \left(\frac{100}{360} \times 90\right)\% - \left(\frac{100}{360} \times 54\right)\%$
= 25% – 15%
= 10% of the total cost

23. (3) Required per cent
$= \frac{100}{360°} \times (72° + 54° + 54°)$
$= \frac{100}{360°} \times 180° = 50$ per cent

24. (4) Differences in percentage
$= \left(\frac{100}{360°} \times 90°\right) - \left(\frac{100}{360°} \times 54°\right)\%$
∴ Required difference
$= 600000 \times \frac{10}{100} = ₹\ 60,000$

25. (4) Corresponding angle of labour = 90°
Clearly, $90° \equiv \frac{1500000 \times 90}{360}$
= ₹ 375000

26. (1) Corresponding angle on the expenditure on bricks, steel and cement
= 54 + 54 + 72 = 180°
∵ 360° ≡ 100%
$\therefore\ 180° \equiv \frac{100}{360} \times 180 = 50\%$

27. (2) Required percentage
$= \frac{36}{72} \times 100 = 50\%$

28. (3) Corresponding angle of labour and supervision combined
= 90° + 54° = 144°
∵ 360° ≡ 1500000
$\therefore\ 144° \equiv \frac{1500000}{360} \times 144$
= ₹ 600000

29. (3) Yasin got the minimum votes.
∵ 360° ≡ 720
$\therefore\ 60° \equiv \frac{720}{360} \times 60 = 120$

30. (1) Sivaraman got the maximum votes. i.e.
$\frac{720}{360} \times 120 = 240$ votes
∴ He was the winner.

31. (1) Angle of the difference of votes of the winner and the nearest rival = 120 – 100 = 20°
∵ 360° ≡ 720
$\therefore\ 20° \equiv \frac{720}{360} \times 20 = 40$

32. (1) ∵ 45° ≡ ₹ 9000
Angle of diff. of money spent of Hockey and Football = 55°
$\therefore\ 55° \equiv \frac{9000}{45°} \times 55° = ₹\ 11000$

33. (3) ∵ 45° ≡ ₹ 9000
$\therefore\ 160° \equiv \frac{9000}{45°} \times 160° = ₹\ 32000$

34. (4) ∵ 45° ≡ ₹ 9000
$\therefore\ 360° \equiv \frac{9000}{45} \times 360° = ₹\ 72000$

35. (3) ∵ 32% ≡ 800000
$\therefore\ 3\% \equiv \frac{800000}{32} \times 3 = 75000$

36. (2) Required percentage
$= \frac{3}{25} \times 100 = 12\ \%$

37. (1) Required ratio = 3 : 7 (clear from the chart)

38. (2) ∵ 100% ≡ ₹ 25000
Total % spent on food and rent
= (45 + 14)%
$\therefore\ 59\% \equiv \frac{25000}{100} \times 59 = ₹\ 14750$

39. (1) Required ratio = 15 : 45
= 1 : 3

40. (2) Required percentage
$= \frac{14}{9} \times 100 \approx 156\%$

41. (2) ∵ 360° ≡ 100%
$\therefore\ 108° \equiv \frac{100}{360} \times 108 = 30\%$
Fuel + Education + Others
= 9 + 15 + 6 = 30%

42. (4) ∵ 540 ≡ 360°
$\therefore\ 105 \equiv \frac{360}{540} \times 105 = 70°$
Hence, the student obtained 105 marks in Hindi

43. (2) Corresponding angle for science
= 360° – (90° + 65° + 55° + 70°)
= (360° – 280°) = 80°

44. (1) Difference of corresponding angles = 90° – 70° = 20°
∵ 360° ≡ 540
$\therefore\ 20° \equiv \frac{540}{360} \times 20 = 30$

45. (2) Corresponding angle for science = 80°
∵ 360° ≡ 540
$\therefore\ 80° \equiv \frac{540}{360} \times 80 = 120$

46. (3) ∵ 60° ≡ ₹ 8000
∴ Expenditure on Education
$= 30 \times \frac{8000}{60} = ₹\ 4,000$

47. (2) Ratio of degree of expenditure on food to savings = 120° : 60°
= 2 : 1

48. (1) Total expenditure
$= \frac{8000}{60} \times (105 + 120 + 45 + 30)$
$= \frac{8000}{60} \times 300$
= ₹ 40000

49. (3) Difference in degree of amount spent on food & housing = (120 – 105) = 15° $= \frac{8000}{60} \times 15° = ₹\ 2000$

50. (2) ∵ 35% ≡ 17500
$\therefore\ 15\% \equiv \frac{17500}{35} \times 15 = ₹\ 7500$

51. (1) ∵ 100% ≡ 360°
$\therefore\ 35\% \equiv \frac{360}{100} \times 35 = 126°$

52. (3) Required percentage
$= \frac{4}{10} \times 100 = 40\%$

53. (4) Central angle for binding charges

$= \frac{360}{100} \times 18 = 64.8°$

Central angle for advertisement charges

$= \frac{360}{100} \times 18 = 64.8°$

$\therefore$ Required difference = 0°

Method 2 :

Percentage value for both is same. Therefore, difference between angles is same.

54. (1) Required ratio = 120° : 90°
= 4 : 3

55. (2) $\because$ 360° ≡ 100%

$\therefore 1° \equiv \frac{100}{360}$

$\therefore 90° \equiv \frac{100}{360} \times 90 = 25\%$

56. (4) $\because$ 360° ≡ 7200 acres

$\therefore 1° \equiv \frac{7200}{360} = 20$ acres

$\therefore$ 70° ≡ 70 × 20 = 1400 acres

57. (3) Required percentage

$= \frac{20}{60} \times 100 = \frac{100}{3} = 33\frac{1}{3}\%$

58. (3) Difference in percentage
= (68 – 32)% = (36)%

$\therefore$ Required answer

$= \frac{36 \times 500}{100} = 180$

59. (4) $\because$ 100% ≡ 360°

$\therefore 30\% \equiv \frac{360}{100} \times 30 = 108°$

60. (2) Percentage of failure in Maths, Language and Science = 30 + 36 + 32 = 98%

$\therefore$ Required no. of students

$= \frac{500 \times 98}{100} = 490$

61. (3) Required answer

$= \frac{500 \times 6}{100} = 30$

62. (3) Required percentage
= 30 + 36 = 66%

63. (1) Students enrolled in NCC activities

$= \frac{1200 \times 15}{100} = 180$

64. (3) Total students in HRD & Debating club

$= 1200 \times \frac{(13+11)}{100} = 288$

65. (4) Required per cent

$= \frac{22}{21} \times 100 = 104.76\ \%$

66. (1) Required ratio
= (18 + 21) : 13
= 39 : 13 = 3 : 1

67. (1) Eco-club: Human resource development club
= 22 : 11 = 2 : 1

68. (2) Required ratio = 144 : 72
= 2 : 1

69. (3) Required difference

$= (144 - 72) \times \frac{600}{360}$

$= \frac{72 \times 600}{360} = 120$

70. (1) $\because$ 360° ≡ 100%

$\therefore 54° \equiv \frac{100}{360} \times 54 = 15\%$

71. (2) Required difference

$= (90 - 54) \times \frac{600}{360}$

$= \frac{36 \times 600}{360} = 60$

72. (3) $\because$ 360° = 100%

$\therefore 144° = \frac{100}{360} \times 144 = 40\%$

73. (2) Percentage of crop B exported

$= \frac{72}{360} \times 100 = 20\%$

74. (2) $\because$ 45° = 1.5 million quintals

$\therefore 360° = \frac{1.5 \times 360}{45} = 12$ million quintals

75. (3) A + B + C = 72° + 72° + 36° = 180°

76. (1) $\because$ 45° = 1.5 million quintals

$\therefore 36° = \frac{1.5 \times 36}{45}$

= 1.2 million quintals

77. (4) A : C = 3 × 72° : 36°
= 6 : 1

78. (3) Required ratio = $30 : \frac{25}{2}$

= 60 : 25 = 12 : 5

79. (1) Expenditure on clothes

$= 50000 \times \frac{25}{200}$ = ₹ 6250

80. (1) Expenditure on the study of children and food

$= 35000 \times \frac{55}{100}$ = ₹ 19250

81. (3) $\because$ 100% ≡ 360°

$\therefore 10\% \equiv \frac{360}{100} \times 10 = 36°$

82. (2) $\because \left(\frac{25}{2} - 10\right)\% \equiv$ ₹ 1500

$\Rightarrow \frac{5}{2}\% \equiv$ ₹1500

$\therefore 10\% \equiv 1500 \times \frac{2}{5} \times 10$

= ₹ 6000

83. (4) $\because$ 100% ≡ 360°

$\therefore 15\% \equiv \frac{360}{100} \times 15 = 54°$

84. (2) $\because$ 55% ≡ ₹ 110

$\therefore 100\% \equiv \frac{110}{55} \times 100$ = ₹ 200

85. (4) $\because$ 100% ≡ ₹ 200

$\therefore 25\% \equiv \frac{200}{100} \times 25$ = ₹ 50

86. (1) $\because$ 360% ≡ 100%

$\therefore 108° \equiv \frac{100}{360} \times 108 = 30\%$

i.e. Paper + Miscellaneous (A + D)

87. (2) Average expenditure percentage = 20%

Expenditure on Printing + Binding is more than average expenditure.

88. (2) Corresponding angle of average expenditure

$= \frac{360°}{5} = 72° \equiv$ cement

89. (1) Required ratio
= 36 : 72 : 54
= 2 : 4 : 3

90. (2) $\because$ 360° ≡ 100%

$\therefore 108° \equiv \frac{100}{360} \times 108 = 30\%$

91. (3) $\because$ 360° ≡ 1

$\therefore 90° \equiv \frac{90}{360} = \frac{1}{4}$

92. (3) Required percent

$= \frac{36+54}{360} \times 100 = 25\%$

93. (3) People who prefer flute

$= 60000 \times \frac{11}{100} = 6600$

New number of people who prefer flute

= 6600 – 2100 = 4500

∴ New percentage

$= \frac{4500}{60000} \times 100 = 7.5\%$

94. (1) Difference of percentage

= 22 + 14 – 20 – 14 = 2%

∴ Required answer

$= 60000 \times \frac{2}{100} = 1200$

95. (2) People who prefer Sarod

$= \frac{60000 \times 14}{100} = 8400$

96. (4) People who prefer Piano

$= 60000 \times \frac{9}{100} = 5400$

∴ New number of people who prefer flute

$= 6600 + 5400 \times \frac{50}{300}$

= 6600 + 900 = 7500

∴ Required percentage

$= \frac{7500 \times 100}{60000}$

= 12.5%

97. (1) Required no. of people

= (22 – 11 – 9)% of 60000

$= \frac{60000 \times 2}{100} = 1200$

98. (4) ∵ 100% ≡ 360°

$\therefore 16\% \equiv \frac{360}{100} \times 16 = 57.6°$

99. (4) Percentage decrease

$= \frac{18-15}{18} \times 100$

$= \frac{50}{3} = 16\frac{2}{3}\%$

100. (2) ∵ 4% ≡ ₹ 1848

$\therefore 100\% \equiv ₹ \frac{1848}{4} \times 100$

= ₹ 46200

∴ C.P. of each book $= \frac{46200}{5500}$

= ₹ 8.4

∴ Marked price of each copy

$= \frac{8.4 \times 125}{100} =$ ₹ 10.50

101. (3) ∵ 35% ≡ ₹ 17500

$\therefore 15\% \equiv ₹ \frac{17500}{35} \times 15 =$ ₹ 7500

102. (1) ∵ 4% ≡ ₹ 6000

$\therefore 18\% \equiv \frac{6000}{4} \times 18 =$ ₹ 27000

103. (3) Number of students who come to school by car.

$= \frac{70}{360} \times 2160 = 420$

104. (2) Car : Bus = 70° : 90°

= 7 : 9 or 21 : 27

105. (3) No. of students coming by (bus + walking)

$= \frac{80+90}{360} \times 2160 = 1020$

106. (4) No. of students do not come by train

$= \frac{360-120}{360} \times 2160 = 1440$

107. (2) (Bus – Walking)%

$= \frac{90-80}{80} \times 100 = 12.5\%$

108. (1) Difference between the students of commerce and science = 200

[∵ 100° ≡ 1000

∴ 1° ≡ 10

∴ 20° ≡ 200]

109. (4) Required ratio

= 100 : 120

= 5 : 6

110. (3) ∵ 100° ≡ 1000

$\therefore 360° \equiv \frac{1000}{100} \times 360 = 3600$

111. (4) Expenditure on education in April

$= 24000 \times \frac{47}{100} =$ ₹ 11280

Expenditure on education in May

$= \frac{25000 \times 50}{100} =$ ₹ 12500

Percentage increase

$= \frac{12500 - 11280}{11280} \times 100$

= 10.82%

112. (1) Required ratio

$= \frac{24000 \times 18}{100} : \frac{25000 \times 2}{100}$

= 24 × 18 : 25 × 2

= 216 : 25

113. (3) Expenditure on grocery

$= \frac{25000 \times 14}{100} =$ ₹ 3500

Expenditure on electricity

$= \frac{25000 \times 9}{100} =$ ₹ 2250

114. (4) Required average

$= \frac{1}{3} \times 24000 \times (47 + 4 + 18)\%$

$= \frac{1}{3} \times \frac{24000 \times 69}{100} =$ ₹ 5520

115. (2) ∵ (81 + 63)° ≡ 80000

$\therefore 360° \equiv \frac{80000}{144°} \times 360°$

= ₹ 200000

116. (4) Required percentage

$= \frac{63-36}{36} \times 100 = 75\%$

117. (3) Required percentage

$= \frac{81-54}{81} \times 100$

$= \frac{27}{81} \times 100 = 33\frac{1}{3}\%$

118. (4) Expenditure on agriculture sector $= \frac{72°}{360} \times 1000$

= ₹ 200 crores

119. (1) ∵ 360° ≡ ₹ 96000

$\therefore 115.2° \equiv \frac{96000}{360°} \times 115.2$

= ₹ 30720

120. (4) Difference of respective angles
$= 144° - 43.2°$
$= 100.8°$
$\therefore$ Required difference
$= \frac{96000}{360°} \times 100.8° =$ ₹ 26880

121. (1) Difference of corresponding angles :
Physics and Chemistry
$= 85 - 70 = 15°$
Chemistry and social science
$= 70 - 55 = 15°$

122. (4) Sum of corresponding angles of Maths and Chemistry
$= 90 + 70 = 160°$
Sum of corresponding angles of Physics and Social Science
$= 85 + 55 = 140°$
Difference $= 20°$
$\because 360° \equiv 810$
$\therefore 20° \equiv \frac{810}{360} \times 20 = 45$

123. (1) $\because 360° \equiv 810$
$\therefore 1° \equiv \frac{810}{360} = \frac{9}{4}$
$\therefore 60° \equiv \frac{9}{4} \times 60 = 135$

124. (1) English + Physics + Social Science = 200°
Maths + Chemistry = 160°
Required percentage
$= \frac{40}{360} \times 100 = \frac{100}{9}\%$ or $11\frac{1}{9}\%$

125. (1) $\because 360° \equiv 9000$ tonnes
$\therefore 110° \equiv \frac{9000 \times 110}{360}$
= 2750 tonnes

126. (3) C.P. $= \frac{180 \times 100}{120} =$ ₹ 150
$\therefore$ Cost of paper $= \frac{150 \times 15}{100}$
= ₹ 22.50

127. (1) Required percentage
$= \frac{20 - 15}{20} \times 100 = 25\%$

128. (4) Expenses on food
$= 40000 \times \frac{17}{100} =$ ₹ 6800

129. (2) Expenses on clothes
$= 48000 \times \frac{30}{100} \times \frac{10}{100}$
= ₹ 1440

130. (3) Savings per month = 8%
$\therefore$ Required savings
$= \frac{48000 \times 8}{100} =$ ₹ 3840

131. (1) Difference of percentage
$= 25 - (5 + 15) = 5\%$
$\therefore$ Required difference
$= \frac{48000 \times 5}{100} =$ ₹ 2400

132. (2) $\because 360° \equiv 100\%$
$\therefore 108° \equiv \frac{100}{360} \times 108 = 30\%$

133. (*) Expenditure on labourers :
Year 1991 $\Rightarrow \frac{360000 \times 90}{360}$
= ₹ 90000
Year 2001 $\Rightarrow \frac{864000 \times 100}{360}$
= ₹ 240000
Percentage increase
$= \frac{240000 - 90000}{90000} \times 100$
$= \frac{1500}{9} = 166.7\%$

134. (4) Expenditure on steel :
Year 1991 $\Rightarrow \frac{360000}{360} \times 50$
= ₹ 50000
Year 2001 $\Rightarrow \frac{864000}{360} \times 60$
= ₹ 144000

135. (3) Two wheelers : cars
= 15 : 21
= 5 : 7

136. (1) Required difference
= (36 – 21)% of 1400
$= \frac{1400 \times 15}{100} = 210$

137. (3) Number of Metro rail users
$= \frac{1400 \times 8}{100} = 112$

138. (4) Number of car users
$\Rightarrow \frac{1400 \times 21}{100} = 294$

139. (1) Food + Rent + Clothing + Miscellaneous
$\Rightarrow 108° + 90° + 36° + 72°$
$= 306°$
$\therefore$ Savings $\Rightarrow 360° - 306° = 54°$.

140. (4) Expenditure of food = 25%
Savings = 15%
$\because 15\% \equiv$ ₹ 3000
$\therefore 25\% \equiv \frac{3000}{15} \times 25 =$ ₹ 5000

141. (1) Number of employees in HR department
$= \frac{800 \times 5}{100} = 40$

142. (2) Number of employees in Marketing department
$= \frac{800 \times 24}{100} = 192$
$\therefore$ Required percentage
$= \frac{165}{192} \times 100 = 86$

143. (2) Number of employees in IT department
$= \frac{800 \times 20}{100} = 160$
Number of females
$= 160 - 74 = 86$
$\therefore$ Required percentage
$= \frac{86}{800} \times 100$
= 10.75

144. (4) Total employees in Marketing department = 192
Males = 165
Females = 192 – 165 = 27
$\therefore$ Required ratio = 165 : 27
= 55 : 9

145. (3) $\because 30\% \equiv$ Rs. 9000
$\therefore 1\% \equiv \frac{9000}{30}$
$\therefore 18\% \equiv \frac{9000 \times 18}{30}$
= Rs. 5400

146. (2) $\because 100\% \equiv 360°$
$\therefore 1\% \equiv \frac{360}{100}$
$\therefore 15\% \equiv \frac{360}{100} \times 15 = 54°$

147. (3) Percentage expenditure on house rent + education
= 38%
Remaining expenses
= 100 – 38 = 62%
$\because$ 15% $\equiv$ Rs. 3000
$\therefore$ 62% $\equiv \frac{3000}{15} \times 62$
= Rs. 12400

148. (3) 30% = x% of (12 + 18 + 15)%
$\Rightarrow 30 = \frac{x \times 45}{100}$
$\Rightarrow x = \frac{30 \times 100}{45} = \frac{200}{3}$
$= 66\frac{2}{3}\%$

149. (2) House rent + clothing + fuel
$\Rightarrow$ 20 + 12 + 15 = 47%
Food $\Rightarrow$ 30%
Difference = 47 – 30 = 17%

150. (1) Corresponding angle for children who go on walking
= 360 – 120 – 72 – 24 = 144°

151. (1) Corresponding angle for children using scooter = 72°
$\because$ 360° $\equiv$100%
$\therefore 72° \equiv \frac{100}{360} \times 72 = 20\%$

152. (2) $\because$ 24° $\equiv$ 10 students
$\therefore$ 120° $\equiv \frac{10}{24} \times 120°$
= 50 students

153. (2) $\because$ 144° $\equiv$ 180 students
$\therefore$ 360° $\equiv \frac{180}{144} \times 360$
= 450 students

154. (2) Corresponding angle to the number of students who travel by public bus = 54°
$\because$ 360° $\equiv$ 800
$\therefore$ 54° $\equiv \frac{800}{360} \times 54° = 120$

155. (4) Corresponding angle to number of students who do not use institute bus
= 360° – 216° = 144°
$\because$ 360° $\equiv$ 800
$\therefore$ 144° $\equiv \frac{800}{360} \times 144 = 320$

156. (1) Corresponding angle to the number of students who go to institute on foot
= 360° – (216° + 54° + 18°)
= 72°
$\therefore$ Required answer
$= \frac{72 \times 800}{360} = 160$

157. (1) $\because$ 100% $\equiv$ 360°
$\therefore$ 10% $\equiv \frac{360}{100} \times 10 = 36°$
$\therefore$ Corresponding angle for expenditure on health and education
$\equiv$ 36 + 54 = 90°
$\because$ 360° $\equiv$ Rs. 100000 crores
$\therefore$ 90° $\equiv \frac{100000}{360} \times 90°$
= Rs. 25000 crores

158. (1) Expenditure on state development $\Rightarrow$ 15%
$\because$ 100% $\equiv$ 360°
$\therefore$ 15% $\equiv \frac{360}{100} \times 15 = 54°$
$\therefore$ Expenditure on (state development – sports)
= 54° – 18° = 36°
$\therefore$ Required amount
$= \text{Rs.} \left(\frac{36}{360} \times 300000\right)$ crores
= Rs. 30000 crores

159. (*) Expenditure on defence
$\equiv$ 15% $\equiv$ 54°
$\therefore$ Required per cent
$= \frac{54-36}{54} \times 100 = \frac{100}{3}\%$

160. (*) Expenditure on others
= 30% = 108°
Required per cent
$= \frac{108-18}{18} \times 100$
$= \frac{90}{18} \times 100 = 500\%$

161. (1)
Expenditure on health $\equiv$ 54°
$\because$ 360° $\equiv$ 100%
$\therefore 54° \equiv \frac{100}{360} \times 54 = 15\%$

162. (1) Number of A–type employees in the year 1998
$\Rightarrow \frac{48640 \times 22}{100} \approx 10700$
Number of C and D-type employees in the year 1997
$\Rightarrow \frac{42980 \times 25}{100}$
= 10745

163. (1) It is obvious from the pie–chart.
Percentage increase
$= \frac{10-6}{6} \times 100$
$= \frac{200}{3} \approx 67\%$

164. (1) Required difference
$= \frac{48640 \times 10}{100} - \frac{42980 \times 6}{100}$
= 4864 – 2579 = 2285

165. (1) Required per cent
$= \frac{5000}{48640} \times 100 \approx 10$

166. (4) Number of A–type employees : Year 1997
$\Rightarrow \frac{42980 \times 20}{100} = 8596$
Year 1998 $\Rightarrow$ 10700
$\therefore$ Required percent
$= \frac{10700}{8596} \times 100 \approx 125$

167. (3) If the amount permitted be Rs. x then,
$x \times \frac{100}{110} = 4910$
$\Rightarrow x = \frac{4910 \times 110}{100}$
= Rs. 5401 crores

168. (3) Difference
= Rs. (11486 – 9695) crores
= Rs. 1791 crores
If increase be x%, then
$29952 \times \frac{x}{100} = 1791$
$\Rightarrow x = \frac{179100}{29952} \approx 6\%$

169. (3) Total funds = Rs. (11486 + 5252 + 4910 + 6000 + 29952) crores

= Rs. 57600 crores

$\because$ 57600 ≡ 360°

$\therefore$ 29952 ≡ $\frac{360}{57600} \times 29952$

= 187.2°

170. (4) Expenditure on food : savings = 120° : 60° = 2 : 1

171. (1) $\because$ 70° – 54° ≡ Rs. 1600

$\because$ 16° ≡ Rs. 1600

$\therefore$ 1° ≡ $\frac{1600}{16}$ = Rs. 100

$\therefore$ 120° ≡ 120 × 100

= Rs. 12000

172. (2) $\because$ 360° ≡ Rs. 36000

$\therefore$ 1° ≡ $\frac{36000}{360}$ = Rs. 100

$\therefore$ 60° ≡ 60 × 100 = Rs. 6000

$\therefore$ Annual savings

= Rs. (6000 × 12)

= Rs. 72000

173. (2) According to the question,

$\because$ Market tax ≡ Rs. 165 crores

$\therefore$ 33% ≡ Rs. 165 crores

$\therefore$ 100 – 33 = 67% ≡ $\frac{165 \times 67}{33}$

= Rs. 335 crores

174. (1) $\because$ 100% ≡ Rs. 733 crores

$\therefore$ 35 + 10 = 45% ≡ $\frac{733}{100} \times 45$

= Rs. 329.85 crores

175. (1) $\because$ 100% ≡ 360°

$\therefore$ 1% ≡ $\frac{360°}{100}$

$\therefore$ 35% ≡ $\frac{360°}{100} \times 35 = 126°$

176. (2) $\because$ 360° ≡ Rs. 40000 crores

$\therefore$ 1° ≡ $\frac{40000}{360}$

$\therefore$ 72° ≡ $\frac{72 \times 40000}{360}$

= Rs. 8000 crores

177. (1) According to the question,

Outlay on agriculture × $\frac{x}{100}$ = Outlay of irrigation

$\Rightarrow 108° \times \frac{x}{100} = 54°$

$\Rightarrow x = \frac{54 \times 100}{108} = 50\%$

178. (4) Required ratio = 54 : 45 = 6 : 5

179. (4) Maximum angle = 120°

$\Rightarrow$ company V

180. (4) Required difference

= Rs. $\left[\left(\frac{120°-100°}{360}\right) \times 72\right]$ crores

= Rs. 4 crores

181. (4) Corresponding angle of expenditure on library = 60°

$\therefore$ Required percent

= $\frac{60}{360} \times 100$

= $\frac{50}{3}$ = 16.67%

182. (4) $\because$ 100% ≡ 360°

$\therefore$ 1% ≡ $\frac{360}{100}$

$\therefore$ 25% ≡ $\frac{360}{100} \times 25 = 90°$

$\Rightarrow$ Art and craft

183. (1) Corresponding angle of expense on library = 60°

Corresponding angle of expense on science = 60°

184. (2) Corresponding angle of expense on sports = 120°.

