

CAMPUS PLACEMENTS

A Comprehensive Guide

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Mr. Malhotra has put together his years of experience, knowledge and expertise—evolved out of his training modules over the years—into this carefully researched book.

CAMPUS PLACEMENTS

A Comprehensive Guide

Ankur Malhotra

Director,

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Chandigarh*



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Dedicated To

*My Father (Captain K. K. Malhotra) and Mother (Mrs. Kamal Malhotra)
for their constant support and encouragement.*

*Also to my Wife (Isha Singh) for being a pillar of strength
throughout the making of this book.*

PREFACE

Born of extensive and thorough research, this book is one-stop solution for students of engineering and management backgrounds preparing for their campus placements. It comprises carefully researched resource materials, tips and skills required by the students to glide through success in attaining the job they are aiming at. It addresses almost every doubt and question that may cross a student's mind with respect to "how to succeed in the campus placement process."

The Approach

The book is divided into five parts and also has an Online Learning Center (OLC) which can be accessed through the URL provided on the back cover of the book. It is recommended to first go through the entire book in the suggested sequence and then move on to the OLC for further practice.

Part 1: Quantitative Ability – This segment consists of 12 chapters on all the concepts of mathematics like *Time, Speed and Distance, Percentages, Profit/Loss etc.* along with solved examples. The chapters contain the short cuts and techniques for solving complex problems. At the end of each chapter, there is an exercise with answer key and explanatory answers. Summary of the important formulae is reiterated in the 'Points to Remember' section. More exercises and quizzes on each chapter are given on the OLC.

Part 2: Logical Reasoning – This portion covers the questions based on logical reasoning, data interpretation and data sufficiency. Chapters based on most of the concepts of logical reasoning like *blood relations, series completion, cubes, linear and complex arrangements etc.* are given with tips for solving the problems in less time. Data interpretation introduces the students to various types of diagrams i.e. *bar graphs, pie charts etc.* and the methodology to solve them. Puzzles and brain teasers provided in the last chapter keep the students' grey cells ticking. Each chapter is again followed by exercises.

Part 3: Verbal Ability – This part contains the key to cracking the verbal ability portion of any paper. The chapter on *Vocabulary* illustrates the easier ways of learning new words through techniques like root words, word groups etc. Chapter on *Sentence Correction* gives some common mistakes made while speaking and writing English. Verbal reasoning is also covered through topics like *Para Jumbles, Syllogisms and Critical Reasoning*. The exercises provided at the end of each chapter will help in understanding the concepts even better.

Part 4: Group Discussions and Interviews – This most dreaded round in the campus placement process, is methodically captured in the book. It discusses myriad tips and techniques for cracking the GDs and interviews. It also discusses techniques for confidently tackling new topics in the GDs. Various myths related to cracking a GD and also do's and don'ts while appearing for a GD are also listed in detail. Later, an exhaustive list of topics usually given during the GDs also follows. For personal interviews, the most important thing is to create the first positive impression. This segment enlists the subtle things that one must keep in mind while dressing up for an interview, making a folder, body language while interacting with the interviewer etc. After that, a list of frequently asked questions during interviews, with probable answers to those, is given. One can make a perfect resume with the help of the guidelines given. Overall, it thoroughly prepares the students for this round through focused planning of minute details. More sample group discussions and personal interviews are given on the OLC.

Part 5: Practice Papers – All that has been learnt so far is now put to practice. These sample papers are based on the past question paper patterns of companies like Infosys, Wipro, TCS, L&T etc. One can practice these papers in specified time. Speed is a crucial factor in clearing these papers. Each paper has an answer key. Detailed explanatory answers to all the papers can be found on the OLC.

Additional Resources on OLC

Additional learning resources have been made available for the students on McGraw Hill Education's Online Learning Centre at www.mhhe.com/malhotracp

This book is a perfect substitute to a personal tutor with the added advantage that students can consult it anytime, anywhere as per their convenience. I am certain that the students who will work with this personal tutor will be immensely benefitted. Its usefulness will be obvious in their success in accomplishing their dream jobs.

Wishing you luck in your endeavours!

Ankur Malhotra

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First of all, I would like to acknowledge the tremendous contribution made by Isha Singh, my wife and Co-founder of TRINITi Center for Learning. Had it not been for her constant motivation, honest feedback, in-depth examination of the content and her insightful inputs through the entire process of writing this book, this book would not have evolved into its current shape. Next, I would like to thank Sanjay Pushpakar and Ritu Singh for their valuable inputs.

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I would also like to acknowledge the fact that I got rich insights from the test papers prepared and used by the leading IT and ITES companies.

I owe my gratitude to McGraw Hill Education (India) for giving me an opportunity to reach a larger audience through this book.

Ankur Malhotra

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TEST FORMATS: A SNAPSHOT*							
COMPANY PROFILE	SELECTION PROCESS	NO. OF SECTIONS	NO. OF QUESTIONS	DURATION	NEGATIVE MARKING	SECTIONAL CUT OFF	IMPORTANT TOPICS
INFOSYS	Logical Reasoning	3	10	25 MIN	NO	NO	Puzzles, Data Sufficiency, Picture Puzzle, Data Interpretation, Syllogism, Blood Relations & Cubes. Reading Comprehension, Sentence Completion, Sentence Correction,
	Quantitative Aptitude		15	25 Min			
	Verbal Ability		40	40 MIN			
WIPRO TECHNOLOGIES	Technical Ability	4	25	30 MIN	NO	YES	C, C++, DS, OS, Sorting, Time Complexities, Error Finding in the Given Program, Heap Definition, C++ Terminologies (over riding/overloading ques). Para Jumbles, Antonyms, Synonyms, Sentence Corrections, Work, Profit & Loss, Partnership, Boats & Streams, Ratio Proportion, Probability, Permutation & Combination, Problems on Ages, Time & Work
	Quantitative Aptitude		20	20 MIN			
	Logical Reasoning		20	25 MIN			
	Verbal Ability		20	20 MIN			
ARICENT	Verbal Ability	4	25	25 MIN	NO	YES	Time & Distance, Time & Work, Logarithm, Profit & Loss, Probability, Permutation & Combination. Antonyms, Synonyms, Reading Comprehension, Para Jumbles, Prepositions, Coding, Seating arrangement, Blood Relations, Series Completion, C,C++, Data Structure and Basic Understanding of the Concepts of Java is Required
	Quantitative Aptitude		25	35 MIN			
	Technical Ability		35	25 MIN			
	Logical Reasoning		25	25 MIN			
ACCENTURE	Verbal Ability	3	25	25 MIN	NO		Comprehension, Antonym, Synonym, Fill in the blanks. Probability, Clocks, Pipes & Cisterns, Arithmetic Progression, Percentages, HCF-LCM, Ratio proportion

* This snapshot is based on information available in public domain and also on memory.

	Quantitative Aptitude		25	35 MIN			
	Logical Reasoning		25	35 MIN			
TCS	Quantitative Aptitude	1	30	80 MIN	NO	NO	Sudoku, Pipes & Cisterns, AP-GP, HCF-LCM, Percentages, Time Speed & Distance, Simple Interest, Compound Interest, Chain rule, Partnership.
DELLITE	Verbal Ability	3	30	20 MIN	NO	NO	Sentence Correction, Synonyms, Antonyms, Reading Comprehension Profit & Loss, Compound Interest, Logarithms, HCF & LCM, Probability, Permutation & Combination, Directions, Sequence, Blood Relations, Coding-Decoding
	Quantitative Aptitude		30	40 MIN			
	Logical Reasoning		30	30 MIN			
HCL TECHNOLOGY	Technical Ability	4	15	15 MIN	NO	YES	C, C++, Data Structures, Numbers, Ages, Profit & Loss, Permutation & Combination, Chain Rule, Probability, Logarithm, Simple Interest, Percentages, Pipes and Cisterns. Syllogisms, Blood Relations, Seating Arrangement, Direction Sense, Logical Sequence of Words, Spotting Errors, Ordering of Words, Completing Statements, Idioms & Phrases, Synonyms-Antonyms, One Word Substitution, Analogy, Sentence Correction
	Quantitative Aptitude		25	30 MIN			
	Logical Reasoning		25	25 MIN			
	Verbal Ability		25	25 MIN			
SYNTEL INC.	Quantitative Aptitude	3	20	20 MIN	NO	YES	Pipes & Cisterns, HCF & LCM, Problems on Trains, Partnership, Compound Interest, Ranking, Discount, Chain Rule. Odd Man Out, Seating Arrangement, Blood Relations, Synonyms, Antonyms, Analogies
	Logical Reasoning		25	25 MIN			
	Verbal Ability		20	20 MIN			

TECH MAHINDRA	Verbal Ability		100	40 MIN	NO	YES	HCF & LCM, Averages, Problems on Ages, Percentages, Time & Work, Mixtures & Alligation, Simple Interest, Compound Interest, Clocks and Simplification. Series completion, Analogy, Coding-Decoding, Blood Relation, Puzzles, Data Sufficiency, Statement-Conclusion, Figure matrix, Odd man out from Image series
	Quantitative Aptitude & Logical Reasoning		70	40 MIN			
ORACLE	Technical	4	25	20 MIN			C, C++, SQL, Prepositions, Articles, Comprehension, Series completion, Para Jumbles, Problems on Trains, Speed & Distance, Work & Time, Profit & Loss, Directions, Seating Arrangement, Series Completion, Blood Relations
	Verbal Ability		20	20 MIN			
	Quantitative Aptitude		10	10 MIN			
	Logical Reasoning		10	10 MIN			
CAPGEMINI	Quantitative	3	15	TOTAL 90 MIN	YES	NO	AP-GP Series, Prime number, Time Speed & Distance, Profit & Loss, SI, CI, Average. Seating Arrangement, Blood Relations, Missing number, Data Sufficiency, Puzzle, Theme Detection.
	Reasoning		25				
	Verbal Ability		25				
IGATE PATNI	Quantitative Aptitude	2	30	30 MIN			Problems on Ages, Trains, Stocks & Shares, Pipes & Cisterns
	Verbal Ability		20	20 MIN			
IBM	Quantitative Aptitude	3	18	20 MIN	YES	NO	Problems on Boats & Streams, Averages, Ages, Trains, Simple Interest, Compound Interest, Profit & Loss. Articles, Prepositions, Comprehension, Para Jumbles, Sentence Correction. Seating Arrangement, Blood Relations, Data Sufficiency, Puzzles, Theme Detection
	Logical Reasoning		18	20 MIN			
	Verbal Ability		18	20 MIN			

CSC	Technical Ability	2	70	40 MIN			DBMS, Operating system, Computer Networks, Unix, Compilers & Data Structures, Heights & Distances, Problems on Averages, Trains, Ages, Partnership
	Quantitative Aptitude		40	40 MIN			
CONVERGYS	Logical Reasoning	3	20	30 MIN			Reading Comprehension, Synonyms, Antonyms, Filling the passage, Error Detection. Permutation & Combination, Square root, Trains, Probability, Pie chart, Bar Graph, Simple Interest, Compound Interest, Syllogisms, Series Completion, Venn Diagrams, Coding Decoding, Odd man out, C, C++, Java, DBMS
	Programming		40	40 MIN			
	Verbal Ability		15	15 MIN			
L&T INFOTECH	Quantitative Aptitude	3	30	30 MIN	NO	NO	Trains & Boats, Profit & Loss, Percentage, Ages, Time & Distance, Seating arrangement, Syllogism, Coding Decoding, Series Completion, Blood Relations, Puzzles, Articles, Jumbled Sentences, Comprehension, Grammar, Synonyms, Blanks
	Logical Reasoning		30	30 MIN			
	Verbal Ability		30	30 MIN			
COGNIZANT	Logical Reasoning	2	30	30 MIN	NO	NO	Data Interpretation, Data sufficiency, Series completion, Coding and decoding, Antonym, Synonym, Parajumbles
	Verbal Ability		15	20 MIN			
SAMSUNG	Technical Ability	2	30	30 MIN	NO	YES	Data Structures, C language, C++, Java, DBMS, Operating System, Data Interpretation, Logical Reasoning, cubes, cuboids, averages and alligations
	Quantitative Aptitude		50	50 MIN			

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Part I

Quantitative Ability

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 - Chapter 2: Percentages, Profit and Loss
 - Chapter 3: Simple and Compound Interest
 - Chapter 4: Time, Speed and Distance
 - Chapter 5: Time and Work
 - Chapter 6: Average, Ratio, Proportion and Mixtures
 - Chapter 7: Equation-based Problems
 - Chapter 8: Venn Diagrams
 - Chapter 9: Permutations and Combinations
 - Chapter 10: Probability
 - Chapter 11: Heights and Distances
 - Chapter 12: Clocks and Calendars
-

Chapter 1

Number System

1.1 Elementary Concepts

Some common terms related to the number system are given as follows:

Natural Numbers: Counting numbers, such as 1, 2, 3, 4, ... are known as natural numbers. Basically, this term is used to refer to those numbers that can exist in nature to denote a quantity physically. For example, one can have 3 bananas, 5 mangoes or 23 coins, but cannot have 4.5 marbles or -21 coins. Natural numbers are denoted by any number in the set (1, 2, 3, 4,...).

Whole Numbers: All the natural numbers and 0 constitute whole numbers. They are denoted by the help of any number in the set (0, 1, 2, 3, 4, ...).

Even Numbers: A number which is exactly divisible by 2 is called an even number, e.g., 2, 4, 6, 8, ... These numbers always have 0, 2, 4, 6 or 8 at the unit's place.

Odd Numbers: A number which is not divisible by 2 is known as an odd number, e.g., 1, 3, 5, 7, ... These numbers always have 1, 3, 5, 7 or 9 at the unit's place.

Prime Numbers: A number which has no factor except its own and unity is a prime number, e.g., 2, 3, 5, 7, 11, 13, 2 is the only even prime number.

Least Common Multiple (LCM): For two or more numbers, the smallest positive number in the set of common multiples is the LCM. For example, the LCM for 4 and 5 can be found by writing multiples of 4 and 5. Multiples of 4 are 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, and so on. Similarly, multiples of 5 will be 5, 10, 15, 20, 25, 30, 35, 40, 45, and so on. The smallest common multiple for both 4 and 5 is 20. Hence, 20 will be their LCM.

Least Common Denominator (LCD): For two or more fractions, the LCD is the LCM of their denominators. For example, for $\frac{1}{3}$, $\frac{1}{2}$ and $\frac{1}{4}$, the LCD is 12.

Reciprocal or Multiplicative Inverse: A unique number, when multiplied with a given number, gives a product of 1 which is a reciprocal or multiplicative inverse of the given number. For example, $\frac{4}{5} \times \frac{5}{4} = 1$; so $\frac{4}{5}$ is the reciprocal of $\frac{5}{4}$.

Additive Inverse: A unique number, when added to a given number gives a sum of zero which is the additive inverse of the given number. For example, $7 + (-7) = 0$; so (-7) is the additive inverse of 7.

Place Value and Face Value: The place value or local value of a digit in a numeral is defined as the value of the place that the digit has in the numeral. For example, in the numerals 235,

- The place value of 5 is units = $5 \times 1 = 5$
- The place value of 3 is tens = $3 \times 10 = 30$

4 Campus Placements

- The place value of 2 is hundreds = 2×100
= 200

The face value of a digit in a numeral is the value of the digit itself, at whatever place it is. Here, the face value of 5 is 5 and of 2 is 2.

Integer: An integer is any number in the set ($\dots -3, -2, -1, 0, 1, 2, 3, \dots$).

Rational Number: Any number in the set (all numbers that can be written in the form p/q , where p and q are integers and q is not zero) is a rational number. For example, $1/9 = 0.111\dots$ and $1/4 = 0.25$.

Irrational Number: Any number in the set (all numbers that do not have repeating or terminal decimal representations) is an irrational number. For example, $\sqrt{2}$, π , etc.

Real Number: Any number in the set (all rational and irrational number) is a real number.

Absolute Value: The absolute value of a number is the equivalent positive value. For example, $|+2| = +2$ and $|-3| = +3$.

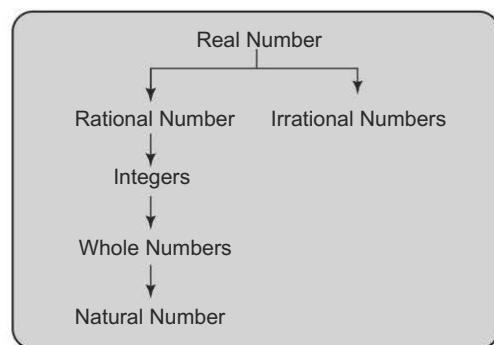


Figure 1

1.2 Divisibility

Often, various questions are asked under various topics including permutations and combinations, probability or sometimes even a direct question to find whether a number is divisible by another number or not is asked.

For example, if we are to use only digits 1, 2, 4, 6, 7 and 8 to form 6-digit numbers, where each digit can be used repeatedly such that the number formed is divisible by 3. How many such numbers can be formed? A brute force approach is to form all such numbers and then filter out those which are divisible by 3. However, filtering out numbers on this criterion is a tedious process. So, a smart approach will be adopted only to those numbers which are divisible by 3 in the first place itself. It is required so that we are able to check if a number is divisible by 3 or not. We will come back to these types of questions in the upcoming chapter on Permutations and Combinations.

Let us list down the divisibility checks of the numbers used frequently.

Table 1

Number	Divisibility Rule	Example
2	If the number is even	2018, 12884, 3946, 2432, 21140
3	If the sum of digits is divisible by 3	1217 Sum = $1 + 2 + 1 + 7 = 11$, not divisible by 3 3186 Sum = $3 + 1 + 8 + 6 = 18$, divisible by 3 Divisible by 3
4	If the number formed by last two digits is divisible by 4	1448, 48 is divisible by 4. So, 1448 is divisible by 4
5	If the last digit of number is 5 or 0	2225, 1350, 9265, 23470

Contd...

Number	Divisibility Rule	Example
6	If the number is divisible by 2 and 3 both	1518 Divisible by 2 as it is even Divisible by 3 as sum of digits 15 So, 1518 is divisible by 6
8	If the number formed by last three digits is divisible by 8	56128, 128 are divisible by 8. So, 56128 is divisible by 8
9	If the sum of digits is divisible by 9	341964, sum of digits = $3 + 4 + 1 + 9 + 6 + 4 = 27$, which is divisible by 9. So, 341964 is divisible by 9
10	If the last digit of number is 0	242230, 1460, 9334500
11	If (Sum of digits at odd places – Sum of digits at even places) = multiple of 11 or 0	412239465 $\frac{1+2+3}{2+9+4+6} = 11$ Difference = $(4 + 2 + 3 + 4 + 5) - (1 + 2 + 9 + 6) = 0$ Hence, 412239465 is divisible by 11

1.2.1 Some General Rules

We saw the divisibility test of 6 in the table. If a number is divisible by 2 and 3, it is also divisible by 6.

$$\text{i.e., } [6 = 2 \times 3]$$

If we generalise this concept, and write 18 as a product of two factors,

$$18 = 3 \times 6 \dots \text{Approach (1)}$$

$$18 = 2 \times 9 \dots \text{Approach (2)}$$

For divisibility test of 18 which factorisation should be used, whether we should check divisibility by 3 and 6 or by 2 and 9.

If we follow Approach (1), then check the divisibility by 3 and 6. If a number is divisible by 6 it will also be divisible by 3. This means, since a number is divisible by 6, so it is also divisible by 18, which obviously cannot be true. For example 24, 42, 66, etc. This approach is wrong. The reason is 3 and 6 have a common factor 3.

If we follow Approach (2), 2 and 9 do not have a common factor. So, this approach can be followed.

Thus, the point is to break the number into such factors that do not have a common factor among themselves, i.e., the factors should be co-prime

$$\text{e.g. } 24 = 2 \times 12 \dots \text{Wrong Approach}$$

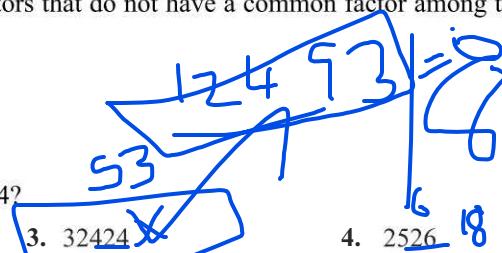
$$24 = 4 \times 6 \dots \text{Wrong Approach}$$

$$24 = 3 \times 8 \dots \text{Correct Approach}$$

Example 1: Which of these numbers is divisible by 24?

$$1. \ 12493 \quad \text{X}$$

$$2. \ 12137 \quad \text{X}$$



$$4. \ 2526 \quad \text{X}$$

Solution: The divisibility test of 24 should be:

$$24 = 4 \times 6 \dots \text{Wrong Approach} \quad [\text{4 and 6 have a common factor}]$$

$$24 = 3 \times 8 \dots \text{Correct Approach}$$

Let us see which of the four given options is divisible by both 3 and 8.

1. 12493 is odd, so it cannot be multiple of 8.

2. 12137 is odd, so it cannot be multiple of 8.

6 Campus Placements

3. 32424, sum of the digits = $3 + 2 + 4 + 2 + 4 = 15$

Hence, it is divisible by 3

Number formed by last 3 digits = 424, this is a multiple of 8.

So 32424 is divisible by 24.

Notes

1. If a number is divisible by x and y , then it is also divisible by $\text{LCM}(x, y)$.
2. If a, b, c, d, \dots are divisible by n , then their sum is also divisible by n . But, the converse is not true, in general.
3. If a number is divisible by x , then it is also divisible by all factors of x .
4. If a number is divisible by x , then its multiples are also divisible by x .

1.3 Finding Last Digit and Remainder

If two numbers are multiplied, the last digit of their product is their unit's digit.

e.g., 157×267 (Last digit will be 9)

$7 \times 7 = 49$ (Last digit is 9)

$121 \times 394 \times 453$ (Last digit will be 2)

$1 \times 4 \times 3 = 12$ (Last digit is 2)

The property is valid for any number of terms in multiplication. Using this property, we can form Table 2.

Table 2

Last Digit of Number	Last Digit of its Square	Last Digit of its Cube
0	0	0
1	1	1
2	4	8
3	9	27
4	6	4
5	5	5
6	6	6
7	9	343
8	4	2
9	1	9

This information is quite important as it will be used in problems.

1.3.1 Remainder of a Sum of Numbers

If a sum $x + y + z + w$ is divided by n .

Find the sum of remainders we get by dividing x, y, z and w ; individually by n .

Then divide this sum by n , the remainder will be the answer.

This property is valid for any number of terms in the sum.

Example 2: Find the remainder when

$$2^3 + 196 \times 56 + 1329 + 47 \text{ is divided by } 8$$

Solution: If we take each term one by one,

$2^3 = 8$ multiple of 8, so the remainder = 0

196×56 (56 is divisible by 8)

So, 196×56 is divisible by 8.

1329 is not a multiple of 8, because number formed by last three digits is not divisible by 8; so remainder = 1

47 is not a multiple of 8, so remainder = 7

Sum of remainder = $0 + 0 + 1 + 7 = 8$

When 8 is divided by 8, the remainder is 0. So, the answer is 0.

$$\begin{array}{r} 0 \times 0 + 1 + 7 \\ 8 \mid 8 \\ -8 \\ \hline 0 \end{array}$$

1.3.2 Remainder of a Product of Numbers

If a product $x \times y \times z \times w$ is divided by n .

Find the product of remainders we get by dividing x, y, z and w individually by n . Then divide this product by n , the remainder will be the answer. This property is valid for any number of terms in the product.

Example 3: What will be the remainder when $12189 \times 12192 \times 12195 \times 12197 \times 12198$ is divided by 11.

Solution: $12189 \times 12192 \times 12195 \times 12197 = (12188 + 1) \times (12188 + 4) \times (12188 + 7) \times (12188 + 9)$

The remainders for each of the term are 1, 4, 7 and 9; respectively.

Product of remainder = $1 \times 4 \times 7 \times 9 = 252$

On dividing 252 by 11, the remainder will be 10. So, the answer is 10.