185. (2) Required ratio = 120° : 90° = 4 : 3

186. (1) Required percent

= (100 – 75 – 15 – 5)%

= 5%

187. (2) Non–members = 40 = 5%

= Members of cricket club only.

188. (1) Required ratio

= 5 : 15 = 1 : 3

189. (4) $\because$ 5% ≡ 40

$\therefore$ 75% ≡ $\frac{40}{5} \times 75$

= 600

190. (2) Corresponding angle for conveyance = 90°

$\because$ 360° ≡ Rs. 60000

$\therefore$ 90° ≡ $\frac{60000}{360} \times 90$

= Rs. 15000

191. (4) Corresponding angle for expenditure on electricity = 72°

$\because$ 360° ≡ 100%

$\therefore$ 72° ≡ $\frac{100}{360} \times 72 = 20\%$

192. (3) Corresponding angle for overhead expenses = 108°

$\because$ 360° ≡ Rs. 60000

$\therefore$ 108° ≡ $\frac{60000}{360} \times 108$

= Rs. 18000

193. (1) Corresponding angle for raw materials = 90°

$\because$ 360° ≡ 100%

$\therefore$ 90° ≡ $\frac{100}{360} \times 90 = 25\%$

194. (3) Required percent

= $\left(\frac{20-15}{20} \times 100\right)\%$

= $\left(\frac{5}{20} \times 100\right)\% = 25\%$

195. (3) Percentage expense on royalty = 15%

$\because$ 100% ≡ 360°

$\therefore$ 15% ≡ $\frac{360}{100} \times 15 = 54°$

196. (2) Transportation cost = 10%

$\because$ 10% ≡ Rs. 82500

$\therefore$ 100% ≡ Rs. 825000

$\therefore$ Cost for publishing 1 book = $\frac{825000}{5500}$ = Rs. 150

For a profit of 25%,

$\therefore$ Required S.P. = $\frac{150 \times 125}{100}$

= Rs. 187.50

197. (3) Percentage of printing cost = 20%

Percentage of Royalty cost = 15%

$\because$ 20% ≡ Rs. 30600

$\therefore$ 15% ≡ $\frac{30600}{20} \times 15$

= Rs. 22950

198. (1) Total amount of expenditure is not given.

199. (1) Required percent

$= \frac{30}{120} \times 100$

$= 25\%$

200. (3) Required ratio $= 150° : 30°$

$= 5 : 1$

201. (4) Corresponding angle for expense on food $= 150°$

$\because 360° \equiv$ Rs. 7200

$\therefore 150° \equiv$ Rs. $\left(\frac{7200}{360} \times 150\right)$

= Rs. 3000

202. (2) Expenditure on clothes

= Rs. 825

$\because 36° \equiv$ Rs. 825

$\therefore 360° \equiv \frac{825}{36} \times 360$

= Rs. 8250

203. (1) Corresponding angle for savings $= 54°$

$\because 360° \equiv 100\%$

$\therefore 54° \equiv \frac{100}{360} \times 54 = 15\%$

204. (3) Required ratio $= 108 : 72$

$= 3 : 2$

205. (1) Total expenditure

= Rs. 8250

Expenditure on clothes and rent

$= \frac{8250 \times (36° + 90°)}{360°}$

$= \frac{8250 \times 126}{360}$ = Rs. 2887.5

$\therefore$ Average expenditure

$= \frac{2887.5}{2}$ = Rs. 1443.75

206. (4) Required ratio

$= \frac{108 + 36 + 72}{3} : \frac{54 + 90}{2}$

$= \frac{216}{3} : \frac{144}{2} = 72 : 72 = 1 : 1$

207. (2) United States $\Rightarrow$ \$1.2 million doller

South Africa $\Rightarrow$ \$888.8 million doller

Mexico $\Rightarrow$ \$1 billion

United Kingdom

$\Rightarrow$ \$637.4 million

Sri Lanka $\Rightarrow$ \$596.9 million

208. (4) Exports to United states

$= 8.40\%$

Exports to United Kingdom and Turkey

$= (4.4 + 4)\% = 8.4\%$

209. (2) Third largest importer $\Rightarrow$ South Africa

Seventh largest importer $\Rightarrow$ Turkey

Required difference

= \$ (888.8 – 580.4) million

= \$ 308.4 million

210. (4) Required average

$= \frac{433.6 + 592.1 + 596.9}{3}$

$= \frac{1622.6}{3}$

= \$540.8 million

211. (1) $\because 100\% \equiv 360°$

$\therefore 4\% \equiv \frac{360 \times 4}{100} = 14.4°$

212. (4) Time spent in studying history and chemistry

$= 4\frac{1}{2}$ hours.

Their corresponding percentage $= (15 + 15)\% = 30\%$

$\because 30\% \equiv \frac{9}{2}$ hours

$\therefore 20\% \equiv \frac{9 \times 20}{2 \times 30} = 3$ hours

213. (2) $\because 15\% \equiv 3$ hours

$\therefore 10\% \equiv \frac{3}{15} \times 10 = 2$ hours

214. (1) $\because 100\% \equiv 10$ hours

$\therefore 30\% \equiv \frac{10}{100} \times 30 = 3$ hours

215. (3) Usual time spent in studying Maths

$= \frac{20}{100} \times 30 = 6$ hours

Usual time spent in studying other subjects

$= \frac{10}{100} \times 20 = 2$ hours

New time spent in studying other subjects

$= \frac{15 \times 20}{100} = 3$ hours

Difference $= 6 - 1 = 1$ hours

116. (4) Corresponding angle for cigarette, pipe and bidi users

$= 180° + 36° + 90° = 306°$

Corresponding angle for other product consumers $= 36°$

Difference $= 306 - 36 = 270°$

$\because 360° \equiv 100\%$

$\therefore 270° \equiv \frac{100}{360} \times 270 = 75\%$

117. (3) $\because 360° \equiv 119060$

$\therefore 1° = \frac{119060}{360}$

$\therefore 180° \equiv \frac{119060 \times 180}{360}$

$= 59530$

118. (2) $\because 360° \equiv 119060$

$\therefore 90° \equiv \frac{119060}{360} \times 90$

$= 29765$

119. (2) Difference between corresponding angles for cigarette and pipe users $= 180° - 36°$

$= 144°$

$\because 360° \equiv 119060$

$\therefore 144° \equiv \frac{119060}{360} \times 144$

$= 47624$

220. (2) Percentage of people without smoking habits

$= \frac{18 \times 100}{360} = 5\%$

221. (1) Number of Engineering colleges in 80's

$= \frac{20000 \times 15}{100}$

$= 3000$

Number of Engineering colleges in 90°s $= \frac{40000 \times 40}{100}$

$= 16000$

Required difference

$= 16000 - 3000$

$= 13000$

222. (3) Number of Management colleges in 80's

$= \frac{20000 \times 10}{100} = 2000$

Number of Management colleges in 90's $\frac{40000 \times 19}{100}$

= 7600

Required difference

= 7600 – 2000 = 5600

223. (1) Required percentage increase

$= \left(\frac{20000 - 5000}{5000}\right) \times 100$

$= \frac{15000 \times 100}{5000} = 300\%$

224. (1) Number of Medical colleges in 1980

$= 20000 \times \frac{12}{100} = 2400$

Number of Medical colleges in 1990 $= \frac{40000 \times 8}{100} = 3200$

∴ Required percent

$= \left(\frac{3200 - 2400}{3200}\right) \times 100$

$= \frac{800}{32} = 25\%$

225. (2) Required average

$= \frac{(5 + 10 + 20 + 40 + 80) \times 1000}{5}$

$= \frac{155000}{5} = 31000$

226. (1) Literate males

$= 35000 \times \frac{45}{100} = 15750$

Literate females

$= 35000 \times \frac{35}{100} = 12250$

Required difference

= 15750 – 12250 = 3500

227. (4) Required difference in percentage shares

= 12 – 8 = 4%

∵ 100% ≡ 360°

$\therefore 4\% \equiv \frac{360 \times 4}{100} = 14.4°$

228. (1) ∵ 360° ≡ 100%

$\therefore 36° \equiv \frac{100 \times 36}{360} = 10\%$

Difference between percentage shares of literate males literate and females = 45 – 35

= 10%

229. (1) ∵ 360° ≡ 100%

$\therefore 169.2° \equiv \frac{169.2 \times 100}{360} = 47\%$

Percentage share of literate females and illiterate females = (35 + 12)% = 47%

230. (2) Percentage of miscellaneous charges = 4%

Percentage of advertisement charges = 18%

∵ 4% ≡ Rs. 6000

$\therefore 18\% \equiv \frac{6000 \times 18}{4}$

= Rs. 27000

231. (2) Difference of percentage charges on printing and advertisement = 35 – 18 = 17%

∵ 100% ≡ 360°

$\therefore 17\% \equiv \frac{360}{100} \times 17 = 61.2°$

232. (3) ∵ 100% ≡ 360°

$\therefore 10\% \equiv \frac{360}{100} \times 10 = 36°$

233. (1) Required ratio = 15 : 18

= 5 : 6

234. (2) Percentage of people involved in trade = 6.7%

Percentage of people involved in service = 20%

Difference of percentage

= (20 – 6.7)%

= 13.3%

∴ Required answer

= 13.3% of 20000

$= \frac{20000 \times 13.3}{100}$

= 2660

235. (2) Required ratio = ratio of corresponding percentages

= 20 : 30 = 2 : 3

236. (3) Corresponding percentage of service = 20%

∵ 100% ≡ 360°

$\therefore 1\% \equiv \frac{360}{100}$

$\therefore 20\% \equiv \frac{360}{100} \times 20 = 72°$

237. (4) Difference of corresponding percentages = (33.30 – 6.7)%

= 26.6%

∴ Required answer

= 26.6% of 20000

$= \frac{20000 \times 26.6}{100} = 5320$

238. (2) Corresponding angle of year 2013 = 135°

Correspomding angle of year 2011 = 75°

∵ 135° ≡ Rs. 31500

$\therefore 75° \equiv \text{Rs.} \left(\frac{31500}{135} \times 75\right)$

= Rs. 17500

239. (2) Required ratio

= Ratio of corresponding central angles

= 45° : 135°

= 1 : 3

240. (4) Required percentage increase

$= \left(\frac{135 - 75}{75}\right) \times 100$

$= \frac{60 \times 100}{75} = 80\%$

241. (2) Percentage increase in 2012 in comparison to 2011

$= \left(\frac{105 - 75}{75}\right) \times 100$

$= \frac{3000}{75} = 40$

Percentage increase in 2013 in comparison to 2012

$= \left(\frac{135 - 105}{105}\right) \times 100$

$= \frac{3000}{105} = \frac{200}{7}$

∴ Required ratio

$= 40 : \frac{200}{7}$

$= 7 : 5$

242. (2) Percentage expenditure on (football + basket ball + cricket)
$= (15 + 12.5 + 25)\% = 52.5\%$
Percentage expenditure on (tennis + hockey + golf)
$= (10 + 15 + 12.5)\%$
$= 37.5\%$
$\therefore$ Required ratio
$= 52.5 : 37.5 = 7 : 5$

243. (4) $\because$ 100% $\equiv$ Rs. 12000000

$\therefore \frac{25}{2}\% \equiv \frac{12000000}{100} \times \frac{25}{2}$

= Rs. 1500000

244. (4) Percentage expenditure on (hockey + football + others)
$= (15 + 15 + 10)\% = 40\%$
$\because$ 100% $\equiv 360°$

$\therefore 1\% \equiv \frac{360°}{100}$

$\therefore 40\% \equiv \frac{360°}{100} \times 40$

$= 144°$.

245. (1) According to the question,
$\because$ 25% $\equiv$ Rs. 2000000

$\therefore 1\% \equiv$ Rs. $\left(\frac{2000000}{25}\right)$

$\therefore 10\% \equiv$ Rs. $\left(\frac{2000000}{25} \times 10\right)$

$\equiv$ Rs. 800000

246. (3) Total population of village X = x (let).

$\therefore \frac{x \times 38}{100} = 12160$

$\Rightarrow x = \frac{12160 \times 100}{38} = 32000$

$\because$ 16% $\equiv$ 32000

$\therefore 11\% \equiv \frac{32000}{16} \times 11 = 22000$

247. (3) Required ratio
$= 46 \times 21 : 42 \times 11 = 23 : 11$

248. (2) Population percentage of village R = 16%
Population percentage of village Y = 15%
$\because$ 16% $\equiv$ 32000

$\therefore 15\% \equiv \frac{32000}{16} \times 15$

$= 30000$

$\therefore$ Population below poverty line in village Y
= 52% of 30000

$= 30000 \times \frac{52}{100}$

$= 15600$

249. (2) Population percentage of village V in 2009 = 10%
$\because$ 15% $\equiv$ 30000

$\therefore 10\% \equiv \frac{30000}{15} \times 10 = 20000$

Population of village V in 2010

$= \frac{20000 \times 110}{100} = 22000$

$\therefore$ Population below poverty line

$= \frac{22000 \times 58}{100} = 12760$

250. (3) Total sales of English News Papers = 2500 + 2000 + 1800 + 3000 + 200 = 9500
Total sales of Hindi News Papers = 3500 + 2400 + 3600 + 2500 + 4000 = 16000
Required difference
$= 16000 - 9500 = 6500$

251. (2) Required central angle

$= \frac{4000}{16000} \times 360° = 90°$

252. (1) Ratio = 160 : 95
$= 32 : 19$
Required sum = 32 + 19 = 51

253. (3) Required ratio

$= \frac{(2000 + 1800 + 200)}{3} : \left(\frac{2500 + 3000}{2}\right)$

$= \frac{4000}{3} : \frac{5500}{2}$

$= \frac{8}{3} : \frac{11}{2}$

$= 16 : 33$

254. (1) Required ratio

$= \frac{5000}{2} : \frac{16000}{5}$

$= 2500 : 3200$
$= 25 : 32$

255. (3) Total number of children
$= 871 + 222 + 275 + 657 + 60$
$= 2085$
$\therefore$ Required per cent

$= \frac{871}{2085} \times 100 \approx 41.7$

256. (1) Required average

$= \frac{2085}{5} = 417$

257. (4) Required ratio = 60 : 275
$= 12 : 55$

258. (1) Number of children with disorders except language disorder
$= 2085 - 657 = 1428$

Their average $= \frac{1428}{4} = 357$

Required ratio = 657 : 357
$= 219 : 119$

259. (2) Number of blood group 'O' donors

$= \frac{100.8}{360} \times 150 = 42$

260. (1) Persons with blood group A or B

$= \frac{(129.6 + 72)}{360} \times 150$

$= \frac{201.6 \times 150}{360} = 84$

261. (3) $\because 360° \equiv 100\%$

$\therefore 1° \equiv \frac{100}{360}\%$

$\therefore 57.6° \equiv \left(\frac{57.6 \times 100}{360}\right)\%$

$= 16\%$

262. (4) Required ratio

$= 72° : \left(\frac{100.8 + 129.6 + 57.6}{3}\right)°$

$= 72° : \frac{288°}{3}$

$= 72° : 96°$
$= 3 : 4$

263. (1) Let the total production of foodgrains be x units.
$\therefore$ Required ratio

$= \frac{(30 + 10)x}{100} : \frac{(55 - 5)x}{100}$

$= 40 : 50 = 4 : 5$

264. (2) Production percentage of rice and tea = 60%

Production percentage of wheat = 30%

Required percentage

$= \left(\frac{60-30}{30}\right) \times 100 = 100\%$

265. (4) $\because$ 100% ≡ 360°

$\therefore$ 30% ≡ $\frac{360°}{100} \times 30 = 108°$

266. (3) Total production

= 500000 kg

Production percentage of rice

= 55%

$\therefore$ Production of rice

$= \frac{500000 \times 55}{100} = 275000$ kg.

267. (2) Expenditure per cent on clothing and grocery

= (8 + 20)% = 28%

$\because$ 100% ≡ Rs. 32000

$\therefore$ 28% ≡ Rs. $\left(\frac{32000}{100} \times 28\right)$

= Rs. 8960

268. (4) Budgetary expenditure on miscellaneous items

= 7% of Rs. 32000

= Rs. $\left(\frac{32000 \times 7}{100}\right)$

= Rs. 2240

New expenditure = Rs. 3040

$\therefore$ Increase = Rs. (3040 – 2240)

= Rs. 800

269. (4) Required difference

= (19 – 6)% of Rs. 32000

= Rs. $\left(\frac{32000 \times 13}{100}\right)$

= Rs. 4160

270. (2) Budgetary expenditure on grocery

= Rs. $\left(\frac{32000 \times 20}{100}\right)$ = Rs. 6400

Actual expenditure

= Rs. 4672

Difference = Rs. (6400 – 4672)

= Rs. 1728

271. (1) Percentage expenditure on cricket and hockey = 40%

$\because$ 100% ≡ Rs. 15000000

$\therefore$ 40% ≡ Rs. $\left(\frac{15000000 \times 40}{100}\right)$

≡ Rs. 6000000

272. (4) $\because$ 100% ≡ Rs. 12000000

$\therefore$ 12.5% ≡ Rs. $\left(\frac{12000000}{100} \times 12.5\right)$

= Rs. 1500000

273. (2) Required ratio = 15 : 15

= 1 : 1

274. (1) Percentage expenditure on tennis = 10%

$\because$ 100% ≡ 360°

$\therefore$ 10% ≡ $\frac{360}{100} \times 10 = 36°$

275. (*) Corresponding central angle :

Food ⇒ 90°

Education + Clothing

⇒ 27 + 18 = 45°

$\therefore$ Required per cent

$= \frac{90°-45°}{45} \times 100 = 100\%$

276. (2) Central angle for savings

= 108°

$\because$ 360° ≡ 100%

$\therefore$ 108° ≡ $\left(\frac{100}{360} \times 108\right)\%$

= 30%

277. (3) Corresponding angle for rent

= 54°

$\because$ 360° ≡ Rs. 72000

$\therefore$ 54° ≡ Rs. $\left(\frac{72000 \times 54}{360}\right)$

= Rs. 10800

278. (4) Corresponding angle for clothing, transportation and entertainment

= 18° + 14° + 13° = 45°

$\because$ 360° ≡ 100%

$\therefore$ 45° ≡ $\frac{100}{360} \times 45 = \frac{25}{2}$

= 12.5%

279. (4) Corresponding percentage of paper = 16%

$\because$ 100% ≡ 360°

$\therefore$ 1% ≡ $\frac{360°}{100}$

$\therefore$ 16% ≡ $\frac{360}{100} \times 16 = 57.6°$

280. (3) Corresponding percentage of printing = 42%

Corresponding percentage of royalty = 12%

$\because$ 42% ≡ Rs. 16800

$\therefore$ 12% ≡ Rs. $\left(\frac{16800}{42} \times 12\right)$

= Rs. 4800

281. (2) Required percent

$= \frac{(24-12)}{24} \times 100$

$= \frac{12}{24} \times 100 = 50\%$

282. (2) $\because$ 2% ≡ Rs. 12000

$\therefore$ 24% ≡ Rs. $\left(\frac{12000}{2} \times 24\right)$

= Rs. 144000

283. (1) Corresponding angle for steel = 36°

$\because$ 360° ≡ 100%

$\therefore$ 36° ≡ $\left(\frac{100}{360} \times 36°\right)\% = 10\%$

284. (3) Required ratio = 72° : 54°

= 4 : 3

285. (2) Corresponding angle for cement = 72°

Corresponding angle for labour expenses = 90°

$\because$ 72° ≡ Rs. 5000

$\therefore$ 90° ≡ Rs. $\left(\frac{5000}{72°} \times 90°\right)$

= Rs. 6250

286. (3) Sum of the corresponding angles for steel, cement and miscellaneous items

= (36° + 72° + 108°) = 216°

$\because$ 360° ≡ 100%

$\therefore$ 216° ≡ $\frac{100}{360} \times 216 = 60\%$

$\therefore$ Required average = 20%

287. (3) Corresponding angle for English, Science and Social Science

= 55° + 80° + 65°

= 200°

Corresponding angle for Hindi and Maths = 90 + 70 = 160°

$\therefore$ Required percent

$= \frac{200-160}{160} \times 100$

$= \frac{400}{16} = 25\%$

288. (2) Corresponding angle for Hindi = 70°

$\because$ 360° ≡ 540

$\therefore$ $70° \equiv \frac{540}{360} \times 70 = 105$

289. (4) Difference between corresponding angles for English and Science = 80° – 55° = 25°

Difference between corresponding angles for Maths and Social Science = 90° – 65° = 25°

290. (3) Corresponding angles :

Hindi + English ⇒ 70 + 90= 160°

English + Social Science

⇒ 55° + 65° = 120°

Difference = 160 – 120 = 40°

$\because$ 360° ≡ 540

$\therefore$ $40° \equiv \frac{540}{360} \times 40 = 60$

291. (1) Corresponding central angle for the cost on timber = 36°

$\because$ 360° ≡ Rs. 600000

$\therefore$ $36° \equiv \text{Rs.} \left(\frac{600000 \times 36}{360}\right)$

= Rs. 60000

292. (3) Corresponding central angles :

Labour ⇒ 90°

Supervision ⇒ 54°

Difference = 90° – 54° = 36°

$\therefore$ Required excess amount

$= \text{Rs.} \left(\frac{36}{360} \times 600000\right)$

= Rs. 60000

293. (1) Corresponding central angles :

Labour ⇒ 90°

Steel ⇒ 54°

$\therefore$ Required excess amount

= 90° – 54° = 36°

i.e. 10% of total cost.

294. (1) Corresponding angle for cement, steel and supervision

= 72° + 54° + 54° = 180°

$\therefore$ Required per cent

$= \frac{180°}{360°} \times 100 = 50\%$

295. (4) Corresponding central angle for miscellaneous expenditure = 108°

$\because$ 360° ≡ 100%

$\therefore$ $1° \equiv \frac{100}{360}\%$

$\therefore$ $108° \equiv \frac{108 \times 100}{360} = 30\%$

296. (1) Required ratio = Ratio of corresponding central angles

= 135° : 81°

= 5 : 3

297. (2) Corresponding angle for expenses on education = 36°

$\because$ 360° ≡ Rs. 16000

$\therefore$ $36° \equiv \frac{16000 \times 36}{360}$ = Rs. 1600

298. (4) Difference between the respective angles for rent and education

= 81 – 36 = 45°

$\therefore$ Required answer

$= \text{Rs.} \left(\frac{45}{360} \times 16000\right)$

= Rs. 2000

TYPE-II

1. (3) ₹ 45.7 [Clear from graph]

2. (3) 24 years [Clear from graph]

3. (4) Required premium

= 43·75 × 10 = ₹ 437·5

4. (2) Required increase

$\frac{46.544}{44} \times 100 = 5.68\%$

5. (2) Required difference

= (44 – 43.50) × 100

= 0.50 × 100 = ₹ 50

6. (2) The car covers 6 km in 1 hour.

$\therefore$ Speed = 6 kmph

7. (2) Speed = 6 kmph

$= \frac{6 \times 1000}{60}$ m/min.

=100m/min.

8. (1) Required distance

= Speed × Time

= 6×4.5 = 27 km

9. (4) Time taken = $\frac{\text{Distance}}{\text{Speed}}$

$= \frac{15}{6} = 2\frac{1}{2}$ hours.

10. (1) Both the lines intersect when time is 10:30 a.m.

11. (2) Time = $\frac{5}{2}$ hours,

Distance = 120 km

$\therefore$ Speed of scooterist

$= \frac{120}{5} \times 2 = 48$ kmph

12. (3) Time = 11:30 – 9:00

$= 2\frac{1}{2}$ hours

13. (4) Clear from the graph.

14. (4) Clear from table.

15. (1) Range of prices :

Year 2000 ⇒ 23 – 5 = ₹ 18

Year 2001 ⇒ 20 – 17 = ₹ 3

Year 2002 ⇒ 14 – 10 = ₹ 4

Year 2003 ⇒ 11 – 5 = ₹ 6

16. (3) Price of rice in June = ₹ 21

17. (4) Clear from table.