1.3.3 Remainder of Some Power of a Number, if x^y is Divided by R , write x^y as

$$x^y = (m + n)^y$$

Where m is a multiple of R just smaller or larger than x . Find n^y . Then divide $(R + n^y)$ by R . The remainder will be the answer.

Example 4: What will be the remainder when 14^{63} is divided by 3.

Solution: $14^{63} = (m + n)^{63} = (3 \times 5 + (-1))^{63}$ $m = 15, n = -1, y = 63, R = 3$.

$n^y = (-1)^{63} = -1$. On dividing $(3 - 1)$ by 3, the remainder is 2.

Example 5: Let a, b and c be distinct natural numbers. Consider a 2 digit number ' ab ' and a 3-digit number ' cab ' such that $(ab)^a = cab$ and $cab > 500$, then the value of ' b ' is:

1. 1

Solution: $(ab)^a = cab$

Since it forms a 3-digit number only, value of a is 2

$ab \times ab = cab$

b = last digit of number = last digit of the square of a number if we look at Table 2, possible values of b are 0, 1, 5 and 6.

Also, $cab > 500 \Rightarrow ab > 22$

$$\begin{array}{r} 125 \\ 500 \\ \hline 475 \end{array}$$

$$\begin{array}{l} b = \frac{c}{a} \\ b = \frac{5}{2} \\ b = 2.5 \end{array}$$

$$\begin{array}{r} 25 \times 25 \times 9 = 5625 \\ 5625 > 500 \end{array}$$

4. 6

$$\begin{array}{r} 25 \times 25 \times 9 = 5625 \\ 5625 > 500 \end{array}$$

$$\begin{array}{r} 25 \times 25 \times 9 = 5625 \\ 5625 > 500 \end{array}$$

8 Campus Placements

$cab < 1000$ (cab is a 3-digit number) $\Rightarrow ab < 32$

Possible values of ab are 25 or 26

$25^2 = 625$ Possible

So, $a = 2$, $b = 5$, $c = 6$.

Ans 2

Example 6: What is the difference between the largest and the smallest number written with all the four digits 9, 3, 1 and 4? 9431 1249

1. 6445

2. 2222

3. 8082

4. None of these

Solution: Largest number written with 9, 3, 1 and 4 = 9431

Smallest number written with 9, 3, 1 and 4 = 1349

Difference = $9431 - 1349 = 8082$.

Ans 3

Example 7: If 95 is multiplied by a certain number, and that number is increased by 7332. Find the number.

1. 78

2. 89

3. 99

4. 69

Solution: Let the number be n .

$$n \times 95 = n + 7332$$

$$94n = 7332$$

$$n = 78$$

$$\begin{aligned} (95+x) + 7332 \\ 95x = x + 7332 \end{aligned}$$

Ans 1

Example 8: What is the number of prime factors in the expression $(6)^{10} \times (17)^{17} \times (19)^{27}$?

1. 50

2. 60

3. 64

4. 70

Solution: $E = (6)^{10} \times (17)^{17} \times (19)^{27}$

$$= (2)^{10} \times (3)^{10} \times (17)^{17} \times (19)^{27}$$

2, 3, 17 and 19 are all prime numbers

So, the number of factors will be $10 + 10 + 17 + 27 = 64$.

Ans 3

Example 9: The ratio between a two-digit number and the sum of the digits of that number is 4 : 1. If the digit in the unit place is 4 more than the digit in the tens place, what is the number?

1. 30

2. 32

3. 34

4. 48

Solution: Let digit in ten's place = n

So, the digit in unit's place = $n + 4$

$$\text{Value of number} = 10 \times n + (n + 4)$$

$$= 11n + 4$$

$$\text{Sum of digits} = n + n + 4 = 2n + 4$$

Their ratio is given as 4 : 1.

$$(11n + 4)/(2n + 4) = 4/1$$

$$11n + 4 = 8n + 16$$

$$3n = 12 \Rightarrow n = 4$$

Number is 48.

$$\begin{array}{c} 1y \\ (x+4) \\ \hline 2x4 : x+y \\ 4 : 1 \end{array}$$

Ans 4

Example 10: A man received a draft in which the dollars were transposed for cents and vice versa. After spending 5 dollars 42 cent, he discovered that he now had exactly six times the value of the correct draft amount. What amount he should have received?

1. \$ 6.44

2. \$ 3.24

3. \$ 8.24

4. \$ 4.36

Solution: Let the correct amount of cheque be r dollars and p cent.

Doubt

The cheque he got was of p dollars and r cents.

In cent, it will be $100 \times p + r = (100p + r)$ cents after spending 5 dollars and 42 cents, or 542 cents, he will be left with $[(100p + r) - 542]$ cents. Now, this is six times value of correct draft.

$$(100p + r) - 542 = 6[r \text{ dollars and } p \text{ cents}]$$

$$100p + r - 542 = 6[100r + p]$$

$$100p + r - 542 = 600r + 6p$$

$$94p - 599r = 542$$

Only option [1] satisfies this equation.

$$p = 44, r = 6.$$

Ans 1

1.4 Number System with Different Bases

In general, we deal with decimal numbers like 2452, 1569, 627, 8, etc. If we talk of whole numbers only, these numbers start from 0, 1, 2, 3, 4, ..., 8, 9, 10, 11 and so on. Have you ever wondered why 10 comes after 9, but not after any other single digit numeral? Since, we were taught in this way from the beginning, most of us never took the pains to answer this question. The reason behind this is that the decimal number system that we usually follow has a base 10. Before we get into details, let us know how important the base of a number system is.

A number system with base b (where b is a positive integer greater than 1) has b unique symbols starting from 0 and ending at $b-1$. To represent any number greater than equal to b , we need at least two such symbols. To represent any number greater than equal to b^2 , we need at least three such symbols. In general, to represent any number greater than equal to b^n and less than b^{n+1} , we need at least $n+1$ such symbols.

Using these concepts for decimal number system, where base is 10, $b = 10$, it should have 10 different symbols ranging from 0 to 9. To represent any number between 1000 and 9999 [$n = 3$], we need four such symbols.

If 89234 is written in base z , its actual value is given by,

$$4 \times z^0 + 3 \times z^1 + 2 \times z^2 + 9 \times z^3 + 8 \times z^4$$

$$\cancel{4} \times z^0 + \cancel{3} \times z^1 + \cancel{2} \times z^2 + \cancel{9} \times z^3 + \cancel{8} \times z^4$$

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Example 11: If 1231 is a number in base 4, what is its equivalent decimal value?

Solution: Using the given formula, value = $1 \times 4^0 + \cancel{2} \times 4^1 + \cancel{3} \times 4^2 + 1 \times 4^3 = 1 + \cancel{12} + \cancel{32} + 64 = \cancel{109}$

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Few other problems that are asked are related to the occurrence of a particular digit in a range of numbers. For example, in base 6, how many times 'digit 4' can occur in the numbers starting from 1 to 100000.

For such type of questions, we have a general formula that can be applied to all bases.

In base b , any digit from 1 to $b-1$ occurs $N \times b^{N-1}$ in the numbers from 1 to 10^N .

Note, this formula is not valid to find occurrence of 0s

Important Points to Remember

1+2+3... n

1. Sum of first ' n ' natural numbers is given by $\frac{n(n+1)}{2}$

1+3+... (2n+1)

2. Sum of first ' n ' odd numbers is given by n^2

3+5+...

3. Sum of first ' n ' even numbers is given by $n(n+1)$

1+2+...+n

4. Sum of squares of first ' n ' natural numbers is given by $\frac{n(n+1)(2n+1)}{6}$

5. Sum of cubes of first ' n ' natural numbers is given by $\left(\frac{n(n+1)}{2}\right)^2$
6. If ' a ' and ' b ' are two numbers, then $HCF(a, b) \times LCM(a, b) = a \times b$; i.e., product of HCF and LCM of two numbers is equal to the product of the two numbers.

Exercise 1.1

1. For $x^4 + 2x^3 + x^2 + 7x + 13$ to be perfectly divisible by $x + 2$, what number should be subtracted from it?
 1. 2 2. 4 3. 3 4. 5
✓ 3. 3 (circled)
2. In a school, students from various classes stand in rows with an equal number of students in each row. The number of students from 5 different classes is 26, 65, 78, 52 and 104. What is the minimum number of rows that would be formed?
 1. 25 2. 12 3. 480 4. 48
✓ 1. 25 (circled)
3. A number when divided by 276 gives a remainder 60. When the same number is divided by 46, what would be the remainder?
 1. 15 2. 14 3. 13 4. 16
✓ 3. 13 (circled)
4. A shopkeeper gives a candy for Re 1 and on returning wrappers of 4 candies, he gives another candy. A boy has ₹ 24. How many candies can he eat?
 1. 30 2. 32 3. 31 4. None of these
✓ 2. 32 (circled)
5. Two numbers, n_1 and n_2 , when divided by 6 leave remainder 2 and 4, respectively. What will be the remainder when $n_1 - n_2$ is divided by 6?
 1. 2 2. 3 3. 4 4. 6
✓ 1. 2 (circled)
6. The largest 4 digit number exactly divisible by 39 is:
 1. 9998 2. 9990 3. 9986 4. 9984
✓ 4. 9984 (circled)
7. What is the unit digit in $(627)^{123} \times (685)^{627} \times (832)^{152}$?
 1. 4 2. 5 3. 0 4. 9
✓ 3. 0 (circled)
8. Seven bells start ringing together and ring at intervals of 2, 3, 4, 6, 8, 10 and 12 seconds respectively. How many times do the bells ring together in 30 minutes?
 1. 15 2. 16 3. 12 4. 8
✓ 2. 16 (circled)
9. Two numbers are in the ratio of 2 : 3 and their LCM is 516. Their HCF is:
 1. 30 2. 10 3. 17 4. 86
✓ 2. 10 (circled)
10. The product of six consecutive even numbers is always divisible by:
 1. 60000 2. 76080 3. 86040 4. 46080
✓ 2. 76080 (circled)
11. $10^{37} - 7$ is divisible by which of the following?
 1. 5 2. 3 3. 9 4. both 3 & 9
✓ 3. 9 (circled)
12. What is the highest power of 6 that can divide 100! completely?
 1. 48 2. 96 3. 18 4. 24
✓ 2. 96 (circled)

**Exercise 1.2**

1. Find the number of digits from 1 to 585?
 1. 1675 2. 1647 3. 1738 4. 1774
2. Find the remainder when 2^{74} is divided by 73?
 1. 16 2. 32 3. 55 4. 4
3. Find the unit's digit in $1674^{102} + 1574^{103}$
 1. 0 2. 2 3. 4 4. 6
4. What is the remainder when $15^1 + 15^2 + 15^3 + \dots + 15^{10}$ is divided by 6?
 1. 3 2. 2 3. 0 4. 5
5. The last three digits of the number N , where $N = 10 + 11 + 12 + 13 + \dots + 101$?
 1. 200 2. 520 3. 250 4. 220
6. A number $X = m!$ has ' n ' zeroes at the end of it. What value of ' n ' is not possible?
 1. 4 2. 5 3. 6 4. 7
7. The least multiple of 11, which leaves a remainder of 3, when divided by 6, 12, 15, 18 and 24 is:
 1. 363 2. 539 3. 154 4. 440
8. A number is divided by a divisor and it leaves a remainder of 28. Now, twice the original number is divided by the same divisor, and now the remainder is 16. What is the value of the divisor?
 1. 37 2. 40 3. 47 4. 53
9. How many numbers from 1 to 601 are divisible by 5 or 11, but not by both?
 1. 164 2. 174 3. 194 4. 154
10. If a number N^2 has 21 factors, how many factors can N have?
 1. 12 2. 6 3. 11 or 8 4. 7
11. What will be remainder when $(49^{49} + 47)$ is divided by 48?
 1. 0 2. 46 3. 47 4. 44
12. For what value of ' n ' will the remainder of 14351^n and 14352^n is same when divided by 7?
 1. 2 2. 3 3. 6 4. 4

**Answer Key****Exercise 1.1**

- | | | | | | |
|------|------|------|-------|-------|-------|
| 1. 3 | 2. 1 | 3. 2 | 4. 3 | 5. 3 | 6. 4 |
| 7. 3 | 8. 2 | 9. 4 | 10. 4 | 11. 2 | 12. 1 |

Exercise 1.2

- | | | | | | |
|------|------|------|-------|-------|-------|
| 1. 2 | 2. 4 | 3. 1 | 4. 3 | 5. 1 | 6. 2 |
| 7. 1 | 8. 2 | 9. 4 | 10. 3 | 11. 1 | 12. 2 |


Explanatory Answers
Exercise 1.1

2. All the students from each class have to be accommodated in a certain number of rows and there should be no student left (remainder) from any class who can be clubbed together with the students left over from other classes.

To have the minimum number of rows, each row should have number of students equal to *HCF* of all the numbers.

$$\text{HCF}(26, 65, 78, 52, 104) = 13.$$

Thus, minimum number of rows = $(26 + 65 + 78 + 52 + 104)/13 = 25$.

Ans 1

5. Two numbers will be $n_1 = 6k_1 + 2$

$$n_2 = 6k_2 + 4$$

$$n_1 - n_2 = 6(k_1 - k_2) - 2 = 6(k_1 - k_2) - 6 + 4 = 6(k_1 - k_2 - 1) + 4$$

Since, $6(k_1 - k_2 - 1)$ is divisible by 6, we get 4 as remainder.

Ans 3

6. Largest 4 digit number = 9999.

On dividing this number by 39, we get the remainder as 15

So, the required number is $9999 - 15 = 9984$.

Ans 4

7. $(627)^{123} \times (685)^{627} \times (832)^{152}$

The last digit of $(627)^{123}$ will be same as last digit of $(7)^{123}$

The last digit of $(685)^{627}$ will be same as last digit of $(5)^{627}$ which is 5 (any power of 5 will have unit's digit 5)

The last digit of $(832)^{152}$ will be same as last digit of $(2)^{152}$ which is always an even number; i.e., multiple of 2.

Since, there is a 5 and a multiple of 2 at unit's place in two terms, it gives 0 at the unit's digit. **Ans 3**

9. Product of two numbers = *HCF* \times *LCM*

Let the numbers be $2a, 3a$. So, their *HCF*. will be a

$$\text{i.e., } 2a \times 3a = 516 \times a$$

$$a = 86, \text{ which is the HCF}$$

Ans 4

10. The product of six consecutive numbers is always divisible by 6!

Since we have 6 even numbers, we have an additional 2 with each number.

It is always divisible by $(2^6)6! = 64(720) = 46080$.

Ans 4

11. $10^{37} - 7 = 1000\ldots\ldots(37 \text{ times } '0') - 7 = 999\ldots\ldots(37 \text{ times } 3)$, where 3 is at the unit's place.

The number has 9s and a 3. So, it is divisible by 3. **Ans 2**

12. To find the highest power of a prime number z in $N!$, keep dividing the number N by z and add all the quotients.

Now, $6 = 3 \times 2$. So, we will find powers of both 3 and 2.

Dividing by 2 we get:

$$100/2 = 50$$

$$50/2 = 25$$

$$25/2 = 12$$

$$12/2 = 6$$

$$6/2 = 3$$

$$3/2 = 1$$

On adding we get $50 + 25 + 12 + 6 + 3 + 1 = 97$

Similarly, on dividing by 3 we get $33 + 11 + 3 + 1 = 48$

So we see 2s are in excess. So, the highest power of 6 = highest power of 3 = 48.

Ans 1

Exercise 1.2

1. When writing from 1 to 585,

There are 9 single digit numbers from 1 to 9. Total number of digits $9 \times 1 = 9$

There are 90 two digit numbers from 10 to 99. Total number of digits $90 \times 2 = 180$

There are 486 three digit numbers from 100 to 585. Total number of digits $486 \times 3 = 1458$

Total number of digits from 1 to 585 = $9 + 180 + 1458 = 1647$.

Ans 2

2. When we take successive powers of 2 and find their remainders with 73, we get the following cyclic patterns of cycle length 9

Viz, 2, 4, 8, 16, 32, 64, 55, 37, 1 and the pattern will repeat after 2^9

i.e., 2^9 leaves a remainder 1

Thus, $2^{74} = (2^9)^8(2^2)$ leaves a remainder of 4.

Ans 4

3. Required unit's digit = unit's digit in $4^{102} + 4^{103}$

4^2 gives a unit's digit 6. So, 4^{102} gives a unit's digit 6. Even powers of 4 have unit's digit as 6 and odd powers have unit's digit as 4.

4^{103} gives unit digit of the product 6×4 , i.e., 4.

Hence, unit's digit in $674^{102} + 574^{103}$ = unit's digit in $(6 + 4) = 0$.

Ans 1

4. For a number to be divisible by 6, it has to be divisible by both 3 and 2.

$15^1 + 15^2 + 15^3 + \dots + 15^{10}$ is divisible by 3 completely as each term 15^n is divisible by 3.

Since, the equation has an even number of terms and each term is an odd number, so it sums up to an even number which is divisible by 2.

Hence, the required remainder will be 0 as the equation is completely divisible by 6 (i.e. 3 and 2)

Ans 3

5. The last three digits of $15 + 16 + 17 + \dots + 101$ are 000.

And the last two digits of $10 + 11 + 12 + 13 + 14$ are 00

From options we can see that there is only one answer with last two digits '00'.

Ans 1

6. $5!$ has one zero in the end. Similarly, $10!, 15!, 20!$ have two, three and four zeroes in the end, respectively. But $25!$ brings in two '5s' instead of one (i.e. $25 = 5 \times 5$). So, $25!$ will have six zeroes in the end. Thus, five zeroes are not possible.

Ans 2

7. LCM of 6, 12, 15, 18 and 24 is 360.

So, the required number will be $360k + 3$, which is a multiple of 11.

14 Campus Placements

Least value of k for which $(360k + 3)$ is divisible by 11 is $k = 1$.

Required number = $(360 \times 1) + 3 = 363$.

Ans 1

8. Let the original number be ' a ' and the divisor be ' d '

Let the quotient of the division of a by d be ' x '

Therefore, we can write the relation as $a = dx + 28$

When twice the original number is divided by d , $2a$ is divided by d .

We know that $a = dx + 28$. Therefore, $2a = 2dx + 56$

Now, when $2dx + 56$ is divided by d remainder is 16

$2dx$ is perfectly divisible by d and will therefore, not leave a remainder.

The remainder of 16 was obtained by dividing 56 by d .

When 56 is divided by 40, the remainder that one will obtain is 16.

Hence, the divisor is 40.

Ans 2

10. For a number m , which is prime factorized as $p^a \times q^b \times r^c$, the number of factors is given by $(a+1)(b+1)(c+1)$ factors.

N^2 has 21 factors. 21 can be either 21×1 or 7×3

So, the prime factorization of $N^2 = p^{20}$ or $N^2 = p^6 \times q^2$

$N = p^{10}$ or $p^3 \times q$

If $N = p^{10}$, it can have 11 factors.

If $N = p^3q$, it has $4 \times 2 = 8$ factors.

Ans 3

11. So $(49^{49} + 47)$ is divisible by 48. When 49^{49} is divided by 48 remainder is 1.

Hence $(1 + 47) = 48$ when divided by 48 will give remainder 0.

Ans 1

12. When 14351 is divided by 7, the remainder is 1.

When 14352 is divided by 7, the remainder is 2.

Choice 1: $n = 2$

14351^2 divided by 7 gives remainder $1^2 = 1$

14352^2 divided by 7, gives remainder $2^2 = 4$

Choice 2: $n = 3$

14351^3 divided by 7 gives remainder $1^3 = 1$

14352^3 divided by 7, gives remainder $2^3 = 8$ which is greater than 7, so divide 8 by 7, this gives remainder 1

So, $n = 3$ gives the same remainders.

Ans 2

Chapter 2

Percentages, Profit and Loss

2.1 Percentages

The term ‘percent’ means per hundred or for every hundred. It is the abbreviation of the Latin phrase *per centum*. Scoring 80 percent marks means out of every 100 marks, the candidate scored 80 marks. The term ‘percent’ is sometimes abbreviated as pc or pct. The symbol % is used for the term *percent*. Thus, 50 percent will be written as 50%. A fraction whose denominator is 100 is called a percentage and the numerator of the fraction is called rate percent, e.g., 10 percent means 10 parts out of every hundred parts.

All percentages can be represented as a ratio with the denominator as 100. The conversion of fractions to percentages and vice-versa is the most useful for doing calculations. Some commonly required fractions and their conversions are given in Table 1. The students are advised to learn them.

Table 1

Fraction	Percent	Fraction	Percent	Fraction	Percent	Fraction	Percent
$\frac{1}{1}$	100%	$\frac{1}{5}$	20%	$\frac{1}{9}$	11.11%	$\frac{1}{13}$	7.69%
$\frac{1}{2}$	50%	$\frac{1}{6}$	16.667%	$\frac{1}{10}$	10%	$\frac{1}{14}$	7.14%
$\frac{1}{3}$	33.33%	$\frac{1}{7}$	14.28%	$\frac{1}{11}$	9.09%	$\frac{1}{15}$	6.66%
$\frac{1}{4}$	25%	$\frac{1}{8}$	12.5%	$\frac{1}{12}$	8.33%	$\frac{1}{16}$	6.25%

Example 1: What is 14.28% of 1,120?

Solution: We know that $14.28\% = 1/7$. So, $14.28\% \text{ of } 1,120 = (1/7) \times 1,120 = 160$.

Example 2: What is 37.5% of 1,440?

Solution: We know that $12.5\% = 1/8$. So, $37.5\% = (3 \times 12.5\%) = (3 \times 1/8) = 3/8$. Therefore, the required answer is $(3/8) \times 1,440 = 540$.

2.1.1 Concept of Multiplying Factor

Consider the following calculation that is done when 40 has to be increased by 10%. Increased Value = $40 + 10\% \text{ of } 40 = 40 + (10/100) \times 40 = 40 + 4 = 44$.

One could also re-arrange and approach it in the following manner. Increased Value = $40 + 10\% \text{ of } 40 = 40 (1 + 10\%) = 40 (1 + 0.1) = 40 \times 1.1 = 44$.

1.1 can be called the *multiplying factor* (MF) corresponding to 10% and can simplify many calculations. So, the concept of MF should be understood very well.

The MF corresponding to $x\%$ increase is nothing, but $1 + (x/100)$ and is $1 - (x/100)$ for an $x\%$ decrease.

Thus, MF corresponding to 40% increase will be 1.4 and corresponding to 4% increase will be 1.04. Similarly, the MF corresponding to 20% decrease will be 0.8 and 0.98 for 2% decrease.

It can also be used in data interpretation to a huge extent. Since ratio of 48 to 36 is = 1.3333, we can say that 48 is 33.33% more than 36.

2.1.2 Successive Percentage Changes

If in the first year, A's salary increases by 10% and in the second year the salary increases by 70%, would the net increase over the two years be $10 + 70 = 80\%$?

Not really.

If A's salary was 100 at start, after the first year it would be 110. In the second year, it would be $110 \times 1.7 = 187$. Thus, the net increase is 87, i.e., 87% and not 80%. The computation of final salary can also be done with multiplying factor as:

Final Salary = (Initial salary $\times 1.1$) $\times 1.7$ = Initial salary $\times 1.87$; i.e., the final salary is 87% more than the initial salary.

The 10% increase and 70% increase in above problem are called successive increases as the second percentage increase is affected on the new base, i.e., on the value after the first increase and not on the initial value.

Let us consider the above calculation with two successive percentage increases of $a\%$ and $b\%$.

Net MF = $(1 + (a/100)) \times (1 + (b/100))$

and the net percentage increase is $a + b + (ab/100)\%$.

Example 3: If A's share is first increased by 10%, then by 20% and then by 30%. Find the overall increment in A's share.

Solution: We know that in case of 2 successive increments of $a\%$ and $b\%$ overall percentage change is

$$a + b + \frac{ab}{100} . \text{ So we will use this formula for } 10 \text{ and } 20, \text{ percentage change} = 10 + 20 + \frac{10 \times 20}{100} = 32\%$$

Now again apply the above formula using 32, 30

$$\text{So, overall percentage change} = 32 + 30 + \frac{32 \times 30}{100} = 71.6\%$$

Example 4: If A's salary is first increased by 10% and then reduced by 10%. Find the overall percentage change in his salary.