Difference = 23 – 5

= 18 ₹ i.e. month is December.

18. (4) Average marks

$= \frac{10 + 12.5 + 15}{3}$

$= \frac{37.5}{3} = 12.5$

19. (2) Difference between temperatures :

Sunday ⇒ 39 – 23 = 16°

Saturday ⇒ 42.5 – 24 = 18.5°

Wednesday ⇒ 32.5 – 15 = 17.5°

20. (2)

Wages	Number of workers
120	12
140	26 – 12 = 14
160	34 – 26 = 8
180	40 – 34 = 6
200	50 – 40 = 10

$\therefore$ Required per cent

$= \frac{8}{50} \times 100 = 16\%$

21. (4) Median

$= \frac{\text{Lowest value + Highest value}}{2}$

$= \frac{120 + 200}{2}$ = ₹ 160

22. (4) Definite income is not known.

23. (4) It is obvious from the graph.

24. (1) Number of students

= 15 + 30 + 35 + 30 + 25 + 22.5 + 22.5 = 180

25. (3) Percentage decrease

$$= \frac{32-27}{32} \times 100$$

$$= \frac{5 \times 100}{32} = \frac{125}{8} = 15\frac{5}{8}\%$$

26. (1) $\frac{\text{Exports}}{\text{Imports}} = 1.75$

$$= \frac{175}{100} = \frac{7}{4}$$

After 40% increase in imports,

$$\frac{\text{Exports}}{\text{Imports}} = \frac{7}{\frac{4 \times 140}{100}} = \frac{700}{4 \times 140}$$

$$= \frac{5}{4} = 1.25$$

27. (2) In the year 2005,
Imports of company X
= ₹ 180 crores
Exports = 1.75 × 180
= ₹ 315 crores
Exports of company Y
= ₹ 157.5 crores
∴ Imports of company Y

$$= \frac{157.5}{0.75}$$

= ₹ 210 crores,

28. (3) Number of examinees getting more than average marks
= 72 + 48 + 24 + 8 = 152

29. (4) Number of students who got above 80% marks = 24 + 8 = 32
∴ Required percent

$$= \frac{32}{273} \times 100 = 11.72\%$$

30. (1) Number of students who got marks above 60% and below 80%
= 72 + 48 = 120
∴ Required percentage

$$= \frac{120 \times 100}{273} = 43.95\%$$

31. (3) Number of students who got 40% or less marks
= 2 + 4 + 12 + 26 = 44
∴ Required percentage

$$= \frac{44}{273} \times 100 = 16.11\%$$

32. (2) Required percentage

$$= \frac{3150}{4500} \times 100 = 70\%$$

33. (3) Average demand

$$\left(\frac{2100+3150+2600+5000+2800+3300}{6}\right)$$ lakh tonnes

$$= \frac{18950}{6}$$ lakh tonnes

Average production

$$= \left(\frac{1450+3660+3100+4200+3700+4500}{6}\right)$$ lakh tonnes

$$= \frac{20610}{6}$$ lakh tonnes

Required difference

$$= \frac{20610}{6} - \frac{18950}{6}$$

$$= \frac{1660}{6} = 276.7$$ lakh tonnes

∴ Required answer
= 275 lakh tonnes

34. (4) Required per cent

$$= \frac{1450}{2600} \times 100$$

$$= \frac{1450}{26} = 55.8$$

35. (2) Companies having more demand than production
⇒ A and D
Companies having more production than demand
⇒ B, C, E and F
∴ Required ratio = 2 : 4 = 1 : 2

36. (1) Average production of type P vehicles

$$= \frac{100+125+200+225+275+275}{6}$$

$$= \frac{1200}{6} = 200$$ thousands

Required years
⇒ 2012, 2013 and 2014

37. (2) Required percentage decrease

$$= \left(\frac{150-125}{150}\right) \times 100$$

$$= \frac{25}{150} \times 100 = \frac{50}{3}$$

= 16.7%

38. (3) Total production of type P vechicles in 2009 and 2011
= 100 + 200 = 300 thousands
Total production of type Q vehicles in 2010 and 2014
= 150 + 225 = 375 thousands
∴ Required percent

$$= \frac{300}{375} \times 100 = 80\%$$

39. (1) Total production of type P vehicles = 1200 thousands
Total production of type Q vehicles
= 175 + 150 + 125 + 175 + 175 + 225 = 1025
∴ Required ratio
= 1200 : 1025 = 48 : 41

40. (3) Required percent

$$= \frac{150}{275} \times 100 = 54.5\%$$

41. (3) Required percent

$$= \left(\frac{73.70-36.49}{36.49}\right) \times 100$$

$$= \frac{3721}{36.49} \approx 102\%$$

42. (3) Difference in 2014
= Rs. (73.70 – 66.79)
= Rs. 6.91
It is obvious from the graph.

43. (1) Required average

$$= \text{Rs.} \frac{\left(\begin{array}{l}33.65+32.85+34.04+\\32.76+38.51+40.01+43.47\end{array}\right)}{7}$$

$$= \frac{255.29}{7} = \text{Rs. } 36.47$$

44. (2) Required ratio = 45 : 50
= 9 : 10

45. (3) Number of employees recruited in 2012 = 25
Number of employees recruited in 2014 = 40
∴ Required percent

$$= \frac{25}{40} \times 100 = 62.5\%$$

46. (2) Required answer = 640 + 35 + 45 + 25 + 50 + 40 = 835

47. (2) Percentage increase

$= \frac{35}{640} \times 100 \approx 5.5$

48. (1) Employees recruited in 2015

$= \frac{40 \times 140}{100} = 56$

TYPE-III

1. (4) According to graph income spend on food is 20%.

2. (2) Percentage expenditure on clothing = 15%
Percentage savings = 12.5%
∴ Required difference
= (15 – 12.5)% = 2.5%

3. (3) Savings
= 12.5% of ₹ 100000

$= ₹ \frac{12.5 \times 100000}{100} = ₹ 12500$

4. (3) Both expenditures are equal to 20% each.

5. (1) The expenditure on housing is 10% which is less than 12.5%, the savings.

6. (3) Birth–rate of Germany = 16
Birth–rate of England = 20

% Diff. $= \frac{20-16}{16} \times 100 = 25\%$

It is 25% more than 16.

7. (1) Birth–rate of India = 33
Birth-rate of England = 20
∴ Required percentage

$= \frac{33}{20} \times 100 = 165\ \%$

8. (4) Birth- rate of China = 40
Birth – rate of Germany = 16
∴ Required answer

$= \frac{40}{16} = 2.5$

9. (2) Required ratio $= \frac{33}{15}$

$= \frac{11}{5} = 11 : 5$

10. (2) Birth–rate of England = 20
Birth–rate of New Zealand = 30
Required percentage

$= \frac{30-20}{30} \times 100 = \frac{100}{3}\%$

$= 33\frac{1}{3}\%$

11. (1) Population in 1971
= 54.80 crores
Population in 1981 = 68.40 crores
Increase = (68.40 – 54.80) crores
= 13.6 crores
∴ Increase%

$= \frac{13.6}{54.80} \times 100 = 24.8\ \%$

12. (4) Percentage increase in 1981
= 24.8% (From Q 11)
Percentage increase in 1971

$= \left(\frac{54.80 - 43.92}{43.92}\right) \times 100$

= 24.77%
Hence, increase is highest in 1981.

13. (2) Percentage increase in 1941

$= \left(\frac{31.85 \times 27.90}{27.90}\right) \times 100$

$= \frac{3.95 \times 100}{27.90} = 14.16\%$

Percentage increase in 1951

$= \left(\frac{36.14 \times 31.85}{31.85}\right) \times 100$

$\frac{4.29 \times 100}{31.85} = 13.47\%$

Hence, % increase is least in 1951

14. (1) Total Increase
= (68.40 – 27.90) crores
= 40.5 crores
∴ Annual increase

$= \frac{40.5}{50}$ crores

$= \frac{40.5 \times 10000000}{50} = 8100000$

15. (2) Required answer
= 16 + 8 + 20 = 44

16. (4) It is obvious from the graph.

17. (3) Required answer
= 7 + 24 + 14 = 45

18. (2) Required number of cycles
= 1060 + 920 = 1980

19. (3) Required number of cycles
= 1440

20. (1) Required number of cycles
= 800 + 1300 + 1060 + 920 + 1440 = 5520

21. (1) Percentage decrease

$= \frac{70-25}{70} \times 100$

$= \frac{4500}{70} = 64.2\ \%$

22. (3) It is obvious from the graph.
Required average production
= 40000 tonnes

23. (2) Percentage increase

$= \frac{90-40}{40} \times 100 = 125\ \%$

24. (3) Average production

$= \frac{(40+30+70+25+55+50+80+90)1000}{8}$ tonnes

$= \frac{440}{8} \times 1000 = 55000$ tonnes

Years having more production than it ≡ 2003, 2007 and 2008

25. (3) Percentage decrease

$= \frac{60-45}{60} \times 100 = 25\ \%$

26. (4) Average production

$= \left(\frac{25+40+60+45+65+50+75+80}{8}\right)$ ten thousand tonnes

= 55 × ten thousand tonnes
∴ Required years = 1997, 1999, 2001 and 2002.

27. (3) Percentage increase :
In Year 1996

$\Rightarrow \frac{40-25}{25} \times 100 = 60\ \%$

In Year 1997

$\Rightarrow \frac{60-40}{40} \times 100 = 50\ \%$

% increase is maximum in 1996

28. (1) Required ratio
= (40 + 60) : (25 + 45 + 50)
= 100: 120 = 5 : 6

29. (3) It is obvious from the graph.

30. (2) Required total daily payment
= 35 × 9 = ₹ 315

31. (2) Required answer

$= \frac{4200}{2800} = 1.5$

32. (3) Percentage increase

$= \frac{4200-2100}{2100} \times 100 = 100\%$

33. (4) Percentage increase

1992-93 $\Rightarrow \frac{3600-2600}{2600} \times 100 \approx 38\%$

1990-91 $\Rightarrow \frac{2800-2100}{2100} \times 100 \approx 33.3\%$

1988-89 $\Rightarrow \frac{3100-2200}{2200} \times 100 \approx 41\%$

34. (1) Average deficit = $\frac{23200}{8}$

= ₹ 2900 crore

∴ Required ratio = 3 : 5

35. (3) Required percentage

$= \frac{3600}{2900} \times 100 \approx 125\%$

36. (2) Required difference

$= \frac{1}{3}[(70 + 80 + 90 - 80 - 60 - 75)]$ lakh tonnes

$= \frac{25}{3}$ lakh tonnes

$= 8\frac{1}{3}$ lakh tonnes

37. (3) Required ratio

= (70 + 90 + 60) : (80 + 80 + 75)

= 220 : 235 = 44 : 47

38. (1) $(90 + 60) \times \frac{x}{100} = 80 + 75$

$\Rightarrow \frac{150 \times x}{100} = 155$

$\Rightarrow x = \frac{155 \times 100}{150} = \frac{310}{3}$

$= 103\frac{1}{3}$

39. (4) In year 2000 average production of fertilizers

$= \frac{455}{6} = 75\frac{5}{6}$ lakh tonnes

40. (4) It is obvious from the graph.

41. (1) Average sales of the branches B1 and B4

$= \frac{20 + 80}{2} = 50$ thousand

Average sales of the branches B3 and B5

$= \frac{55 + 45}{2} = 50$ thousand

42. (2) Average sales of all branches

$= \frac{300}{6} = 50$ thousand

The sale of branches B1, B2 and B5 are less than the average sales.

43. (1) New sale of books from branch

B2 = $\frac{40 \times 130}{100}$

= 52 thousand

New sale of books from branch B4

$= \frac{80 \times 90}{100} = 72$ thousand

New average sales = $\frac{304}{6}$

$= \frac{152}{3}$ thousand

Increase = $\frac{152}{3} - 50 = \frac{2}{3}$ thousand

∴ Percentage increase

$= \frac{2}{3 \times 50} \times 100 = \frac{4}{3} = 1.33\%$

44. (2) Required total sales

$= \frac{300 \times 102}{100} = 306$ thousand

45. (2) B1 + B4 = B2 + B6

= B3 + B5 = 100000

B3 – B5 = 55 – 45

= 10 thousand

B4 – B1 = 80 – 20

= 60 thousand

B6 – B2 = 60 – 40

= 20 thousand

∴ Minimum diff. = 10

46. (4) Total number of students

= (6 + 15 + 11 + 18 + 16) × 10

= 66 × 10 = 660

47. (2) Bicycle and Rickshaw users

= (18 + 16) × 10 = 340

48. (3) Number of students who use bus = 150

∴ Required percentage

$= \frac{150}{660} \times 100$

$= \frac{250}{11} = 22\frac{8}{11}\%$

49. (4) Required ratio = 6 : 16 = 3 : 8

50. (2) Required sales

= ₹ (1773 + 1115) crore

= ₹ 2888 crore

51. (1) It is obvious from the bar diagram.

52. (2) Clear from the graph

53. (2) Required average

$= \frac{8730 + 924}{2}$

$= \frac{9654}{2}$ = ₹ 4827 crores

54. (2) Required difference

= ₹ (5345 – 1841) crores

= ₹ 3504 crore

55. (2) It is obvious from the bar graph.

Section A = section F = 34

56. (4) Required ratio = 34 : 31

57. (3) Total number of students

= 34 + 35 + 31 + 32 + 33 + 34

= 199

58. (3) Required ratio = 35 : 31

59. (4) Required percentage

$= \frac{31}{199} \times 100 = 15.57\%$

60. (3) Required percentage

$= \frac{440}{400} \times 100 = 110\%$

61. (2) Percentage decrease(2001)

$= \frac{340 - 320}{340} \times 100 = 6\%$

Percentage decrease (2005)

$= \frac{440 - 400}{440} \times 100 = 9\%$

∴ % decrease is least in 2001

62. (3) Required difference

= (420 – 320) × 1000

= ₹ 100000

63. (2) Required answer

$= \frac{320}{400} = 0.8$

64. (4) Percentage increase in 2004

$= \frac{440 - 420}{420} \times 100 = 4.76\%$

Percentage increase in 2003

$= \frac{420 - 400}{400} \times 100 = 5\%$

∴ % Increase in least in 2004

65. (3) Year 1999 ⇒ 1500 quintals

66. (1) Percentage increase

$= \frac{1000 - 500}{500} \times 100 = 100\%$

67. (3) Production in 1999

= 1500 quintal

Production in 2000

= 1300 quintal

Percentage decrease

$= \frac{1500 - 1300}{1500} \times 100$

$= \frac{40}{3} = 13\frac{1}{3}\%$

68. (4) Required total production
= (1200 + 600 + 500 + 1000) quintals
= 3300 quintals

69. (3) Average production

$= \frac{8834}{7} = 1262$ quintals

Years of more than average production
= 2003, 2005 and 2006

70. (3) Per cent rate of decline :
Year 2004

$\Rightarrow \frac{400}{1640} \times 100 = 24.4\%$

Year 2002

$\Rightarrow \frac{1085 - 720}{1085} \times 100$

$= \frac{365}{1085} \times 100 = 33.64\ \%$

71. (2) Average marks obtained by the student.

$= \frac{60 + 30 + 80 + 50 + 60}{5}$

$= \frac{280}{5} = 56$

72. (2) It is obvious from the bar graph.

73. (4) Required ratio = 100 : 40
= 5 : 2

74. (4) Required ratio = 80 : 60
= 4 : 3

75. (3) Required average

$= \frac{70 + 40}{2} = \frac{110}{2} = 55$

76. (3) Required number of girls
= 15 + 10 = 25

77. (1) Number of girls who ate six or more servings per day
= 3 + 3 + 3 = 9
∴ Required percentage

$= \frac{9}{72} \times 100 = \frac{25}{2} = 12.5\%.$

78. (3) Required number of girls
= 10 + 8 + 5 = 23

79. (4) Required per cent

$= \frac{(17.5 - 12.5)}{12.5} \times 100$

$= \frac{500}{12.5} = 40\%$

80. (4) Required ratio
= (20 + 12.5) : (10 + 17.5)
= 32.5 : 27.5 = 13 : 11

81. (2) Difference in percentage for expenditure on transport and taxes
= 12.5 – 10 = 2.5%
∵ 15 % ≡ ₹ 2.10 crore

$\therefore 2.5\% \equiv \frac{2.10 \times 2.5}{15}$

= ₹ 0.35 crore
= ₹ 35 lakh

82. (3) Total expenditure = 5 × N

$\therefore N = \frac{100}{5} = 20$

83. (2) Percentage of (Advertisement + Taxes + Research and development) = 15 + 10 + 5 = 30%
∵ 17.5% ≡ ₹ 2.45 crore

$\therefore 30\% \equiv \frac{2.45}{17.5} \times 30$

= ₹ 4.2 crore

84. (3) Difference of percentage expenditure on transportation and taxes
= 12.5 – 10 = 2.5%
Expenditure on advertisement = 15%
∵ 15% ≡ Rs. 2.10 crores
∴ 2.5%

$\equiv \text{Rs.} \left(\frac{2.10}{15} \times 2.5\right)$ crores

= Rs. 0.35 crore
= Rs. 35 lakhs

85. (2) Required ratio
= (20 + 12.5) : (10 + 17.5)
= 32.5 : 27.5
= 13 : 11

86. (3) Percentage expenditure on loans = 17.5%
Percentage expenditure on advertisement, taxes and research and development
= (15 + 10 + 5)% = 30%
∵ 17.5% ≡ Rs. 2.45 crores

$\therefore 30\% \equiv \frac{2.45}{17.5} \times 30$

= Rs. 4.2 crores

87. (2) Required percentage

$= \left(\frac{17.5 - 12.5}{12.5}\right) \times 100$

$= \frac{500}{12.5} = 40$

88. (4) According to the question,

$\frac{x \times 100.17}{100} = 77.23 - 76.23$

$\Rightarrow \frac{x \times 100.17}{100} = 1$

$\Rightarrow x = \frac{100}{100.7} \approx 1$

89. (2) Required ratio = (77.23 + 88.93) : (76.23 + 100.17)
= 166.16 : 176.40
= 16616 : 17640 = 2077 : 2205

90. (2) Average production during 1920 – 1927

$= \left(\frac{71.30 + 43.51 + 67.66 + 76.23 + 77.23 + 88.93 + 91.75 + 100.17}{8}\right)$ million tonnes

$= \frac{616.78}{8} = 77.1$ million tonnes

∴ Required years = 1920, 1921, 1922 and 1923

91. (3) Average production of steel = 77.1 million tonnes

92. (1) Average production =

$\left(\frac{25 + 40 + 60 + 45 + 65 + 50 + 75 + 80}{8}\right)$ ten thousand tonnes

$= \frac{440}{8} = 55$ ten thousand tonnes

Required years ⇒ 1997, 1999, 2001 and 2002

93. (1) Total production in 1996 and 1997
= 40 + 60 = 100 ten thousand tonnes
Total production in 1995 and 2001
= 25 + 75 = 100 ten thousand tonnes

94. (1) Required percentage increase

$= \left(\frac{80 - 25}{25}\right) \times 100$

$= \frac{55 \times 100}{25} = 220\%$

95. (2) Percentage increase in 1997

$$= \frac{60-40}{40} \times 100$$

= 50%

Percentage increase in 1996

$$= \frac{40-25}{25} \times 100$$

$$= \frac{1500}{25} = 60\%$$

96. (2) Required percentage decrease

$$= \frac{60-45}{60} \times 100$$

$$= \frac{1500}{60} = 25\%$$

97. (2) FDI in 1992 and 1993
= Rs. (5.7 + 10.15) crores
= Rs. 15.85 crores.

98. (4) Highest FDI in :
Year 1997 ⇒ Rs. 31.36 crores
Year 1996 ⇒ Rs. 24.23 crores

99. (1) Average investment

$$= \text{Rs.} \left(\frac{5.7+10.15+20.16+10.22+24.23+31.36}{6} \right) \text{crores}$$

$$= \frac{101.82}{6} = \text{Rs. } 16.97 \text{ crores}$$

∴ Required ratio
= 31.36 : 16.97
≈ 2 : 1

100. (2) Required difference
= Rs. (31.36 – 24.23) crores
= Rs. 7.13 crores

101. (2) Total foodgrain production in 1982 and 1984
= (20 + 15) thousand tonnes
= 35 thousand tonnes
= Production in 1981

102. (3) Required difference
= (35 – 30) thousand tonnes
= 5000 tonnes

103. (4) Percentage increase

$$= \frac{30-15}{15} \times 100 = 100\%$$

104. (1) It is obvious from the graph.
Year 1981 ⇒ 35 from 30 (Increase)
Year 1982 ⇒ 20 from 35 (Decrease)
Year 1983 ⇒ 25 from 20 (Increase)
Year 1984 ⇒ 15 from 25 (Decrease)
Year 1985 ⇒ 30 from 15 (Increase)
By calculating percentage, answer can be found.

105. (4) There is continuous increase in population as evident form the bar diagram.

106. (4) Clearly in the year 2011 the population will be maximum as it increases each year.

107. (4) We have only percentage increase in population, and no data about population in 2008 or else where is available.

108. (3) Single equivalent percentage increase for 2005 and 2006

$$= \left(6+3+\frac{6\times 3}{100}\right)\%$$

= 9.18%

Similarly,

Single equivalent percentage increase for 9.18% and 4%

$$= \left(9.18+4+\frac{9.18\times 4}{100}\right)\%$$

= 13.18 + 0.3672 ≈ 13.55%

Single equivalent percentage increase for 13.55% and 8%

$$= \left(13.55+8+\frac{13.55\times 8}{100}\right)\%$$

= 21.55 + 1.08 ≈ 22.63%

109. (3) Average foreign exchange reserve

$$= \frac{(2640+3720+2520+3360+3120+4320+5040+3120)}{8} \text{ million dollar}$$

$$= \frac{27840}{8} = 3480 \text{ million dollar}$$

∴ Required ratio = 3 : 5

110. (4) Required per cent

$$= \frac{4320}{3480} \times 100 \approx 124\%$$

111. (1) Percentage increase

$$= \frac{5040-2520}{2520} \times 100$$

$$= \frac{2520}{2520} \times 100 = 100\%$$

112. (3) Required ratio
= (2640 + 3720 + 2520) : (3120 + 4320 + 5040)
= 8880 : 12480 = 37 : 52

113. (3) Percentage expenditure on interest on loans = 17.5%
Percentage expenditure on transport = 12.5%
∴ Required per cent

$$= \left(\frac{17.5-12.5}{12.5}\right) \times 100$$

$$= \frac{500}{12.5} = 40\%$$

114. (2) Percentage expenditure on interest on loans
= 17.5%
Percentage expenditure on advertisement, tax and research and development
= 15 + 10 + 5
= 30%
∵ 17.5% ≡ Rs. 2.45 crores

$$\therefore 30\% \equiv \text{Rs. } \left(\frac{2.45}{17.5} \times 30\right) \text{crores}$$

≡ Rs. 4.2 crores

115. (4) Required ratio
= (20 + 12.5) : (10 + 17.5)
= 32.5 : 27.5
= 13 : 11

116. (3) Ratio of expenses on transport and salary
= 12.5 : 20
= 125 : 200
= 5 : 8

117. (4) Total accidents in the city = 25 + 19 + 30 + 43 + 35 + 27 = 179
Accidents in April = 43
∴ Required per cent

$$= \frac{43}{179} \times 100 = 24\%$$

118. (2) Required per cent

$$= \left(\frac{25-19}{25}\right) \times 100$$

$$= \frac{6}{25} \times 100 = 24\%$$

119. (1) Average Number of accidents

$$= \frac{179}{6} = 29.83$$

Required answer = 43 – 29.83
= 13.17

120. (3) Required per cent

$$= \left(\frac{35-27}{35}\right) \times 100$$

$$= \frac{8}{35} \times 100 = \frac{160}{7}$$

$$= 22\frac{6}{7}\%$$

121. (2) Maximum production = 540
Minimum production = 120
Difference = 540 – 120 = 420

122. (3) Required average

$$= \frac{260+540+360+120+200+320}{6}$$

$$= \frac{1800}{6} = 300$$

213. (3) Required ratio
= (260 + 540 + 360) : (120 + 200 + 320)
= 1160 : 640 = 29 : 16

124. (2) Average production on Monday and Tuesday

$$= \frac{260+540}{2} = \frac{800}{2} = 400$$

Average production of the week = 300
Required difference
= 400 – 300 = 100 fans

125. (3) Total expenditure
= Rs. (80 + 10 + 20 + 10 + 15) lakhs
= Rs. 135 lakhs
Expenditure on miscellaneous items = Rs. 15 lakhs
∴ Required per cent

$$= \frac{15}{135} \times 100$$

$$= \frac{100}{9} = 11\frac{1}{9}\%$$

126. (2) Required answer

$$= \frac{10}{135} = \frac{2}{27}$$

127. (3) Total expenditure
= Rs. 135 lakhs

128. (1) Required ratio
= 20 : 80
= 1 : 4

129. (1) There was steady increase from March to May.