Solution: We can use the above formula of $\left(a + b + \frac{ab}{100} \right)$

$$a = 10\%, b = -10\%$$

$$\text{So, overall percentage change} = 10 - 10 - \frac{10 \times 10}{100} = -1\%$$

Here, negative sign implies that there is an overall decrease of 1% in his salary.

Example 5: If the price of butter is increased by 20%. What should be the percentage decrease in the consumption so that expenditure remains the same.

Solution: Let price of butter be P Rs/kg

Let consumption be C kg

So Expenditure $E = P \times C$

New price of butter = $1.2P$

Let new consumption be C_1

So, $P \times C = 1.2P \times C_1$ (as the expenditure remains same)

$$C_1 = 10C/12 = 5C/6$$

Reduction in consumption = $C - C_1$

$$C - 5C/6 = C/6$$

$$\% \text{ reduction in consumption} = \frac{C/6}{C} \times 100 = 100/6 = 16.67\%$$

Shortcut Method

If the price of an article increases or decreases by $a\%$, then the decrease or increase in the consumption so as not to change the total expenditure is equal to $\left(\frac{a}{100 \pm a}\right) \times 100\%$.

Using the formula $\left(\frac{a}{100 + a}\right) \times 100$, here $a = 20$

$$\text{Hence, overall percentage change} = \frac{20}{120} \times 100 = 16.67\%$$

2.2 Profit and Loss

When a person deals in the purchase and sale of any item, generally he either gains or loses some amount. The commonly used terms involving sale and purchase are as follows:

- **Cost Price:** The cost price of an article is the price at which an article has been purchased. It is abbreviated as C.P.
- **Selling Price:** The selling price of an article is the price at which an article has been sold. It is abbreviated as S.P.
- **Profit or Gain:** If the selling price of an article is more than the cost price, then there is a gain or profit. Thus, profit = S. P. – C. P.

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- **Loss:** If the cost price of an article is greater than the selling price, the seller suffers a loss. Thus, loss = C. P. – S. P.
- Note that profit percentage and loss percentage are always calculated with respect to the cost price of the item.
- **Marked Price:** The price which is printed/marked on the article is called the marked price. It is also known as list price or sale price. It is abbreviated as M. P.

In case of profit

$$\text{Profit \%}, P = (\text{Profit} \times 100)/\text{C.P.}$$

$$\text{S.P.} = \text{C.P.} \times (1 + (P/100))$$

$$\text{Profit} = \text{C.P.} \times (P/100)$$

In case of loss

$$\text{Loss \%}, L = (\text{Loss} \times 100)/\text{C.P.}$$

$$\text{S.P.} = \text{C.P.} \times (1 - (L/100))$$

$$\text{Loss} = \text{C.P.} \times (L/100)$$

Example 6: Thakur sold his cow for Rs 10700 at a gain of 7%. What is the cost price of the cow?

Solution: We have, S.P. = Rs 10,700; gain %, P = 7%

$$\text{So, C.P.} = \text{S.P.}/(1 + (P/100)) = 10,700/1.07$$

$$\text{C.P.} = \text{Rs } 10,000$$

Example 7: A man sells a pen at a profit of 20%. Had he bought it at 20% lesser price and sold it for Rs 50 less, he would have gained 25%. What is the cost price of the pen?

Solution: Let the C.P. be Rs x . Gain = 20%

$$\text{S.P.} = \text{Rs } 1.20x$$

$$\text{New C.P.} = 20\% \text{ less} = \text{Rs } 0.80x$$

$$\text{If gain is } 25\% \text{ then S.P.} = \text{Rs } (1.25 \times 0.80x) = \text{Rs } x$$

$$\text{Difference in S.P.} = \text{Rs } (1.20x - x) = \text{Rs } 0.20x = \text{Rs } 50$$

$$\text{So, } x = \text{CP} = \text{Rs } 250$$

Example 8: A shopkeeper sells 2 watches each for Rs 100. He sells one at a loss of 10% and other at a profit of 10%. Find the overall loss and loss percentage?

Solution: Let us find C.P. of both the watches.

Case 1:

$$\text{S.P.} = 100, \text{ Profit\%} = 10\%$$

$$\text{So, C.P}_1 = (100 \times 100)/110 = \text{Rs } 90.9090$$

Case 2:

$$\text{S.P.} = 100, \text{ Loss\%} = 10\%$$

$$\text{So C.P}_2 = (100 \times 100)/90 = \text{Rs } 111.1111$$

$$\text{So total C.P.} = \text{C.P}_1 + \text{C.P}_2 = 90.9090 + 111.1111 = \text{Rs } 202.02$$

$$\text{Loss} = 202.02 - 200 = \text{Rs } 2.02$$

$$\text{Overall loss \%} = (2.02/202.02) \times 100 = 1\% \text{ (approx)}$$

Shortcut Method

If two articles are sold at the same S.P. ‘ x ’, one at a loss of ‘ y %’ and the other at a gain of ‘ y %’, then there is always a net loss in the transaction. The loss percentage is given by $y^2/100\%$

And absolute value of the loss = $2xy^2/(100^2 - y^2)$

Overall Loss % = $10^2/100 = 1\%$

Overall Loss = $(2 \times 100 \times 10^2)/100^2 - 10^2 = 2.02$

2.3 Discount

The reduction in the price given to a customer as a percentage/absolute value of the marked price is called discount. Thus, Discount = M.P. – S.P.

In case of discount

Discount %, $D = (\text{Discount} \times 100)/\text{M.P.}$

S.P. = M.P. $\times (1 - (D/100))$

Discount = M.P. $\times (D/100)$

In case of multiple discount series like $d_1 + d_2 + d_3 + \dots$

Net discount = $100 \times [1 - \{(1 - (d_1/100)) \times (1 - (d_2/100)) \times (1 - (d_3/100)) \times \dots\}]$

Note: The order in which discounts in a multiple discount series are calculated has no effect on final result.

Example 9: A shop offers multiple discounts of 20%, 25% and 30%. What is the actual discount a customer gets?

Solution: Using the given formula.

$$\text{Net discount} = 100 \times [1 - \{0.80 \times 0.75 \times 0.70\}] = 58\%$$

Example 10: A shopkeeper uses a weight of 950 g instead of the 1 kg weight. Find dealer's gain percent.

Solution: Suppose goods cost the dealer Re. 1 per kg he sells for Re. 1, what costs him Re. 0.95.

$$\therefore \text{Gain on Rs } 0.95 = \text{Rs } 1 - \text{Rs } 0.95 = \text{Rs } 0.05$$

$$\therefore \text{Gain on Rs } 100 = (0.05/0.95) \times 100 = \text{Rs } 100/19$$

$$\therefore \text{Gain \%} = 100/19\%$$

Shortcut Method

$$\% \text{ gain/loss} = \frac{\text{Error}}{\text{True value} - \text{Error}} \times 100$$

$$\% \text{ gain/loss} = \frac{\text{True weight} - \text{False weight}}{\text{False weight}} \times 100$$

By using the formula

$$\text{Gain \%} = (50/950) \times 100 = 100/19\%$$

**Exercise 2.1**

1. In an Assembly Election, there were three candidates. Out of the total 1,200 votes polled, A received 30%, B received 720 votes and C received the rest of the votes. What is the percentage of votes received by the winner as compared to his closest rival?
 1. 150%
 2. 200%
 3. 210%
 4. None of these
2. 5% income of Param is equal to 15% income of Taran and 10% income of Taran is equal to 20% income of Vivek. If the income of Vivek is Rs 4,000, then the total income of Param, Taran and Vivek is:
 1. Rs 12,000
 2. Rs 18,000
 3. Rs 24,000
 4. Rs 36,000
3. If Aman's savings are 25% more than Yash's and his savings are 20% more than Bunty's, by what per cent is Aman's savings more than Bunty's?
 1. 25%
 2. 33.33%
 3. 50%
 4. 60%
4. The sides of a box are increased by 20%. By what percentage does its volume increase?
 1. 20%
 2. 44%
 3. 60%
 4. 72.8%
5. The population of a city increased from 3.5 lakhs to 3.85 lakhs in a decade. The average percent increase of population per year is:
 1. 4.37%
 2. 1%
 3. 10%
 4. 8.75%
6. A student multiplied his marks by $\frac{7}{5}$ instead of $\frac{5}{7}$. What is the percentage error in the calculation?
 1. 34%
 2. 28%
 3. 64%
 4. 96%
7. A product can be insured only up to 80% of its purchase value. If insurance amount is 70,000, then find the minimum purchase value?
 1. Rs 78,500
 2. Rs 80,000
 3. Rs 82,500
 4. Rs 87,500
8. In a cricket match, Team A scored some runs and its top scorer scored 7% of the total runs. Similar thing happened with Team B who also scored exact runs. Its top scorer scored 8% of the total and got 85 more runs than Team A's top scorer. What was the final score of each team?
 1. 7,600
 2. 8,500
 3. 8,400
 4. Data inadequate
9. When 15% is lost in grinding Corn, India can export 30 lakh tons of corn. But if it loses 10% in grinding, it can export 40 lakh tons of corn. The production of corn in India is:
 1. 20 lakh tons
 2. 80 lakh tons
 3. 200 lakh tons
 4. 800 lakh tons
10. Shyam sold a scooter at a gain of $x\%$. Had he sold it at a loss of $x\%$, he would have got Rs $100x$ lesser as compared to the price that he got at a gain of $x\%$. What is the cost of the scooter?
 1. Rs 5,000
 2. Rs 1,000
 3. Rs 2,000
 4. Cannot be determined

**Exercise 2.2**

1. The entrance fee of a circus was reduced by 20%, but the daily attendance was increased by 30%. What was the effect of this on the daily collection?
 1. 2% increase
 2. 2% decrease
 3. 4% decrease
 4. 4% increase
2. "Buy 5 shirts, get 1 free" is equivalent to getting a discount of:
 1. $16 \frac{2}{3}\%$
 2. 20%
 3. 33%
 4. None of these

3. The price of pickle is increased by 25% and so a person reduced his consumption by 25%. What is the percentage increase or decrease in the expenditure incurred by him on pickle?
1. 6.25% decrease 2. 7% decrease 3. 6.75% increase 4. 6% increase
4. Grapes weigh 5,000 g. Water is 99% of its weight. It is kept in a heated room to dry and after some time it is found out that water now is 98% by weight. What is the weight of grapes now?
1. 2,500 g 2. 4,600 g 3. 4,900 g 4. None of these
5. Due to the reduction in the price of mangoes by 40%, a customer can buy 24 mangoes more in the same amount. Find the original number of mangoes purchased.
1. 25 2. 18 3. 36 4. 21
6. Radius of the base of a cone is increased by 10% and height is increased by 10%. What is the percentage increase or decrease in: a. area of the base of the cone, b. volume of the cone, respectively?
1. 21% increase, 33.1% increase 2. 10% increase, 12% decrease
 3. 10% increase, 12% decrease 4. 21% increase, 3.2% decrease
7. If $H = m\%$ of n and $R = n\%$ of m , then which of the following is true?
1. H is smaller than R .
 2. H is greater than R .
 3. Relationship between H and R cannot be determined.
 4. If m is smaller than n , then H is greater than R .
 5. None of these
8. Around 33.33% of a machine's daily output is equal to 50% of the second machine's daily output. If the second machine turns out 1,500 nuts daily, then the first machine's output screws is:
1. 500 2. 1,000 3. 2,000 4. 2,250
9. In an exam, Aman scored 25% of total marks and failed by 100 marks whereas Raman scored 45% of total marks and he got 40 marks more than the pass marks. Find out the total marks for the exam held.
1. 500 2. 600 3. 700 4. 800
10. A group of P friends decided to buy a cricket bat, for which they agreed to contribute an average of Rs Q each. Of the R friends who agreed to pay an average of Rs S each, nobody sent their contribution. Which of the following expressions represents the percentage of the contribution money to that of the cost of cricket bat?
1. $100 PQ/RS$ 2. $100 RS/PQ$
 3. $100 RQ - 100 RS/PQ$ 4. $100 - 100 [RS/PQ]$



Exercise 2.3

1. The spring balance of a trader showed 10,000/11 g for 1 kg. Find the profit or loss percentage, if the trader marks up the price 10% above the cost price.
1. 20% profit 2. 21% loss 3. 21% profit 4. 20% loss
2. What is the difference in profit/loss percentage of two cloth merchants, if one uses a scale which measures less by 20% and the other one uses a scale which measures more by 20%? Both of them claim to sell at cost price.
1. No difference 2. 33.34 3. 5.72 4. 41.67

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3. An importer gets a trade discount of 40% on the listed price of goods imported from England, but he pays 50% of the net price as the export duty at London. He spends 10% of the landed cost of the goods as import duty. How much percent higher than the list price should the goods be marked, so that the importer may get 40% net profit?
1. 38.6% 2. 56.56% 3. 93.75% 4. 66.67%
4. A trader allows a discount of 25% to his customers. What price should he mark on an item, the cost price of which is Rs 1,600 so as to make a profit of 25% on his outlay?
1. Rs 2,000 2. Rs 2,667 3. Rs 2,500 4. Rs 2,223
5. Which of the following is/are true?
a. Buy 2, get 1 free is equivalent to a discount of 33.33%.
b. Buy 3, get 1 free is equivalent to a discount of 25%.
c. Buy 3, get 2 free is equivalent to a discount of 50%.
d. Buy 6, pay only for 5 is equivalent to a discount of 20%.
e. A 20% discount means buy 5 and pay only for four.
1. a and b only 2. b, c and d only
3. a, b and e only 4. All of the above

Directions for questions 6 to 8: Each question is followed by two statements, I and II. Mark:

- If the questions can be answered by using one of the statements alone, but cannot be answered using the other statement alone.
 - If the question can be answered by using either statement alone.
 - If the questions can be answered by using both statements together, but cannot be answered using either statement alone.
 - If the question cannot be answered even by using both statements together.
6. How much percent marks did Ajay's score in the last 2 tests?
I. His average for the last 3 tests is 90%.
II. He got 80% in his first test.
7. The number of people who can vote in an election is 78% of the population. How many of them actually cast their vote?
I. The population of the town is 90,000.
II. 64% of the eligible men and 58% of the eligible women voted.
8. If after 6 years a man gets an interest of Rs 576 on his investment, what is the rate at which interest is charged?
I. The amount after 6 years is Rs 4276.
II. Had he invested Rs 463 more the bank would have offered him 8% rate of interest.
9. 40% of the employees of TRINITi Center for Learning are men, and 75% of the men earn more than Rs 50,000 per month. If 45% of employees earn more than Rs 50,000 per month, what fraction of the women (out of total women) in the company earns Rs 50,000 per month or less?
1. 2/11 2. 1/4 3. 1/3 4. 3/4
10. By selling 10 pens a man loses selling price of 2 pens. Find the loss percentage?
1. 300/13% 2. 30% 3. 300/7% 4. 16.67%

 **Answer Key**
Exercise 2.11. 2
7. 42. 4
8. 23. 3
9. 34. 4
10. 1

5. 2

6. 4

Exercise 2.21. 4
7. 52. 1
8. 43. 1
9. 34. 1
10. 4

5. 3

6. 1

Exercise 2.31. 3
7. 42. 4
8. 13. 1
9. 44. 2
10. 4

5. 3

6. 4

 **Explanatory Answers**
Exercise 2.1

1. Total Votes = 1,200

A received $30\% = (30/100) \times 1200 = 360$

B received 720 votes

C received rest, i.e. 120 votes

 $\Rightarrow B$ is the winner \Rightarrow Percent age of votes received by the winner as compared to his closest rival $(720/360) \times 100 = 200\%$ **Ans 2**

- 2.
- $5\% I_P = 15\% I_T$

(i)

 $10\% I_T = 20\% I_V$

(ii)

 $I_V = 4000$ (given) \Rightarrow From (ii), $I_T = 8,000$ And hence from (i), $I_p = 24,000$ $\Rightarrow I_p + I_T + I_V = 36,000$.**Ans 4**

3. Let Aman's saving =
- X
- , Yash's saving =
- Y
- and Bunty's Saving =
- Z

 $X = 25\% Y + Y = 1.25 Y$ $Y = 20\% Z + Z = 1.20 Z$ $X = 1.25 \times 1.20 Z = 1.5 Z = 50\% Z + Z$

Aman's savings is 50% more than Bunty's savings.

Ans 3

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4. $V = l \times b \times h$

$$V' = l' \times b' \times h' = 1.2l \times 1.2b \times 1.2h = 1.728V$$

So there is an increase of $1.728V - V = 0.728V$

% increase = Fractional increase $\times 100$

= (Increase/ Initial) $\times 100$

= $\{(Final - Initial)/Initial\} \times 100$.

% increase = 72.8%

Ans 4

5. Increase in population over the decade = $385,000 - 350,000 = 35,000$

The average yearly increase = $35,000/10 = 3,500$

% Increase in Population. = $(3,500/350,000) \times 100 = 1\%$

Ans 2

$$\begin{array}{r} 5 \\ - 7 \\ \hline 7 \\ - 5 \\ \hline \end{array}$$

6. Fractional Error $\frac{5}{7} = \frac{24}{25}$

$$\% \text{ Error} = \frac{24}{25} \times 100 = 96\%.$$

Ans 4

8. Let x be the final score of both Teams A and B . (given equal)

$$\therefore 0.07x + 85 = 0.08x$$

where, $0.07x$ and $0.08x$ are the individual scores of highest scorers of A and B respectively.

$$x = 8500.$$

Ans 2

9. Let X is the production amount and Y be the amount for country use itself.

$$\Rightarrow X - 0.15X = 30 + Y$$

$$\Rightarrow 0.85X = 30 + Y \quad (\text{i})$$

$$\text{And, } X - 0.10X = 40 + Y$$

$$\Rightarrow 0.90X = 40 + Y \quad (\text{ii})$$

From (i) and (ii)

$$\Rightarrow 0.05X = 10$$

$$\Rightarrow X = 200 \text{ lakh tonnes.}$$

Ans 3

10. Let $CP = a$

$$\text{Difference in Selling Price} = a\left(1 + \frac{x}{100}\right) - a\left(1 - \frac{x}{100}\right) = 100x$$

$$\frac{2ax}{100} = 100x$$

$$\Rightarrow a = 5000.$$

Ans 1.

Exercise 2.2

1. Daily collection ($D.C.$) = (Daily Attendance) ($D.A.$) \times (Entrance Fees) ($E.F.$)

$$D.A.' = 1.3 D.A.$$

$$E.F.' = 0.8 E.F.$$

$$\Rightarrow (D.R.)' = (1.3 D.A.) \times (0.8 E.F.)$$

$$= 1.04 D.R.$$

$$\Rightarrow 4\% \text{ increase.}$$

Ans 4

2. Let the S.P. of one shirt be Rs x . So 6 shirts are being sold at the selling price of 5 or we can say a discount of Rs x is being given. Let the discount % be $y\%$.

$$\Rightarrow x = \frac{y}{100} \times 6x$$

$$\Rightarrow y = 16 \frac{2}{3}\% .$$

Ans 1

3. Expenditure (E) = Price (P) \times Consumption (C)

$$\Rightarrow E' = P'C'$$

$$\Rightarrow E' = (1.25P)(0.75C)$$

$$= 0.9375 PC = 0.9375 E$$

$$\Rightarrow \text{The new expenditure is } (E - 0.9375E) = 0.0625E \text{ less than } E$$

$$\Rightarrow \text{There is a } 6.25\% \text{ decrease in expenditure.}$$

Ans 1

4. Let X is the weight of the pulp in the grapes.

$$\Rightarrow X + 99\% (5,000) = 5,000$$

$$\Rightarrow X = 50 \text{ grams}$$

Now,

$$50 + 98\% (Y) = Y$$

$$\Rightarrow Y = 2,500 \text{ grams.}$$

Ans 1

5. $P_1 N_1 = P_2 N_2$

where, P_1 and P_2 are the original and the new price respectively

And, N_1 and N_2 are the number of mangoes which a customer can buy in both the situations.

$$P_1 N_1 = 0.6 P_1 (N_1 + 24)$$

$$N_1 = 36.$$

Ans 3

6. a. Area of a Base $A \pi r^2$

$$\text{or } A^2 \propto r^2$$

$$\frac{A_1}{A_2} = \frac{r_1^2}{r_2^2}$$

$$\text{where } r_2 = r_1 + 10\% r_1$$

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$$= 1.1 r_1$$

$$A_2 = \frac{A_1 \times r_2^2}{r_1^2} = \frac{A_1 \times (1.1r_1)^2}{r_1^2} = \frac{A_1 \times 1.21 r_1^2}{r_1^2} = 1.21 A_1 = A_1 + 0.21 A_1$$

There is a 21% increase.

b. Volume of a right circular cylinder $V = \frac{1}{3} \times \pi r^2 h$, $V \propto r^2 h$

$$\frac{V_1}{V_2} = \frac{r_1^2 h_1}{r_2^2 h_2}$$

$$\text{where } r_2 = r_1 + 10\% r_1$$

$$= 1.1 r_1$$

$$\text{and } h_2 = 1.1 h_1$$

$$\Rightarrow V_2 = \frac{V_1 \times r_2^2 h_2}{r_1^2 h_1}$$

$$\frac{V_1 \times (1.1r_1)^2 (1.1h_1)}{r_1^2 h_1} = 1.331 V_1 = V_1 + 0.331 V_1$$

\Rightarrow There is 33.1% increase.

Ans 1

7. $H \frac{m}{100}(n) = \frac{mn}{100}$ and $R = \frac{n}{100}(m) = \frac{mn}{100}$

$$\Rightarrow H = R$$

\Rightarrow None of these.

Ans 5

8. $33.33\% O_1 = 50\% \text{ of } O_2$

where O_1 and O_2 are output of 1st and 2nd machine respectively.

$$\text{and } O_2 = 1500 \text{ given}$$

$$\Rightarrow O_1 = 750 \times 3 = 2250.$$

Ans 4

$$25\% X = Y - 100$$

$$45\% X = Y + 40$$

where X is total marks and Y is the number of passing marks.

Solving the equations, we get $X = 700$.

Ans 3

$$P \rightarrow Q \text{ each}$$

$$\Rightarrow P \rightarrow PQ \text{ (decided to buy)}$$

and

$$R \rightarrow S \text{ each}$$

$$R \rightarrow RS \text{ (not Contributing)}$$

$$\text{Contributed} = \frac{PQ - RS}{PQ} \times 100 = 100 - 100 \left[\frac{RS}{PQ} \right]$$

Ans 4

Exercise 2.3

1. False weight = $10000/11$ g, Error in weight = 1000 g – $10000/11$ g = $1000/11$

Profit earned by false weight = $((1000/11)/(10000/11) \times 100) = 10\%$

Profit earned by marking up the price = 10%

So overall profit% = $10 + 10 + 10 \times 10/100 = 21\%$

Ans 3

2. Profit earned by first merchant,

False scale = 80 units, Error = 20 units

Profit % = Error × 100/False scale = $20 \times 100/80 = 25\%$

Now for second merchant,

False scale = 120 units, Error = 20 units

Loss % = Error × 100/False scale = $20 \times 100/120 = 16.67\%$

So net difference = $25\% + 16.67\% = 41.67\%$.

Ans 4

3. Let List Price = Rs 100, After 40% trade discount Price = Rs 60

After 50% as export duty price = $60 + (50/100) \times 60 = \text{Rs } 90$

Landed Cost being 10% on Rs 90 , So price = $90 + 10\% \text{ of } 90 = \text{Rs } 99$

To earn 40% Net profit his SP = $1.4 \times 99 = \text{Rs } 138.6$

So, it is 38.6% higher than the original List Price.

Ans 1

4. Marked Price (M.P.)

Selling Price (S.P.)

$$\text{C.P.} + \text{Profit} = \text{S.P.} \text{ where, Profit} = \frac{\text{Profit}\%}{100} \times \text{C.P.}$$

$$\Rightarrow 1,600 + 0.25(1600) = \text{S.P.}$$

$$\Rightarrow \text{S.P.} = \text{Rs } 2,000$$

After giving 25% discount on marked price

$$\Rightarrow 0.75 \text{ M.P.} = \text{S.P.} \quad \text{M.P.} = 2000/0.75 = \text{Rs } 2,667.$$

Ans 2

5. a. Getting 3 units at the price of 2 means discount of 1 unit.

$$\text{Discount}\% = \frac{1}{3} \times 100 = 33.33\%. \text{ The given statement is true}$$

- b. Getting 4 units at the price of 3 means discount of 1 unit.

$$\text{Discount \%} = \frac{1}{4} \times 100 = 25\%$$

The given statement is true.

- c. Getting 5 units at the price of 3 means discount of 2 units.

$$\Rightarrow \text{Discount \%} = \frac{2}{5} \times 100 = 40\%$$

The given statement is false.

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d. Getting 6 units at the price of 5 means discount of 1 unit.

$$\text{Discount} = \frac{1}{6} \times 100 = 16.67\%$$

\Rightarrow The given statement is false.

e. Getting 5 units at the buy of 4 means discount of 1 unit.

$$\Rightarrow \text{Discount\%} = \frac{1}{5} \times 100 = 20\%$$

\Rightarrow The given statement is true.

\Rightarrow a, b and e options are true.

Ans 3

6. The question expects us to give a particular value as the answer.

Statement I alone doesn't give any answer to the question.

Statement II alone either doesn't give answer.

Combining both the statements also doesn't help.

Ans 4

7. The question expects us to give a particular value as the answer i.e. the number of people who actually voted and not who can vote.

\therefore Statement I alone doesn't give any answer to the question because it will give the number of people who can vote, i.e. 78% of 90,000.

Statement II alone either cannot give the answer.

Combining both the statements we will not be able to get the answer since we do not have the actual figure of eligible men and eligible women.

Ans 4

8. The question expects us to give a particular value as the answer, i.e. the rate of interest. The given data is time (t) = 6 years, Interest (I) = Rs 576. So we need Principal to find out the rate.

Statement I alone can answer the question because using the value of Amount = Rs 4276 and the Interest given above we can find

$$\text{Principal } (P) = \text{Amount } (A) - \text{Interest } (I)$$

Hence, we can find the rate of interest (r) by using the formula:

$$I = \frac{P \times r \times t}{100}$$

Hence, using Statement I only we can find the answer.

Ans 1

9. Let the number of employees be X

And the number of men = M

$\Rightarrow 0.4X = M$ so No. of women = $0.6X$

If $0.75M$ men earn more than 50,000

$\Rightarrow 0.75(0.4X)$ men earn more than 50,000

$\Rightarrow 0.3X$ men earn more than 50,000

$\Rightarrow 0.4X - 0.3X = 0.1X$ men earn less than 50,000

And it is also given that $0.45X$ employees earn more than 50,000

$\Rightarrow 0.55X$ employees earn less than 50,000

$$\Rightarrow 0.55X - 0.1X = 0.45X \text{ women earn less than 50,000}$$

$$\therefore \text{Fraction of women employed who earn less than 50,000} = \frac{0.45X}{0.6X} = \frac{3}{4}. \quad \text{Ans 4}$$

10. Let Selling price of one pen = 1

Selling price of 10 pens will be = 10

Cost price of 10 pens = S.P. of 10 pens + Loss

Here Loss = 2

C.P. of 10 pens = 12

$$\text{Loss \%} = (2/12) \times 100 = 16.67\%. \quad \text{Ans 4}$$

Chapter 3

Simple and Compound Interest

3.1 Concept of Interest

The basic principle underlying the concept of simple and compound interest is that whenever an amount of money or resource is given to someone, some extra amount is taken besides the original amount that was being lent initially.

In this context, the original resource or money that was lent is called **Principal**, the extra amount that was returned is called **Interest** and the total amount that is being paid back is called **Amount**. By definition, amount is equal to the sum of principal and interest.

Thus, **Amount = Principal + Interest**

Now, the way in which the interest is calculated tells us whether it is a case of simple interest or compound interest. We shall discuss both of them separately, but let us know some of these terms used in both simple and compound interest.

3.1.1 Rate of Interest

The rate of interest is always associated with a specific amount of time, may be 1 year, 6 months, 3 months, etc. It can be for any fixed period of time. In the absence of time specification, the term rate of interest remains incomplete and has no significance to it. So, by definition, rate of interest can be defined as “how much percentage of Principal will be included in Interest after a particular amount of time (associated with rate of interest) has passed”. For example, if Rs 4,000 has been lent out at the rate of interest of 6% per annum (per annum means one year), so after one year 6% of Rs 4,000 (i.e., Rs 240) will be added in interest.

Note: At times, the rate of interest is to be given on per annum basis, but the interest is computed after a different interval of time, say 6 months or 3 months or 9 months. In this case, we need to take the rate of interest proportionately. For example, if rate of interest is 12% per annum, but is computed after every 6 months or 4 months or 3 months or 1 month, then $R = 12\% \text{ for } 12 \text{ months} = 6\% \text{ for } 6 \text{ months} = 4\% \text{ for } 4 \text{ months} = 3\% \text{ for } 3 \text{ months} = 1\% \text{ for } 1 \text{ month}$. Apply the appropriate proportionate conversion depending on the given situation.

The time period for which money or a resource has been given has a clear meaning and mathematically indicates how many times we have to include interest in accordance with the rate of interest. Its usage will become much clear once we move to solved examples and demarcate between simple and compound interest.

Note: Time that is to be substituted in the formulae is not always the number of years for which a resource or money is lent. If we again look at the definition, it is the number of times a ‘specific amount of time period of rate of interest’ occurs in the given time period. For example, if rate of interest is 12% per annum and interest is calculated for 3 years, the time to be substituted in formulae is (3 years/per annum) = (3 years/1 year) = 3. But, if the rate of interest is 5% per 3 months and interest is calculated for 2 years, then the time to be substituted in formulae is (2 years/3 months) = (2 years/0.25 year) = 8.

3.2 Calculating Simple Interest

3.2.1 Case of Simple Interest

The interest is always calculated keeping the original Principal as the base. So, if Rs 6,000 is lent at 5% per annum, in first year; the interest will be 5% of 6,000, the Amount after first year will become Principal + Interest = Rs 6,000 + (5% of Rs 6,000) = Rs 6,300. Now, even though the Amount has become Rs 6,300 in the second year, the interest will be calculated on initial Principal only, i.e., 5% of 6,000. So, after two years, the Amount will be Principal + 1st year Interest + 2nd year Interest, and so on.

Using the definition explained above, we can derive formulae:

$$\text{Simple Interest} = (\text{Principal} \times \text{Rate of Interest} \times \text{Time})/100$$

$$\text{Which we simply write as S.I.} = \frac{PRT}{100}$$

$$\text{Amount} = \text{Principal} + \text{S.I.} = P + \frac{PRT}{100} = P \left(1 + \left(\frac{RT}{100} \right) \right)$$

3.3 Calculating Compound Interest

3.3.1 Case of Compound Interest

The interest is always calculated keeping the present Amount as the base. So, if Rs 6,000 has been lent at 5% per annum, in first year the interest will be 5% of 6,000, the Amount after first year will become Principal + Interest = Rs 6,000 + (5% of Rs 6,000) = Rs 6,300. Now, the Amount has become Rs 6,300, in the second year the interest will be calculated on this present Amount, i.e., 5% of 6,300. So, after two years, the Amount will be Principal + 1st year Interest (on Rs 6,000) + 2nd year Interest (on Rs 6,300), and so on.

Using the definition explained above, we can derive formulae.

$$\text{Amount} = \text{Principal} \times (1 + (\text{Rate of Interest}/100))^{\text{Time}}$$

$$\text{Which we simply write as Amount} = P(1 + (R/100))^{\text{Time}}$$

$$\text{Compound Interest} = \text{Amount} - \text{Principal} = P[(1 + (R/100))^T - 1]$$

3.4 EMIs

Formula for calculating instalments of EMI is given as follows:

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If one has taken a loan from a bank of Rs P at a rate of interest $R\%$ per annum and wishes to pay it back in T equal yearly instalments, then each instalment will be equal to

$$E = PR[(1 + R)^T / \{(1 + R)^T - 1\}]$$

Now the instalments may be monthly or may be once in 3 months, the appropriate conversions for R and T are to be applied as explained in the notes above. For example, if rate of interest is 8% per annum and instalments are taken once in 3 months for 8 years. So, $R = 8\%$ per annum = 2% per 3 months.

Accordingly, $T = 8$ years/3 months = 32

Example 1: Akshay borrowed some amount at a rate of 5% p.a. for the first 2 years, at the rate of 10% p.a. for next one year and at the rate of 15% p.a. for the period beyond three years. If he pays a total simple interest of 43,200 at the end of seven years, how much money did he borrowed?

1. 54,000

2. 65,000

3. 18,500

4. 30,400

Solution: Let the sum borrowed by Akshay be s

Then,

$$\frac{(s \times 5 \times 2)}{100} + \frac{(s \times 10 \times 1)}{100} + \frac{(s \times 15 \times 4)}{100} = 43,200$$

$$(s/10) + (s/10) + (6s/10) = 43,200$$

$$s = 432,000/8 = 54,000$$

Hence, the sum borrowed = 54,000.

Ans 1

Example 2: A sum was put at simple interest at a certain rate for 4 years. Had it been put at 5% higher rate, it would have fetched Rs 739 more. What was the sum?

1. 3,000

2. 3,695

3. 3,500

4. 5,215

Solution: Let the sum be s and the rate be r

$$\text{So, } \frac{[s \times (r + 5) \times 4]}{100} - \frac{[s \times r \times 4]}{100} = 739$$

$$4sr + 20s - 4sr = 73,900$$

$$20s = 73,900$$

$$\text{So, } s = 3,695$$

Hence, sum = 3,695.

Ans 2

Example 3: A sum of Rs 5,200 is to be lent in two parts for one year, one at 7% and other at 10%. If the total annual income is Rs 400. Find the money lent at each rate.

1. 4,000; 1,200

2. 3,800; 1,400

3. 3,200; 2,000

4. 2,600; 2,600

Solution: Let the sum lent at 7% be S and sum lent at 10% be $(5,200 - S)$.

The total annual income is = 400

$$\text{So, } \frac{[s \times 7 \times 1]}{100} + \frac{[(5200 - s) \times 10 \times 1]}{100} = 400$$

$$7S + 52,000 - 10S = 40,000$$

$$3S = 12,000$$

$$S = 4,000$$

So, the sum lent at 7% = 4,000

And sum lent at 10% = $(5,200 - 4,000) = 1,200$

Ans 1

Example 4: Find compound interest on 17,000 at 10% p.a. for 2 years compounded annually.

1. 2,650

2. 3,570

3. 3,000

4. 4,100

Solution: Here, $P = 17,000$

$$R = 10\%$$

$$T = 2 \text{ years}$$

Compound interest is given by:

$C.I. = \text{Total amount} - \text{Principle}$

$$\text{Amount} = [P \times \{1 + (R/100)\}^T] = [17,000 \times \{1 + (10/100)\}^2]$$

$$= 170 \times 121 = 20,570$$

$$\text{So, } C.I. = 20,570 - 17,000 = 3,570.$$

Ans 2

Example 5: Find the compound interest on Rs 22,000 in 1.5 years at the rate of interest 20% p.a. The interest is compounded half yearly.

1. 3,267

2. 3,990

3. 7,282

4. 4,741

Solution: Here, $P = 22,000$

$$R = 20\% \text{ p.a.} = 10\% \text{ half yearly}$$

$$T = 1.5 \text{ years} = 3 \text{ half years}$$

$$\text{So, Amount} = [P \times \{1 + (R/100)\}^T] = [22,000 \times \{1 + (20/200)\}^3]$$

$$= 22,000 \times (11/10) \times (11/10) \times (11/10)$$

$$= 29,282$$

So, $C.I. = \text{Amount} - \text{Principle}$

$$= 29,282 - 22,000$$

$$= 7,282.$$

Ans 3

Example 6: The difference between compound interest and simple interest on a certain sum at 25% per annum for 2 years is 800. Find the sum?

1. 31,000

2. 90,000

3. 14,000

4. 12,800

Solution: Let the sum be S

$$\text{Then, } C.I. = [S \times \{1 + (25/100)\}^2] - S = 9S/16$$

$$S.I. = [(S \times 25 \times 2)/100] = S/2 = 8S/16$$

Now difference between $C.I.$ and $S.I.$ is 800

$$\text{So, } C.I. - S.I. = 800$$

$$9S/16 - 8S/16 = 800$$

$$S = 800 \times 16 = \text{Rs } 12,800.$$

Ans 4

Shortcut Method

When rate of interest and sum are same for a period of 2 years, then we have a relation $P(R/100)^2 = CI - SI$.

$$\text{Hence, } P(R/100)^2 = 800, P = 800 \times 16 = 12,800.$$

Example 7: A sum of money at simple interest becomes four times of itself in 20 years. What is the rate of interest?

1. 15%

2. 8%

3. 10%

4. 12%

Solution: The amount of money becomes four times of itself, i.e., amount = $4P$

$$P + I = 4P$$

$$I = 3P$$

$$I = PRT/100$$

$$3P = P \times R \times 20/100$$

$$R = 15\%.$$

Ans 1

Example 8: Population of a town now is 62,500; it grows at a constant rate compounded annually. After 2 years it becomes 72,900. Find the rate at which it grew in 2 years.

1. 15%

2. 8%

3. 10%

4. 12%

Solution: If current population is P and it grows at rate of $R\%$ compounded annually.

$$\text{So, population after } T \text{ years } P' = P \left(1 + \frac{R}{100}\right)^T$$

$$\text{So } 62,500 \left(1 + \frac{R}{100}\right)^2 = 72900$$

$$\text{So, } \left(1 + \frac{R}{100}\right)^2 = \frac{729}{625}, \left(1 + \frac{R}{100}\right) = 27/25$$

$$R = 8\%.$$

Ans 2



Exercise 3.1

- Ram invested an amount of Rs 9,200 in two different schemes A and B at the simple interest rate of 15% p.a. and 10% p.a., respectively. After 2 years, the total simple interest amounts to Rs 2,120. How much was invested in scheme B?
 - 2,800
 - 3,600
 - 6,400
 - 6,000
- A man borrows Rs 560 at simple interest in the beginning of a year at a certain rate. After 8 months, he borrows another sum of Rs 540 more at the rate twice the former. At the end of the year, he pays a total of Rs 73.60 as interest. What was the original rate of interest?
 - 10.5%
 - 10%
 - 8.5%
 - 8%
- A person borrows Rs 200,000 for 2 years at 6% p.a. simple interest and immediately lends it to another person at 8% p.a. for 2 years. Find his gain in the transaction per year.
 - Rs 4,000
 - Rs 8,000
 - Rs 6,000
 - Rs 8,500
- An amount of Rs 4,500 is invested in two types of shares. The first yields an interest of 6% per annum and the second 8% per annum. If the total interest at the end of one year is $6\frac{14}{15}\%$, then the amount invested in each share was:
 - Rs 3,000; Rs 1,500
 - Rs 2500; Rs 2000
 - Rs 3100; Rs 1,400
 - Rs 2400; Rs 2100
- The difference between simple interest on a sum of Rs 8,500 and another sum of Rs 7,000 at 6% is Rs. 360. Find the time in years?
 - 5
 - 4
 - 3
 - 3.5
- A sum of money at simple interest triples itself in 25 years. What is the rate of interest?
 - 15%
 - 8%
 - 10%
 - 12%

7. In how many years does the compound interest on Rs 8,000 at 20% per annum become Rs 3,520?
1. 2 2. 3 3. 2.5 4. None of these

8. A father divides Rs 84,000 between his two sons Ajay and Vijay, such that Ajay's share at the end of 6 years is equal to Vijay's share at the end of 5 years when compounded annually at the rate of 10%. Find Vijay's share.
1. Rs 44,000 2. Rs 36,300 3. Rs 40,487 4. Rs 39,736

9. Chandigarh has 2500 citizens. It is estimated to be 3600 in next 2 years. What will be the population 2 years from then, if the rate of growth of population has been constant over the years and has been compounding annually?
1. 5184 2. 7400 3. 6672 4. 7500

10. What will be the compound interest on a sum of Rs 72,000 after 2 years at a rate of 5% p.a.?
1. Rs 8,560 2. Rs 9,400 3. Rs 7,380 4. None of these

Exercise 3.2

- What sum of money at simple interest amounts to Rs 960 in 5 years and Rs 888 in 4 years?
1. 650 2. 700 3. 600 4. 750
 - Ajay lends money to Ankur and claims to be lending money at simple interest. But at the end of 6 months, he adds the interest to the principal and calculates the interest for the next 6 months on this new principal. If he is charging an interest at the rate of 10%, the effective rate of interest becomes:
1. 10.25% 2. 10% 3. 10.5% 4. 10.75
 - Seema wants to purchase a flat in Mumbai which costs 60 lakhs. Seema takes loan from the bank at 8% p.a. Find the amount paid by her in 10 years?
1. 48 lakhs 2. 108 lakhs 3. 120 lakhs 4. 92 lakhs
 - Divide Rs 2,530 into 3 parts so that their amount after 5 years be equal, the rate of interest being 4%, 6%, 8% per annum, respectively at simple interest. The third part is:
1. Rs 780 2. Rs 865 3. Rs 870 4. Rs 685
 - The difference between the Simple Interest and Compound Interest on a certain sum for 2 years at 20% p.a. is Rs 100. Find the Principle?
1. Rs 4,200 2. Rs 2,500 3. Rs 3,000 4. Rs 4,000
 - What annual payment will discharge a debt of Rs 7,420 due in 4 years at 4% simple interest?
1. Rs 2,000 2. Rs 1,750 3. Rs 1,800 4. Rs 1,900
 - A customer deposits Rs 1,800 in a bank which offers 10% compound interest calculated on yearly basis. At the end of 2 years, what amount will he gain?
1. Rs 378 2. Rs 392 3. Rs 280 4. Rs 181
 - The least number of complete years in which a sum of money put out at 20% compound interest will be more than doubled is:
1. 3 2. 4 3. 5 4. 6
 - The effective annual rate of interest corresponding to a rate of 10% p.a., when compounded half-yearly, is:
1. 12.25% 2. 11.25% 3. 10.5% 4. 10.25%

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10. Rs 100 doubled in 3 years when compounded annually. How many more years will it take to get another Rs 200 compound interest
1. 3 2. 4 3. 6 4. None of these

Answer Key

Exercise 3.1

1. 3 2. 4 3. 1 4. 4 5. 2 6. 2
7. 1 8. 1 9. 1 10. 3

Exercise 3.2

1. 3 2. 1 3. 2 4. 1 5. 2 6. 2
7. 1 8. 2 9. 4 10. 1

Explanatory Answers

Exercise 3.1

2. The original rate is for 1 yr and the new rate is for 1/3 yr.

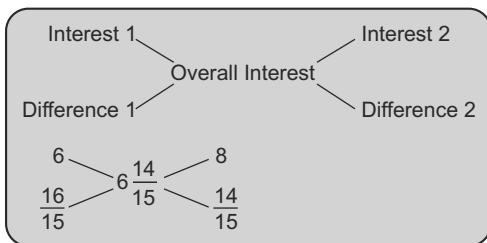
$$[(560 \times R \times 1)/100] + [(540 \times 2R \times 1)/300] = 73.6$$

$$(56 + 36)R = 736$$

$$R = 8\%.$$

Ans 4

4. Allegation can be used to solve this question.



Amount is divided in the ratio $16/15 : 14/15 = 8:7$

So two parts are 2,400 and 2,100

Ans 4

6. The amount of money triples itself, i.e. amount = $3P$

$$P + I = 3P$$

$$I = 2P$$

$$I = PRT/100$$

$$2P = P \times R \times 25/100$$

$$R = 8\%.$$

Ans 2

8. Ratio of Vijay's share to Ajay's share = $(1 + 0.1)^6 / (1 + 0.1)^5 = (1.1) = 11/10$

So, Vijay's share = $84,000 \times 11/21 = \text{Rs } 44,000.$

Ans 1

Exercise 3.2

1. S.I. for 1 year = Rs $(960 - 888) = \text{Rs } 72.$

S.I. for 4 years = Rs $(72 \times 4) = \text{Rs } 288.$

Principal = Rs $(888 - 288) = \text{Rs } 600.$

Ans 3

2. Let the principal = Rs 100

$$\text{SI for first 6 months} = \frac{100 \times 10 \times 1}{100 \times 2} = \text{Rs. } 5$$

So, new principal = Rs 105

$$\text{SI for next 6 months} = \frac{105 \times 10 \times 1}{100 \times 2} = \text{Rs. } 5.25$$

So, amount at the end of 1 year = Rs $(100 + 5 + 5.25) = \text{Rs } 110.25$

Effective rate = $(110.25 - 100) = 10.25\%.$

Ans 1

4. Let the three parts be A, B, C

$$A + \frac{A \times 4 \times 5}{100} = B + \frac{B \times 6 \times 5}{100} = C + \frac{C \times 8 \times 5}{100}$$

$$\frac{6A}{5} = \frac{13B}{10} = \frac{7C}{5} = K; A = \frac{5K}{6}, B = \frac{10K}{13}, C = \frac{5K}{7}$$

But $A + B + C = 2530$

$$\frac{5K}{6} + \frac{10K}{13} + \frac{5K}{7} = 2530; 455K + 420K + 390K = 2530 \times 13 \times 7 \times 6$$

$$K = \frac{2530 \times 13 \times 7 \times 6}{1265} = 1092$$

$$C = \frac{5}{7} \times 1092 = \text{Rs } 780.$$

Ans 1

5. Let the principal be P

Difference = $P(R/100)^2$

$$100 = P(20/100)^2, P = 2500.$$

Ans 2

6. Let the annual instalment be Rs $a.$ Then,

$$a + \frac{a \times 3 \times 4}{100} + a + \frac{a \times 2 \times 4}{100} + a + \frac{a \times 1 \times 4}{100} + a = 7420$$

$$\frac{28a}{25} + \frac{27a}{25} + \frac{26a}{25} + a = 7420$$

$$106a = 7420 \times 25$$

$$a = 70 \times 25 = 1750.$$

Ans 2

7. Total amount = $1800 \times \left(1 + \frac{10}{100}\right)^2$

$$= 1800 \times \frac{121}{100}$$

= Rs 2178

$$C.I. = \text{Rs } 2178 - \text{Rs } 1800 = \text{Rs } 378.$$

Ans 1

8. $P(1 + 20/100)^n > 2P$

$$(6/5)^n > 2, \text{ so } n = 4.$$

Ans 2

9. Amount of Rs 100 when compounded half yearly

$$= 100 \times \left(1 + \frac{5}{100}\right)^2 = 110.25$$

$$\text{Interest} = 110.25 - 100 = 10.25$$

$$\text{Effective rate} = (10.25 \times 100)/100 \% = 10.25\%.$$

Ans 4

10. Rs 100 invested in compound interest becomes Rs 200 in 3 years.

The amount will double again i.e. it will become Rs 400 in another 3 years.

So, to earn another Rs 200 interest, it will take another 3 years.

Ans 1

Chapter 4

Time, Speed and Distance

4.1 Introduction

Whenever an object moves, there are a few physical quantities that can be associated with it, like its mass, the change in its position, the rate at which it is changing its position, the direction in which it is moving, the time it is taking and many more. Keeping in mind the kind of questions that come in campus placement tests, we need to go through some of these and discuss them in detail.

Distance which a particular object covers, irrespective of the direction of its movement. Distance is always a positive scalar quantity (a scalar quantity is the one whose value does not depend on direction). It can be represented in various units like metres (m), kilometres (km), miles, etc.

Time taken to cover the distance. The normal units for representing time are seconds (s), minutes (min), hours (hr), etc.

Speed: It is defined as the rate at which a particular object is covering the distance per unit time. The units for speed are normally m/s, km/h, miles/h, etc. However, it can be represented as a ratio of any unit of distance and any unit of time.