130. (2) Income in February
= Rs. 4 lakhs
Income in March = Rs. 9 lakhs
Required ratio = 9 : 4
It is obvious from the graph.

131. (1) Required answer $= \frac{13}{4}$
= 3.25

132. (3) Average income of the company

$$= \text{Rs.} \left(\frac{7+4+9+11+13}{5}\right) \text{ lakhs}$$

$$= \frac{44}{5} = \text{Rs. } 8.8 \text{ lakhs}$$

133. (4) Number of cycles parked from 9 am to 7 pm.
= 95 + 75 + 85 + 65 + 75 + 55 + 65 + 45 + 55 + 35 + 45
= 695
∴ Collected amount
= Rs. 695

134. (4) Required percentage decrease $= \left(\frac{45-25}{45}\right) \times 100$

$$= \frac{2000}{45} = 44.44\%$$

135. (4) Required average

$$= \frac{695+25}{12} = \frac{720}{12} = 60$$

136. (4) Required answer = 6 times i.e., 95, 75, 85, 65, 75 and 65.

137. (2) Required average height

$$= \frac{8200+6000+8600+7500+8800+6500}{6}$$

$$= \frac{45600}{6} = 7600 \text{ metre}$$

138. (2) Height of mountain peak C
= 8600 metre

139. (1) Required ratio
= 8800 : 6000
= 22 : 15

140. (4) The ascending order is :
6000 < 6500 < 7500 < 8200 < 8600 < 8800
Required average

$$= \frac{7500+8200}{2}$$

$$= \frac{15700}{2} = 7850 \text{ metre}$$

TYPE-IV

1. (4) Totat accidents = 230 + 150 + 120 + 160 + 40 + 200 + 100
= 1000
Percentage of accidents involving two-wheelers and two wheelers

$$= \frac{230}{1000} \times 100 = 23\%$$

Percentage of accidents involving two-wheelers and other objects

$$= \frac{770 \times 100}{1000} = 77\%$$

∴ Required difference
= 77 – 23 = 54%

2. (3) Two-wheelers + Cars + Buses + Stationary Vehicles
= 230 + 150 + 120 + 100
= 600 ≈ 60%

3. (4) ∵ 1000 ≡ 360°

$$\therefore 100 \equiv \frac{360}{1000} \times 100 = 36°$$

4. (1) Required percentage

$$= \frac{40+200}{1000} \times 100$$

$$= \frac{24000}{1000} = 24\%$$

5. (2) Required difference

$$= \frac{160-120}{1000} \times 100 = 4\%$$

6. (2) Number of Graduate job-seekers in 1974 = 525
Number of Senior secondary job-seekers in
1974 = 1050 – 525 = 525

7. (3) Number of job-seekers :
Year 1973 → 1625
Year 1977 → 4000
Difference = 4000 – 1625 = 2375

8. (4) Number of Matriculate job-seekers :
Year 1976 → 3300 – 1800 = 1500
Year 1977 → 4000 – 2200 = 1800
→ maximum

9. (2) Required number of job-seekers = 1850 – 1050 = 800

10. (3) Required answer

$$= \frac{35 \times 30}{100} + \frac{35 \times 15}{100} + \frac{35 \times 15}{100}$$

$$= \frac{35}{100}(30 + 15 + 15)$$

$$= \frac{35 \times 60}{100} = 21 \text{ lakhs}$$

11. (4) Percentage variation :

$$\text{Model A} \Rightarrow \frac{40 - 30}{30} \times 100 = 33\frac{1}{3}\%$$

$$\text{Model B} \Rightarrow \frac{20 - 15}{15} \times 100 = 33\frac{1}{3}\%$$

$$\text{Model C} \Rightarrow \frac{15 - 20}{20} \times 100 = -25\%$$

12. (1) Required difference

$$= \frac{44 \times 20}{100} - \frac{35 \times 15}{100}$$

$$= \frac{880 - 525}{100} = \frac{355}{100} \text{ lakhs}$$

= 355000

13. (2) Required production

$$= \frac{44 \times 30}{100} \text{ lakhs}$$

= 1320000

14. (3) Required answer

$$= 35 \times \frac{10}{100} \times \frac{15}{100} + 44 \times \frac{10}{100} \times \frac{15}{100}$$

$$= \frac{150}{10000} \times 79 = 1.1850 \text{ lakhs}$$

= 118500

15. (4) Total students in 2008 = 170

Students passed in 1st division = 20

∴ Required percentage

$$= \frac{20}{170} \times 100$$

$$= \frac{200}{17} = 11\frac{13}{17}\%$$

16. (4) Total students who passed in 2008 = 140

∴ Required percentage

$$= \frac{140}{170} \times 100$$

$$= \frac{1400}{17} = 82\frac{6}{17}\%$$

17. (1) Percentage of passed candidates :

$$\text{Year 2008} \Rightarrow 82\frac{6}{11}\%$$

$$\text{Year 2009} \Rightarrow \frac{140}{190} \times 100$$

= 73.7%

$$\text{Year 2010} \Rightarrow \frac{150}{200} \times 100 = 75\%$$

18. (2) Students passed in third division in 2008 = 140 – 80 = 60

19. (1) Required percentage

$$= \frac{60}{200} \times 100 = 30\%$$

20. (3) Percentage expenditure on clothes for family B = 15

∴ Required expenditure

$$= \frac{10000 \times 15}{100} = ₹\ 1500$$

21. (3) Expenditure on education for family A = 20%

$$\text{Required fraction} = \frac{20}{100} = \frac{1}{5}$$

22. (1) Food + clothes + house rent = 30 + 15 + 15 = 60%

∴ Required expenditure

$$= \frac{30000 \times 60}{100} = ₹\ 18000$$

23. (4) Number of students who stood second in the year 2000 = 50

∴ Required percentage

$$= \frac{50}{160} \times 100$$

$$= \frac{125}{4} = 31\frac{1}{4}\%$$

24. (1) Required percentage

$$= \frac{60}{120} \times 100 = 50\%$$

25. (2) Number of students who passed with third class in 2002 = 10

26. (3) Number of students who passed with second class in 2002 = 130 – 80 = 50

27. (2) Required ratio = 45 : 30 = 3 : 2

28. (1) Production of sandal perfume remained same.

29. (4) Production of jasmine perfume in 1977 = 30% of 5000

$$= \frac{5000 \times 30}{100} = 1500 \text{ units}$$

30. (1) Total students in year 2007 = 190

Students who passed in first division = 30

Required percent

$$= \frac{30}{190} \times 100 = \frac{300}{19}$$

$$= 15\frac{15}{19}\%$$

31. (3) Total students in the year = 240

Successful students = 180

∴ Required percentage

$$= \frac{180}{240} \times 100 = 75\%$$

32. (1) Students who passed in third division in 2006

= 140 – 80 = 60

33. (3) Pass percentage :

$$\text{Year 2006} \Rightarrow \frac{140}{170} \times 100$$

≈ 82.35

$$\text{Year 2007} \Rightarrow \frac{150}{190} \times 100$$

≈ 78.94

Year 2008 ⇒ 75%

34. (1) Required percent

$$= \frac{200 - 160}{160} \times 100$$

$$= \frac{40}{160} \times 100 = 25\%$$

35. (1) Ascending order of yield per acre :

82, 120, 120, 130, 160, 200

∴ Required difference

= [(130 + 160 + 200) – (82 + 120 + 120)]

= (490 – 322) quintals

= 168 quintals

36. (3) Total product per acre

= 490 + 322 = 812 quintal

∴ Required percent

$$= \frac{120}{812} \times 100 \approx 14.8\%$$

37. (4) Required average =

$$\left(\frac{80+120+132+120+160+200}{6}\right) \text{ kg.}$$

$$= \frac{812}{6} = \frac{406}{3} = 135\frac{1}{3}\text{kg.}$$

38. (2) Required percent

$$= \frac{200-160}{160} \times 100$$

$$= \frac{40 \times 100}{160} = 25\%$$

39. (2) Required percent

$$= \frac{132}{812} \times 100 \approx 16.2\%$$

40. (3) Ascending order of yield per acre :

80 < 120 = 120 < 132 < 160 < 200

Required difference

= [(132 + 160 + 200) – (80 + 120 + 120)] kg.

= (492 – 320) kg. = 172 kg.

41. (4) Required answer = $\frac{5040}{3360}$

= 1.5

42. (1) Required percentage increase

$$= \frac{5040-2520}{2520} \times 100$$

$$= \frac{2520}{2520} \times 100 = 100\%$$

43. (3) Average foreign exchange reserves

$$= \frac{(2640+3720+2520+3360+3120+4320+5040+3120)}{8} \text{ million dollar}$$

$$= \left(\frac{27840}{8}\right) \text{ million dollar}$$

= 3480 million dollar

Years that have more than average foreign exchange reserves ⇒ 2007, 2011, 2012

Required ratio = 3 : 5

44. (1) Total exports = Rs. (22.6 + 12.5 + 12.1 + 10.6 + 3.3 + 2.5 + 1.6 × 3 + 1.2) billion

= Rs. 69.6 billion

Total exports to bottom six countries = Rs. (3.3 + 2.5 + 1.6 × 3 + 1.2) billion

= Rs. 11.8 billion

∴ Required ratio = $\frac{11.8}{69.6} \approx \frac{1}{6}$

45. (4) Average exports = $\frac{69.6}{10}$

= Rs. 6.96 billion

Exports to UAE

= Rs. 3.3 billion

46. (1) Required ratio

= (12.5 + 12.1 + 10.6) : (69.6 – 35.2)

= 35.2 : 34 : 4

≈ 35 : 34

47. (3) Required answer = $\frac{10.6}{1.1}$

≈ 10

TYPE-V

1. (2) Required percent increase

$$= \frac{7500-5300}{5300} \times 100 = 41.5\%$$

2. (1) Profit in year 1996-97 = Gross Traffic Receipt – Total expenditure

= 8500 – 8000 = 500

Therefore, profit percent of Gross Traffic Receipt

$$= \frac{500}{8500} \times 100 = 5.9\%$$

3. (3) Profit percent of Gross Traffic Receipt in year 1997-98

$$= \frac{9400-8800}{9400} \times 100 = 6.38\%$$

In year 1995-1996

$$\Rightarrow \frac{7500-5900}{7500} \times 100 = 21.33\%$$

4. (3) Profit percent

$$= \frac{\text{Gross Traffic profit - Total expenditure}}{\text{Gross Traffic profit}} \times 100$$

$$\Rightarrow \frac{\text{Total Expenditure}}{\text{Gross Traffic profit}}$$

$$= 1 - \frac{10}{100} = 0.9$$

According to question,

Total expenditure = 5800

∴ Gross Traffic profit $= \frac{5800}{0.9}$

= ₹ 6444 crores

5. (4) Required increase = ₹ (8800 – 5100) crores = ₹ 3700 crore

6. (1) Growth rate per annum of expense for :

$$1995 \rightarrow \frac{100}{300} \times 100 = \frac{100}{3}\%$$

1996 → 0%

$$1997 \rightarrow \frac{200}{400} \times 100 = 50\%$$

$$1998 \rightarrow \frac{100}{600} \times 100 = \frac{50}{3}\%$$

∴ Average

$$= \frac{\frac{100}{3} + 50 + \frac{50}{3} + 0}{4} = 25\%$$

7. (2) It was lowest in 1996 as 3 : 4.

8. (3) Required average

$$= \frac{100-200+200+300}{5}$$

= ₹ 80 crores

9. (2) Profit in

1994 → 100, 1995 → 100, 1996 → – 100

1997 → – 100, 1998 →100

10. (3) Sales : capital in

1994 → 2 : 1,

1995 → 5 : 2,

1996 → 3 : 2,

1997 → 5 : 3,

1998 → 8 : 3

11. (1) In Arts faculty, there was a regular decrease in students' strength as it was 600 in 1990-91, 550 in 1991-92 and 500 in 1992-93.

12. (3) Number of students in all faculties taken together in 1990-91.

= 600 + 400 + 200 + 150

= 1350

Number of students in science faculty = 400

∴ Required percentage

$$= \frac{400}{1350} \times 100 = 29.6\%$$

13. (4) Total students' strength in 1991-92

= 550 + 500 + 250 +200 = 1500

Students' strength in commerce in 1991-92 = 250

∴ Required answer $= \frac{1500}{250} = 6$

14. (1) Students' strength in Science in 1990-91 = 400
Students' strength in Science in 1992-93 = 600
Increase = 600 – 400 = 200
Per cent increase

$= \frac{200}{400} \times 100 = 50\%$

15. (4) Companies with more demand than production are A, C and E. Companies with more production than demand are B and D.
∴ Required ratio = 3 : 2

16. (3) Average demand

$= \frac{3300+1200+3000+600+2500}{5}$

$= \frac{10600}{5} = 2120$

Average production

$= \frac{2200+2700+1500+1800+1000}{5}$

$= \frac{9200}{5} = 1840$

∴ Required difference
= 2120 – 1840 = 280

17. (3) Required percentage

$= \frac{600}{2500} \times 100 = 24\%$

18. (2) Average demand of companies B and D

$= \frac{1200+600}{2} = \frac{1800}{2} = 900$

Average production of companies B and D

$= \frac{2700+1800}{2} = 2250$

∴ Required ratio = 900 : 2250
= 2 : 5

19. (4) Required answer = $\frac{6}{15} = 0.4$

20. (3) It is obvious from the graph.

21. (1) Total cotton production in State C = (6 + 11 + 15) lac × 100 kg
= 320000000 kg

22. (2) Required states are B and E.

23. (1) Required difference
= (350 – 250) × thousand tonnes
= 100 thousand tonnes

24. (3) Required ratio

$= \left(\frac{250+500+400}{5}\right) : \left(\frac{350+400+500}{5}\right)$

= 1150 : 1250 = 23 : 25

25. (1) Required percentage increase

$= \frac{400-350}{350} \times 100 = \frac{100}{7}\%$

$= 14\frac{2}{7}\%$

26. (1) Average production :
Company X

$= \frac{300+450+250+500+400}{5}$

$= \frac{1900}{5} = 380$ thousand tonnes

Company Y

$= \frac{250+350+350+400+500}{5}$

$= \frac{1850}{5} = 370$ thousand tonnes

Company Z

$= \frac{350+400+450+350+350}{5}$

$= \frac{1900}{5} = 380$ thousand tonnes

∴ X & Z has maximum production

27. (1) In 1997,
Gross profit = ₹ 50 lakh
Net profit = ₹ 25 lakh

28. (3) Required percentage

$= \frac{15}{40} \times 100 = 37.5\%$

29. (4) Required difference

$= ₹\ \frac{1}{4}$ (20 + 25 + 20 + 25) lakhs

$= \frac{1}{4} \times 90 = ₹\ 22.5$ lakhs

30. (1) Gross profit : net profit
In Year 1994 ⇒ 3 : 1
Year 1995 ⇒ 40 : 15 = 8 : 3
Year 1996 ⇒ 45 : 25 = 9 : 5
Year 1997 ⇒ 50 : 25 = 2 : 1

31. (3) Required ratio
= 165 : 75 = 11 : 5

32. (1) Required ratio = 3300 : 2200
= 3 : 2

33. (3) Required percentage

$= \frac{600}{2500} \times 100 = 24\%$

34. (2) Required answer

$= \frac{2700}{1500} = 1.8$

35. (4) Required ratio = 3 : 2

36. (3) Required difference in profit
= ₹ [(50 – 30) – (40 – 30)] lakh
= ₹ 10 lakh

37. (3) Average income

$= ₹\left(\frac{30+50+40+60+60}{5}\right)$ lakh

$= \frac{240}{5} = ₹\ 48$ lakh

In the years 1983, 1985 and 1986, the income were more than the average income.

38. (2) Average profit

$= ₹\left(\frac{10+20+10+20+25}{5}\right)$ lakh

= ₹ 17 lakh
Required ratio = 48 : 17

39. (1) Required percentage increase

$= \frac{25-10}{10} \times 100$

$= \frac{15}{10} \times 100 = 150\%$

40. (1) Total income = ₹ 240 lakh
Total expenditure = ₹ 155 lakh
∴ Difference = 240 – 155
= ₹ 85 lakhs

41. (3) Required percentage drop

$= \frac{30-22.5}{30} \times 100$

$= \frac{7.5}{30} \times 100 = 25\%$

42. (2) Required difference
= [(12.5 + 27.5 + 30) – (25 + 20)] thousand
= (70 – 45) thousand
= 25 thousand

43. (1) Total production :
Year 1993 ⇒ 65 thousand (least)
Year 1994 ⇒ 75 thousand
Year 1995 ⇒ 85 thousand (maximum
Year 1996 ⇒ 75 thousand
Year 1997 ⇒ 80 thousand

44. (1) It is obvious from above answer

45. (2) Required ratio :

Year 1993 ⇒ $\frac{30}{65}$

Year 1994 ⇒ $\frac{30}{75}$

Year 1996 ⇒ $\frac{25}{75}$

Year 1997 ⇒ $\frac{22.5}{80}$

46. (4) January

$\Rightarrow \frac{2500}{1000} \times 100 = 250\%$

February $\Rightarrow \frac{100}{1300} \times 100 = \frac{100}{13}\%$

April $\Rightarrow \frac{700}{2200} \times 100 \approx 32\%$

47. (1) Required percentage

$= \frac{100}{2000} \times 100 = 5\%$

48. (1) Required answer

$= \frac{2200}{1000} = 2.2$

49. (4) Average demand

$= \frac{8100}{5} = 1620$

Average production

$= \frac{6800}{5} = 1360$

Required difference
= 1620 – 1360 = 260

50. (3) Required ratio = 3 : 2

51. (4) Number of Hindus

$= 80 \times \frac{25}{100} = 20$ lakhs

52. (1) Percentage decrease

$= \frac{30-15}{30} \times 100 = 50\%$

53. (2) Required difference = 15%

54. (4) Number of Muslims
= 16 lakhs

55. (1) Legal $= \frac{20}{30} = \frac{2}{3} = 0.67$

Clerical $= \frac{30}{35} = 0.86$

Medical $= \frac{10}{20} = \frac{1}{2} = 0.5$

56. (2) Required percentage

$= \frac{70+80}{205} \times 100 = 73.17\%$

57. (4) Required ratio
= (75 + 65) : (85 + 95)
= 140 : 180 = 7 : 9

58. (1) Average sales of stores B_1, B_2 and B_3 in 2001

$= \frac{105+65+110}{3} = \frac{280}{3}$

Average sales of stores B_1, B_3 and B_6 in 2000

$= \frac{80+95+70}{100} = \frac{245}{3}$

Required percentage

$= \frac{245}{280} \times 100 = 87.5\%$

59. (2) Required average

$= \frac{80+75+95+85+75+70}{6}$

$= \frac{480}{6} = 80$

60. (1) Year 2007
Decrease%

$= \frac{60-50}{60} \times 100 = 16\frac{2}{3}\%$

61. (3) Required percentage

$= \frac{60+60}{50+40} \times 100$

$= \frac{120 \times 100}{90} = 133.3\%$

62. (2) Total production :
Flavour P = 300 lakh bottles
Flavour Q = 325 lakh bottles
Flavour R = 300 lakh bottles

63. (2) Percentage decrease

$= \frac{60-40}{60} \times 100 = 33\frac{1}{3}\%$

or 33.33%

64. (4) Average production of flavour Q during 2008, 2009 and 2010

$= \frac{55+50+55}{3}$

$= \frac{160}{3}$ lakh bottles

Average production of flavour P in 2005, 2006 and 2007

$= \frac{50+40+55}{3}$

$= \frac{145}{3}$ lakh bottles

Difference $= \frac{160}{3} - \frac{145}{3}$

$= \frac{15}{3} = 5$ lakh bottles

65. (3) Total income
= ₹ 30.75 thousand

Average $= \frac{30.75}{5}$

= ₹ 6.15 thousands = ₹ 6150

66. (4) Income range
= ₹ (8.75 – 4.25) thousand
= ₹ 4500

67. (3) Required ratio = 30 : 45
= 2 : 3

68. (2) Hindus + Muslims

$= \frac{500000 \times 55}{100} = 275000$

69. (4) Hindus $= \frac{5000000 \times 35}{100}$

= 1750000

70. (4) Total students in 2001 – 2002
= 1350
∴ Required percentage

$= \frac{400}{1350} \times 100 = 29.6\%$

71. (3) Total students in 2003-04
= 1600
∴ Required percentage

$= \frac{250}{1600} \times 100 = 15.6\%$

72. (2) Required percentage increase

$= \frac{600-400}{400} \times 100 = 50\%$

73. (3) Required percentage

$= \frac{35}{85+35} \times 100$

$= \frac{35}{120} \times 100 \approx 29\%$

74. (1) Required ratio
= 70 : 40 = 7 : 4

75. (4) Required ratio
= 50 : 85 = 10 : 17

76. (4) Difference in 2010
= 85 – 35 = 50 million

77. (1) It is obvious from the graph.

78. (1) Required average

$= \left(\frac{5+4+4+3+4}{5}\right)$ million tonnes = 4 million tonnes

79. (1) Percentage increase :
In Year 1996

$\Rightarrow \frac{(225-120)}{120} \times 100 \approx 87.5\%$

In Year 1997

$\Rightarrow \frac{(375-225)}{225} \times 100 \approx 67\%$

80. (4) Average of total investment

$= \frac{1}{6}(120+225+375+330+525+420)$

$= \frac{1}{6} \times 1995 =$ ₹ 332.5 lakhs

Average value of sales

$= \frac{1}{6}(200+300+500+400+600+460)$

$= \frac{1}{6} \times 2460$

= ₹ 410 lakhs

Difference = 410 – 332.5

= ₹ 77.5 lakh

81. (1) Students in arts = 2400

Students in commerce = 1000

Ratio = 2400 : 1000 = 24 : 10

= 12 : 5

82. (2) Percentage increase in Science students

$= \frac{500-450}{450} \times 100$

$\frac{100}{9} = 11.1\%$

83. (2) It is obvious from the bar diagram. The bar of West Bengal (W.B.) is lowest.

84. (2) The bar of West Bengal is the largest.

85. (2) Total production of rice

= 24 million tonnes

Haryana's share = $\frac{2}{24} = \frac{1}{12}$

86. (3) Total production of rice and wheat is least in

Maharashtra 5 million tonnes

87. (4) Uttar Pradesh (UP) produces 16 million tonnes of wheat that is largest.

88. (3) Required percentage

$= \frac{600}{2500} \times 100 = 24\%$

89. (3) Average demand = 2120

Average production = 1840

Difference = 2120 – 1840 = 280

90. (2) Required ratio

$= \left(\frac{1500+1800+1000}{3}\right) : \left(\frac{2700+2200}{2}\right)$

= 2 × 4300 : 4900 × 3

= 86 : 147

91. (4) Required ratio = 3 : 2

92. (3) Required answer

$= \frac{2700}{1500} = \frac{9}{5} = 1.8$

93. (1) Required average price

$= \frac{1}{2}(33 \times 120 + 33 \times 120)$

$= \frac{1}{2} \times 120 \times 66 =$ ₹ 3960

94. (2) Required cost of wheat

= 36 × 156 = ₹ 5616

95. (2) Required number of students in 2002

= 15 + 60 + 120 = 195

96. (2) Required % increase

$= \frac{120-120}{120} \times 100 = 0$

97. (1) Number of students :

Year 2000 ⇒ 20 + 50 + 90 = 160

Year 2001 ⇒ 30 + 60+110= 200

Year 2002 ⇒ 195

Year 2003 ⇒ 170

98. (3) Required ratio = 50 : 160

= 5 : 16

99. (4) It is obvious from the graph. Minimum sales in 1989

= 60 lakh bottles.

100. (1) Average annual sales during 1988 – 1993 :

cool sip ⇒

$\left(\frac{25+6+19+15+25+30}{6}\right)$

$= \frac{120}{6} = 20$ lakh bottles

Pep – up ⇒

$\left(\frac{30+35+30+25+20+20}{6}\right)$

$= \frac{160}{6} = 26\frac{2}{3}$ lakh bottles.

101. (2) Sales of Pep – up :

Year 1989 ⇒ 35 lakh bottles

Year 1990 ⇒ 30 lakh bottles

∴ Required percent

$= \frac{35-30}{35} \times 100$

$= \frac{100}{7} \approx 14\ \%$

102. (*) Sales of Cool – sip in 1989 = 6 lakh bottles

Sales in 1990 = 19 lakh bottles

Required percent

$= \frac{19-6}{6} \times 100$

$= \frac{1300}{6} \approx 217$

103. (2) Sales of Dew - drop in 1992 = 30 lakh bottles.

104. (4) Average annual sales of Dew - drop

$= \left(\frac{10+15+25+15+30+25}{6}\right)$

$= \frac{120}{6} = 20$ lakh bottles.