Using the above definition of speed, we can establish a relation between these quantities:

$$\text{Distance} = \text{Speed} \times \text{Time}$$

However, there are some points that need to be remembered before applying this formula.

- You should make sure that the values you put in this equation have consistent units. For example, if speed is in km/h, time should be in hours, not in seconds or minutes. If the units are not consistent, change them before putting in the equation.
- To convert speed from km/h to m/s, multiply by $5/18$. To convert speed from m/s to km/h, multiply by $18/5$.

Note: This formula is only valid when the speed is constant throughout the journey for which you are applying this formula.

For example, if Meena is travelling a distance of 15 km at 4 m/s, it can be applied to find the time. But, if she is travelling 9 km at 5 m/s and 6 km at 3 m/s, this formula can be applied to both the parts of journey independently to find time taken to cover first 9 km and the time taken to cover last 6 km, but it cannot be applied taking a total distance of 15 km as the speed is changing during the journey.

Example 1: *A, B and C start swimming in a pool simultaneously from the same end. To complete 5 laps, A takes 5 minutes, B takes 4 minutes and C takes 3 minutes. What is the ratio of speeds of A, B and C.*

Solution: Since all three swim for 5 laps, i.e., distance is the same for all the three, speed is inversely proportional to the time taken and thus ratio of speeds of A, B and C is = 12 : 15 : 20.

Example 2: In order to travel a certain distance, when the speed reduces by 2 m/s, time taken increases by 10 s and when the speed is reduced by 3 m/s, the time increases by 18 s. Find his normal speed, time and distance.

Solution: Let V , T and D be the original speed, time and distance respectively.

$$\text{Then } D = VT = (V - 2)(T + 10) = (V - 3)(T + 18)$$

$$\text{Now, } VT = (V - 2)(T + 10) = VT + 10V - 2T - 20 \text{ or}$$

$$5V - T = 10 \quad (\text{i})$$

$$\text{Similarly, } VT = (V - 3)(T + 18) = VT + 18V - 3T - 54 = 18V - 3T = 54$$

$$6V - T = 18 \quad (\text{ii})$$

Using (i) and (ii), we get $V = 8$ m/s and $T = 30$ s. Hence, $D = 240$ m.

Example 3: Train leaves station at 8:00 am. If Yatin walks at a speed of 4 km/h from his house, he misses the train by 30 mins. If he walks at a speed of 6 km/h, he reaches the station at 7:55 am. Find the distance between the station and Yatin's house.

Solution: Suppose the distance is ' d ' km between his house and the station.

Let us say that he takes ' t ' hours in general to reach station in time.

$$\text{If he walks at } 4 \text{ km/h, then } d = \left(t + \frac{30}{60}\right) \times 4 \quad (\text{i})$$

$$\text{If he walks at } 6 \text{ km/h, then } d = \left(t - \frac{5}{60}\right) \times 6 \quad (\text{ii})$$

Equating (i) and (ii)

$$\left(t + \frac{30}{60}\right) \times 4 = \left(t - \frac{5}{60}\right) \times 6$$

$$2t + 1 = 3t - 15/60$$

$$t = 5/4 \text{ hours}$$

$$\text{Distance} = 4 \left(t + \frac{30}{60}\right) = 4 \times \frac{105}{60} = 7 \text{ km}$$

Shortcut Method

If a person covers a certain distance at a speed of a km/h and reaches t_1 minutes late. If he had travelled at a speed of b km/h, he would have reached t_2 minutes early. In this case the required distance is given by

$$\frac{\text{Product to speeds}}{\text{Difference of two speeds}} \times \text{Difference between arrival times}$$

$$\text{Distance} = \frac{4 \times 6}{6 - 4} \times \frac{35}{60}$$

$$= 12 \times \frac{35}{60} = 7 \text{ km}$$

4.2 Average Speed

Now, the next question arises, how can we deal with the situations when the speed changes during the journey. The speed may vary abruptly, just like in the case of Meena's journey we discussed or it may vary at a constant rate or may be in any random fashion, just like the way people drive their vehicles.

In such cases, many times it is not possible to get into the details of journey, but the average speed of the overall journey can be calculated as:

$$\text{Average speed} = \frac{\text{Total distance covered}}{\text{Total time taken}}$$

Meena's case that we have discussed, is a special case of this type and we call this as Multiple Constant Speed journeys.

If we see the journey diagram in Figure 1, where a person travels the journey in four different phases.

This is a journey covered in four phases,

$$\text{Total distance} = d_1 + d_2 + d_3 + d_4$$

$$\text{Time} = t_1 + t_2 + t_3 + t_4$$

Using the formula for average speed,

$$\text{Average Speed} = \frac{d_1 + d_2 + d_3 + d_4}{t_1 + t_2 + t_3 + t_4}$$

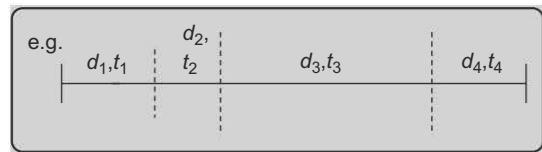


Figure 1

The formula is valid for any number of phases.

A special case of this formula occurs when the distances covered in each of the phases is same. In such a special case, the average speed is given by calculating the harmonic mean of the individual speeds in each of the phases.

$$\text{Average speed in this special case} = \text{harmonic mean of } s_1, s_2, s_3, s_4 \dots \dots = \frac{1}{\frac{1}{s_1} + \frac{1}{s_2} + \frac{1}{s_3} + \frac{1}{s_4} + \dots}$$

$$\text{If the journey has two phases only, average speed becomes} = \frac{2 \times s_1 \times s_2}{s_1 + s_2}$$

$$\text{If the journey has three phases only, average speed becomes} = \frac{3 \times s_1 \times s_2 \times s_3}{s_1 \times s_2 + s_2 \times s_3 + s_3 \times s_1}$$

Example 4: If Pankaj travels from Chandigarh to Delhi at a speed of 80 km/h and returns at a speed of 120 km/h, find the average speed of his journey.

Solution: In this case distance covered in onward and return journey is same. Let it be d . So, total distance = $2d$. Total time = $d/80 + d/120$.

$$\text{So, Average Speed} = \frac{\text{Total Distance}}{\text{Total Time}} = \frac{2d}{d/80 + d/120} = 96 \text{ km/h}$$

Shortcut Method

$$\text{Average speed of journey} = \frac{2 \times s_1 \times s_2}{s_1 + s_2} = \frac{2 \times 80 \times 120}{80 + 120} = 96 \text{ km/h}$$

Example 5: A bus travels at a speed of 70 km/h. It stops for 6 min every half an hour. What is the average speed?

Solution: In half an hour, Distance covered by bus = $\frac{24}{60} \times 70 = 28$ km (Since it travels for 24 mins for

every 30 mins) Speed = $\frac{28}{1/2} = 56$ km/h

4.3 Two Journeys Concept

Let us consider a case, where two persons start from opposite ends of a road and move toward each other.

They meet somewhere at point P , and stop moving.

In this case, we can easily see that the time taken to travel by both persons is the same. (Because both started moving at same instance of time, and stopped together after some time.)

Let us consider another case,

I travel from my home to my college on Tuesday at a speed of 80 km/h. On Wednesday, I cover this distance from my home to my college with a speed of 100 km/h. It is quite obvious, that I will reach college earlier on Wednesday. But, on both days, the quantity that is same for both the journeys is the distance covered.

Whenever you see a problem where two separate journeys take place you should try to find out which quantity (among time, distance and speed) is same for both the journeys. Once you have done this, apply the appropriate formula from the ones given below.

In Journey 1 : d_1, s_1, t_1	Same Time	Same Distance	Same speed
In Journey 2 : d_2, s_2, t_2	$d_1/s_1 = d_2/s_2$	$s_1t_1 = s_2t_2$	$d_1/t_1 = d_2/t_2$

Example 6: Mohit and Geetanjali are 100 m away. They run towards each other and meet at 30 m from Geetanjali. Tell the ratio of speeds of Mohit and Geetanjali?

Solution: Distance covered by Geetanjali = 30 m

Distance covered by Mohit = 70 m

Time taken by both = t s

Speeds:

Mohit = $70/t$, Geetanjali = $30/t$

So, Ratio = 7 : 3

4.4 Relative Speed

When two bodies are moving at speeds of s_1 and s_2 , where s_1 and s_2 are in same units, their relative speed is defined as the rate at which one of them is moving with respect to other.

For example, if a bike is moving towards east at 40 km/h and a truck is moving in the same direction at 60 km/h. What can we say about the distances they are going to travel? Let us suppose they start from point P . After 1 hour, the bike will reach a point 40 km from P , while truck will reach a point 60 km from P . If we take the reference as point P , bike travelled at 40 km/h and truck travelled at 60 km/h. But, if we take bike as the reference, initially bike and truck are at the same point. After one hour, truck is 20 km ahead of bike and 60 km ahead of P . So, with respect to bike, truck is travelling at 20 km/h. In this manner, after two hours truck should be 40 km ahead of bike, which is actually true as after two hours, bike would have travelled 80 km and truck would have travelled 120 km.

Note: Relative Speed concept is only useful when there are at least two objects under consideration, as a single object motion can always be dealt without relative speed.

If two objects are travelling towards each other with speeds s_1 and s_2 , their relative speed is given by $(s_1 + s_2)$.

If two objects are travelling in the same direction with speeds s_1 and s_2 , their relative speed is given by $|s_1 - s_2|$.

In both the cases, s_1 and s_2 should have the same units.

Example 7: In a cricket match, a ball is going towards the boundary at a speed of 5 m/s. Virat chases the ball in order to just save the boundary. At what speed should he run in order to save it. You are given that the distance between Virat and ball is 12 m and the distance between ball and boundary is 60 m.

Solution: The ball reaches the boundary in $60/5 = 12$ s,

Distance between Virat and the boundary is $60 + 12 = 72$ m

Speed of Virat = $72/12 = 6$ m/s

Shortcut Method

Let the speed of Virat = a m/s

So, relative speed = $a - 5$ m/s

So, $t = 12/(a - 5)$

$a = 6$ m/s

Example 8: There is a robbery in a jewellery shop. A police station is at a distance of 2 km. If a thief runs at a speed of 8 km/h and gets caught in an hour, what is the speed of police?

Solution: Speed of Police is x km/h

Distance travelled by thief in an hour = 8 km

Distance travelled by Police is $8 + 2 = 10$ km

Speed of Police = $10 \text{ km}/1\text{h} = 10 \text{ km/h}$

Shortcut Method

Speed of Police = x km/h

Relative distance = 2 km

Relative speed = $x - 8$ km/h

Time = 1 h

$2/(x - 8) = 1$

$x = 10$ km/h

4.5 Two Objects Crossing Each Other

A moving object always has two properties: size and movement. In terms of size, an object can have a finite size or it can be a point sized or zero sized. By point size, we mean that the size of this object is negligible in comparison to the other object, e.g., if a boy is crossing a train, the size of a boy is negligible in comparison to a train. The size of the object is always to be considered in the direction of the motion. In terms of movement, an object can be moving or be at rest. If an object is at rest, its speed will be 0. Whenever two objects cross each other, each of them will have these properties.

Object 1: Length = l_1 , Speed = s_1

Object 2: Length = l_2 , Speed = s_2

Any of the two objects given in the problem can be taken as object 1 and the other object 2.

Case – 1: When both the objects are non-moving.

Two non-moving objects can never cross each other.

Therefore, time taken to cross each other is infinity (∞).

Case – 2: When one object is moving, other is non-moving

$$l_1, s_1 \quad l_2, s_2 = 0$$

Time taken in this case = $(l_1 + l_2)/s_1$

Case – 3: When both objects are moving

$$l_1, s_1 \quad l_2, s_2$$

This is the most general case and both the previous cases can be derived from it.

$t = (l_1 + l_2)/(|s_1 - s_2|)$, if both the objects are moving in the same direction and the faster one is chasing the slower one.

$t = (l_1 + l_2)/(|s_1 + s_2|)$, if both the objects are moving towards each other.

If both objects are non-moving, $S_1 = S_2 = 0$, we get the case 1.

If one object is non-moving, $S_2 = 0$, we get the case – 2.

Note : In general, we can say that the time taken to cross each other = sum of lengths/relative speed

Example 9: A train crosses a bridge in 30 sec and a standing man in 10 sec. If the speed of the train is 72 km/h, find the length of bridge.

Solution: Speed of train = $72 \times 5/18 = 20$ m/s.

$$\begin{aligned} \text{Length of the train} &= (\text{speed of the train}) \times (\text{time taken by train to cross a standing man}) \\ &= 20 \times 10 = 200 \text{ m.} \end{aligned}$$

Let the length of the bridge = l

Time taken by the train to cross the bridge = $(\text{Length of the train} + l)/(\text{speed of train})$

$$\text{So, } (l + 200)/20 = 30, l = 400 \text{ m.}$$

So, length of the bridge = 400 m.

Important Points to Remember

- (i) If two trains A and B start from P and Q , towards Q and P respectively. After passing each other train A takes T_1 time to reach Q while train B takes T_2 time to reach P . If speed of train A is given as S km/h.

$$\text{Speed of train } B = S \times \sqrt{\frac{T_1}{T_2}}.$$

- (ii) If two trains A and B of equal lengths take T_1 and T_2 to cross a pole, then time taken by both the trains to cross each other, is $\frac{2T_1 T_2}{T_1 \pm T_2}$ ('+' is used when trains are moving in opposite directions and '-' is used when trains are moving in same direction)

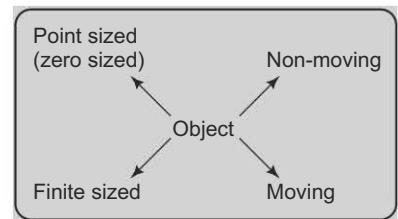


Figure 2

Example 10: Two trains A and B start from Bandra to Chennai and Chennai to Bandra, respectively. After passing each other, A reaches Chennai in 4 hours and B reaches Bandra in 9 hours. If speed of A is 120 km/h, find the speed of B ?

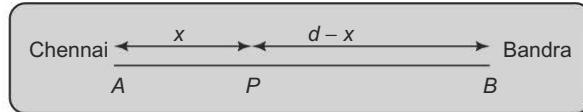


Figure 3

Solution: Let the distance be ‘ d ’ km

Let P be the meeting point.

In going from A to P and B to P time taken is same

$$\frac{x}{S_a} = \frac{d-x}{S_b}$$

$$S_a = 120 \text{ km/h}$$

$$S_b = \frac{120}{x} (d-x) \quad (\text{i})$$

$$d-x = S_a \times 4 = 120 \times 4 = 480 \quad (\text{ii})$$

$$x = S_b \times 9 \quad (\text{iii})$$

$$\frac{x}{9} = \frac{480 \times 120}{x}$$

$$x^2 = 9 \times 120 \times (120 \times 4)$$

$$x = 3 \times 120 \times 2 = 720$$

$$d = 1200 \text{ km}, S_b = x/9 = 720/9 = 80 \text{ km/h}$$

Shortcut Method

$$\text{Speed of train } B = S_a \sqrt{\frac{T_1}{T_2}} = 120 \sqrt{\frac{4}{9}} = 120 \times 2/3 = 80 \text{ km/h}$$

Example 11: If two trains of the same length cross a pole in 10 s and 20 s, find the time taken to cross each other, if they are moving in the same direction.

Solution : Let distance be d km

$$\text{Speed of train } A = \frac{d}{10} \text{ km/s}$$

$$\text{Speed of train } B = \frac{d}{20} \text{ km/s}$$

$$\text{Relative Speed} = \left(\frac{d}{10} - \frac{d}{20} \right) = \frac{10d}{200} \text{ km/s}$$

$$\text{Relative distance} = 2d$$

$$\text{Time to cross} = \frac{2d}{10d} \times 200 = 40 \text{ s}$$

Shortcut Method

Time taken is $\frac{2T_1 T_2}{T_1 - T_2}$

$$= \frac{2 \times 20 \times 10}{20 - 10} = 40 \text{ s}$$

4.6 Boats

The problems on boats are related to motion of an object with or against an external force that affects the speed of the object. The size of the object under consideration is negligible in comparison to the object causing this natural force. Let us suppose, a boat is rowing in a stream at a speed of 20 km/h. However, since the stream itself is flowing and has a much larger size than the boat, there will be a change in speed of boat because of the flow of stream.

Analysing the mathematics behind, assuming boat's original speed to be u , and speed of stream be v .

If the boat is flowing with the direction of stream flow, we call this motion as downstream motion, and its speed will increase.

$$S_{\text{downstream}} = u + v$$

If the boat is flowing against the direction of stream flow, we call this motion as upstream motion, and its speed will decrease.

$$S_{\text{upstream}} = u - v$$

With the help of these two equations, all the problems of boats and streams can be solved. Let us go through an example.

Example 12: If a boat covers 40 km upstream and comes back the same distance downstream, it takes a total of 6 hours. If the speed of river is 5 km/h, what is the original speed of boat in still water?

Solution: Let the speed of boat in still water = u km/h

$$\text{Speed of river} = v = 5 \text{ km/h}$$

$$\text{Upstream speed} = u - v = u - 5$$

$$\text{Downstream speed} = u + v = u + 5$$

Total time taken = time in upstream motion + time in downstream motion

$$6 = 40/(u - 5) + 40/(u + 5)$$

$$\text{Solving, } u = 15 \text{ km/h}$$

4.7 Races

This is yet another very important concept. In any form of race, two or more participants are involved and time in which any participant completes a race depends upon the speed of the participant.

Concept of giving a start: In a 100 metre race, A gives B a start of 10 metre so what does that mean. This means that when A runs 100 metre (complete length of race course) in same time B runs only 100 metre – 10 metre = 90 metre.

Distance travelled by B = Length of race course – Start given to B by A .

Races are of two types:

- (i) Linear Races (ii) Circular Races

4.7.1 Linear Races

When it is said that A gives B a start of 10 metre in a 100 metre race, this can be explained in two ways:

(i) It is assumed that B starts the race 10 metre ahead of A such that both A and B reach at the finishing line at same point of time.

(ii) If A and B both start the race from same point so when A finishes the race B is still 10 metre away from finishing line.

- Winner's distance = Length of track
- Loser's distance = Winner's distance – (beat distance + start distance)
- If a race ends in a dead heat, i.e., both reach the winning post together then beat time = 0 and beat distance = 0.
- So, $\frac{\text{Speed of } A}{\text{Speed of } B} = \frac{\text{Distance covered by } A}{\text{Distance covered by } B}$

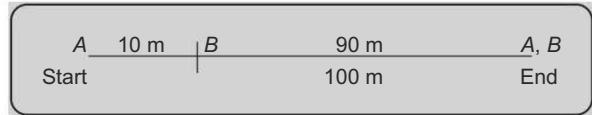


Figure 4

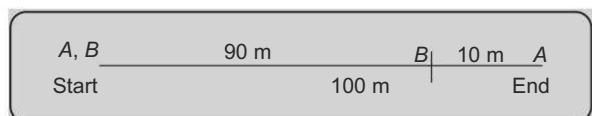


Figure 5

Example 13: In a 2 km race, Raman beats Chaman by 30 metres or 6 seconds. What is the time taken by Raman to complete the race?

Solution: Chaman runs 30 metres in 6 seconds.

$$\text{Time taken to cover the whole course by Chaman} = (6 / 30) \times 2000 = 400 \text{ seconds.}$$

$$\Rightarrow \text{Time taken by Raman to complete the race} = (400 - 6) \text{ seconds} = 394 \text{ seconds} \\ = 6 \text{ minutes } 34 \text{ seconds.}$$

Example 14: A , B and C are three contestants in a km race. If A can give B a start of 200 metres and B can give C a start of 200 metres. How many metres start can A give C ?

$$\text{Solution: } \frac{\text{Speed of } A}{\text{Speed of } B} = \frac{1000}{800} \quad (i)$$

$$\frac{\text{Speed of } B}{\text{Speed of } C} = \frac{1000}{800} \quad (ii)$$

By multiplying equation (i) and (ii)

$$\frac{\text{Speed of } A}{\text{Speed of } B} \times \frac{\text{Speed of } B}{\text{Speed of } C} = \frac{1000}{800} \times \frac{1000}{800} = \frac{1000}{640}$$

$$\frac{\text{Speed of } A}{\text{Speed of } C} = \frac{1000}{640}, \text{ So } A \text{ gives } C \text{ a start of } 360 \text{ metres.}$$

4.7.2 Circular Races

In a circular race, the race course is circular. Suppose the length of track is L metres and there are two opponents A and B . There can be two cases:

- When they run in same direction

Time after which A and B meet for first time = $L / |\text{Speed of } A - \text{Speed of } B|$

A will only meet B when A travels an extra track length that is

Distance travelled by A = Distance travelled by $B + L$

- When they run in opposite direction

Time after which A and B meet for first time = $L / (\text{Speed of } A + \text{Speed of } B)$

For example if A overtakes B in the middle of the 4th round implies that when A has completed $3\frac{1}{2}$ rounds, B has completed $2\frac{1}{2}$ rounds.

$$\text{So, } \frac{\text{Speed of } A}{\text{Speed of } B} = 3\frac{1}{2} / 2\frac{1}{2} = 7:5$$

Example 15: A , B and C run on a circular track of length 600 m in the same direction from the same point simultaneously. Speed of A is 3 m/s, B moves at 5 m/s and C at 6 m/s. When will they all meet?

Solution: Time after which A meets B , $t_1 = 600/(5 - 3) = 300$ seconds

Time after which B meets C , $t_2 = 600/(6 - 5) = 600$ seconds

Time after A , B and C meet = $\text{LCM}(t_1, t_2) = \text{LCM}(300, 600) = 600$ seconds or 10 mins.