Average annual sales of Cool - sip = 20 lakh bottles.

105. (1) Profit of company during 2007

= 45 – 40 = ₹ 5 crore

Profit of company during 2008

= 60 – 50 = ₹10 crore

Difference = 10 – 5 = ₹ 5 crore

106. (3) Average expenditure of company

$= ₹\ \frac{1}{5}$ (25+40+40+50+55) crore

$= \frac{210}{5} =$ ₹ 42 crore

Required answer

⇒ Year 2008 and 2009

107. (3) Required percentage increase

$= \frac{(60-45)}{45} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$

108. (2) Total income of company

= ₹ (35 + 50 + 45 + 60 + 60) crore

= ₹ 250 crore

Total expenditure of company

= ₹ 210 crore

Required ratio = 250 : 210

= 25 : 21

109. (3) Number of wrist watches sold in 2010 = 28.7 lakhs

Number of table clocks sold in 2010 = 22.3 lakhs

∴ Required per cent

$$= \left(\frac{28.7 - 22.3}{22.3}\right) \times 100$$

$$= \frac{6.4}{22.3} \times 100 \approx 28.7\%$$

110. (4) Required ratio = 3.5 : 9.5

= 7 : 19

111. (2) Required per cent

$$= \frac{30.7 - 9.5}{30.7} \times 100$$

$$= \frac{21.2 \times 100}{30.7} = 69.05\%$$

112. (4) Here, decrease is evident from bar diagram.

Wrist watches : 21.3 ⇒ 28.7 lakhs

Table clocks 9.5 ⇒ 22.3 lakhs

Wall clocks 30.7 ⇒ 32.7 lakhs

113. (1) Percentage increase in the sales of table clocks

$$= \frac{(22.3 - 9.5)}{9.5} \times 100$$

$$= \frac{12.8}{9.5} \times 100 \approx 135$$

114. (4) More demand than production in companies A, C and E

Less demand than production in companies B and D

= B

Required ratio = 3 : 2

115. (3) Required difference

$$= \left(\frac{3300 + 1200 + 3000 + 600 + 2500}{5}\right)$$

$$- \left(\frac{2200 + 2700 + 1500 + 1800 + 1000}{5}\right)$$

= 2120 – 1840 = 280

116. (2) Required percentage

$$= \frac{600}{2500} \times 100 = 24$$

117. (2) Required ratio = 900 : 2250

= 2 : 5

118. (1) Ratio of demand and production :

$$\text{Company E} \Rightarrow \frac{2500}{1000} = 2.5$$

$$\text{Company C} \Rightarrow \frac{3000}{1500} = 2$$

$$\text{Company A} \Rightarrow \frac{3300}{2200} = 1.5$$

119. (2) Required answer

$$= \frac{9}{12} = \frac{3}{4}$$

= 0.75

120. (3) Total production of state B

= 12 + 18 + 18 = 48 lakh bales

Total production of state A

= 6 + 14 + 21

= 41 lakh bales

121. (4) Average production in 1992–93 = $\frac{6 + 12 + 5 + 9 + 8}{5}$

$$= \frac{40}{5} = 8 \text{ lakh bales}$$

Average production in 1993-94

$$= \frac{14 + 18 + 9 + 9 + 14}{5}$$

$$= \frac{64}{5} = 12.8 \text{ lakh bales}$$

Required answer ⇒ state A

122. (2) Required average production

$$= \frac{21 + 18 + 15 + 12 + 7}{5}$$

$$= \frac{73}{5} = 14.6 \text{ lakh bales}$$

123. (2) Percentage increase in Maths is maximum.

124. (3) Percentage increase

$$= \left(\frac{265 - 248}{248}\right) \times 100$$

$$= \frac{1700}{248} = 6.85\%$$

125. (2) Required percentage increase

$$= \frac{(2580 - 2170) \times 100}{2170}$$

$$= \frac{41000}{2170} = 18.89\%$$

126. (1) Required percentage increase

$$= \frac{(1454 - 1240) \times 100}{1240}$$

$$= \frac{21400}{1240} = 17.26\%$$

127. (3) Required percentage increase

$$= \frac{(2230 - 1870)}{1870} \times 100$$

$$= \frac{36000}{1870} = 19.25\%$$

128. (4) Total sale of branches B1, B3 and B5 together for both the years = (80 + 105 + 95 +110 + 75 + 95) thousands

= 560 thousands

129. (4) Required ratio = (75 + 65) : (85 + 95)

= 140 : 180 = 7 : 9

130. (1) Average sale of branches B1, B2 and B3 in 2001

$$= \frac{105 + 65 + 110}{3}$$

$$= \frac{280}{3} \text{ thousand}$$

Average sale of branches B1, B3 and B6 in 2000

$$= \left(\frac{80 + 95 + 70}{3}\right) \text{Thousand}$$

$$= \frac{245}{3} \text{ Thousand}$$

∴ Required percentage

$$= \frac{\frac{245}{3}}{\frac{280}{3}} \times 100$$

$$= \frac{24500}{280} = 87.5\%$$

131. (1) Required percentage

$$= \frac{(110 - 65)}{65} \times 100$$

$$= \frac{45 \times 100}{65} = 69.2\ \%$$

132. (1) Girls in Biology = 300
Girls in all other departments
= 140 + 180 + 260 + 220 = 800
∴ Required percentage
$= \frac{300}{800} \times 100$
$= \frac{75}{2} = 37\frac{1}{2}\%$

133. (4) Total number of boys
= 60 + 220 + 100 + 160 + 120
= 660
Total number of girls = 1100
Required difference
= 1100 – 660 = 440

134. (2) Average number of boys
$= \frac{660}{5} = 132$

135. (3) Boys in Biology = 220
∴ Required percentage
$= \frac{220}{660} \times 100 = \frac{100}{3} = 33\frac{1}{3}\%$

136. (1) Required ratio = 140 : 220
= 7 : 11

137. (1) From class IX 75 students participated in exhibition.

138. (3) Average number of students participating in cultural events
$= \frac{60+45+45+30}{4}$
$= \frac{180}{4} = 45$

139. (2) Average number of students Participating in exhibition
$= \frac{45+30+60+75}{4} = \frac{210}{4}$
= 52.5

140. (1) Required ratio
= 75 : (75 + 30)
= 75 : 105
= 5 : 7

141. (2) Total number of participants in cultural events = 180
Students of class VIII = 45
Required percentage
$= \frac{45}{180} \times 100 = 25\%$

142. (2) Required ratio
= (100 + 160) : (180 + 60)
= 260 : 240 = 13 : 12

143. (3) Boys who use smart phones
= 100 + 160 + 240 + 40 = 540
∴ Required percentage
$= \frac{100}{540} \times 100$
= 18.52%

144. (4) Girls who use smart phones
= 180 + 60 + 120 + 20 = 380
∴ Required percentage
$= \frac{120}{380} \times 100$
= 31.58%

145. (3) Required difference
= (240 + 120) – (100 + 180)
= 360 – 280 = 80

146. (2) Profit of company :
Year 2006 ⇒ 60 – 35
= Rs. 25 crore
Year 2007 ⇒ 50 – 40
= Rs. 10 crore
Difference = 25 – 10
= Rs. 15 crore

147. (3) Average income of company
$= \text{Rs.} \left(\frac{40+60+50+65+70}{5}\right) \text{crore}$
$= \frac{285}{5} = \text{Rs. 57 crore}$
Required years ⇒ 2005 and 2007

148. (2) Required percent increase
$= \frac{50-40}{40} \times 100$
$= \frac{100}{4} = 25\%$

149. (3) **Profit of company :**
Year 2005 ⇒ 40 – 30
= Rs. 10 crore
Year 2006 ⇒ Rs. 25 crore
Year 2007 ⇒ 10 crore
Year 2008 ⇒ 65 – 50
= Rs. 15
Year 2009 ⇒ 70 – 60
= Rs. 10 crore

150. (1) Required ratio
= (75 + 65) : (85 + 95)
= 140 : 180 = 7 : 9

151. (2) Total sales of branch B 6 for both the years
= 70 + 80 = 150 thousand
Total sales of branch B 3 for both the years
= 95 + 110 = 205 thousand
$\therefore\ 205 \times \frac{x}{100} = 150$
$\Rightarrow x = \frac{150 \times 100}{205} = 73.17\%$

152. (2) Total sales of branches B1, B2 and B3 in 2010 = 105 + 65 + 110 = 280 thousand
Total sales of branches B1, B3 and B6 in 2009 = 80 + 95 + 70
= 245 thousand
$\therefore\ \frac{280}{3} \times \frac{x}{100} = \frac{245}{3}$
$\Rightarrow x = \frac{245 \times 100}{280} = 87.5\%$

153. (3) Average sales of all the branches in 2009 = $\frac{1}{6}$ (80 + 75 + 95 + 85 + 75 + 70) thousand
$= \frac{1}{6} \times 480 = 80$ thousand

154. (4) Total sales of branches B1, B3 and B5 for both the years
= (80+105 + 95 + 110 + 75 + 95) thousand
= 560 thousand

155. (3) Required ratio = 100 : 70
= 10 : 7

156. (4) Required average
$= \frac{80+80+75+65+60}{5}$
$= \frac{360}{5} = 72$

157. (1) Total number of all products produced in 2006 and 2008 together
= (10 + 7.5 + 15 + 25 + 30 + 20) × 1000
= 107.5 × 1000 = 107500

158. (3) Average number of pen drives

$= \frac{1}{5}(15 + 7.5 + 15 + 30 + 17.5) \times 1000$

$= \frac{85000}{5} = 17000$

159. (4) Required difference
$= (25 + 30 - 15) \times 100$
$= 40000$

160. (3) Required ratio
$= 15 : 30 : 20$
$= 3 : 6 : 4$

161. (1) Required ratio $= 22.5 : 25$
$= 225 : 250$
$= 9 : 10$

162. (*) Value per lakh bags :

Year 2000 $\Rightarrow \frac{500}{200}$ = Rs. 2.5 crore

Year 2001 $\Rightarrow \frac{120}{50}$ = Rs. 2.4 crore

Percentage decrease

$= \frac{2.5 - 2.4}{2.5} \times 100 = 4\%$

163. (1) Required difference
$= (200 - 100)$ lakhs
$= 100$ lakhs
$= 10000000$

164. (3) Value per lakh bags

Year 2001 $\Rightarrow \frac{120}{50}$ = Rs. 2.4 crores

Year 1999 $\Rightarrow \frac{150}{100}$ = Rs. 1.5 crores

Year 1996 $\Rightarrow \frac{150}{120}$ = Rs. 1.25 crores

Year 1997 $\Rightarrow \frac{260}{130}$ = Rs. 2 crores

165. (*) Percentage increase

$= \frac{150 - 130}{130} \times 100$

$= \frac{200}{13} \approx 15.4\%$

166. (3) Total production of electronic items :

Year 2009 $\Rightarrow 6000 + 7000 = 13000$

Year 2010 $\Rightarrow 9000 + 9400 = 18400$

Year 2011 $\Rightarrow 13000 + 9000$

$= \boxed{22000}$

year 2012 $\Rightarrow 11000 + 10000$
$= 21000$

Year 2013 $\Rightarrow 8000 + 12000 = 20000$

167. (1) Required Ratio
$= 9000 : 12000 = 3 : 4$

168. (4) Average production of T.V. from 2009 to 2012

$= \frac{6000 + 9000 + 13000 + 11000}{4}$

$= \frac{39000}{4} = 9750$

Average production of LCD from 2009 to 2012

$= \frac{7000 + 9400 + 9000 + 10000}{4}$

$= \frac{35400}{4} = 8850$

Required difference
$= 9750 - 8850 = 900$

169. (3) Required ratio
$= 6000 : 9000 = 2 : 3$

170. (1) Required average runs

$= \frac{60 + 80}{2} = \frac{140}{2} = 70$

The required cricketer is M.S. Dhoni.

171. (4) The required cricketer is Cheteshwar Pujara.
$\therefore$ Required average runs

$= \frac{70 + 10}{2} = \frac{80}{2} = 40$

172. (2) Required total score
$= 60 + 50 + 70 + 30 = 210$

173. (1) Required average score

$= \frac{80 + 50 + 10 + 20}{4} = \frac{160}{4}$

$= 40$

174. (3) Average units consumption in 2012

$= \frac{600 + 700 + 400 + 300 + 200}{5}$

$= \frac{2200}{5} = 440$ units

Required months $\Rightarrow$ July, August

175. (*) Average units consumption in the year 2013

$= \frac{550 + 500 + 400 + 350 + 500}{5}$

$= \frac{2300}{5} = 460$ units.

176. (4) In the month of November,
Difference $= 500 - 200 = 300$ units
In the month of August,
Difference $= 700 - 500 = 200$ units.

177. (*) Total consumption in 2012 = 2200 units
Total consumption in 2013
= 2300 units
Percentage increase

$= \left(\frac{2300 - 2200}{2200}\right) \times 100$

$= \frac{100}{22} = \frac{50}{11} = 4.5\%$

178. (2) Percentage increase

Year 2010 $\Rightarrow \frac{70 - 64}{64} \times 100$

≈ 9.4

Year 2011

$\Rightarrow \frac{77 - 70}{70} \times 100 = 10$

Year 2012 $\Rightarrow \frac{85 - 77}{77} \times 100$

≈ 10.4

179. (1) Required average production

$= \left(\frac{72 + 90 + 100}{3}\right)$ thousands

$= \frac{262}{3} = 87.33$ thousands

180. (2) Required average

$= \left(\frac{70 + 77 + 85 + 93}{4}\right)$ thousands

$= \frac{325}{4} = 81.25$ thousands

181. (3) Required ratio

$= \left(\frac{64 + 70}{2}\right) : \left(\frac{72 + 80}{2}\right)$

$= 67 : 76$

182. (*) Total income

= Rs. (35 + 50 + 40 + 40 + 50) crores = Rs. 215 crores

Total expenditure

= Rs. (45 + 40 + 45 + 30 + 45) crores

= Rs. 205 crores

∴ Profit percent

$$= \left(\frac{\text{Income} - \text{Expenditure}}{\text{Expenditure}}\right) \times 100$$

$$= \frac{215 - 205}{205} \times 100$$

$$= \frac{1000}{205} = 4.88\%$$

183. (*) Income of company Q in 2000

$$= \frac{100}{110} \times 40 = \text{Rs. } \frac{400}{11} \text{ crores}$$

If expenditure in 2000 be Rs. x crores,

Profit% =

$$\left(\frac{\text{Income} - \text{Expenditure}}{\text{Expenditure}}\right) \times 100$$

$$= \frac{\frac{400}{11} - x}{x} \times 100$$

$$\Rightarrow \frac{20}{100} = \frac{1}{5} = \frac{400 - 11x}{11x}$$

$\Rightarrow 5 \times 400 - 55x = 11x$

$\Rightarrow 66x = 2000$

$$\Rightarrow x = \frac{2000}{66}$$

= Rs. 30.30 crores

184. (1) It is obvious from bar diagram.

Profit percent of company Q.

$$= \frac{40 - 30}{30} \times 100$$

$$= \frac{100}{3} = 33\frac{1}{3}\%$$

185. (1) Total income of companies M and N

= Rs. (35 + 50) crores

= Rs. 85 crores

Total expenditure

= Rs. (45 + 40) crores

= Rs. 85 crores

186. (*) Expenditure of company R in 2000

$$\equiv \frac{45 \times 100}{120} = \text{Rs. } 37.5 \text{ crores}$$

Let the income of company in 2000 be Rs. x crores.

$$\therefore\ 10 = \frac{x - 37.5}{37.5} \times 100$$

$$\Rightarrow x - 37.5 = \frac{37.5 \times 10}{100} = 3.75$$

$\Rightarrow x = 37.5 + 3.75$

= Rs. 41.25 crores

187. (2) Difference between demand and production of company A = 3000 – 1500 = 1500

Difference between production and demand of company D

= 2700 – 1200 = 1500

188. (1) According to the question,

$$\frac{2500 \times x}{100} = 600$$

$\Rightarrow 25x = 600$

$$\Rightarrow x = \frac{600}{25} = 24$$

189. (4)

$$h = \frac{\text{Production of company D}}{\text{Production of company A}}$$

$$= \frac{2700}{1500} = \frac{9}{5} = 1.8$$

190. (2) Total production = 1500 + 1800 + 1000 + 2700 + 2200

= 9200

Total demand = 3000 + 600 + 2500 + 1200 + 3300 = 10600

Required difference

$$= \frac{1}{5}(10600 - 9200)$$

$$= \frac{1}{5} \times 1400 = 280$$

191. (3) Required ratio = 3 : 2

192. (2) Percentage of production of company Z to that of company Y :

Year 1998 $\Rightarrow \frac{45}{35} \times 100$

≈ 129%

Year 1996 $\Rightarrow \frac{35}{25} \times 100$

= 140%

193. (2) Average production during 1998 – 2000 :

Company X

$$\Rightarrow \left(\frac{25 + 50 + 40}{3}\right) \text{ lakh tonnes}$$

$$= \frac{115}{3} \text{ lakh tonnes}$$

Company Y

$$\Rightarrow \left(\frac{35 + 40 + 50}{3}\right) \text{ lakh tonnes}$$

$$= \frac{125}{3} \text{ lakh tonnes}$$

$$\text{Required ratio} = \frac{115}{3} : \frac{125}{3}$$

= 23 : 25

194. (1) Average production for 5 years :

Company X

$$\Rightarrow \left(\frac{30 + 45 + 25 + 50 + 40}{5}\right)$$

lakh tonnes

$$\Rightarrow \frac{190}{5} = 38 \text{ lakh tonnes}$$

Company Y

$$\Rightarrow \left(\frac{25 + 35 + 35 + 40 + 50}{5}\right)$$

lakh tonnes

$$= \frac{185}{5} = 37 \text{ lakh tonnes}$$

Company Z

$$\Rightarrow \left(\frac{35 + 40 + 45 + 35 + 35}{5}\right)$$

lakh tonnes

$$= \frac{190}{5} = 38 \text{ lakh tonnes}$$

195. (1) Required percentage increase

$$= \left(\frac{40 - 25}{25} \times 100\right)$$

$$= \frac{15 \times 100}{25} = 60\%$$

196. (4) Required difference

= (45 – 25) lakh tonnes

= 2000000 tonnes

197. (2) Total votes received by X

= 45 + 73 + 51 + 56 = 225

Total votes

= (41 + 97 + 52 + 59) + 225

= 474

∴ Required per cent

$= \frac{225}{474} \times 100 \approx 47.5\%$

198. (1) Required per cent

$= \frac{23}{474} \times 100 \approx 4.9\%$

199. (2) Required per cent

$= \frac{88-73}{73} \times 100$

$= \frac{1500}{73} \approx 21\%$

200. (3) Required per cent

$= \frac{73}{225} \times 100 \approx 32$

201. (3) Difference between male and female students in statistics = 16 – 15 = 1

202. (4) Difference of the choices of subject between male and female students chemistry

= 61 – 24 = 37

203. (3) In Economics and Mathematics :

Total male students

= 30 + 32 = 62

Total female students

= 20 + 34 = 54

Difference = 62 – 54 = 8

∴ Required percent

$= \frac{8}{54} \times 100$

= 14.8% more

204. (4) It is obvious from the bardiagram.

The percentage of females in Chemistry is least.

205. (4) The number of children in respective standard is not known.

206. (2) Number of students admitted in 2001 = 9000

Number of students admitted in 2003 = 12000

Percentage increase

$= \frac{12000-9000}{9000} \times 100$

$= \frac{100}{3}\% = 33.3\%$

207. (4) From 2000 to 2003,

Total students admitted

= (6 + 9 + 8 + 12) thousands

= 35 thousands

Total students passed

= (4 + 6 + 6 + 9) thousands

= 25 thouseands

∴ Required ratio = 25 : 35

= 5 : 7

208. (1) Passing percentage in 2000

$= \frac{4}{6} \times 100$

$= \frac{200}{3} = 66\frac{2}{3}\%$

Passing percentage in 2001

$= \frac{6}{9} \times 100 = \frac{200}{3} = 66\frac{2}{3}\%$

209. (2) Required ratio = $8 : \frac{9+9}{2}$

= 8 : 9

210. (2) Required average

$= \frac{90+75}{2} = \frac{165}{2} = 82.5$

211. (3) Difference between the marks in Biology

= 85 – 60 = 25

Difference between the marks in Maths = 100 – 80

= 20

212. (4) Required percent

$= \left(\frac{70+65}{200}\right) \times 100 = \frac{135}{2}$

= 67.5%

213. (3) Required ratio

$= \frac{85+60}{2} : \frac{70+100}{2}$

= 145 : 170 = 29 : 34

214. (4) Required percentage increase

$= \left(\frac{36.2-26.6}{26.6}\right) \times 100$

$= \frac{9.6 \times 100}{26.6} \approx 36\%$

215. (3) Change in world = 16 – 14.6 = 1.4

216. (1) USA had better control on inflation.

217. (2) Percentage increase

$= \left(\frac{36.2-16}{16}\right) \times 100$

$= \frac{20.2 \times 100}{16} = 126.25$

≈ 126

218. (1) Required answer = (40 + 30 + 60 + 20 + 10 + 20) thousand

= 180000

219. (4) Required ratio = 30 : 40

= 3 : 4

220. (2) Required ratio = 40 : 50 : 40

= 4 : 5 : 4

221. (2) Required ratio

$= \frac{30+60+10}{3} : \frac{40+20+20}{3}$

= 100 : 80 = 5 : 4

222. (3) Required answer

= 14000 – 12000 = 2000

223. (3) Required total enrolment

= {(8 + 10) + (14 +12) + (12 + 14)} thousands

= (18 + 26 + 26) thousands

= 70 thousands

224. (4) Required ratio

= (8 + 12) : (10 + 14)

= 20 : 24

= 5 : 6

225. (2) Required total collected amount as fees

= Rs. (12000 × 6500)

= Rs. 78000000

226. (1) The number of students in arts decreased regularly.

227. (1) Required percentage increase

$= \frac{600-400}{400} \times 100$

$= \frac{200}{4} = 50\%$

228. (2) Required ratio

= (200 + 250 + 250) : (150 + 200 + 250)

= 700 : 600 = 7 : 6

229. (3) Number of students in arts during 1992–93 = 300

Year 1990–91 ⇒ 600

Year 1991–92 ⇒ 550

230. (1) Total population in 1991

= (44 + 41) crores

= 85 crores

∴ Required per cent

$= \frac{41}{85} \times 100 \approx 48.23\%$

231. (3) Number of men per thousand women in 1971

$= \frac{28}{26} \times 100 \approx 1077$

232. (*) Required ratio

$= \frac{21}{23} \times 1000 : \frac{44}{41} \times 100$

= 21 × 41 : 44 × 23

= 861 : 1012

233. (2) Total population in 1981
= 35 + 33 = 68 crores
Total population in 1991
= 44 + 41 = 85 crores
Percentage increase

$$= \frac{85-68}{68} \times 100$$

$$= \frac{1700}{68} = 25\%$$

∴ Total population in 2001
= 125% of 85 crores

$$= \left(\frac{85 \times 125}{100}\right) \text{crores}$$

= 106.25 crores

234. (2) Total number of students :
Science ⇒ 400 + 400 + 450 + 500 = 1750
Commerce ⇒ 200 + 250 + 300 + 250 = 1000

∴ Required ratio = $\frac{1750}{4} : \frac{1000}{4}$

= 7 : 4

235. (3) Required percentage increase

$$= \left(\frac{700-550}{550}\right) \times 100$$

$$= \frac{1500}{55} = 27.27\%$$

236. (*) Total number of students in during 2006-07
= 550 + 450 + 300 = 1300
∴ Required per cent

$$= \frac{450}{1300} \times 100 = \frac{450}{13} = 34.6\%$$

237. (4) Total number of students :
Session 2004-05 ⇒ 600 + 400 + 200 = 1200
Session 2007-08 ⇒ 700 + 500 + 250 = 1450
Percentage increase

$$= \left(\frac{1450-1200}{1200}\right) \times 100$$

$$= \frac{250}{12} = 20.83\%$$

238. (3) Total number of men
= (3500 + 4500 + 4700 + 2250 + 3250)
= 18200
Total number of women
= 3000 + 3500 + 4000 + 1500 + 3700
= 15700
Difference = 18200 – 15700
= 2500

239. (3) Average number of women =

$$\frac{15700}{5} = 3140$$

Number of men in organisation D = 2200
Required per cent

$$= \frac{3140-2250}{2250} \times 100$$

$$= \frac{8900}{225} \approx 40\%$$

240. (4) Required ratio
= (3500 + 4000) : (2250 + 3250)
= 7500 : 5500
= 15 : 11

241. (1) Required per cent

$$= \frac{3500+4500}{10200} \times 100$$

$$= \frac{8000}{102} \approx 78.4$$

242. (*) Required ratio

$$= \frac{3000+3500+4000}{3}$$

$$: \frac{4700+2250+3250}{3}$$

= 3500 : 3400 = 35 : 34

TYPE-VI

1. (4) Required number of students
= 4 + 7 + 5 = 16

2. (3) Number of failures = 2 + 6 + 10 = 18

3. (2) Number of successful students = 45 – 18 = 27
∴ Required percentage

$$= \frac{27}{45} \times 100 = 60\%$$

4. (1) It is obvious from the histogram.

5. (1) Bar of class interval 30–40

6. (3) Required number of persons
= 450 + 250 + 150 + 75 + 50 + 25 = 1000

7. (2) Required answer
= 250 + 150 = 400

8. (3) Required ratio = 250 : 75
= 10 : 3

9. (2) Age group 15 – 20 → 450

$$\Rightarrow \frac{450}{500} = \frac{9}{10}$$

10. (4) Required percentage

$$= \frac{25}{500} \times 100 = 5\%$$

11. (3) Total number of workers
= 3 + 8 + 5 + 4 + 9 + 8 + 6 + 7
= 50

12. (1) Required ratio = 3 : 7

13. (2) Required amount
= 3000 + 8800 + 6000 + 5200 + 12600 + 12000 + 9600 + 11900 + 50 × 50 = ₹ 71600

14. (1) Wage group – 1400 – 1500
Amount = 1450 × 9 = ₹ 13050

15. (3) Number of students
= 2 + 8 = 10

16. (3) Students obtaining above 60
= 35
∴ Required percentage

$$= \frac{35}{50} \times 100 = 70\%$$

17. (1) Required number of students
= 4 + 6 + 10 + 8 + 5 = 33

18. (2) Students in class interval 20 – 30 = 10

19. (4) Required class interval
= 0 – 10

20. (3) Required ratio = 4 : 5

21. (1) Required percentage increase

$$= \frac{1000-400}{400} \times 100$$

$$= \frac{600}{4} = 150\%$$

22. (1) Required percentage decrease

$$= \frac{900-800}{900} \times 100$$

$$= \frac{100}{9} = 11\frac{1}{9}\%$$

23. (1) Percentage increase :
Year 2007 – 2008

$$\Rightarrow \frac{200}{1000} \times 100 = 20\% \text{ (lowest)}$$

Year 2006 – 2007

$$\Rightarrow \frac{200}{800} \times 100 = 25\%$$

24. (4) Required percentage increase

$$= \frac{1200-600}{600} \times 100 = 100\%$$

25. (3) Required average

$$= \frac{100+220+300+200+250}{5}$$

$$= \frac{1070}{5} = 214$$

26. (3) Number of families = 15 + 10 + 40 + 5 + 20 + 30 + 15 + 10 + 40 + 15 = 200

27. (2) Required number of families = 40 + 15 = 55

28. (1) Required number of families = 15 + 10 = 25

29. (4) Required answer = 55

30. (2) Required percentage

$= \frac{90}{200} \times 100 = 45\%$

31. (3) Required number of students = 25 + 7 + 4 + 2 = 38

32. (3) Required number of students = 6 + 8 = 14

33. (2) Number of students in 150 – 160 class interval = 25

34. (2) Required answer = 4 patients

35. (4) Required answer = 4 + 3 + 2 + 1 = 10

36. (1) Required answer = 8 + 7 + 5 = 20

37. (3) Total number of patients = 1 + 4 + 8 + 7 + 5 + 4 +3 + 2 + 1 = 35

Patients of age less than 45 years = 1 + 4 + 8 = 13

Required percent

$= \frac{13}{35} \times 100 \approx 37\ \%$

38. (4) 11% of 35 = $\frac{35 \times 11}{100}$

= 3.85 ≈ 4

Patients between 35 years and 40 years = 4

Patients between 55 years and 60 years = 4

39. (3) Number of workers who earn more than Rs. 950 = 10 + 5 + 3 + 3 + 5 = 26

40. (1) Number of workers who earn less than Rs. 950 = 3 + 2 + 4 + 9 + 5 = 23

41. (3) Total number of workers surveyed = 26 + 23 = 49

42. (1) Required number of workers = 5 + 10 = 15

43. (2) Number of workers who earn between Rs. 950 to Rs.960 = 10

Required percentage

$= \frac{10}{49} \times 100 = 20.4\%$

44. (2) Unsuccessful students in Maths ⇒ 10

Class-interval 25–30 = 15

45. (4) Total students in the class ⇒ 15 + 20 + 40 + 50 + 10 = 135

46. (4) Total students ⇒ 135

Successful students

⇒ 20 + 40 + 50 + 10 = 120

∴ Required per cent

$= \frac{120}{135} \times 100$

$= \frac{800}{9} = 88\frac{8}{9}\%$

47. (1) Number of students who score more than 90% = class – interval 45 – 50 = 10

48. (2) Number of literate people in the age group 15 to 45 years = 900 + 800 + 650 + 600 + 500 + 250 = 3700

49. (1) Required answer = 800 + 650 + 600 = 2050

50. (2) Number of literate people in the age group 30–45 years = 600 + 500 + 250 = 1350

Total literate people = 3700 + 350 = 4050

Required percent

$= \frac{1350}{4050} \times 100$

$= \frac{100}{3} = 33.33\%$

51. (3) Required ratio = (800 + 650 + 600) : (600 + 500 + 250)

= 2050 : 1350 = 41 : 27

52. (3) Students who score less than 60 marks = 7 + 8 + 18 = 33

53. (1) Required average marks

$= \frac{10 \times 7 + 30 \times 8 + 50 \times 18 + 70 \times 4 + 90 \times 13}{50}$

$= \frac{70 + 240 + 900 + 280 + 1170}{50}$

$= \frac{2660}{50} = 53.2$

Mid-value of class-interval (x)

$= \frac{\text{Highest value} + \text{Lowest value}}{2}$

∴ Average = $\frac{\sum fx}{\sum f}$

where $\sum f$ = Total number of students

54. (1) Required answer = 18 + 4 = 22

55. (3) Students who score more than 59 marks = 4 + 13 = 17

∴ Required per cent

$= \frac{17}{50} \times 100 = 34\%$

56. (3) Total number of students = 5 + 10 + 15 + 19 + 13 = 62

Number of students who obtained 40 marks or less = 15

Required per cent

$= \frac{15}{62} \times 100 \approx 24.2$

57. (4) Required ratio = (19 + 13) : (5 + 10 + 15)

= 32 : 30 = 16 : 15

TYPE-VII

1. (3) 15 per cent ≈ 24000

∴ 85 per cent ≈ $\frac{85 \times 24000}{15}$

= 136000

2. (4) According to table T

3. (2) According to table Q

4. (4) According to table T

5. (3) According to table 452500

6. (3) Average $= \frac{476}{6} = 79.33 \approx 80$

Which is equal to total production of all types of cars in 1993.

7. (4)

Year→	1989	1990	1991	1992	1993	1994
P + Q	24	30	30	29	33	20
R + S	25	23	26	31	33	39

Therefore, the required answer is year 1993, which is none of the above.

8. (4) From visual inspection of table it is clear that the continuous increase in production is obtained from S type of car.

9. (1) According to question,

25% of 80 $= \frac{25 \times 80}{100}$

= 20 i.e. Equal to S type of car in 1993.

10. (2) Required answer

$= \frac{(90 - 75)}{75} \times 100 = 20\ \%$

11. (4) The number of children in 1988 = 146947 – (65104 + 60387)

= 146947 – 125491 = 21456

12. (2) The total population in 1989 = population in 1988 + increase

= 146947 + 11630 = 158577

13. (1) Number of children in 1989 = Total population in 1989 – Total population of men and women

= 158577 – (70391 + 62516)

= 25670

14. (1) Number of women in 1991 = Total population in 1991 – total population of men and children in 1991
= (153922 – 5337) – (69395 + 21560) = 57630

15. (2) Total population in 1992
= 160998
Total population in 1991
= 153922 – 5337 = 148585
∴ Increase in population in 1992 over 1991
= 160998 – 148585
= 12413

16. (1) Average number of scooters produced per year (in thousands)

$$= \frac{115+108+149+102+101}{5}$$

$$= \frac{575}{5} = 115$$

Clearly, it was in the year 1985.

17. (3) Company Q produced 20 thousands scooters in 1988 and 15 thousands in 1989. Clearly, a decrease of 25%.
Similar is the case with company R also.

18. (2) Required ratio $= \frac{20}{40}$
= 1 : 2

19. (3) It was maximum in the year 1987.

20. (2) Total production of scooters during 1985 - 1989 in thousands.
= 115 + 108 + 149 + 102 + 101
= 575
Now, 20% of 575

$$= \frac{20 \times 575}{100} = 115$$

It was in the year 1985.

21. (1) The difference between the total sales and the gross profit is the least in the year 1990.

22. (4) Total sales in 1993
= ₹ 439.7 lakhs
Total sales in 1990
= ₹ 351.6 lakhs
∴ Required percentage

$$= \frac{439.7}{351.6} \times 100$$

$$\approx \frac{440}{350} \times 100 \approx 125\%$$

23. (1) It is obvious from the table.

24. (4) Percentage increase in the year,

$$1992 \rightarrow \frac{(149.9-134.3)}{134.3} \times 100$$

$$= \frac{15.6 \times 100}{134.3} = 11.6\%$$

$$1993 \rightarrow \frac{(160.5-149.9)}{149.9} \times 100$$

$$= \frac{10.6 \times 100}{149.9} = 7\%$$

$$1994 \rightarrow \frac{(203.3-160.5)}{160.5} \times 100$$

$$= \frac{42.8 \times 100}{160.5} = 26.6\,\%$$

Note : It is not necessary to calculate percentage increase for every year. It can be inferred easily from the data given in the table.

25. (4) Required average of marks in 1995

$$= \frac{56+68+68+48}{4} = \frac{240}{4} = 60$$

26. (2) Total marks
= 68×40 = 2720

27. (2) It was maximum in the year 1993.
Highest marks = 94
Average marks = 60
Difference = 94 – 60 = 34

28. (3) It was in the year 1994.
Highest marks = 66
Average marks = 58
Difference = 66 – 58 = 8

29. (2) Percentage increase in the export from :

$$\text{Port A} \rightarrow \frac{61-57}{57} \times 100 = 7\%$$

$$\text{Port B} \rightarrow \frac{160-148}{148} \times 100 = 8.1\%$$

$$\text{Port C} \rightarrow \frac{234-229}{229} \times 100 = 2.2\%$$

$$\text{Port D} \rightarrow \frac{150-146}{146} \times 100 = 2.74\%$$

Export form B is highest.

30. (1) Aggregate export in 1998
= ₹ (57 + 148 + 229 + 146) crore
= ₹ 580 crore
Aggregate export in 1999
= ₹ (61 + 160 + 234 + 150) crore
= ₹ 605 crore
Increase = ₹ (605 – 580) crore
= ₹ 25 crore
∴ Percentage increase

$$= \frac{25}{580} \times 100 = 4.3\%$$

31. (4) Average increase in export

$$= ₹\ \frac{25}{4} \text{ crore}$$

$$= ₹\ \frac{25}{4} \times 10000000$$

= ₹ 62500000

32. (3) The Percentage increase in the export of the commodity was the lowest from port C.

33. (2) ∵ 15% ≡ 2400

$$\therefore 85\% \equiv \frac{2400}{15} \times 85 = 13600$$

34. (3) It is obvious from the table.

35. (2) In city E,
∵ 25% ≡ 8000

$$\therefore 100\% \equiv \frac{8000}{25} \times 100 = 32000$$

36. (4) City A

$$\Rightarrow \frac{2400}{40} \times 100 = 6000$$

City D

$$\Rightarrow \frac{8000 \times 100}{75} = 6000$$

37. (2) Percentage increase

$$= \frac{125-105}{105} \times 100$$

$$= \frac{20}{105} \times 100 \approx 19\%$$

38. (1) Percentage decrease

$$= \frac{200-180}{200} \times 100$$

$$= \frac{20}{200} \times 100 = 10\%$$

39. (3) Total production of toys in 2005 = 675 thousand
Total production of toys in 2006 = 750 thousand
Percentage increase

$$= \frac{750-675}{675} \times 100 = 11\%$$

40. (2) Difference in production of toys of type B and C :
Year 2002 ⇒ 150 – 78
= 72 thousand
Year 2003 ⇒ 180 – 100
= 80 thousand
Year 2004 ⇒ 175 – 92
= 83 thousand
Year 2005 ⇒ 160 – 120
= 40 thousand
Year 2006 ⇒ 185 – 130
= 55 thousand
∴ Required answer

$$= \frac{72+80+83+40+55}{5}$$

$$= \frac{330}{5} = 66 \text{ thousand}$$

41. (2) Required percentage

$$= \frac{326}{384} \times 100 \approx 85\%$$

42. (4) Total number of students appearing in 2004
= 310 + 395 + 106 + 1180
= 1991
Required percentage

$$= \frac{1180}{1991} \times 100 \approx 59.3\%$$

43. (3) Total number of students appearing in all streams :
Year 2002 ⇒ 2136
Year 2003 ⇒ 2179
Year 2004 ⇒ 1991 (minimum)
Year 2006 ⇒ 2298

44. (2) Total number of students passing in all streams :
Year 2001
⇒ 289 + 246 + 69 + 1310 = 1914
Year 2004
⇒ 246 + 298 + 92 + 1074 = 1710
Year 2005
⇒ 382 + 382 + 74 + 1326 = 2164 (maximum)
Year 2006
⇒ 286 + 405 + 63 + 1207 = 1961

45. (2) Percentage decrease

$$= \frac{234-228}{234} \times 100$$

$$= \frac{600}{234} = 2.56\%$$

46. (3) It is obvious from the table.

47. (1) It is obvious from the table.

48. (1) Percentage increase

$$= \frac{860-680}{680} \times 100$$

$$= \frac{180}{680} \times 100 = 26.47\%$$

49. (1) Science + Commerce Students
= (29 + 31)% = 60%
Students who neither have commerce nor science

$$= 200 \times \frac{40}{100} = 80$$

50. (2) Average production of whole duration $= \frac{476}{6} = 79$, which is total production in 2000.

51. (2) Number of people who read only English Newspapers
= 123 + 206 + 325 = 654

52. (4) Total number of people surveyed = 608 + 586 + 742
= 1936

53. (3) Per cent increase

$$= \frac{380-320}{320} \times 100 = 18.75\%$$

54. (2) Total production :
Wheat ⇒ 3700 million tonnes
Rice ⇒ 2000 million tonnes
Barley ⇒ 1800 million tonnes
Other cereals ⇒ 2400 million tonnes

$$\therefore x = \frac{3700}{9900} \times 100 = 37.4$$

55. (1) Perecentage increase in

$$\text{Rice} = \frac{160}{400} \times 100 = 40\%$$

$$\text{Cereals} = \frac{190}{500} \times 100 = 38\%$$

56. (4) Required difference

$$= \frac{2000}{5} - \frac{1800}{5} = 400 - 360$$

= 40 million tonnes

57. (3) B's average speed

$$= \left(\frac{25+40+35+25}{4}\right) \text{kmph}$$

= 31.25 kmph

58. (2) Required ratio of average speed

$$= \frac{20+30+20+15+25}{5} : \frac{15+25+35+20+30}{5}$$

= 110 : 125 = 22 : 25 km

59. (2) Required distance
= (25 + 40 + 35 + 25 + 35 + 10 + 25 +15) – (20 + 30 + 20 + 15 + 25 + 15 + 25 +35) = 210 – 185
= 25 km

60. (4) Distance after 2 hours
= 65 – 50 = 15 km
Distance after 3 hours
= 100 – 70 = 30 km
Distance after 4 hours
= 125 – 85 = 40 km
Distance after 5 hours
=160 – 110 = 50 km (maximum distance)

61. (4) Required percentage

$$= \frac{60}{15} \times 100 = 400\%$$

62. (3)

$$\text{School A} \Rightarrow \frac{120}{270} \times 100 \approx 44\%$$

$$\text{School B} \Rightarrow \frac{60}{150} \times 100 = 40\%$$

$$\text{School C} \Rightarrow \frac{210}{450} \times 100 \approx 47\%$$

(highest income %)

$$\text{School D} \Rightarrow \frac{90}{210} \times 100 \approx 43\%$$

63. (2) School A ⇒ 120 > 4 × 24
School B ⇒ 60 > 12 × 4
School C ⇒ 210 > 45 × 4
School D ⇒ 90 < 24 × 4
School E ⇒ 120 = 30 × 4

64. (1) $\text{School B} \Rightarrow \frac{54}{60} = 0.9$

$$\text{School C} \Rightarrow \frac{120}{210} \approx 0.57$$

$$\text{School D} \Rightarrow \frac{42}{90} \approx 0.47$$

$$\text{School E} \Rightarrow \frac{55}{120} = 0.46$$

(lowest income ratio)

65. (2) Total grain production of state
P = 45 + 103 + 27 + 29
= 240 lakh tonnes
Q = 48 + 86 + 73 + 19 + 15
= 241 lakh tonnes

R = 59 + 32 + 67 + 14 + 31
= 203 lakh tonnes
S = 41 + 37 + 59 + 21 + 15
= 173 lakh tonnes
Obviously, State Q had the highest grain production.

66. (3) Total rice Production
= 45 + 48 + 59 + 41 + 37 + 68 + 57 + 38 = 393 lakh tonnes
Total wheat production = 103 + 86 + 32 + 37 + 22 + 15 + 8 + 28 = 331 lakh tonnes
∴ Required ratio
= 393 : 331 = 1.2 : 1

67. (1) In the states Q, R and S Jowar recorded highest production (Here state Q in second highest)

68. (4) Required percentage

$$= \frac{103}{331} \times 100 = 31\% = 30\%$$

69. (3) Average per hectare yield of rice = 30 tonnes
Total rice production
= 393 lakh tonnes
∴ Required area

$$= \frac{393}{30} \text{ lakh hectares}$$

= 13.1 = 13 lakh hectares

70. (2) Average loan

$$= \frac{87+104+113+120}{4}$$

$$= \frac{424}{4} = ₹\ 106 \text{ crore}$$

Required year = 1996

71. (2) Required percentage

$$= \frac{120-113}{113} \times 100$$

$$= \frac{7}{113} \times 100 = \frac{700}{113} = 6\frac{22}{113}\%$$

72. (4)

year	A + B	C + D
	(₹ in crores)	(₹ in crores)
1995	45	52
1996	56	48
1997	63	50
1998	71	49

73. (4) 13 < 19 < 28 < 32

74. (2) 30% of 120 = $120 \times \frac{30}{100}$
= ₹ 36
∴ Loans disbursed by Bank B in 1998 is 30% more than the loans disbursed by all banks.

75. (1) From the table it is clear that age group up to 15 years accounts for maximum population, as its share is 30 per cent. But out of the given options, the age group (16 – 25) years accounts for maximum population.

76. (1) Below 26 years, the percent of population is (30 + 17.75)
= 47.75
∴ The required answer
= 47.75% of 4200

$$= \frac{47.75 \times 4200}{100}$$

= 2005.5 ≈ 2006

77. (2) Below 36 years, the percent of population is (30 + 17.75 + 17.25) = 65%
∴ The required number of people $= \frac{200 \times 5.12}{65}$ millions
= 15.75 millions

78. (2) Per cent of population in the age group 56 years and above
= 5.12 + 1.13 = 6.25
Now, 6.25% of population
= 10 millions
∴ Total Population

$$= \frac{10 \times 100}{6.25} \text{ millions}$$

= 160 millions
Difference in per cent of people in the age groups (16 – 25) and (46 – 55)
= 17.75 – 14.25 = 3.5%
∴ The required difference
= 3.5% of 160 millions

$$= \frac{3.5 \times 160}{100} \text{ millions}$$

= 5.6 millions

79. (2) Difference in per cent of people in the age groups (46 – 55) and (26 – 35)
= 17.25 – 14.25 = 3%
Now, 3% of total Population
= 11.75 million
∴ Total Population

$$= \frac{11.75 \times 100}{3}$$

= 391.67 millions (approx.)

80. (2) Candidates qualified under arts discipline In 2010

$$= \frac{900 \times 19}{100} = 171$$

$$= \frac{850 \times 18}{100} = 153$$

Difference = 171 – 153 = 18

81. (1) Candidates qualified under science discipline in

Year 2006 ⇒ $\frac{780 \times 40}{100} = 312$

Year 2007 ⇒ $\frac{650 \times 42}{100} = 273$

Year 2008 ⇒ $\frac{500 \times 45}{100} = 225$

Year 2009 ⇒ $\frac{45 \times 620}{100} = 279$

Year 2010 ⇒ $\frac{35 \times 900}{100} = 315$

Year 2011 ⇒ $\frac{42 \times 850}{100} = 357$

Required average difference

$$= \frac{1}{3}[(279 + 315 + 357) - (312 + 273 + 225)] = \frac{1}{3}(951 - 810)$$

$$= \frac{1}{3} \times 141 = 47$$

82. (1)

Height	No. of girls
135-140	04
140-145	07
145-150	18
150-155	11
155-160	06
160-165	05

Required answer
= 11 + 6 + 5 = 22

83. (2) Class interval (155 – 160)
= 6 girls

$$\text{Mid-value} = \frac{155+160}{2} = 157.5$$

Class interval (160 – 165)
= 5 girls

$$\text{Mid value} = \frac{160+165}{2} = 162.5$$

∴ Required average

$$= \frac{6 \times 157.5 + 5 \times 162.5}{11}$$

$= \frac{945 + 812.5}{11} = \frac{1757.5}{11}$

= 159.8 cm

84. (1) Percentage of people below 36 years = 55%

i.e. (20 + 18.25 + 16.75)%

$\because$ 55% ≡ 22 million

$\therefore$ $12.50\% \equiv \frac{22}{55} \times 12.50$

= 5 millions

85. (2) Difference = 0.975 million

$\Rightarrow$ (18.25 – 15)% ≡ 0.975 million

$\therefore$ $100\% \equiv \frac{0.975}{3.25} \times 100$

≡ 30 millions

86. (3) People in southern zone

= 1450 + 1120 + 420 + 350 + 50

= 3390

People who take coffee at least once a day = 1450 + 1120

= 2570

Required percentage

$= \frac{2570}{3390} \times 100$

≈ 75.81

87. (4) Total people in north zone

= 4840

Total people in south zone

= 3390

Total people in east zone

= 2820

Total population = 4840 + 3390 + 2820 = 11050

People who take coffee only once a week in these zones

= 620 + 540 + 350 = 1510

Required per cent

$= \frac{1510}{11050} \times 100 \approx 14$

88. (2) Number of people who take coffee more than 3 times a day = 410 + 310 + 700 + 1450 = 2870

Total number of people who do not take coffee at all

= 950 + 430 + 620 + 50 = 2050

Required ratio = 2870 : 2050

= 1.4 : 1 = 14 : 10

= 7 : 5

Calculations (89-91) :

Students	No. of students scoring marks less than 50%	No. of students scoring marks more than 50%	No. of students who score 50% marks
School A	240	$600 \times \frac{55}{100} = 330$	600 – 330 – 240 = 600 – 570 = 30
School B	220	$\frac{400 \times 40}{100} = 160$	400 – 220 – 160 = 400 – 380 = 20
School C	300	$\frac{375 \times 20}{100} = 75$	375 – 300 – 75 = 0
School D	280	$\frac{350 \times 10}{100} = 35$	350 – 280 – 35 = 350 – 315 = 35
School E	210	$\frac{300 \times 25}{100} = 75$	300 – 210 – 75 = 15
Sum	1250	675	100

89. (3) Required ratio = 1250 : 100

= 25 : 4

90. (3) School B

91. (4) Required answer = 675

92. (4) Production of all types of scooters was the lowest in June. It was 90.

93. (1) Production of equal number of all types of scooters was 25 each in January.

94. (3) Total number of scooters produced = 100 + 105 + 108 + 110 + 110 + 90 = 623

95. (2) Total production :

April $\Rightarrow$ 110

May $\Rightarrow$ 110

96. (2) Total runs scored by warner

= 267 = 155.77

$\therefore$ Strike rate

$= \frac{\text{Total runs}}{\text{balls faced}} \times 100$

$\Rightarrow 155.77 = \frac{567}{\text{Balls faced}} \times 100$

$\Rightarrow$ Balls faced

$= \frac{567 \times 100}{155.77} \approx 364$

97. (2) Ajinkya Rahade's strike rate

$= \frac{461}{364} \times 100 = 127$

Cokk's strike rate $= \frac{385}{266} \times 100$

= 145

Required percent

$= \left(\frac{145 - 127}{145}\right) \times 100$

$= \frac{1800}{145} \approx 12\%$

98. (3) Runs scored by sixes

= (28 + 32 + 23 + 9 + 5 + 4 + 12 + 6 + 12) × 6

= 131 × 6 = 786

99. (2) Viral Kohali's Batting average

$= \frac{752}{12 - 3}$

$= \frac{752}{9} = 83.5$

$\therefore$ Required percent

$= \frac{83.5 - 45}{45} \times 100$

≈ 85

100. (1) Murali Vijay's strike rate

$= \frac{378}{315} \times 100 = 120$

Required difference

= 130.77 – 120 = 10.77

101. (2) Production of D – type cycles :

Year 1998 ⇒ 105

Year 2000 ⇒ 125

Percentage increase

$= \frac{125-105}{105} \times 100$

$= \frac{2000}{105} \approx 19\%$

102. (1) Total production of cycles :

Type–A ⇒ 945

Type–B ⇒ 850

Type–C ⇒ 520

Type–D ⇒ 565

Type–E ⇒ 375

103. (1) Required percentage decrease $= \left(\frac{200-180}{200}\right) \times 100$

$= \frac{20}{2} = 10\%$

104. (2) Required per cent

$= \frac{80}{160} \times 100 = 50\%$

105. (4) Respective production :

January ⇒ 590

February ⇒ 1240 – 590 = 650

March ⇒ 1940 – 1240 = 700

April ⇒ 2610 – 1940 = 670

May ⇒ 3050 – 2610 = 440

∴ Total production of cars in April and May = 670 + 440

= 1110

106. (4) Total distance covered

= (3 + 2 + 2.5 + 5 + 1 + 2.5 + 4) km.