Exercise 4.1

- A person crosses a platform of length 240 m in 2 minutes. What is the speed of the person?
 - 180 m/s
 - 2 m/s
 - 3 m/s
 - 60 m/min
- Two boys are running in a ground. The ratio of their speeds is 7 : 8. If the second boy runs 32 km in 2 hours, then the speed of the first boy is:
 - 12 km/h
 - 17.5 km/h
 - 15 km/h
 - 14 km/h
- In covering a distance of 240 km, Rahul takes 2 hours more than Ram. If Rahul doubles his speed, then he would take 1 hour less than Ram. Rahul's speed is:
 - 50 km/h
 - 40 km/h
 - 60 km/h
 - 30 km/h
- Amit is travelling from Chandigarh to Shimla. For the first 2 hours of his journey he travels at 60 mph speed and for the remaining 3 hours at 80 mph speed. What is the average speed of Amit throughout the travel in mph?
 - 68 mph
 - 66 mph
 - 72 mph
 - 76 mph
- A lady has travelled for 5 hours. She covered the first half of her journey at a speed of 40 km/h and second half at 60 km/h. Find her total journey in km.
 - 200 km
 - 230 km
 - 240 km
 - 234 km

6. Ashok travels from city A to B at a speed of 80 mph and then returns from B to A at a speed of 120 mph. What is his average speed over the entire journey?
1. 100 mph
 2. 94 mph
 3. 104 mph
 4. 96 mph
7. During a journey of 160 km a car covers first 120 km with a speed of 80 km/h and completes the remaining distance with a speed of 40 km/h. What is the average speed of the car during the whole journey?
1. 64 km/h
 2. 60 km/h
 3. 72 km/h
 4. 80 km/h
8. A train travelling at 100 kmph leaves behind a truck travelling at 64 kmph in $\frac{4}{3}$ of a minute. How long is the train in metres?
1. 200 m
 2. 400 m
 3. 600 m
 4. 800 m
9. In a 2000 m race P and Q take 20 minutes and 25 minutes, respectively. How far is Q from the finishing line when P finishes the race?
1. 500 m
 2. 120 m
 3. 300 m
 4. 400 m
10. A stunt man on a Yamaha bike attached with a truck travelling at 72 kmph jumps across the platforms during his flying stunt in 30 seconds and a marking pole on starting platform in 18 seconds. What is the distance between the two platforms?
1. 240
 2. 360
 3. 480
 4. 520
11. A train of length 300 m, takes 20 s to pass another train 200 m long coming from the opposite direction. If the speed of the first train be 60 km/h, the speed of the second train is
1. 54 km/h
 2. 30 km/h
 3. 72 km/h
 4. 36 km/h
12. A journey of 300 km between two cities takes 1 hour less by train than by car. If the average speed of travel by car is 10 km/h less than the speed of the train, the average speed of the train is:
1. 60 km/h
 2. 50 km/h
 3. 40 km/h
 4. 80 km/h
13. A person rows 2 km down the stream in 20 minutes and upstream in 30 minutes. Find the speed of the stream.
1. 1 km/h
 2. 2 km/h
 3. 3 km/h
 4. 4 km/h
14. On a normal day, wind is blowing in the sky at a constant speed of 60 km/h. An airplane which can travel at 300 km/h in still air takes a total time of 2 h for a journey when travelling against the wind. How long will it take for the return journey with the wind?
1. 105 minutes
 2. 80 minutes
 3. 90 minutes
 4. 120 minutes
15. Walking from home to office at $\frac{3}{4}$ th of his usual speed, Ramesh reaches his office 30 minutes late. How long does Ramesh usually take to reach his office from home?
1. 45 minutes
 2. 75 minutes
 3. 90 minutes
 4. 120 minutes

Exercise 4.2

1. Geeta and Mala start running at 3 m/s and 4 m/s, respectively on a circular track from the same point but in opposite directions. If the circumference of the track is 360 metres after what time will they meet at the starting point?
 1. 360 s
 2. 100 s
 3. 300 s
 4. 200 s
2. A car travels its journey from point P to Q . It arrives at Q , 20 minutes early when its speed is 50 km/h, and 40 minutes late when its speed is 30 km/h. What is the distance between the points P and Q ?
 1. 40 km
 2. 75 km
 3. 60 km
 4. 70 km

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3. A boat goes 12 km upstream and 12 km downstream in 5 hours. It goes 16 km upstream and 6 km downstream also in 5 hours. The speed of the stream:
1. 1 km/h 2. 8 km/h 3. 2 km/h 4. 6 km/h
4. Two trains start at the same time from stations *A* and *B*, respectively, which are 100 km apart. When they travel in the same direction, they meet in 5 hours and when they travel towards each other, they meet in 1 hour. The speeds of the two trains are:
1. 48 and 32 km/h 2. 70 and 10 km/h 3. 40 and 30 km/h 4. 60 and 40 km/h
5. *X*, *Y*, and *Z* are the three contestants in a km race. If *X* can give *Y* a start of 50 m and *X* can give *Z* a start of 69 m, how many metres start can *Y* give *Z*?
1. 40 m 2. 15 m 3. 20 m 4. 25 m
6. Alok and Bishnu ran a race which lasted a 3/2 minutes. Alok gives Bishnu a start of 8 metres and beat him by 2 m. Also, Alok runs 80 metres and Bishnu runs 78 m in the same amount of time. Find the length of the course.
1. 100 m 2. 500 m 3. 400 m 4. 600 m
7. Two women, Monica and Nancy, started walking towards each other simultaneously from places *P* and *Q* respectively which are 50 miles apart. They met after 5 hours. After their meeting, Monica reduced her speed by 2 miles/h and Nancy increased her speed by 2 miles/h. They arrived at *Q* and *P* respectively at the same time. Find their initial speeds.
1. $4\frac{1}{2}$ miles/h and $3\frac{1}{2}$ miles/h 2. 6 miles/h and 5 miles/h
3. 6 miles/h and 4 miles/h 4. $5\frac{1}{2}$ miles/h and $3\frac{1}{2}$ miles/h
8. A thief started running from a prison at a speed of 8 km/h. After 6 hours, the security realised it and started chasing the thief at 10 km/h. The security also had a dog which could run at 12 km/h. The dog would run to the thief and then return to the security and then would turn back towards the thief. It kept on doing so till the thief is caught. Find the total distance travelled by the dog.
1. 288 km 2. 160 km 3. 360 km 4. 300 km
9. A caterpillar climbs up 3 feet on a stone pillar in one day and falls down 2 feet on the second day and so on. On which day will it climb to the top if the pillar is 10 feet tall.
1. 20th day 2. 14th day 3. 16th day 4. 15th day
10. A man walks from his home to office every day. One day he notices that if he walks at 4 km/h, he reaches the office 10 min earlier than the scheduled time. However if he walks at 3 km/h, he reaches the office 10 min late. Find the distance between his home and office.
1. 6 km 2. 4.5 km 3. 4 km 4. 3 km
11. Vijay and Shiv start simultaneously from the opposite ends of a pool which is 100 m long. They pass each other, reach the respective ends and immediately turn back. Now they meet at a distance of 30 m from where Vijay started, 10 s after the start. Find the speed of Shiv.
1. 13 m/s 2. 15 m/s 3. 8.5 m/s 4. 12 m/s
12. Poonam and Rashmi start from *P* and *Q* respectively at the same time toward each other. They meet at a distance of 120 m from *P* at a point *T*. If Poonam and Rashmi take 45 s and 20 s to reach their respective destinations from *T*, then what is the distance between *P* and *Q*?
1. 214 m 2. 220 m 3. 240 m 4. 300 m

13. Two cars run from points *A* and *B* at the same time and proceed towards each other at 60 km/h and 85 km/h, respectively. When they meet, it is found that one has travelled 150 km more than the other. Find the distance between *A* and *B*.
1. 210 km 2. 2,000 km 3. 870 km 4. None of these
14. Two cars were driven by *A* and *B*. They were 600 miles apart and they drove towards each other. *A*'s car had travelled 20 mph, 5 h per day for 4 days, when it had met *B*'s car. If *B* had driven 2 h a day for 4 days, what was *B*'s speed?
1. 18 mph 2. 30 mph 3. 15 mph 4. 25 mph
15. A thief ran from a jail. The policeman starts chasing him on foot but the thief is already 120 m ahead. The time in which the thief takes 10 steps the policeman takes only 6 steps. In one step the thief covers 1.5 m while the policeman covers 3 m. In how many steps would the policeman catch up the thief?
1. 240 2. 200 3. 150 4. 250

 **Answer Key**
Exercise 4.1

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. 2 | 2. 4 | 3. 2 | 4. 3 | 5. 3 | 6. 4 |
| 7. 1 | 8. 4 | 9. 4 | 10. 1 | 11. 2 | 12. 1 |
| 13. 1 | 14. 2 | 15. 3 | | | |

Exercise 4.2

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. 1 | 2. 2 | 3. 1 | 4. 4 | 5. 3 | 6. 3 |
| 7. 3 | 8. 1 | 9. 4 | 10. 3 | 11. 1 | 12. 4 |
| 13. 3 | 14. 4 | 15. 1 | | | |

 **Explanatory Answers**
Exercise 4.1

3. Let the speed of Rahul and Ram be R_h and R_m respectively.

Total distance = 240 km

We know that, time = distance/speed

We are given, Time taken by Rahul – Time taken by Ram = 2

According to the question, $(240/R_h) - (240/R_m) = 2$

$$120R_m - 120R_h = R_h \times R_m \quad (1)$$

We are given, Time taken by Ram – Time taken by Rahul (when his speed is double) = 1

According to the question, $(240/R_m) - (240/2R_h) = 1$

$$240R_h - 120R_m = R_h \times R_m \quad (2)$$

Equating (1) and (2), we get,

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$$2Rm = 3Rh \quad (3)$$

Substituting (3) in (1)

We get speed of Rahul = 40 km/h.

Ans 2

4. Average speed = Total distance/ Total time taken

$$= (S_1 T_1 + S_2 T_2) / \text{Time}$$

$$= \{(2 \times 60) + (3 \times 80)\}/5$$

$$= 72 \text{ mph.}$$

Ans 3

5. Let the total distance = D km

$$\text{Total time} = 5 \text{ hours} = (d_1/s_1) + (d_2/s_2)$$

$$5 = \frac{D/2}{40} + \frac{D/2}{60}$$

Solving this, we get, $D = 240$ km.

Ans 3

6. Let the total distance be AB

$$\text{Average speed} = \text{Total distance}/\text{Total time taken}$$

$$= 2 AB / \{(AB/80) + (AB/120)\}$$

$$= 96 \text{ km/h.}$$

Ans 4

9. Let the speeds of P and Q be P and Q respectively

Since both travel 2000 m in the first case, distance remains the same

$$\text{Speed of } Q = 2000/25 = 80 \text{ m/min}$$

$$\text{Distance travelled } Q = 80 \times \text{Time taken by } P = 80 \times 20 = 1600 \text{ m.}$$

Q is 400 m behind P .

Ans 4

10. Speed of bike = 72 km/h = $72 \times (1000/3600)$ m/s = $72 \times (5/18)$ m/s = 20 m/s

Let the length of the bike is L and the distance between two platforms is P

When the bike jumps across the platform, it covers a total distance of $L + P$

$$D = S \times T$$

$$L + P = 20 \times 30 = 600 \quad (1)$$

When the bike crosses the marking pole, it covers a total distance equal to its own length = L

$$L = 20 \times 18 = 360 \quad (2)$$

Subtracting (2) from (1), we get

$$P = 240 \text{ m.}$$

Ans 1

11. This is a concept of relative speed

Let the speeds of two trains be V_1 and V_2

Relative distance = total length of the two trains = $300 + 200 = 500$ m

Relative speed = relative distance / time

$$V_{\text{rel}} = 500/20 = 25 \text{ m/s}$$

$$= 25 \times (3600/1000) \text{ km/h} = 90 \text{ km/h}$$

Since the trains are travelling in opposite directions, $V_{\text{rel}} = V_1 + V_2$

$$90 = 60 + V_2$$

$$V_2 = 30 \text{ km/h.}$$

Ans 2

13. Let the speed of the boat is B and that of the stream is S

$$\text{Upstream} = U = B - S \quad (1)$$

$$\text{Downstream} = D = B + S \quad (2)$$

Time taken rowing downstream = 20 minutes = $20/60$ hours = $1/3$ hours

Distance = speed \times time

$$\text{Downstream} = 2/(1/3) = 6 \text{ km/h}$$

Time taken rowing upstream = 30 minutes = $30/60$ hours = $1/2$ hours

$$\text{Upstream Speed} = 2/(1/2) = 4 \text{ km/h}$$

From (1) and (2), we have

$$B - S = 4$$

$$B + S = 6$$

Solving these two equations we get,

$$S = 1 \text{ km/h.}$$

Ans 1

14. $A = 300 \text{ km/h}$

$$W = 60 \text{ km/h}$$

Upstream (when airplane is travelling against the wind) = $U = 300 - 60 = 240 \text{ km/h}$

Downstream (when airplane is travelling with the wind) = $D = 300 + 60 = 360 \text{ km/h}$

When going upstream,

Total distance = speed \times time

$$= 240 \times 2 = 480 \text{ km}$$

When going downstream,

Distance is same, i.e. 480 km and speed is 360 km/h

$$\text{Time} = \text{distance/speed} = 480/360 = 4/3 \text{ hours} = (4/3) \times 60 \text{ minutes} = 80 \text{ minutes.}$$

Ans 2

15. Let the usual time taken is T and the normal speed be S

$$T = D/S \quad (1)$$

Now, the speed changes to $S' = (3/4)S$

$$\text{New time} = T' = D/S' = D/(3S/4) = 4D/3S \quad (2)$$

We are given that $T' - T = 30$

From equations (1) and (2)

$$(4D/3S) - (D/S) = 30$$

$$\text{Or } D/3S = 30$$

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$$(1/3)(D/S) = (1/3) T = 30$$

$$T = 30 \times 3 = 90 \text{ minutes.}$$

Ans 3

Exercise 4.2

1. Time after which Geeta reaches back the starting point, i.e., completes one round of the circular track
= distance/speed

$$T_1 = 360/3 \text{ seconds} = 120$$

Time after which Mala reaches back the starting point

$$T_2 = 360/4 \text{ seconds} = 90$$

Time at which both reach together will be the LCM of T_1 and T_2

LCM (120, 90) = 360 (LCM of fractions = LCM of numerator/ HCF of denominator)

Hence, they meet at starting point after 360 seconds.

Ans 1

2. Let the actual time be T and distance between P and Q is D

We know, time = distance / speed

$$D/50 = T - (20/60) \quad (1)$$

$$D/30 = T + (40/60) \quad (2)$$

Solving equations (1) and (2)

$$D = 75 \text{ km.}$$

Ans 2

3. Let the speed upstream = U and downstream = D

$$5 = (12/U) + (12/D) \quad (1)$$

$$5 = (16/U) + (6/D) \quad (2)$$

Let $1/U = X$ and $1/D = Y$

Equation (1) and (2) become

$$5 = 12X + 12Y$$

$$5 = 16X + 6Y$$

Now solving the two equations we get,

$$X = 1/4 \text{ and } Y = 1/6$$

i.e. $U = 4 \text{ km/h}$ and $D = 6 \text{ km/h}$

Let speed of boat = B and speed of stream = S

$$U = B - S = 4$$

$$D = B + S = 6$$

Solving these two equations we get $S = 1 \text{ km/h.}$

Ans 1

4. Relative distance = 100 km

When they travel in same direction relative speed = $V_1 - V_2$

When they travel in opposite directions relative speed = $V_1 + V_2$

Speed = distance/time

$$V_1 - V_2 = 100/5 = 20 \quad (1)$$

$$V_1 + V_2 = 100/1 = 100 \quad (2)$$

Solving equations (1) and (2)

$$V_1 = 60 \text{ km/h and } V_2 = 40 \text{ km/h.}$$

Ans 4

5. According to the question when X runs 1000 m Y runs 950 m

Also, when X runs 1000 m, Z runs 931 m

From the two statements we can see that when Y runs 950 m, Z runs 931 m

So, when Y runs 1000 m, Z runs $= (931/950) \times 1000 = 980$ m

So, Y can give Z a start of $1000 - 980 = 20$ m for the race.

Ans 3

6. Let the speed of Alok = A and Bishnu = B

$$\text{Total time} = 3/2 \text{ minutes} = (3/2) \times 60 = 90 \text{ seconds}$$

We are given, Alok runs 80 m and Bishnu runs 78 m in the same time

$$\text{i.e. } 80/A = 78/B$$

$$\text{or } A/B = 40/39 \quad (1)$$

Let the length of the course = D

The time in which Alok covers D distance, Bishnu will cover $D - 8 - 2 = D - 10$

$$\text{So, } D/A = (D - 10)/B$$

Substituting the value of A/B from equation (1) we get, $D = 400$ m.

Ans 3

7. This question can be solved with the help of options.

Let the initial speed of Monica and Nancy be M and N respectively.

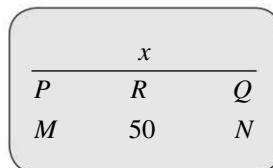


Figure 6

$$\text{Relative Speed} = 50/5 = 10 \text{ km/h}$$

$$\text{So option 3 has sum of speeds} = 10 \text{ km/h.}$$

Ans 3

8. The thief runs in 6 hours a distance of $8 \times 6 = 48$ km and reaches say a point P

After 6 hours let the security catch the thief at a distance x from point P

$$\text{Time taken by police to catch thief} = 48/(10 - 8) = 24\text{h}$$

So distance covered by dog = $24 \times 12 = 288$ km. (Since the dog keeps running for 24 hours at a constant speed irrespective of the direction)

Ans 1

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9. The caterpillar climbs a net of $3 - 2 = 1$ feet in two days. So, it should reach the top in 20 days at that pace. But after 14 days it will have climbed 7 feet and on the 15th day it will reach the top and not fall back. So answer is 15th day. **Ans 4**

10. Let the usual time taken by the man = T

The distance remains the same, so equating the distance in both the cases:

$$4(T - 10/60) = 3(T + 10/60)$$

$$T = 7/6 \text{ hours}$$

$$\text{So distance} = 4(T - 10/60) = 4(7/6 - 1/6) = 4 \text{ km.}$$

Ans 3

- 11.

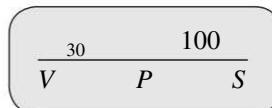


Figure 7

$$\text{Distance travelled by Shiv} = 100 + 30 = 130 \text{ m}$$

$$\text{Time taken} = 10 \text{ s}$$

$$\text{Speed of Shiv} = 130/10 = 13 \text{ m/s.}$$

Ans 1

- 12.

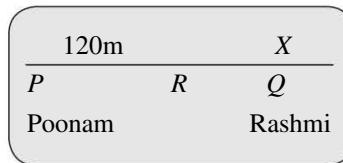


Figure 8

After crossing each other

$$\text{Speed of Rashmi} = 120/20 = 6 \text{ m/s}$$

$$\text{Speed of Poonam} = x/45 \text{ m/s}$$

Before crossing each other

Time taken by Poonam to reach T is same as that taken by Rashmi

$$120/(x/45) = x/6$$

$$X = 180 \text{ m.}$$

$$\text{So total distance} = 180 + 120 = 300 \text{ m.}$$

Ans 4

13. Let the distance travelled by one car is x , the distance by the faster car is $x + 180$

According to the question,

$$x/60 = (x + 150)/85$$

$$x = 360$$

$$\text{total distance} = (x) + (x + 180)$$

= 870 km.

Ans 3

14. Speed of $A = 20 \text{ mph}$

Time = 4 days \times 5 hours/day = 20 hours

Distance covered by $A = 20 \times 20 = 400 \text{ miles}$

Distance covered by $B = 600 - 400 = 200 \text{ miles}$

Time taken by $B = 4 \text{ days} \times 2 \text{ hours/day} = 8 \text{ hours}$

Speed of $B = 200/8 = 25 \text{ mph.}$

Ans 4

15. Let the speed of policeman be P and thief be T

The time in which the thief takes 10 steps = 15 m, the policeman takes 6 steps = 18 m

i.e. $P/T = 15/18$

Let the police catches the thief at a distance of x metres from where thief started

When policeman catches the thief,

$$x/15 = (120 + x)/18$$

$$x = 600 \text{ m}$$

Total distance covered by policeman = $600 + 120 = 720 \text{ m}$

Number of steps = $720/3 = 240.$

Ans 1

Chapter 5

Time and Work

5.1 Chain Rule

Let us list some examples, where some kind of work is being done. For example, 5 monkeys eat 5 bananas in 5 days, 18 workers build a 24 km long road in 2 months and 12 boys along with 15 girls type 15 books in 5 days. If we analyse each of these examples closely, we find that each of them has three attributes, which can be represented in a quantitative form. These are given below:

1. How many workers are there?
2. How much work is being done?
3. How much time does it take?

Let us discuss the first example in detail. Here, the monkeys signify workers and they are 5 in number. Work that is being done is eating bananas and 5 bananas are being eaten by them. Time taken to do this activity is 5 days.

Let us see what happens if we change values of some of them.

Table 1

No of workers (n)	Amount work (w)	Time taken (t)	Changes	Result
Constant	↑ Proportional	Directly ↑ Proportional	If amount of work is increased/ decreased, time taken will increase/decrease accordingly	$W \propto t$
	↑ Inversely proportional	Constant ↓	For same amount of work, increasing/decreasing no. of workers will decrease/increase the time taken	$n \propto \frac{1}{t}$
↑ Proportional	Directly ↑	Constant	In same time, the amount of work done increases/decreases when no of workers increases/ decreases	$w \propto n$

Combining the results together,
 $w \propto t$, $n \propto 1/t$ and $w \propto n$, we get
 $nt \propto w$

The above equation is the basic equation of chain rule. If one of the three quantities is kept constant, the change in second quantity can be calculated if change in third quantity is known.

5.2 Generalizing the Chain Rule to Analyse Work

To convert this proportionality equation into an equality equation, we need to introduce a constant of proportionality.

$$n \times e \times t = w \quad (1)$$

where e is the efficiency.

So from this, we drive principle of work equivalence, which states if n_1 people having an efficiency e_1 and working for t_1 days complete a certain work w_1 , then under similar conditions it is proportional to n_2 people having an efficiency e_2 and working for t_2 days complete a certain work w_2 .

$$\frac{n_1 \times e_1 \times t_1}{w_1} = \frac{n_2 \times e_2 \times t_2}{w_2} \quad (2)$$

By definition, efficiency is the amount of work done by one worker of a particular type in one unit time.

All the questions of work and pipes can be solved using the formula (1), but for that one needs to have a clear understanding of each of the terms in the formula.

Let us consider each of the terms one by one. If a work is being done,

- (a) There may be only one type of worker doing that job. For example: 5 men dig a well in 4 days.
- (b) There may be more than one type of workers involved. For example: 12 boys and 30 girls type 5 books in 5 hours; 3 monkeys, 5 men and 6 women eat 95 bananas in 10 minutes.

For the cases involving more than one type of workers, the general formula should be used.

$$n_1e_1t_1 + n_2e_2t_2 + n_3e_3t_3 + \dots = w \text{ (where each of the terms on the LHS stand for each of the worker type)}$$

If we use this formula for one type of worker, it becomes $n \times e \times t = w$, i.e., formula (1) only.

The value of n , number of workers can easily be made out from the statement, or it may be the variable whose value is asked in the question.

For e.g., in statement (a) $n = 5$

in statement (b), $n_1 = 12$, $n_2 = 30$; $n_1 = 3$, $n_2 = 5$, $n_3 = 6$

Efficiency, e , is a term which is a little complex to understand. If we look at its definition once again, we can note down some key points.

Efficiency is the amount of work done by one worker of a particular type in one unit time.

Efficiency is always a property of one particular type of worker. It will be different for different types of workers like man, woman, child, monkey, boy, cat, etc.

Efficiency is always the property of one worker and not a group of workers.

For e.g., in statement a) 5 men dig a well in 4 days.

In one unit time, i.e. one day, they will dig one fourth of the wall. But this $1/4$ is not the efficiency of a man. Because this $1/4$ of well is dig by 5 men in one day. One man will dig $(1/5) \times (1/4)$ of well, i.e. $1/20$ of the well, this is the work done by one man in one day. So, the efficiency will be $1/20$.

Example 1: 6 girls complete 18 sketches in 3 days. What is the efficiency of a girl?

Solution: In 3 days, 6 girls complete 18 sketches.

In 1 day, 6 girls complete 6 sketches.

In 1 day, 1 girl completes 1 sketch.

Efficiency, $e = 1$

Alternately, as we said, all questions can be done using formula (1) or (2). Here, we have only one type of worker. So, formula (1) should be used.

$$\text{net} = w$$

$$6 \times e \times 3 = 18$$

$$e = 1$$

Example 2: Two boys and 3 girls eat 24 apples in 6 days. Two boys and 6 girls eat 24 apples in 4 days. Find the efficiency for each of them.

Solution: Here, we have more than one type of workers. So, formula (2) should be used.

$$n_1 e_1 t_1 + n_2 e_2 t_2 = w$$

$$2 \times e_b \times 6 + 3 \times e_g \times 6 = 24$$

$$2e_b + 3e_g = 4 \quad (i)$$

$$2 \times e_b \times 4 + 6 \times e_g \times 4 = 24$$

$$4e_b + 12e_g = 12$$

$$e_b + 3e_g = 3 \quad (ii)$$

Solving (i) and (ii)

Efficiency of boy, $e_b = 1$

Efficiency of girl, $e_g = 2/3$

If a statement like, A completes a work in 3 days, is given, efficiency of A can immediately be taken as $1/3$.

For example, a pipe fills a tank in 15 minutes.

Efficiency of pipe = $1/15$

A man can build a wall but he can also break the wall. A pipe can fill or it can empty the tank. A tank can be emptied by a leakage as well. The idea is to understand that there can be constructive as well as destructive work.

For destructive works like breaking the wall, emptying the tank, etc., the efficiency is negative.

For example; a leakage empties a tank in 18 minutes.

Efficiency of leakage = $-1/18$

The time taken, t , for a work can also be easily figured out from the problem statement. If two or more type of workers are working together throughout, the time taken by both of them will be same. But if one or more of them stops working in between or they do not start together, we will have to consider their times individually. Also, the unit of time that you take has to be kept same throughout the question; else you may get a wrong answer.

Example 3: A can type 48 pages in 8 minutes. B can type 48 pages in 12 minutes. If both start typing 48 pages together, when should A stop typing so that all the work gets finished in 5 minutes.

Solution: Suppose A stops typing after X minutes. To get efficiency of A ,

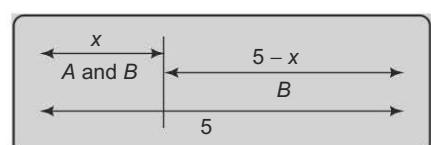


Figure 1

$$\text{Net} = w \Rightarrow 1 \times e_A \times 8 = 48 \Rightarrow e_A = 6$$

To get efficiency of B ,

$$1 \times e_B \times 12 = 48 \Rightarrow e_B = 4$$

For the first x minutes, both A and B are typing. For the remaining $5 - x$ minutes, only B types. A types for x minutes and B types for all 5 minutes. Hence, we have more than one type of workers working together.

$$n_A e_A t_A + n_B e_B t_B = w$$

$$1 \times 6 \times X + 1 \times 4 \times 5 = 48$$

Solving, $X = 14/3$ minutes

So, A should stop typing pages after $14/3$ minutes or 4 minutes 40 seconds.

Shortcut Method

A 's 1 min work = $48/8 = 6$ pages

B 's 1 min work = $48/12 = 4$ pages

B works for complete 5 mins, so work done by B in 5 mins = $4 \times 5 = 20$ pages.

Work left = $48 - 20 = 28$.

This work is to be done by A . So time taken by $A = 28/6 = 14/3$ mins.

So, A should stop typing pages after $14/3$ minutes or 4 minutes 40 seconds.

* The amount of work done, w , can be represented as an exact or as an abstract value both. Let us see the difference between two.

Ram writes 300 pages in 6 hours. $\Rightarrow w = 300$

6 boys lift 20 boxes in 10 minutes. $\Rightarrow w = 20$

Here, the amount of work is exact.

There two statements could have been stated differently as.

Raman writes a notebook in 15 hours.

6 boys lift some boxes in 10 minutes.

Here, the amount of work is given but not as an exact value. In such cases, we should take $w = 1$.

* In case of problems relating to pipes.

Efficiency of pipe \propto area of pipe

So, if the area of pipe is made four times, efficiency will also become 4 times, or if area is made half, efficiency becomes half, and so on.

Example 4: 24 boys working at 8 hours a day can finish a work in 10 days. Working at the rate of 10 hours per day, the number of boys required to finish the same work in 12 days is,

Solution: Here, we have only one type of worker.

$$\text{net} = w$$

for first case,

$$n = 24, t = (10 \times 8) = 80 \text{ hours}, 24 \times e \times 80 = 1 \quad (1)$$

for second case

$$t = (10 \times 12) = 120 \text{ hours}, n \times e \times 120 = 1 \quad (2)$$

Divide (2) by (1)

$$(n/24) \times (120/80) = 1, n = 16 \text{ boys}$$

Example 5: 9 men complete a work in 13.5 days. After working for 4.5 days, 3 men joined them. How many days will all of them take to complete the remaining work?

1. 7.5 days 2. 6.75 days 3. 6 days 4. 9 days

Solution: Work done in 13.5 days = 1, then work done in 4.5 days = $1/3$.

$$\text{So, work left} = 1 - 1/3 = 2/3$$

Initially manpower = 9, after 4.5 days manpower = 12.

Efficiency in both the cases same, so $e_1 = e_2$

$$n_1 = 9, t_1 = 4.5, w_1 = 1/3$$

$$n_2 = 12, w_2 = 2/3$$

Using principal of work equivalence

$$\frac{n_1 \times e_1 \times t_1}{w_1} = \frac{n_2 \times e_2 \times t_2}{w_2} \Rightarrow \frac{9 \times e_1 \times 4.5}{1/3} = \frac{12 \times e_2 \times t_2}{2/3}, \text{ So } t_2 = 6.75 \text{ days.}$$

Example 6: 2 pipes M and N can fill a cistern in 48 mins and 64 mins, respectively. If both the pipes are opened together, then after how many minutes should N be closed, so that the tank is full in 36 minutes?

1. 16 2. 18 3. 10 4. 12

Solution: M 's 1 min work = $1/48$, N 's 1 min work = $1/64$.

M works for complete 36 mins, so work done by $M = 36 \times 1/48 = 3/4$

Work left = $1 - 3/4 = 1/4$. This work is to be done by N .

So, time taken by $N = (1/4)/(1/64) = 16$ mins.

Example 7: 2 pipes X and Y can fill a tank in 20 and 30 h respectively, and Z can empty it in 15 hours. If the three pipes are opened and closed one after the other successively for 1 h each in that order, how soon will the tank fill?

1. 160 h 2. 165 h 3. 167 h 4. 170 h

Solution: Let efficiencies of pipes X , Y and Z be e_X , e_Y and e_Z , respectively.

$$e_X = 1/20, e_Y = 1/30, e_Z = -1/15$$

Table 2

Pipe that is open	Hours
X	1 st
Y	2 nd
Z	3 rd
X	4 th
Y	5 th
Z	6 th

The three pipes are opened and closed one after the other successively for 1 h.

After every three hours, the cycle repeats itself. The work done in one cycle, i.e., 3 hours = Work done by X in one hour + Work done by Y in one hour + work done by Z in one hour
 $= (1/20) + (1/30) - (1/15) = 1/60$

Taking each option one by one and considering the work done in that time.

$$1. 160 \text{ hours} = 53 \times 3 + 1$$

$$= 53 \text{ cycles} + X \text{ works for one hour}$$

$$\text{Work done} = 53 \times (1/60) + 1 \times (1/20) = 56/60 < 1$$

2. $165 \text{ hours} = 55 \times 3 + 0 = 55 \text{ cycles}$
 Work done $= 55 \times (1/60) = 55/60 < 1$
3. $167 \text{ hours} = 55 \times 3 + 2$
 $= 55 \text{ cycles} + X \text{ works for one hour} + Y \text{ works for one hour}$
 Work done $= 55 \times (1/60) + 1 \times (1/20) + 1 \times (1/30) = 60/60 = 1$
4. $170 \text{ hours} = 56 \times 3 + 2$
 $= 56 \text{ cycles} + X \text{ works for one hour} + Y \text{ works for one hour}$
 Work done $= 56 \times (1/60) + 1 \times (1/20) + 1 \times (1/30) = 61/60 > 1$

Example 8: A can complete certain work in 8 days, B completes same work in 12 days. They work together and complete that work and in the end they are paid Rs. 2500. Find share of A and B.

1. 1500, 1000 2. 1300, 1200 3. 1700, 800 4. 1400, 1100

Solution: A's one day work $= 1/8$, B's one day work $= 1/12$

Amount will be divided in ratio of their one day work $= 1/8 : 1/12 = 3 : 2$

So A's share $= 3/5 \times 2500 = \text{Rs. } 1500$

So B's share $= 2/5 \times 2500 = \text{Rs. } 1000$



Exercise 5.1

1. If 10 elephants take 30 min to eat a certain amount of food in a jungle, then how much time would 30 elephants take to eat the same amount of food?
 1. 2 min 2. 150 min 3. $50/3$ min 4. 10 min
2. 42 dogs can eat a camel meat in 12 days, eating 5 hours a day. In how many days will 30 dogs, eating 6 hours a day, finish the entire camel meat?
 1. 14 2. 13 3. 15 4. 16
3. 9 loggers can cut 9 trees in 9 days. At the same rate, how many trees would be cut by 12 loggers in 12 days?
 1. 20 2. 14 3. 12 4. 16
4. 15 men take 21 days working 4 h each to arrange a party. How many days if working 6 h a day would it take for 21 boys if 3 boys do as much work as 2 men?
 1. 15 2. 20 3. 19 4. 29
5. A, B and C can do a piece of work in 2, 3 and 5 days respectively. In how many days they can complete the work if they work together?
 1. 1 day 2. Less than 1 day
 3. More than 1 day 4. More than 2 days
6. A can do a work in 6 days and B in 8 days. If they work on it together for 2 days, then the fraction of the work that is left is:
 1. $5/12$ 2. $9/14$ 3. $7/12$ 4. $1/3$
7. A, B and C can do a piece of work in 4, 6 and 8 days respectively. A and C work for 2 days, then rest of the work is completed by B alone, so how much time (days) B takes to do so?
 1. 2 2. 4 3. $2/3$ 4. $3/2$

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8. A is 4 times as good a workman as B and therefore is able to finish a job in 30 days less than B . Working together, they can do it in:
1. 10 days 2. 12 days 3. 8 days 4. 16 days
9. A alone can do a piece of work in 6 days and B alone in 8 days. A and B undertook to do it for Rs. 5600. With the help of C , they completed the work in 3 days. How much is to be paid to C ?
1. 1200 2. 700 3. 1400 4. 1800

Questions 10 to 12: A and B can do a piece of work in 20 days, B and C can do the same work in 24 days, C and A can do it in 30 days.

10. In how many days A , B and C can complete the work working together?
1. 15 2. 6 3. 17 4. 16
11. In how many days, B will complete the work working alone?
1. $240/7$ days 2. $120/7$ days 3. $140/7$ days 4. $150/7$ days
12. In how many days, C will complete the work working alone?
1. 72 2. 24 3. 60 4. 80
13. With 80% full tank the vehicle travels 20 miles. If the distance travelled by the vehicle is inversely proportional to the fuel in the tank, what is the distance travelled by the vehicle when three-fifth of the fuel tank of the vehicle is empty?
1. 40 miles 2. 15 miles 3. 10 miles 4. 19.6 miles
14. Pipe A fills a tank in 20 minutes. Pipe B can empty 60 litres per minute. If it takes 1 h for the tank to get completely filled, if both pipes are opened, what is the capacity of tank in litres?
1. 1200 litres 2. 1500 litres 3. 1800 litres 4. 2100 litres
15. Four taps can fill a reservoir in 15, 20, 30 and 60 hours, respectively. The 1st was opened at 6 a.m., 2nd at 7 a.m., 3rd at 8 a.m. and 4th at 9 a.m. When will the reservoir be full?
1. 3 pm 2. 2 pm 3. 1 pm 4. 7 pm
16. A tank is fitted with 6 pipes, some fill the tank and others empty the tank. Each of the pipes that fill the tank can fill it in 6 hours, while each of those that empty the tank can empty it in 4 hours. If all the pipes are opened when the tank is full, it takes exactly 4 hours for the tank to empty. How many of these are pipes that fill that tank?
1. 2 2. 3 3. 4 4. 5
17. Pipe A fills a tank in 40 min, another pipe B fills the same tank in 30 min. A pipe at the bottom of the tank drains the tank in 20 mins. If pipe A is kept open for 1 minute and then closed and pipe B is kept open for 1 minute and then closed and then pipe C is kept open for 1 minute and then closed and the cycle repeated, how sooner will the empty tank overflow?
1. 360 min 2. 341 min 3. 120 min 4. none of these
18. Pipe A and B take 10 minutes and 40 minutes respectively to fill a tank while pipe C and D take 20 minutes and 50 minutes to empty the tank. After how long will the tank be completely filled if all the pipes are opened together?
1. $200/11$ minutes 2. 120 minutes 3. $160/7$ minutes 4. never gets filled
19. There are 3 pumps P , Q and R connected to a tank. Pump P and Q fill the tank while R takes out water from the tank. Q takes 10 hours more than P to fill the tank and the time taken by R to empty the tank is 20 hours more than the time taken by Q to fill the tank. When all the pumps are working together, it

takes 8 hours to fill the tank completely. How much time does Q takes to fill the tank; P and Q working together fill the tank?

- | | | | |
|---|---------------|-----------------|--------------|
| 1. 10 h, 5 h | 2. 15 h, 10 h | 3. 20 h, 20/3 h | 4. 30 h, 6 h |
| 20. Two taps A and B can fill a tank in 14 min and 21 min respectively. Both the taps are kept open for 4 min and then the tap A is turned off. In how many more minutes will the tank be filled? | | | |
| 1. 18.5 min | 2. 11 min | 3. 4.2 min | 4. 18 min |

Answer Key

Exercise 5.1

- | | | | | | |
|-------|-------|-------|-------|-------|--------|
| 1. 4 | 2. 1 | 3. 4 | 4. 1 | 5. 2 | 6. 1 |
| 7. 4 | 8. 3 | 9. 2 | 10. 4 | 11. 1 | 12. 4] |
| 13. 1 | 14. 3 | 15. 3 | 16. 2 | 17. 2 | 18. 1 |
| 19. 3 | 20. 2 | | | | |

Explanatory Answers

Exercise 5.1

- From the equation, $w = \text{net}$, we know that
 $n \propto 1/t$ which means $n \times t$ is constant (where n is number of elephants and t is time taken)
So, $10 \times 30 = 30 \times t$
 $t = 10$ min. Ans 4
- Work remains the same, so $n_1 \times r_1 \times t_1 = n_2 \times r_2 \times t_2$ (1)
In the first case, total time in hours will be 12×5 hours
In the second case, let the number of days is d
So, total time will be $d \times 6$ hours
So, equation (1) becomes $42 \times 5 \times 12 = 30 \times 6 \times d$
 $d = 14$ days. Ans 1
- Here, work done is the number of trees cut.
We know that $w = \text{net}$
 e is same for the loggers.
So, $w_1/n_1 t_1 = w_2/n_2 t_2$
 $9/(9 \times 9) = w_2/(12 \times 12)$
 $w_2 = 16$ trees. Ans 4
- In this question, the efficiency of men and boys is different
3 boys do as much work as 2 men or $3B = 2M$
So, if efficiency of men is e , that of boys will be $(2/3)e$
Now, work remains the same, so $n_1 \times t_1 \times e_1 = n_2 \times t_2 \times e_2$
 $15 \times (21 \times 4) \times e = 21 \times (d \times 6) \times (2/3)e$
 $d = 15$ days. Ans 1

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5. Let total work = LCM(Days A take, Days B take) = LCM (6, 8) = 24 units

A's 1 day work = $24/6 = 4$

B's 1 day work = $24/8 = 3$

(A + B)'s 1 day work = $4 + 3 = 7$

(A + B)'s 2 day work = $2 \times 7 = 14$.

Work left = Total work – work done = $24 - 14 = 10$, so fraction of work left is = $10/24 = 5/12$.

Ans 1

6. Let total work = LCM(Days A take, Days B take, Days C take) = LCM (4, 6, 8) = 24 units

A's 1 day work = $24/4 = 6$

B's 1 day work = $24/6 = 4$

C's 1 day work = $24/8 = 3$

(A + C)'s 1 day work = $6 + 3 = 9$

(A + C)'s 2 day work = $2 \times 9 = 18$.

So work left = $24 - 18 = 6$

Time taken by B to complete remaining work = $6/4 = 3/2$ days.

Ans 4

7. Let the number of days taken by A = x days

So, the number of days taken by B = $4x$ days

We are given, $4x - x = 30$

$x = 10$ days

$4x = 40$ days

So, number of days taken by both to complete the work = $1/ [1/10 + 1/40] = 8$ days.

Ans 3

8. The amount given to each A, B and C will be in proportion with the work done by each of them.

C's 1 day work = total work done in one day – work done by A and B in one day

= $1/3 - (1/6 + 1/8) = 1/24$

A's wage : B's wage : C's wage = $1/6 : 1/8 : 1/24 = 4 : 3 : 1$.

Therefore, C's share (for 3 days) = Rs. $(3 \times 1/24 \times 5600)$ = Rs. 700.

Ans 2

9. (A + B)'s 1 day work = $1/20$

(1)

(B + C)'s 1 day work = $1/24$

(2)

(C + A)'s 1 day work = $1/30$

(3)

Adding 1, 2 and 3 we get

$2(A + B + C)'s 1$ day work = $1/20 + 1/24 + 1/30 = 1/8$

(A + B + C)'s 1 day work = $1/16$

(4)

Number of days = 16.

Ans 4

10. Fuel left = $K \times 1/\text{distance}$, which means fuel left \times distance = K

Let total fuel = x , so $.8x \times 20 = K$ and $2x/5 \times d = K$

$.8x \times 20 = .4x \times d$, so $d = 40$ miles.

Ans 1

11. Time taken to get the tank completely filled = 60 min

Now pipe A fills the tank and pipe B empty the tank, so pipe B is negating the work done by pipe A. So,

Pipe A's one min work – Pipe B's one min work = Total one min work

$(1/20) - \text{Pipe B's one min work} = (1/60)$

Pipe B 's one min work = $(1/20) - (1/60) = (1/30)$

So, time taken by B to completely empty the tank = 30 min

We are given, Pipe B can empty 60 litres per minute, so it can empty $60 \times 30 = 1800$ litres in 30 min which is the capacity of the tank. **Ans 3**

12. For the first three hours i.e. from 6 am to 9 am the work done per hour varies. After 9 am all the four pipes are working. Till 9 am first pipe works for 3 hours, second one for 2 hours and the third one for one hour

Total work done till 9 am = $3(A$'s one hour work) + $2(B$'s one hour work) + C 's one hour work
 $= 3(1/15) + 2(1/20) + (1/30) = 1/3$. So work left = $1 - (1/3) = 2/3$

After 9 am all four pipes are working, so total one hour work of all pipes = $(1/15) + (1/20) + (1/30) + (1/60) = 1/6$

So, all the pipes together take 6 hours to completely fill the reservoir.

To fill $2/3$ rd of the reservoir time taken will be = 4 hours. So the time will be 1 pm. **Ans 3**

13. Let the number of fill pipes = n

Number of waste pipes = $6 - n$

One hour work of all waste pipes – one hour work of all fill pipes = total one hour work

$(6 - n) \times (1/4) - n \times (1/6) = (1/4)$, $n = 3$. **Ans 2**

14. See solved Example 7

15. Since we have to find when the tank gets completely filled, we take filling of tank as positive work done. Work done by all the pipes ($A + B + C + D$) in one minute = $(1/10) + (1/40) - (1/20) - (1/50) = 11/200$. So time taken to fill the tank = $200/11$ minutes. **Ans 1**

16. Let the time taken by Q is Q hours

So, the time taken by P is $(Q - 10)$ hours and R is $(Q + 20)$ hours

We are given, $[1/(Q - 10)] + [1/Q] + [1/(Q + 20)] = 1/8$

Substitute the options. We see that $Q = 20$ satisfies the equation.

P and Q hence takes $20/3$ hrs. **Ans 3**

Chapter 6

Averages, Ratio, Proportion and Mixtures

6.1 Averages

The term average stands for a single value that can replace the values of a group of objects, so that this average value represents the overall quantitative nature of this group of objects. However, this quantity does not give us any information about the individual values or the way in which the values are distributed.

For example, the average age of a group of 12 students is 15 years.

The formula says,

Average or arithmetic mean = sum of values/number of values

What we can derive is that if we sum up ages of 12 students, the sum would be equal to 180 years. Another point we can derive is that there will be at least a single student whose age is less than or equal to 15 years and there will be at least a single student whose age is more than or equal to 15 years among these 12 students.

Sometimes, instead of finding average of individual values, we are asked to find the average of a group or groups where the individual average of each of the groups is given. In this case, we call the final average as **weighted arithmetic mean or weighted average**. Suppose, we have a group of 12 men with an average age 30 years, a group of 15 women with average age 24 years and a group of 13 children with average age of 10 years.

Here, we have three groups with each of them having individual average. To find the overall average age, we use formula for weighted average.

Weighted Average = $(n_1a_1 + n_2a_2 + n_3a_3 + \dots) / (n_1 + n_2 + n_3 + \dots)$

where n_1, n_2, n_3 , etc. are the number of objects in each group and a_1, a_2, a_3 , etc. are individual averages of each of the group.

Using this formula, we get an average age for quoted example as $(12 \times 30 + 15 \times 24 + 13 \times 10) / (12 + 15 + 13)$

$$= 850/40 = 21.25$$

6.2 Ratio

Ratio refers to a comparison of two quantities by division. In other words, ratio means what fraction one quantity is of another. The quantities may be of the same or different kinds. For example, when we consider the ratio of the weight of 48 kg of a bag of rice to the weight of 36 kg of a bag of sugar, we are considering the quantities of same kind.

If x and y are two numbers, the ratio of x to y is x/y and is denoted by $x : y$. The two quantities that are being compared are called terms. The first is called the antecedent and the second term is called consequent. For example, the ratio $5 : 7$ represents antecedent 5 and consequent 7. A ratio does not change, if its terms are multiplied or divided by the same number for example $5 : 7$, $10 : 14$ and $15 : 21$ are all same.

Problem solving: In problems relating to ratios, a ratio may be given to you or it may be asked in the question. Let us consider some examples to clarify each of these equations.

(i) A ratio is given, say A and B have money in the ratio $4 : 9$. In such kind of cases the best approach is to assume that the money they have to be $4x$ and $9x$, respectively.

(ii) If more than one ratio is given in the same problem, say A and B have money in ratio of $4 : 9$ and; B and C have money in ratio of $6 : 7$, in this case B is the common term; so take LCM of B in both the terms,

i.e., $\text{LCM}(9,6) = 18$. $A : B$ can be written as $\frac{4}{9} : 1$ and $B : C$ can be written as $1 : \frac{7}{6}$. Hence, $A : B : C = \frac{4}{9} : 1 : \frac{7}{6}$.

Now, multiply $A : B : C$ by 18. The ratio comes out to be $8 : 18 : 21$. So, we can assume money they have is $8x$, $18x$ and $21x$ respectively.

Example 1: The ratio of zinc and copper in a brass piece is $13 : 17$. How much zinc will be there in 300 kg of such a piece?

1. 120 kg 2. 135 kg 3. 110 kg 4. 130 kg

Solution: The ratio is given to be $13 : 17$, assume quantities of zinc and copper to be $13x$ and $17x$, respectively. If total weight of piece is 300 kg,

$$13x + 17x = 300$$

$$30x = 300$$

$$x = 10$$

So, the quantity of zinc in 300 kg piece = 13 times 10 = 130 kg

The correct option is 4.

Example 2: The ratio of the measures of angles A and B of $\triangle ABC$ is $2 : 3$. The ratio of angles A and C is $1 : 5$. What are the measures of the angles of $\triangle ABC$?

Solution: A is the common term, so take $\text{LCM}(2, 1) = 2$.

$A : B = 1 : \frac{3}{2}$ and $A : C = 1 : 5$, so $A : B : C = 1 : \frac{3}{2} : 5$ and multiply it by 2. The ratio comes out

to be $2 : 3 : 10$. Hence, we can assume angles A , B and C as $2x$, $3x$ and $10x$ respectively.

$2x + 3x + 10x = 180$, $x = 12$. Angles A , B and C are 24, 36 and 120 respectively.

Example 3: The heights of 10 students in a class A is 100 cm each, heights of 25 students of class B is 120 cm and heights of 15 students of class C is 80 cm. What is the average height of each student?

Solution: This is question of weighted average. Let n_i be the number of entities in a group and w_i be the weightage of each group.

So weighted average = $(n_1 \times w_1 + n_2 \times w_2 + n_3 \times w_3 + \dots) / (n_1 + n_2 + n_3 + \dots)$

Average height of each student = $(10 \times 100 + 25 \times 120 + 15 \times 80) / (10 + 25 + 15) = 104 \text{ cm.}$

6.3 Proportion

The equality of two ratios is called proportion. Consider $2 : 5 = 4 : 10$. We can also write this as $2 : 5 :: 4 : 10$ and say that 2, 5, 4 and 10 are in proportion. 2, 5, 4 and 10 are called the first, second, third and fourth proportional respectively. The first and the fourth proportional are called the extreme terms. The second and the third proportional are called the mean terms.

1. Product of means = Product of extremes.
2. If $a : x :: x : b$, i.e. $x^2 = ab$, then x is known as mean proportional of a and b .
3. If $a : b :: b : x$, i.e. $b^2 = ax$, then x is known as third proportional of a and b .

Example 4: Find:

- a. Fourth proportional to numbers 6, 8 and 15.
- b. Third proportional to 20 and 30.
- c. The mean proportional between 6 and 24.