= 20 km.

∵ 5 km. ≡ 400 calories

∴ 20 km. $\equiv \left(\frac{400}{5} \times 20\right)$ calories

≡ 1600 calories

107. (4) Total expenditure

= Rs. (11 + 7 + 5 + 3 + 3) lakhs

= Rs. 29 lakhs.

Expenditure on raw materials and taxes = Rs. 14 lakh

∴ Required percent

$= \frac{14}{29} \times 100$

≈ 48.28%

108. (1) Respective production :

January ⇒ 480

February ⇒ 1050 – 480 = 570

March ⇒ 1630 – 1050 = 580

April ⇒ 1970 – 1630 = 340

May ⇒ 2670 – 1970 = 700

∴ Total production of cars in May and April

= 700 + 340 = 1040

109. (2) Total distance covered

= (2.5 + 4 + 2.5 + 3.5 + 0.5 + 2.5 + 1.5) km.

= 17 km.

∵ 5 km. ≡ 400 calories

∴ 17 km. $\equiv \left(\frac{400}{5} \times 17\right)$ calories

= 1360 calories

110. (4) Total expenditure

= Rs. (12 + 6 + 3 + 4 + (3) lakhs

= Rs. 28 lakhs

Total expenditure on raw materials and interest together

= Rs. 16 lakhs

∴ Required per cent

$= \frac{16}{28} \times 100$

= 57.14%

TYPE-VIII

1. (4) Required average

$= \frac{110+138+156}{3}$

$= \frac{404}{3} = 134.67$

2. (3) Required percentage increase

$= \left(\frac{170-110}{110}\right) \times 100$

$= \frac{600}{11} = 54.5\%$

3. (3) Required percentage decrease

$= \left(\frac{170-156}{170}\right) \times 100$

$= \frac{140}{17} = 8.24\%$

4. (1) IQ score ⇒ 130 – 140 ⇒ 2

IQ score of 140

⇒ undeterminable

5. (2) Number of students whose IQ score is 100 and more

= 16 + 13 + 4 + 2 = 35

6. (2) In 2011,

Taxable products = $4x$

Non-taxable products = x

In 2012,

Total products $= 5x \times \frac{110}{100}$

$= \frac{11x}{2}$

Taxable products $= \frac{11x}{2} \times \frac{2}{5}$

$= \frac{11x}{5}$

Non-taxable products

$= \frac{11x}{2} \times \frac{3}{5} = \frac{33x}{10}$

∴ Required ratio

$= \left(4x + \frac{11x}{5}\right) : \left(x + \frac{33x}{10}\right)$

$= \left(\frac{20x+11x}{5}\right) : \left(\frac{10x+33x}{10}\right)$

$= \frac{31x}{5} : \frac{43x}{10}$

= 62 : 43

□□□

TEST YOURSELF

Directions (1–5) : The following Pie Chart shows the export of different foodgrains from India in 2010. Study the chart and answer the questions :

1. Of the total export of foodgrains, the percentage of crop B exported is
(1) 15% (2) 20%
(3) 18% (4) 10%

2. If a total of 1.5 million quintals of crop F was exported, the amount of total foodgrains exported (in million) quintals was
(1) 8.7 (2) 12
(3) 10.8 (4) 9.6

3. The three crops which combine to contribute to exactly 50% of the total export of foodgrains are
(1) A, F and others
(2) B, C and F
(3) A, B and C
(4) C, F and others

4. If a total of 1.5 million quintals of crop F was exported, then the total quantity of D and E that was exported (in million quintals) was
(1) 1.2 (2) 1.5
(3) 4.5 (4) 6.5

5. If the revenue from 1 quintal of crop A is thrice that from 1 quintal of crop C, then the ratio of the total revenues of A and C is
(1) 1 : 6 (2) 2 : 3
(3) 3 : 2 (4) 6 : 1

Directions (6–10) : The following is a horizontal bar diagram showing the accidents in which two-wheelers are involved with other objects. Study the diagram and answer the questions.

OBJECTS HIT

6. The difference in percentage between the accidents involving two-wheelers and two-wheelers and two-wheelers and other objects is respectively.
(1) 77% more (2) 77% less
(3) 54% more (4) 54% less

7. 60% of the accidents are involved due to
(1) cars, buses, tanker lorry and pedestrians
(2) cars, tanker lorry, bicycles and stationary vehicles
(3) two-wheelers, cars, buses and stationary vehicles
(4) two-wheelers, cars, buses and tanker lorry

8. If the data of the bar diagram is represented by a pie-chart, and the angle of a sector of the pie-chart is 36°, then this sector represents the accidents involving
(1) pedestrians
(2) bicycles
(3) buses
(4) stationary vehicles

9. The percentage of accidents in which pedestrians and cyclists are involved is
(1) 24% (2) 6%
(3) 60% (4) 20.4%

10. The percentage by which the accidents involving buses is less than the accidents involving tanker lorry is
(1) 6% (2) 4%
(3) 40% (4) 28%

Directions (11-15) : Study the following graph carefully to answer the questions given below.

Number of selected employees in different grades/ranks by three companies during 2012

11. What is the average number of selected employees by company A in all grades taken together ?
(1) 450 (2) 460
(3) 475 (4) 375

12. What is the respective ratio of selected employees for the post of assistant IT managers by all the companies A, B and C together ?
(1) 8 : 10 : 11 (2) 10 : 8 : 11
(3) 11 : 10 : 8 (4) 10 : 11 : 8

13. By what percent is the number of selected employees for finance managers by company C more than that of selected employees by company B for the same post ?
(1) 35% (2) 30%
(3) 25% (4) 40%

14. What is the average number of selected employees for the post of assistant marketing managers by all companies taken together ?
(1) 570 (2) 520
(3) 620 (4) 720

15. What is the respective ratio of selected employees for IT managers by all companies A, B and C ?
(1) 6 : 4 : 7 (2) 5 : 3 : 7
(3) 4 : 7 : 9 (4) 8 : 7 : 6

Directions (16-20) : The following questions are based on the pie–charts given below.

Percentagewise Distribution of students studying in Arts and commerce in seven different institutions

Different institutions — A, B, C, D, E, F and G

Total number of students studying Arts = 3800

Total number of students studying commerce = 4200

16. What is the total number of students studying Arts in institutes A and G together ?
(1) 1026 (2) 1126
(3) 1226 (4) 1206

17. How many students from institute B study Arts and Commerce ?
(1) 1180 (2) 1108
(3) 1018 (4) 1208

18. The respective ratio between the number of students studying Arts and commerce from institute E is
(1) 27 : 14 (2) 19 : 27
(3) 19 : 16 (4) 19 : 28

19. The ratio between the number of students studying Arts from institute E and that of students studying commerce from institute D is
(1) 12 : 17 (2) 12 : 7
(3) 19 : 21 (4) 17 : 19

20. How many students from institutes B and D together study commerce ?
(1) 1320 (2) 1302
(3) 1202 (4) 1220

SHORT ANSWERS

1. (2)	**2.** (2)	**3.** (3)	**4.** (1)
5. (4)	**6.** (4)	**7.** (3)	**8.** (4)
9. (1)	**10.** (2)	**11.** (1)	**12.** (2)
13. (3)	**14.** (4)	**15.** (1)	**16.** (1)
17. (3)	**18.** (2)	**19.** (3)	**20.** (2)

EXPLANATIONS

1. (2) Percentage of crop B exported
$= \frac{72}{360} \times 100 = 20\%$

2. (2) $\because$ 45° = 1.5 million quintals
$\therefore$ 360° $= \frac{1.5 \times 360}{45} = 12$ million quintals

3. (3) A + B + C = 72° + 72° + 36° = 180°

4. (1) $\because$ 45° = 1.5 million quintals
$\therefore$ 36° $= \frac{1.5 \times 36}{45}$
= 1.2 million quintals

5. (4) A : C = 3 × 72° : 36°
= 6 : 1

6. (4) Total accidents = 230 + 150 + 120 + 160 + 40 + 200 + 100
= 1000
Percentage of accidents involving two-wheelers and two wheelers
$= \frac{230}{1000} \times 100 = 23\%$
Percentage of accidents involving two-wheelers and other objects
$= \frac{770 \times 100}{1000} = 77\%$
$\therefore$ Required difference
= 77 – 23 = 54%

7. (3) Two-wheelers + Cars + Buses + Stationary Vehicles
= 230 + 150 + 120 + 100
= 600 ≈ 60%

8. (4) $\because$ 1000 ≡ 360°
$\therefore$ 100 ≡ $\frac{360}{1000} \times 100 = 36°$

9. (1) Required percentage
$= \frac{40 + 200}{1000} \times 100$
$= \frac{24000}{1000} = 24\%$

10. (2) Required difference
$= \frac{160 - 120}{1000} \times 100 = 4\%$

11. (1) Required average
$= \frac{2700}{6} = 450$

12. (2) Required average
= 500 : 400 : 550
= 10 : 8 : 11

13. (3) Required percentage
$= \frac{250 - 200}{200} \times 100 = 25\%$

14. (4) Required average
$= \frac{800 + 700 + 660}{3}$
$= \frac{2160}{3} = 720$

15. (1) Required ratio
= 300 : 200 : 350 = 6 : 4 : 7

16. (1) Required answer
$= 3800 \times \frac{27}{100} = 1026$

17. (3) Required answer
$= \frac{3800 \times 8}{100} + \frac{4200 \times 17}{100}$
= 304 + 714 = 1018

18. (2) Required ratio
$= \frac{3800 \times 14}{100} : \frac{4200 \times 18}{100}$
= 38 × 14 : 42 × 18
= 19 : 27

19. (3) Required ratio
$= \frac{3800 \times 14}{100} : \frac{4200 \times 14}{100}$
= 19 : 21

20. (2) Required answer
$= \frac{4200 \times 17}{100} + \frac{4200 \times 14}{100}$
= 714 + 588 = 1302

22 MISCELLANEOUS

Importance : Race is an applied concept and to understand different aspects, this chapter is separately introduced.

Scope of questions : The asked and experted questions are related to race of persons, horses, boats, or competitions of swimming and ships or steamers.

Way to success : Practice these questions after understanding the different definitions and rules.

IMPORTANT POINTS

SOME IMPORTANT POINTS :

Here, Race refers to human race, horse race, boat **race** or swimming.

The field/ground/way at which these races are conducted is called **race course**.

The place from where the race starts is called **initial point/starting point.**

The place where the race ends is called winning point/ finishing point.

"Start of d metres" : If two runners A and B are running a race such that A starts earlier than B and B starts running when A has already travelled a distance of d metres then it says A has a head start of d metres..

If initial point is A and B is 12m leading from A, then we can say that A gives the 12m of start to B.

Start of 't' seconds : If two runners A and B are running a race such that B starts running 't' seconds later than A we say A has a head start of 't' seconds.

Won by d metres : If two runners A and B are running a race such that when A reaches the finishing point and B still has to cover d metres to reach the final point then it is said that A won the race by 'd' metres.

Won by 't' seconds : If two runners A and B are running a race such that B reaches the final point 't' seconds later than A then it is said that A won the race by 't' seconds.

Rule 1 : Circular Races : Let L is the length of circular track and speed of A and B are a and b respectively.

	When both of them are running in same direction	When both of them are running in opposite direction
Time taken to meet 1st time	$\frac{L}{(a-b)}$	$\frac{L}{(a+b)}$
Time taken to meet 1st time at starting point	LCM of $\left\{\frac{L}{a},\frac{L}{b}\right\}$	LCM of $\left\{\frac{L}{a},\frac{L}{b}\right\}$

When three people A, B and C are running in the same direction around a circular track with respective speed a, b and c:

Time taken to meet 1st time.	LCM of $\left\{\frac{L}{a-b},\frac{L}{b-c}\right\}$
Time taken to meet 1st time at starting point.	LCM of $\left\{\frac{L}{a},\frac{L}{b},\frac{L}{c}\right\}$

Rule 2 : The length (L) of race course required to cover a lead of 'x' :

$$L = x\left(\frac{1}{1-\frac{1}{n}}\right) \text{ or, } L = \frac{nx}{n-1}$$

$$\text{Where, } n = \frac{\text{Speed of faster person}}{\text{Speed of slower person}}$$

Rule 3 : If in a race of length L, the time taken by A and B be t_A and t_B ($t_B > t_A$), then the distance (d) by which A beats B is given by,

$$d = \left(\frac{L}{t_B}\right)(t_B - t_A)$$

or, d = B's speed × ($t_B - t_A$)

Rule 4 : If in a race of length L, A can give B a start of 'b' and C a start of 'c' then the start that B can give C

$$= L\left(\frac{c-b}{L-b}\right)$$

Rule 5 : If A gives B a start of distance 'd' and still beats him by time 't' in a race of length 'L'. then B's speed is

$$S_B = \frac{L-d}{\frac{L}{S_A}+t} = \frac{\text{Distance covered by B}}{\text{Total time taken by B}}$$

Where, S_A : A's speed

Rule 6 : If in a race of length L_1, A beats B by a distance 'd_1'
In a race of length L_2, B beats C by a distance 'd_2'
Then, in a race of length L_3, the distance (d) by which A beats C is ,

$$d = \frac{(l_1 l_2 l_3)-(l_1-d_1)(l_2-d_2)l_3}{l_1 l_2} \text{ And,}$$

$$\text{When } l_1 = l_2 = l_3 = l, \text{ then } d = \frac{l^2-(l-d_1)(l-d_2)}{l}$$

Rule 7 : A and B walk around a circle of circumference 'P' with speeds S_A and S_B respectively. If they start simultaneously from the same point, the time after which they will be together again for the first time

$$= \frac{P}{S_A - S_B} = \frac{\text{Circumference}}{\text{Relative Speed}}$$

❑❑❑

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. If log (0.57) = 1.756 then the value of log 57 + log $(0.57)^3$ + log $\sqrt{0.57}$ is :

(1) 0.902 (2) 1.902
(3) 1.146 (4) 2.146

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If $\log_{10}2 = 0.3010$ and $\log_{10}7 = 0.8451$, then the value of $\log_{10}2.8$ is :

(1) 0.4471 (2) 1.4471
(3) 2.4471 (4) 3.4471

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. If $\log_{10} 2 = 0.3010$ is given, then $\log_2 10$ is equal to :

(1) 0.3010 (2) 0.6990
(3) $\frac{1000}{301}$ (4) $\frac{699}{301}$

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. The simplified form of $\left(\log\frac{75}{16} - 2\log\frac{5}{9} + \log\frac{32}{243}\right)$ is :

(1) log 2 (2) 2 log 2
(3) log 3 (4) log 5

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

5. If log 2 = 0.3010, then log 5 equals :

(1) 0.3010 (2) 0.6990
(3) 0.7525
(4) Given log 2, it is not possible to calculate log 5

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

TYPE–II

1. Out of 450 students of a school 325 play football, 175 play cricket and 50 neither play football nor cricket. How many students play both football and cricket ?

(1) 50 (2) 100
(3) 75 (4) 225

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

2. If the number of items of a set A be $n(A) = 40$, $n(B) = 26$ and $n(A \cap B) = 16$, then $n(A \cup B)$ is equal to

(1) 30 (2) 40
(3) 50 (4) 60

(SSC CGL Tier-II Exam. 21.09.2014)

3. If the Universal Set U = {1, 2, 3, 4, 5, 6, 7, 8} and A = {1, 2, 3, 4}, then A^C is equal to

(1) {5, 6, 7, 8} (2) {5, 6, 1, 2}
(3) {5, 6, 2, 3} (4) {5, 6, 3, 4}

(SSC CHSL DEO & LDC Exam. 16.11.2014)

TYPE–III

1. A die with faces numbered from 1 to 6 is thrown twice. The probability, that the numbers shown up differ by 2, is

(1) $\frac{1}{9}$ (2) $\frac{2}{9}$
(3) $\frac{3}{9}$ (4) $\frac{4}{9}$

(SSC CPO S.I. Exam. 07.09.2003)

2. A coin is tossed thrice. The probability that exactly two heads show up is

(1) $\frac{1}{8}$ (2) $\frac{2}{8}$
(3) $\frac{3}{8}$ (4) $\frac{4}{8}$

(SSC CPO S.I. Exam. 05.09.2004)

2. There are 222 red balls in a basket. A boy takes out 6 red balls from it and replaces them by 12 white balls. He continues to do so till all the red balls are replaced by white balls. Determine the number of white balls put in the basket.

(1) 444 (2) 111
(3) 333 (4) 222

(SSC Multi-Tasking Staff Exam. 30.04.2017)

TYPE–IV

1. For a certain month, the dates of three of the Sundays are even numbers. Then, the 15th of that month falls on a

(1) Thursday (2) Friday
(3) Saturday (4) Sunday

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

TYPE–V

1. A wall-clock takes 9 seconds in tringing at 9 O'clock. The time, it will take in tringing at 11 O'clock, is

[**Note :** The wall-clock trings 9 times at 9 O'clock and 11 times at 11 O'clock.]

(1) 10 seconds
(2) 11 seconds
(3) 11.25 seconds
(4) 10.80 seconds

(SSC CPO S.I. Exam. 05.09.2004)

2. A wall clock gains 2 minutes in 12 hours, while a table clock loses 2 minutes every 36 hours. Both are set right at 12 noon on Tuesday. The correct time when both show the same time next would be

(1) 12.30 at night, after 130 days
(2) 12 noon, after 135 days
(3) 1.30 at night, after 130 days
(4) 12 midnight, after 135 days

(SSC Graduate Level Tier-II Exam.16.09.2012)

3. From 9.00 AM to 2.00 PM, the temperature rose at a constant rate from 21°C to 36°C. What was the temperature at noon ?

(1) 27°C (2) 30°C
(3) 32°C (4) 28.5°C

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

4. The length of a minute hand of a clock is 7cm. The area swept by the minute hand in 30 minutes is :

(1) 210 sq.cm (2) 154 sq.cm
(3) 77 sq.cm (4) 147 sq.cm

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

5. The minute hand of a big wall-clock is 35cm long. Taking $\pi = \frac{22}{7}$, length of the arc, its extremity moves in 18 seconds is :

(1) 11 cm (2) 1.1 cm
(3) 6.6 cm (4) 6 cm

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

6. If a clock strikes appropriate number of times at each hour, how many times will it strike a day ?
(1) 300 (2) 156
(3) 68 (4) 78
(SSC Graduate Level Tier-II Exam. 29.09.2013

7. The angle between the hands of a clock when the time is 3:20 is
(1) 6° (2) 10°
(3) 20° (4) 12°
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

8. If a clock started at noon, then the angle turned by hour hand at 3.45 PM is
(1) $117\frac{1^\circ}{2}$ (2) $104\frac{1^\circ}{2}$
(3) $97\frac{1^\circ}{2}$ (4) $112\frac{1^\circ}{2}$
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

9. The angle between the minute hand and hour hand of a clock when the time is 7:20 is equal to
(1) 45° (2) 90°
(3) 100° (4) 120°
(SSC CGL Tier-I Re-Exam, 30.08.2015)

TYPE–VI

1. If a machine consumes $\frac{k}{5}$ kilowatts of power every t hours, how much power in kilowatts, will three such machines consume in 10 hours ?
(1) $\frac{k}{t}$ (2) $\frac{6t}{k}$
(3) $\frac{6k}{t}$ (4) $\frac{t}{k}$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

2. I walk a certain distance and ride back taking a total time of 37 minutes. I could walk both ways in 55 minutes. How long would it take me to ride both ways ?
(1) 30 minutes (2) 19 minutes
(3) 37 minutes (4) 20 minutes
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

3. A piece of cloth measured with a metre stick, one cm short, is 100 metres long. Reckoning the metre stick as being right, the actual length of the cloth (in cm) is
(1) 3, 900 (2) 9, 900
(3) 8, 000 (4) 6, 100
(SSC CGL Tier-I Exam. 26.10.2014)

4. A man having height 169 cm is standing near a pole. He casts a shadow 130 cm long. What is the length of the pole if it gives a shadow 420 cm long ?
(1) 550 cm (2) 589 cm
(3) 323 cm (4) 546 cm
(SSC CGL Tier-I Exam. 26.10.2014)

5. 11 friends went to a hotel and decided to pay the bill amount equally. But 10 of them could pay ₹60 each, as a result 11th has to pay ₹50 extra than his share. Find the amount paid by him.
(1) ₹ 105 (2) ₹ 110
(3) ₹ 115 (4) ₹ 120
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

6. 2 km 5 m is equal to
(1) 2.05 km (2) 2.5 km
(3) 2.005 km (4) 2.0005 km
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

7. For Rs. 25,500, a furniture shop sells 3 computer tables and 5 chairs OR 2 computer tables and 9 chairs. If one wants to buy a set of only 1 computer table and 1 chair, how much does he need to pay?
(1) Rs. 1,500 (2) Rs. 5,100
(3) Rs. 6,000 (4) Rs. 7,500
(SSC CPO SI, ASI Online Exam.05.06.2016) (IInd Sitting)

8. Every Sunday, Gin jogs 3 miles. For he rest of the week, each day he jogs 1 mile more than the previous day. How many miles Gin jogs in 2 weeks?
(1) 42 (2) 63
(3) 84 (4) 98
(SSC CGL Tier-I (CBE) Exam. 30.08.2016) (IInd Sitting)

9. Three runners A, B and C run a race, with runner A finishing 12 metres ahead of runner B and 18 metres ahead of runner C, while runner B finishes 8 metres ahead of runner C. Each runner travels the entire distance at a constant speed. The length of the race is
(1) 36 metres (2) 48 metres
(3) 60 metres (4) 72 metres
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

10. An hour-long test has 60 problems. If a student completes 30 problems in 25 minutes, then the required seconds he has taken on average for computing each of the remaining problems is
(1) 70 seconds
(2) 50 seconds
(3) 40 seconds
(4) 30 seconds
(SSC CGL Tier-II (CBE) Exam. 30.11.2016)

11. A gun is fired at a distance of 1.7 km from Ram and he hears the sound after 25 seconds. The speed of sound in metre per second is :
(1) 60 (2) 62
(3) 64 (4) 68
(SSC CGL Tier-I (CBE) Exam. 29.08.2016 (IST Sitting)

12. The amount of extension in a spring is proportional to the weight hung on it. If the weight of 5 kgs produces an extension of 0.4 cm, what weight would produce an extension of 5 cm?
(1) 6.25 kgs. (2) 62.5 kgs.
(3) 4 kgs. (4) 40 kgs.
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IInd Sitting)

13. A man walks 1 km. on 1st day, 2 km. on 2nd day, 3 km. on 3rd day and so on. The total distance the man covers in 10 days is :
(1) 40 km. (2) 50 km.
(3) 55 km. (4) 58 km.
(SSC CGL Tier-I (CBE) Exam. 04.09.2016 (IIIrd Sitting)

14. A box weighs 8.5 kg when full of sand and weighs 5.5 kg when it is half filled with sand. The weight of the empty box is :
(1) 5 kg. (2) 6 kg.
(3) 2.5 kg. (4) 4.5 kg.
(SSC CGL Tier-I (CBE) Exam. 06.09.2016 (IInd Sitting)

SHORT ANSWERS

TYPE-I

1. (1)	**2.** (1)	**3.** (3)	**4.** (1)
5. (2)			

TYPE-II

1. (2)	**2.** (3)	**3.** (1)	

TYPE-III

1. (2)	**2.** (3)	**2.** (1)	

TYPE-IV

1. (3)			

TYPE-V

1. (2)	**2.** (2)	**3.** (2)	**4.** (3)
5. (2)	**6.** (2)	**7.** (3)	**8.** (4)
9. (3)			

TYPE-VI

1. (3)	**2.** (2)	**3.** (2)	**4.** (4)
5. (3)	**6.** (3)	**7.** (4)	**8.** (3)
9. (2)	**10.** (1)	**11.** (4)	**12.** (2)
13. (3)	**14.** (3)		

EXPLANATIONS

TYPE-I

1. (1) $\log 57 + \log (0.57)^3 + \log \sqrt{0.57}$

$= \log [(0.57) \times 100] + 3 \log 0.57 + \frac{1}{2} \log 0.57$

$= \log 100 + \log (0.57) + 3 \log (0.57) + \frac{1}{2} \log (0.57)$

$= 2 + \frac{9}{2}\log(0.57)$ [$\because \log 100 = \log 10^2 = 2\log 10 = 2$]

$= 2 + \frac{9}{2} \times (1.756)$

$= 2 + \frac{9}{2} \times 0.756 - \frac{9}{2}$

$= 2 + 3.402 - 4.5 = 0.902$

2. (1) $\text{Log}_{10} 2.8$

$= \log_{10}\left(2 \times 2 \times \frac{7}{10}\right)$

$= \log_{10} 2 + \log_{10} 2 + \log_{10} 7 - \log_{10} 10$

$= 0.3010 + 0.3010 + 0.8451 - 1$

$= 1.4471 - 1 = 0.4471$

3. (3) Given $\log_2 10$

$= \frac{1}{\log_{10} 2} = \frac{1}{0.3010} = \frac{1000}{301}$

4. (1)

$\text{Log} \frac{75}{16} - 2 \text{ Log} \frac{5}{9} + \text{Log} \frac{32}{243}$

$= \text{Log} \frac{5^2 \times 3}{2^4} - 2\text{Log} \frac{5}{3^2} + \text{Log} \frac{2^5}{3^5}$

$= 2 \text{ Log}5 + \text{Log } 3 - 4 \text{ Log}2 - 2\text{Log}5 + 4 \text{ Log}3 + 5 \text{ Log}2 - 5 \text{ Log}^3 = \text{Log } 2$

5. (2) $\text{Log } 5 = \log \frac{10}{2}$

$= \log 10 - \log 2$

$= 1 - 0.3010 = 0.6990$

TYPE-II

1. (2) Number of students who play either football or cricket or both

$A \rightarrow$ football $= 450 - 50 = 400$

$= n(A \cup B)$

$B \rightarrow$ Cricket $n(A \cup B)$

$= n(A) + n(B) - n(A \cap B)$

$\Rightarrow 400 = 325 + 175 - n(A \cap B)$

$\Rightarrow n(A \cap B) = 500 - 400 = 100$

2. (3) $n(A \cup B)$

$= n(A) + n(B) - n(A \cap B)$

$= 40 + 26 - 16 = 50$

3. (1) $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$

$A = \{1, 2, 3, 4\}$

$A^C = \{x : x \in U \text{ and } x \notin A\}$

$= \{5, 6, 7, 8\}$

TYPE-III

1. (2) Total possible outcomes

$= 6 \times 6 = 36$

Favourable number of cases

= (1, 3), (3, 1), (2, 4), (4,2), (3,5), (5,3), (4,6), (6,4) = 8

Required probability $= \frac{8}{36} = \frac{2}{9}$

2. (3) A coin has two faces : head and tail.

Total (Exhaustive) number of cases $= 2^3 = 8$

Possible outcomes = (HHH, HHT, HTH, THH, HTT, TTH, THT, TTT)

Favourable number of cases =3

$\therefore$ Required probability $= \frac{3}{8}$

3. (1) 6 red balls $\equiv$ 12 white balls

$\therefore$ 222 red balls $\equiv \frac{12}{6} \times 222$

= 444 white balls

TYPE-IV

1. (3) If a sunday lies on 2nd of a month, other sundays will lie on 9, 16, 23, 30.

Hence, 15th will fall on Saturday.

TYPE-V

1. (2) 11 seconds

2. (2) The wall clock gains 6 minutes in 36 hours, while table clock loses 2 minutes in 36 hours.

$\because$ Difference of 8 minutes is there in $\frac{3}{2}$ days

$\therefore$ Difference of 12 hours is in

$= \frac{3}{2} \times \frac{1}{8} \times 12 \times 60 = 135$ days

Hence, both will show correct time at 12 noon after 135 days

3. (2) Temperature difference in 5 hours

$= 36 - 21 = 15°C$

$\therefore$ Temperature difference in 3 hours = 9°C

Hence, required temperature

$= 21 + 9 = 30°C$

4. (3) Area swept by the minute hand in an hour $= \pi r^2$

$\therefore$ Required area $= \frac{\pi r^2}{2}$

$= \frac{22 \times 7 \times 7}{7 \times 2} = 77$ sq.cm.

5. (2) Traced arc length by minute hand in 60 × 60 seconds $= 2\pi r$

radius = 35 cm

$\therefore$ Length of arc made in 18 seconds

$= \frac{2\pi r}{60 \times 60} \times 18$

$= 2 \times \frac{22}{7} \times \frac{35 \times 18}{60 \times 60} = 1.1$ cm

6. (2) Required answer = 2 (1 + 2 + 3 + ... + 12)

$= 2 \times \frac{12 \times 13}{2} = 156$

[$\because$ Sum of first n natural no.s $= \frac{n(n+1)}{2}$]

7. (3) 3 hours 20 minutes

$= 3\frac{1}{3}$ hours

$= \frac{10}{3}$ hours

Hour hand traces 360° in 12 hours.

$\therefore$ Angle traced in $\frac{10}{3}$ hours

$= \frac{360}{12} \times \frac{10}{3} = 100°$

Minute hand traces 360° in 60 minutes.

∴ Angle traced in 20 minutes

$= \frac{360}{60} \times 20 = 120°$

∴ Required angle

= 120° – 100° = 20°

8. (4) The hour hand traces 30° in an hour.

∴ Angle traced in $3\frac{3}{4}$ hours i.e

$\frac{15}{4}$ hours $= \frac{15}{4} \times 30°$

$= \frac{225°}{2} = 112\frac{1}{2}°$

9. (3) At 7 : 20,

Number of hours

$= 7\frac{20}{60} = 7\frac{1}{3}$ hours

$= \frac{22}{3}$ hours

The hour–hand traces 360° in 12 hours.

∴ Angle traced by hour hand in $\frac{22}{3}$ hours

$= \frac{360°}{12} \times \frac{22}{3} = 220°$

∵ Minute hand traces 360° in 60 minutes.

∴ Angle traced by minute hand in 20 minutes $= \frac{360°}{60} \times 20$

= 120°

∴ Required angle

= 220° – 120° = 100° 0

TYPE-VI

1. (3) Power consumed by each machine in 10 hours

$= \frac{k \times 10}{5 \times t} = \frac{2k}{t}$ Kilowatts

∴ Power consumed by three such machines

$= 3 \times \frac{2k}{t} = \frac{6k}{t}$ kilowatts

2. (2) Walking + Riding

≡ 37 mintues ...(i)

2 × Walking ≡ 55 minutes ...(ii)

By equation (i) × 2 – equation (ii),

2 × Riding = 2 × 37 – 55

= 74 – 55 = 19 minutes

3. (2) ∵ 1 metre ≡ 99 cm

∴ 100 metre ≡ 9900 cm

4. (4) $\frac{\text{Height of man}}{\text{Height of pole}}$

$= \frac{\text{Length of shadow of man}}{\text{Length of shadow of pole}}$

$\Rightarrow \frac{169}{\text{Height of pole}} = \frac{130}{420}$

⇒ Height of pole × 130

= 169 × 420

$\Rightarrow$ Height of pole $= \frac{169 \times 420}{130}$

= 546 cm

5. (3) Total bill = Rs. x (let)

$\therefore 10 \times 60 + \frac{x}{11} + 50 = x$

$\Rightarrow 600 + 50 + \frac{x}{11} = x$

$\Rightarrow x - \frac{x}{11} = 650$

$\Rightarrow \frac{11x - x}{11} = 650$

$\Rightarrow 10x = 650 \times 11$

$\Rightarrow x = 65 \times 11 = 715$

∴ Amount paid by the eleventh person

$= \frac{x}{11} + 50 = \text{Rs.}\left(\frac{715}{11} + 50\right)$

= Rs. (65 + 50)

= Rs. 115

6. (3) ∵ 1000 metre = 1 km

∴ 5 metre $= \frac{5}{1000} = 0.005$ km

∴ 2 km 2 metre

= (2 + 0.005) km = 2.005 km

7. (4) C.P. of 1 computer table = Rs. x

C.P. of 1 chair = Rs. y

According to the question,

$3x + 5y = 25500$ ..... (i)

$2x + 9y = 25500$ ..... (ii)

Clearly, cost of 1 computer table = cost of 4 chairs

From equation (i),

$3 \times 4y + 5y = 25500$

$\Rightarrow 17y = 25500$

$\Rightarrow y = \frac{25500}{17} = 1500$

∴ Cost of 1 computer table

= 4 × 1500

= Rs. 6000

∴ Required answer

= 6000 + 1500

= Rs. 7500

8. (3) Total distance covered in two weeks = 2 (3 + 4 + 5 + 6 + 7 + 8 + 9) miles

= 2 × 42 = 84 miles

9. (2) Let the length of the race be x km.

When A finishes the race,

∴ A : B : C = x : (x – 12) : (x – 18)

When B covers 12 km., C covers 10 km.

$\therefore \frac{x-12}{x-18} = \frac{12}{10} = \frac{6}{5}$

$\Rightarrow 6x - 108 = 5x - 60$

$\Rightarrow 6x - 5x = 108 - 60$

$\Rightarrow x = 48$ km.

10. (1) The student is required to answer 30 questions in 35 minutes.

∴ Required average time

$= \left(\frac{35}{30} \times 60\right)$ seconds

= 70 seconds

11. (4) Speed $= \frac{\text{Distance}}{\text{Time}}$

$= \left(\frac{1.7 \times 1000}{25}\right)$ m./sec.

= 68 m./sec.

12. (2) According to the question,

∵ 0.4 cm. ≡ 5 kg.

∴ 1 cm. $\equiv \frac{5}{0.4}$ kg.

∴ 5 cm. $\equiv \left(\frac{5}{0.4} \times 5\right)$ kg.

= 62.5 kg.

13. (3) According to the question,

Required distance

= (1 + 2 + 3 + ---- + 10) kg.

$= \frac{10 \times 11}{2} = 55$ km.

$\left[\because 1 + 2 + 3 + \ldots\ldots + n = \frac{n(n+1)}{2}\right]$

14. (3) According to the question,

Box + 1 part sand = 8.5 kg.

Box + $\frac{1}{2}$ filled sand = 5.5 kg.

On subtracting,

Weight of $\frac{1}{2}$ filled sand

= 8.5 – 5.5 = 3 kg.

∴ Weight of 1 part sand

= 6 kg.

∴ Weight of empty box

= (8.5 – 6) kg.

= 2.5 kg.

TEST Y0URSELF

1. Find the angle in radian between the hour-hand and minute-hand of a clock at half-past 4.

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{3}$

(3) $\frac{\pi}{6}$ (4) $\frac{\pi}{10}$

2. A can beat B by 40m in a kilometre race, and B can beat C by 20m in a kilometre race. By how much will A beat C in a kilometre race ?

(1) 59 metre (2) 59.2 metre
(3) 58.2 metre (4) None of these

3. Two passengers A and B of a train have 27kg of luggage and are charged for the excess above the weight allowed free Rs. 150 and Rs. 105 respectively. If the luggage belonged to one of them, he would have been charged Rs. 330. Find the weight allowed free and also the charge per kilogram of weight.

(1) 15 kg, Rs. 15 per kg
(2) 16 kg, Rs. 14 per kg
(3) 14 kg, Rs. 15 per kg
(4) None of these

4. A man bought two heaps of oranges one for Rs. 346.50 and the other for Rs. 198. If the price of each orange be the same, and not less than three rupees and not greater than four rupees, find the possible number of oranges he bought in two heaps.

(1) 176 (2) 140
(3) 186 (4) 196

5. A boy bought some mangoes with his savings. If he got 20 mangoes more, the price of mango would be 25 paise less and if he got 30 mangoes less, the price of a mango would be75 paise more. How many mangoes did he buy and with how many rupees ?

(1) Rs. 100, 80 mangoes
(2) Rs. 80, 50 mangoes
(3) Rs. 80, 100 mangoes
(4) 75 mangoes, Rs. 80

6. At 5 : 45 am what will be the angle between hour hand and minute hand of a clock ?

(1) 97.5° (2) 98.5°

(3) 95° (4) 100°

7. A bus left with some definite number of passengers. At the first stop, half the passengers left the bus and 35 boarded the bus. At the second stop $\frac{1}{5}$ th of the passengers left and 40 boarded the bus. Then, the bus moved with 80 passengers towards its destination without stopping anywhere. How many passengers were there originally?

(1) 40 (2) 30
(3) 50 (4) 60

8. A sum of ₹45 is made up of 100 coins, partly of 50 paise and partly of 25 paise. How many 25 paise coins are there?

(1) 50 (2) 20
(3) 40 (4) 80

9. When three coins are tossed together, the probability that all coins have the same face is :

(1) $\frac{1}{4}$ (2) $\frac{1}{6}$

(3) $\frac{1}{3}$ (4) None of these

10. In a football championship, 153 matches were played. Every team played one match with each other. The number of teams participating in the championship is:

(1) 16 (2) 17
(3) 18 (4) None of these

11. A box contains 85 nuts each of 100 gms. and 94 bolts each of 150 gms. If the entire box with its contents weighs 42.5 kgs, then what is the weight of the empty box ?

(1) 20.5 kgs. (2) 21. 5 kgs.
(3) 18.5 kgs. (4) None of these

12. A bus consumes 25 litres of diesel in covering a distance of 90 kilometres. How much diesel is needed to cover 288 kilometres?

(1) 70 litres (2) 78 litres
(3) 80 litres (4) None of these

13. A stack of 1000 sheets of paper is 11.8 cm. high. The thickness of each sheet of paper is:

(1) 11.18 cm (2) 0.0118 cm
(3) 0.118 cm. (4) None of these

14. A cook purchased $5\frac{1}{6}$ kg potatoes, $3\frac{5}{12}$ kg tomatoes and $1\frac{5}{9}$ kg. carrots. What is the total quantity of vegetables purchased?

(1) $10\frac{5}{36}$ (2) $9\frac{4}{35}$

(3) $8\frac{3}{37}$ (4) $10\frac{3}{35}$

15. When a person distributed sweets among a gathering of people, each person got 7 sweets and 14 sweets remained undistributed. If two more people had joined the gathering, no sweet would have remained undistributed. How many people had gathered?

(1) 70 (2) 56
(3) 63
(4) Cannot be determined

16. Out of 60 students in a class, 15 fail in English and 13 fail in Hindi. If 4 students fail both in Hindi and English, Then the number of students who pass in both the subjects is:

(1) 34 (2) 36
(3) 38 (4) 26

SHORT ANSWERS

1. (1)	**2.** (2)	**3.** (1)	**4.** (1)
5. (1)	**6.** (1)	**7.** (2)	**8.** (2)
9. (1)	**10.** (3)	**11.** (4)	**12.** (3)
13. (2)	**14.** (1)	**15.** (4)	**16.** (2)

EXPLANATIONS

1. (1)

At half past 4, hour hand lies in the middle of 4 and 5, and minute had lies at 6. One division of a clock

$= \frac{360°}{12} = 30°$

$\therefore \frac{3}{2}$ divisions $= \frac{3}{2} \times 30° = 45°$

$\because 180° = \pi$ radian

$\therefore 45° = \frac{\pi}{180} \times 45°$

$= \frac{\pi}{4}$ radian

2. (2) A : B = 1000 : 960;
B : C = 1000 : 980

$\therefore$ A : C = $\frac{1000}{960} \times \frac{1000}{980}$

$= \frac{1000000}{940800} = \frac{1000}{940.8}$

A beats C by (1000 – 940.8)
= 59.2 m

3. (1) Let A have x kg of luggage.
$\therefore$ Luggage with B = $(27 - x)$ kg
Luggage allowed free = F kg
Rate per kg extra luggage= Rs. T
$\therefore (x - F)\,T = 150$ .....(i)
$(27 - x - F)\,T = 105$ .....(ii)
$(27 - F)\,T = 330$ .....(iii)
Equation (i) ÷ (ii)

$\frac{x - F}{27 - x - F} = \frac{150}{105} = \frac{10}{7}$

$\Rightarrow 7x - 7F = 270 - 10x - 10\,F$
$\Rightarrow 17x + 3F = 270$ .....(iv)
Equation (i) ÷ (iii),

$\frac{x - F}{27 - F} = \frac{150}{330} = \frac{5}{11}$

$\Rightarrow 11x - 11F = 135 - 5\,F$
$\Rightarrow 11x - 6F = 135$ .....(v)
Equation (iv) × 2 + (i)

$$\begin{array}{rcrcr} 34x & + & 6F & = & 540 \\ 11x & - & 6F & = & 135 \\ \hline & & 45x & = & 675 \end{array}$$

$\Rightarrow x = 15$ kg
From equation (iv),
$17 \times 15 + 3\,F = 270$
$\Rightarrow 3F = 15 \Rightarrow F = 5$kg
From equation (i),
$(15 - 5)\,T = 150$

$T = \frac{150}{10}$ = Rs. 15/kg

4. (1)

19800)34650(1
19800
14850)19800(1
14850
4950)14850(3
14850
×

HCF of 198 and 346.50 = 49.50

Minimum cost price = $\frac{49.50}{16}$

= Rs. 3.09375

Number of oranges

$= \frac{198}{3.09375} + \frac{346.50}{3.09375}$

= 64 + 112 = 176

5. (1) Let the mangoes bought be x in number and money spent by Rs. y.

Case I,

$\frac{y}{x + 20} = \frac{y}{x} - \frac{1}{4}$

$\Rightarrow y\left(\frac{1}{x} - \frac{1}{x + 20}\right) = \frac{1}{4}$

$\Rightarrow y\left(\frac{x + 20 - x}{x(x + 20)}\right) = \frac{1}{4}$

$\Rightarrow y = \frac{x(x + 20)}{80}$ .....(i)

Case II,

$\frac{y}{x - 30} - \frac{y}{x} = \frac{3}{4}$

$\Rightarrow y\left(\frac{x - x + 30}{x(x - 30)}\right) = \frac{3}{4}$

$\Rightarrow y = \frac{x(x - 30)}{40}$ .....(ii)

$\therefore \frac{x(x + 20)}{80} = \frac{x(x - 30)}{40}$

$\Rightarrow x + 20 = 2x - 60$
$\Rightarrow x = 80$
From equation (i)

$y = \frac{80\,(80 + 20)}{80}$ = Rs. 100

6. (1) 5 : 45 hours

$= \left(5 + \frac{45}{60}\right)$ hours

$= \left(5 + \frac{3}{4}\right)$ hours $= \frac{23}{4}$ hours

$\because$ The hour hand traces 360° in 12 hours.
$\therefore$ Angle traced by hour hand in

1 hour = $\frac{360°}{12}$ = 30°

$\therefore$ Angle traced in $\frac{23}{4}$ hours

$= \frac{23}{4} \times 30° = 172.5°$

$\because$ The minute hand traces 360° in 60 minutes.
$\therefore$ Angle traced in 45 minutes

$= \frac{360}{60} \times 45 = 270°$

$\therefore$ Required angle
= 270° – 172.5° = 97.5°

7. (2) Let the original number of passengers be x.
Number of passengers in the bus after first stop

$= \frac{x}{2} + 35$

Number of passengers in the bus after second stop

$= \frac{4}{5}\left(\frac{x}{2} + 35\right) + 40$

$\therefore \frac{4}{5}\left(\frac{x}{2} + 35\right) + 40 = 80$

$\Rightarrow \frac{4}{5}\left(\frac{x}{2} + 35\right) = 40$

$\Rightarrow \frac{x}{2} + 35 = \frac{40 \times 5}{4} = 50$

$\Rightarrow \frac{x}{2} = 50 - 35 = 15$

$\Rightarrow x = 2 \times 15 = 30$

8. (2) Number of 25 paise coins = x

$\therefore \frac{x}{4} + \frac{100 - x}{2} = 45$

$\Rightarrow \frac{x + 200 - 2x}{4} = 45$

$\Rightarrow 200 - x = 45 \times 4 = 180$
$\Rightarrow x = 200 - 180 = 20$

9. (1) Total possible outcomes
$= 2 \times 2 \times 2 = 8$
Total favourable outcomes
= 2
$\therefore$ Required probability

$= \frac{2}{8} = \frac{1}{4}$

10. (3) ${}^{n}C_{2} = 153$

$\Rightarrow \frac{n(n-1)}{2} = 153$

$\Rightarrow n^2 - n - 306 = 0$
$\Rightarrow n^2 - 18n + 17n - 306 = 0$
$\Rightarrow n\,(n - 18) + 17\,(n - 18) = 0$
$\Rightarrow (n - 18)\,(n + 17) = 0 \Rightarrow n = 18$

11. (4) Weight of the empty box

$= \left(42.5 - \frac{85 \times 100}{1000} - \frac{150 \times 94}{1000}\right)$kg

= (42.5 – 8.5 – 14.1) kg
= 19.9 kg

12. (3) $\because$ 90 km $\equiv$ 25 litres

$\therefore$ 288 km $= \frac{25}{90} \times 288$

= 80 litres

13. (2) Required thickness

$= \frac{11.8}{1000} = 0.0118$ cm

14. (1) Required sum

$= \frac{31}{6} + \frac{41}{12} + \frac{14}{9}$

$= \frac{186 + 123 + 56}{36}$

$= \frac{365}{36} = 10\frac{5}{36}$

15. (4) If the number of persons be x, then
$7x + 14 = 7(x + 2)$
No result will be obtained.

16. (2) Unsuccessful students in English or Hindi or both
= 15 + 13 – 4 = 24
$\therefore$ Number of successful students = 60 – 24 = 36

❑❑❑

LAST MINUTE REVISION

A book you can **TRUST** upon

Code 1728 Rs. 125/-

Kiran's SUPERFAST

English

For BANK & SSC Exam

An Exclusive & Probably First Book containing more than 570 Rules

- 570+ Golden Rules of Grammar & Usage
- Covering Complete Grammar
- Explained with Solved Examples
- Previous Year Questions of different exams (updated till 2016)
- Test Yourself Exercise for Extensive Practice
- "Must" for every Student as well as Teacher

COMMON ERRORS IN ENGLISH

A MUST FOR ALL ASPIRANTS

It is generally said that subtleness is the foundation of success. In today's world of competition, seeking opportunity by faring in competitive examinations has really become indisputably a tough affair. In this context, the importance of English, as a subject, is undeniable. Not only for the sake of examinations, but just to master English, one should have the knowledge of good and apt English, correct standard of written English, proper art of conversation and application of correct dialogue, as well as personal development, which all pose as a stairway of qualities towards sound English proficiency.

AN OUTSTANDING BOOK THAT HELPS ASPIRANTS In their SUCCESSFUL PREPARATION FOR COMPETITIVE EXAMS

In order to test the knowledge of English Language in various competitive examinations, questions are set in several patterns to ascertain one's understanding of the language. Among the various patterns, one is related to the topic of Common Errors. Having essential knowledge in Grammar, we learn to read and write, as well as talk correct English. Due to the presence of various topics in Grammar and the host of rules that are related to those topics, we somehow miss to explore the correct usage of English.

In this book, all these topics have been widely discussed with explanations and examples for better grasp of the minute differences that appear in examinations and which restrain us from dealing with those questions related to Common Errors. The explanations which have been given at the end of each chapter, are in all way helpful to understand each and every problem with clarity and thus sharpen the edge of knowledge.

Salient Features

- This book has been divided into two parts. The first part contains several topics of English Grammar, which are classified into 14 different chapters. Each chapter discusses a topic at length. The second part consists of Model Question Papers.
- In each of the 14 chapters, concepts about the Fundamental and Basic Principles/Rules have been provided. Simultaneously, while discussing the various aspects of the chapter, several related examples have been provided. The variety of the questions tell the tale of the nature of questions asked in different competitive exams.
- Each chapter is essentially supplemented with 'a ready reckoner', which helps in understanding and recapitulating the basic rules at a glance.
- Each chapter is supplemented with a number of questions based on the topic discussed. The questions may have Error in one part and you are required to find out that error.
- The questions have been explained adequately, which help you understand the root cause of the error.
- Model Question Papers help in understanding the overall genre of a topics and thereby assist in developing a solid and sound knowledge of the topic of discussion.

visit us at www.kiranprakashan.com

To Explore more, see inside

Rs. 495/-

Get PROBLEM SOLVING Videos For SSC Mathematics

ABSOLUTELY FREE

Why Choose us

- Chapterwise Visual Presentation of SSC Mathematics
- Based on SSC Syllabus and Pattern
- Access through App & Browser

Activation Code

KIRANPREP

Download our app at:

kiranprep.quizsolver.com

visit our website: **www.kiranprep.com**

Code No. KP 1905

Kiran Prep

Quizsolver
A Radix Edusystems Initiative