Solution: a. Let the fourth proportional be x . Then, $6 : 8 :: 15 : x \Rightarrow 6x = 8 \times 15$ or $x = 20$.
 b. Let the third proportional be x . Then $20 : 30 :: 30 : x \Rightarrow 20x = 30 \times 30$ or $x = 45$.
 c. Let the mean Proportional be x . Then $6 : x :: x : 24$.

$$x^2 = 6 \times 24 \text{ or } x^2 = 144 \text{ or } x = 12$$

Example 5: Two balls have their radii in the ratio $2 : 3$. Find the ratio of their volumes?

Solution: The volume V of a sphere is given by the equation $V = (4\pi / 3)r^3$
 Since $4\pi/3$ is a constant, therefore, V is directly proportional to r^3

$$V_1 : V_2 = (r_1)^3 : (r_2)^3$$

$$\text{So, } V_1 : V_2 = 8 : 27$$

6.3.1 Changes in Two Proportional Quantities

When two quantities change, it is possible that the two quantities may vary with each other directly or inversely. In such cases, we call these quantities to be directly or inversely proportional to each other.

If some changes are made in one of these quantities, we can calculate changes in the other depending on whether they are directly or inversely proportional.

- **Directly proportional:** If a quantity A increases/decreases by $x\%$, then the quantity B also increases/decreases by $x\%$.
- **Inversely proportional:** If a quantity A increases by $x\%$, then the quantity B decreases by $(100x)/(100 + x)\%$.

If a quantity A decreases by $x\%$, then the quantity B increases by $(100x)/(100 - x)\%$.

Example 6: If the price of wheat be raised by 30%, find by how much percent a householder must reduce his consumption of the article so as not to increase his expenditure.

1. $23\frac{1}{13}\%$
2. 25%
3. 39%
4. 42.8%

Solution: Here, Expenditure = Price of one kg \times Amount of wheat bought

Since, expenditure has to remain constant, price and amount will be inversely proportional to each other (as their product is constant).

So, if price is increased by 30%, putting $x = 30\%$ in the formula, we get $100x/(100 + x) = 3000/130$

$$= 23\frac{1}{13}\%.$$

The correct option is 1.

6.4 Mixtures

The questions related to the topic ‘mixtures’ come into the picture when two or more types of things are mixed in same or different quantities to give a resultant mixture. The way the properties of individual items and the mixture are related, frames all of the questions related to this topic.

Let us take an example where two qualities of tea are mixed together, one of them is sold at Rs P per kg while the other one is sold at Rs Q per kg. If we take x kg of first type and y kg of second type, then the total quantity we have taken is $(x + y)$ kg. The total amount of money spent would be Rs $Px + Qy$.

The average price of the mixture will be, $A = (Px + Qy)/(x + y)$

The ratio in which two qualities have been mixed is $x/y = (Q - A)/(A - P)$

In case, more than two types of items are mixed, we can write general equation as:

$$A = (Px + Qy + Rz + \dots)/(x + y + z + \dots)$$

Example 7: There are two types of rice, type 1 cost Rs 30 per kg and type 2 cost Rs 40 per kg. The shopkeeper wants to mix these two types of rice sell the mixture at Rs 36 per kg. Find the ratio in which the rice should be mixed.

Solution:

Important Points to Remember

If we have x l of liquid A and y l of liquid B are being replaced by liquid B . If this process is being repeated n times. So, the actual amount of liquid A left = $x \left(1 - \frac{y}{x}\right)^n$

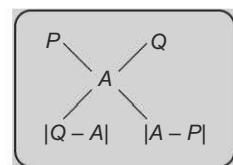


Figure 1

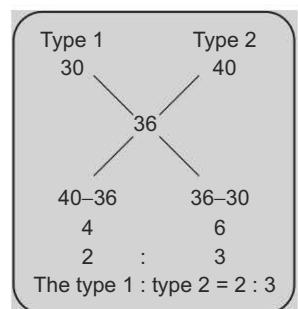


Figure 2

Example 8: In a tank there are 20 l of pure milk. A milkman replaces 2 l of pure milk with water and repeats this process for one more time. So what is the amount of pure milk left.

Solution: Amount of pure milk left = $20 \left(1 - \frac{2}{20}\right)^2$

$$= 20 \times 81/100 = 16.2 \text{ l}$$

**Exercise 6.1**

1. What number must be added to each term of the ratio $9 : 51$ to make it equal to $1 : 3$?
 1. 22 2. 12 3. 13 4. 20
2. The sum of two numbers is 1547. If $\frac{4}{7}$ of one is equal to $\frac{2}{5}$ of another, what is the value of both the numbers?
 1. 810, 400 2. 637, 910 3. 626, 584 4. 510, 700
3. A mixture of 90 l of brandy and water contains 80% brandy. How much water should be added to it to decrease the percentage of brandy to 60%?
 1. 50 l 2. 40 l 3. 30 l 4. 20 l
4. Find the fourth proportional to 4, 5, 12
 1. 3 2. 15 3. 9 4. 12
5. The ratio of the measures of angle A and B of $\triangle ABC$ is $2 : 3$. The ratio angle B and C is $2 : 14/3$. What are the measures of the angles of $\triangle ABC$?
 1. 30, 45, 105 2. 20, 25, 135 3. 30, 75, 75 4. 55, 40, 85
6. Fill in the blanks for each of the following

The average of 7 consecutive odd numbers a, b, c, d, e, f and g is _____.
 The average of 5 consecutive even numbers a, b, c, d and e is _____.
 The average of 6 consecutive odd numbers p, q, r, s, t and u is _____.
 The average of 4 consecutive even numbers p, q, r and s is _____.
 1. a, d, q, s 2. c, d, r, r
 3. $d, c, (p+u)/2, (p+s)/2$ 4. none of these
7. If $x/y = 3/4$ then $(3x^2 + y^2)/(x^2 + 3y^2) =$
 1. 43/57 2. 70/12 3. 33/4 4. 146/25
8. The measures of the angles of a quadrilateral are in the ratio $3 : 5 : 6 : 4$. What are the measures of the angles and what is the type of the quadrilateral?
 1. 60, 100, 120, 80, cyclic 2. 150, 60, 30, 120, cyclic
 3. 60, 30, 150, 120, cyclic 4. 150, 60, 30, 120, parallelogram
9. The wavelength (λ) of sound and its frequency (f) are in inverse proportion to each other. The frequency is 400 Hz when the wavelength is 160 cm. What is the wavelength of sound when its frequency is 640 Hz.
 1. 200 2. 300 3. 160 4. 100
10. Two numbers are in the ratio $4 : 5$. If difference between their squares is 81, find the numbers.
 1. (8, 12) or (-8, -12) 2. (16, 5) or (-16, -5)
 3. (12, 15) or (-12, -15) 4. (6, 36) or (-6, -36)
11. Three positive numbers are in the ratio $3 : 4 : 5$, and the sum of their squares is equal to 450. Find the numbers.
 1. 6, 9, 12 2. 6, 12, 18 3. 6, 8, 10 4. 9, 12, 15
12. Divide 930 into three parts which are in the ratio $1/2 : 1/3 : 1/5$.
 1. 31, 155, 93 2. 450, 300, 180 3. 188, 94, 31 4. None of these

13. How many one-rupee, two-rupee and five-rupee coins are there if these are in the ratio $4 : 6 : 9$ and together amount to Rs 366?
 1. 24, 36, 54 2. 28, 42, 63 3. 20, 25, 30 4. 24, 30, 36
14. The ratio of volumes of 2 cones is $x : y$ and the ratio of their heights is $p : q$. Find the ratio of the squares of their diameters.
 1. xq/py 2. xp/qy 3. pq/xy 4. xy/pq
15. The average of 15 numbers is 150. If each number is increased by 25, the new average is:
 1. 150 2. 175 3. 54 4. none of these



Exercise 6.2

1. If $a/4 = b/5 = c/2 = (3a + 5b - 7c)/x$. Find x .
 1. 21 2. 17 3. 23 4. 20
2. A certain quantity of an alcohol is diluted with 40 l water and this mixture is worth Rs 42 per l. If pure alcohol is of worth Rs 70 per l, how much alcohol is there in the mixture?
 1. 25 litres 2. 60 litres 3. 28 litres 4. 35 litres
3. In a vessel A , a mixture of apple juice and orange juice is in the ratio $14 : 8$ and in vessel B this ratio is $18 : 26$. In what ratio should quantities be taken from the two vessels so as to form a mixture in apple juice and orange juice will be in the proportion of $12 : 10$?
 1. 3 : 2 2. 4 : 11 3. 4 : 7 4. 11 : 4
4. Three varieties of rice are mixed together in the ratio $1 : 1 : 2$. The first two varieties are worth Rs 24 per kg and Rs 32 per kg. If the mixture is worth Rs 56 per kg, the price of the third variety of rice per kg will be
 1. Rs 64 2. Rs 84 3. Rs 35 4. Rs 49
5. A dishonest milkman professes to sell his milk at cost price but he mixes it with water and thereby gains 20% in the process. The ratio of water to milk in the mixture is:
 1. 1 : 5 2. 10 : 3 3. 6 : 1 4. 6 : 5
6. The value of a diamond is proportional to the square root of its weight. Find the gain by cutting a diamond worth Rs 1300 into two pieces whose weights are in the ratio $25 : 144$.
 1. 20 2. 400 3. 800 4. 1600
7. If the volume of a sphere is given by $V = (4/3)\pi r^3$ and the surface area by $S = 4\pi r^2$. Find the surface in terms of the volume.
 1. $3v/r$ 2. $1/3(vr)$ 3. $v/3r$ 4. None of these
8. If $a/(b+c) = b/(c+a) = c/(a+b)$, what is the value of each of the fractions? ($a, b, c > 0$)
 1. $\frac{1}{2}$ 2. $\frac{3}{4}$ 3. $\frac{2}{9}$ 4. $\frac{3}{2}$
9. A cask is full of wine. 1 litre of wine from this cask is replaced with water. This operation is performed two more times. The ratio of the quantity of wine now left in cask to that of water is $64 : 61$. How much wine did the cask hold originally?
 1. 8 litres 2. 6 litres 3. 5 litres 4. 3 litres

 Answer Key

Exercise 6.1

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. 2 | 2. 2 | 3. 3 | 4. 2 | 5. 1 | 6. 3 |
| 7. 1 | 8. 1 | 9. 4 | 10. 3 | 11. 4 | 12. 2 |
| 13. 1 | 14. 1 | 15. 2 | | | |

Exercise 6.2

- 1.** 3 **2.** 2 **3.** 1 **4.** 2 **5.** 2 **6.** 2
7. 1 **8.** 1 **9.** 3 **10.** 3

Explanatory Answers

Exercise 6.1

- $$2. \quad A + B = 1547 \quad (\text{i})$$

$$\text{And, } \frac{4}{7} \times A = \frac{2}{5} \times B$$

$$A = 7/10 \times B$$

putting the value of A in (i) we get,

$$7/10 \times B + B = 1547$$

$$17/10 \times B = 1547, B = 910$$

$$A = 1547 - 910 = 637.$$

Ans 2

3. Total mixture is 90 l.

80% is brandy, i.e. $(80/100) \times 90 = 72$ l brandy

Let new quantity of mixture = X_1

So $0.6 \times X = 72$, so $X = 120$ l. Hence 30 l of water is required.

Ans 3

- $$5. \quad A/B = 2/3 \text{ or } A = 2/3 B$$

(j)

$$B/C = 2/(14/3) \quad \text{or} \quad C = 7/3 B$$

(ii)

In a triangle, sum of all angles is 180

$$\text{So, } A + B + C = 180$$

(jii)

Substituting the values of equations (i) and (ii) in equation (iii)

$$2/3 R + R + 7/3 R = 180$$

$$A \equiv 30, B \equiv 45, C \equiv 105.$$

Ans 1

7. $x/y = 3/4$ or $x^2/y^2 = 9/16$ (i)

$$(3x^2 + y^2)/(x^2 + 3y^2)$$

Substituting the value of $x^2 = 9/16 y^2$, we get 43/57.

Ans 1

8. Let the common ratio be x

So the angles of the quadrilateral are $3x, 5x, 6x, 4x$

Sum of angles of a quadrilateral 360°

$$3x + 5x + 6x + 4x = 360^\circ$$

$$x = 20^\circ$$

So the angles of the quadrilateral are 60, 100, 120, 80

Here we can see that we have two supplementary pairs (60, 120) and (80, 100)

Hence, it is a cyclic quadrilateral.

Ans 1

12. The numbers are in the ratio $1/2 : 1/3 : 1/5$

LCM of the denominators is 30. Multiply all the terms with the LCM of the denominators.

We get ratio of three numbers as $15 : 10 : 6$

We are given $15x + 10x + 6x = 930$

$$x = 30$$

So the numbers are 450, 300, 180.

Ans 2

13. Let the number of 1 ₹, 2 ₹ and 5 ₹ coins be $4x, 6x$ and $9x$ respectively

We are given, $4x(1) + 6x(2) + 9x(5) = 366$

$$x = 6$$

So, number of coins of 1 ₹, 2 ₹ and 5 ₹ coins are 24, 36 and 54 respectively.

Ans 1

14. Volume of a cone = $1/3\pi r^2 h = 1/3\pi (d/2)^2 h$

$$V \propto d^2 h$$

$$V_1/V_2 = x/y = (d_1/d_2)^2 (p/q)$$

$$(d_1/d_2)^2 = xq/py.$$

Ans 1

15. Sum of 15 numbers originally = $15 \times 150 = 2250$

Each number is increased by 25. So the new total becomes $2250 + 15 \times 25 = 2625$

$$\text{New average} = 2625/15 = 175.$$

Ans 2

Exercise 6.2

1. Let $a/4 = b/5 = c/2 = (3a + 5b - 7c)/x = k$

$$\text{So, } a = 4k, b = 5k, c = 2k$$

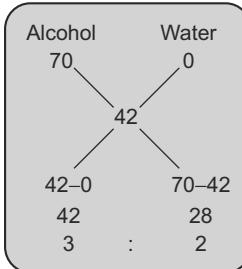
Substitute these values in $(3a + 5b - 7c)/x = k$

$$\text{So, } \{3(4k) + 5(5k) - 7(2k)\}/x = k$$

k gets cancelled out giving $x = 23$.

Ans 3

2. By rule of allegation, we know

**Figure 3**

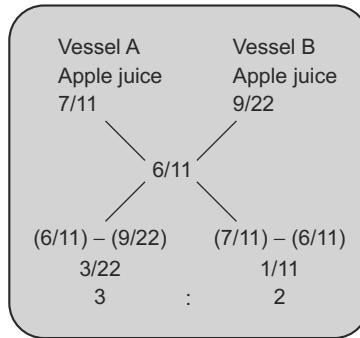
So, Alcohol/water = 3/2

Alcohol/40 = 3/2

Alcohol = 60 litres.

Ans 2

3. By rule of allegation, we know

**Figure 4**

Quantity from vessel A : Quantity from vessel B = 3 : 2.

Ans 1

4. Since mixture is in the ratio 1 : 1 : 2, so let us take 1 kg of each and assume that price of third type of rice = Rs x per Kg.

$$24 \times 1 + 32 \times 1 + 2x = 4 \times 56$$

$$2x = 56 \times 3, x = \text{₹ } 84 \text{ per kg.}$$

Ans 2

5. Let CP of 1 litre of milk = ₹ 1

So, SP of 1 litre of mixture = ₹ 1

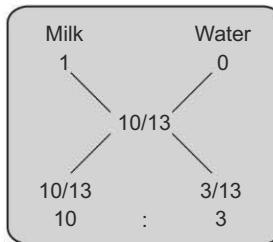
We know, $SP = CP \{1 + (P\%) / 100\}$

$$1 = CP \{1 + (30/100)\}$$

$$\text{So, } CP \text{ of 1 litre of mixture} = \text{₹ } 10/13$$

By rule of allegation

Ans 2

**Figure 5**

8. $a/(b+c) = b/(c+a) = c/(a+b)$

Apply componendo, we get

$$(a+b+c)/(b+c) = (a+b+c)/(c+a) = (a+b+c)/(a+b)$$

Now, $(a+b+c)$ gets cancelled out and we get

$$1/(b+c) = 1/(c+a) = 1/(a+b)$$

Taking the two equations separately,

$$1/(b+c) = 1/(c+a)$$

$$b+c=c+a$$

$$a=b$$

$$1/(c+a) = 1/(a+b)$$

$$c+a=a+b$$

$$c=b$$

From (1) and (2)

$$a=b=c$$

$$a/(b+c) = a/(a+a) = a/2a = \frac{1}{2}.$$

Ans 1

9. Quantity of a liquid left in a mixture when x litres of liquid is replaced by water after n operations = $V[1 - (x/V)]^n$

Where V is the total quantity of original liquid

In this question the ratio of wine to water in the final mixture = 64 : 61

So, quantity of wine = {64/(125)} $V = V(64/125)$

$$V(64/125) = V[1 - (1/V)]^3$$

$$(64/125) = [1 - (1/V)]^3$$

$$(4/5)^3 = [1 - (1/V)]^3$$

$$(4/5) = [1 - (1/V)]$$

$$V = 5 \text{ litres.}$$

Ans 3

10. Total marks of 10 students = $85 \times 10 = 850$

Total marks of 8 students, when students with highest and lowest scores are not considered = $87 \times 8 = 696$

$850 = \text{lowest marks} + \text{highest marks} + \text{total marks of other students}$

$$850 = \text{lowest marks} + 92 + 696$$

$$\text{Lowest marks} = 62.$$

Ans 3

Chapter 7

Equation-based Problems

7.1 Introduction

To solve a quantitative aptitude problem the following two steps are involved:

- i. Use the given statements to form the mathematical equations.
- ii. Solve these equations to get the solution.

The first step requires an understanding of the related topic, while in the second step we need to solve the equations formed in the fastest possible manner.

Depending on the number of variables in the equation and the complexity of the problem, various approaches are being used.

Let us go through them one by one.

7.2 One-variable Equation

7.2.1 Linear Equation

One equation in one variable

For example: $5x + 7 = 19$

$$5y + 4y/3 + 8y/13 + 18 = 65$$

Best method: Solve the equation to find the value of unknown variable. Substituting the options in the equation can take more time.

7.2.2 Complex Equation

One equation in one variable

For example: $6x^3 + 7x^2 + 5 = 0$

$$\sin y \cdot \sec y + 5 = 4/9$$

Best method: Substitute the options in the equation as solving the equation may not be possible. Even if it is possible, it may take more time.

7.2.3 Quadratic Equation

One equation in one variable

For example: $x^2 + 7x + 3 = 0$

Best method: The general equation of this type is

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

This will give two values of x , called roots of the equation.

Sum of roots $= -b/a$

Product of roots $= c/a$

7.3 Two-variable Equation

7.3.1 Complex Equations

Two equations in two variables

For example: $x^2 + 2y^3 = 7$

Best method: Substitute the options in the equation as solving the equation may not be possible. Even if it is possible, it will take time.

7.3.2 Linear Equations

Two equations in two variables

For example: $13x + 11y = 78$

$$8x + 3y = 51$$

Several cases arise further in this type of equations.

7.3.3 Case I

If value of only a single variable is asked.

Example 1: Few tickets of a show are sold at Rs 12 per ticket and the other tickets at Rs 15 per ticket. In all 25 tickets were sold out. If the amount collected on a day was Rs 345, find the number of tickets sold at Rs 12.

Solution: Let 'x' tickets be sold at Rs 10 and 'y' tickets be sold at Rs 8.

$$x + y = 25 \quad (i)$$

$$12x + 15y = 345 \quad (ii)$$

Multiplying equation (i) by 15,

$$15x + 15y = 375 \quad (iii)$$

Subtracting equation (ii) from (iii),

$$3x = 30, \text{ So } x = 10$$

Hence, 10 tickets were sold at Rs 12.

Best Method: Eliminate the variable that is not asked from the two equations, and solve for the remaining variable.

7.3.4 Case II

If value of both the variables is asked

The general format of such equations is:

$$a_1x + b_1y + c_1 = 0$$

$$a_2x + b_2y + c_2 = 0$$

The test for consistency of the above system of linear equations has been given in Table 1.

Table 1

Test	Conclusion
$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ or $\neq \frac{c_1}{c_2}$	Consistent and Unique Solution
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Consistent and Infinite solution
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	Inconsistent and No solution

If there exists a consistent and unique solution,

$$x = \frac{b_1c_2 - b_2c_1}{a_1b_2 - a_2b_1}$$

$$y = \frac{c_1a_2 - c_2a_1}{a_1b_2 - a_2b_1}$$



Exercise 7.1

- A number is as much greater than 19 is less than 27. Find the number.
 1. 20 2. 23 3. 21 4. 19
- Age of Mihir is x years today. His sister is 12 years elder to him. Sum of their ages is 36. Which of the following statements is/are true?
 (a) Three years ago, Mihir was one third his sister's age.
 (b) Two years hence the sum of their ages will be 40.
 (c) Today his sister is twice as old as Mihir.
 1. (a) only 2. (a) and (b) only 3. (b) and (c) only 4. All of these
- The sum of the rational number and its reciprocal is $170/77$. Find the number.
 1. $11/9$ 2. $9/11$ 3. $7/11$ 4. $12/7$
- The sum of the numerator and denominator of a fraction is 9. If 1 is subtracted from both numerator and denominator, the fraction equals $3/4$. Find the fraction.
 1. $4/3$ 2. $3/4$ 3. $4/5$ 4. $5/3$
- In a bag containing only red and blue balls, one third the number of red balls is equal to one fourth of the number of blue balls. Twice the total number of balls is four less than five times the number of red balls. Find the number of red balls.
 1. 9 2. 12 3. 8 4. 10

6. In a rectangular garden if the length and breadth are decreased by 1 the area decreases by 13. If however, the length is increased by 2 and breadth is increased by 1 the area increases by 22. Find the area of the rectangle.
1. 40
 2. 48
 3. 28
 4. Can't be determined
7. The sum of two numbers is 16 and that of their squares is 130. Find the numbers.
1. 6 and 10
 2. 5 and 12
 3. 7 and 9
 4. 6 and 11
8. The average of seven consecutive even numbers is 32. Find the second largest of these numbers.
1. 30
 2. 32
 3. 36
 4. 34
9. The sum of the squares of three consecutive odd numbers is 2195. Find the 2nd (largest) number.
1. 29
 2. 27
 3. 31
 4. None of these
10. The sum of the digits of a 2 digit number is 9. If 45 is added to it, its digits are interchanged. Find the number.
1. 27
 2. 63
 3. 54
 4. 18



Exercise 7.2

1. Which of the following is/are true?
 1. If x is odd then $x + 16$ is even
 2. If x is odd then $5x + 27$ is also odd
 3. If x is odd then $7x + 6$ is also odd
 4. If x is even then $3x + 17$ is also even
2. For what value of ' p ' will the following pair of equations lead to no solution for ' x ' and ' y '?

$$8x - 40y = q; px + 10y = r$$
 1. 1
 2. 0
 3. -2
 4. 2
3. A two digit number is equal to 5 times the sum of its digits. Which of the following can be the number?
 1. 27
 2. 18
 3. 36
 4. 45
4. If three numbers are added in pairs, the sum equals 12, 19 and 23. Which is not one of the numbers?
 1. 3
 2. 8
 3. 4
 4. 15
5. 400 has been divided into three parts such that one-third of the first part, half of the second part and one-fifth of the third part are equal. The largest part is:
 1. 240
 2. 120
 3. 160
 4. 200
6. The sum of four numbers is 80. Second number is 6 more than the first. Third is $5/3$ times the first and fourth is 4 more than the first. Find the difference between the largest and the smallest number?
 1. 21
 2. 27
 3. 10
 4. None of these
7. The product of the three numbers is 39366. If the ratio between first and second be 2 : 3 and that between second and third is 1 : 3, then the second number is:
 1. 40
 2. 48
 3. 27
 4. 18
8. If the present age of Daman is first divided by 6 and then 10 is subtracted from it, then the present age of his grandson Rahul is obtained. If Rahul is 3 years younger to Shyam whose age is 6 years, then what is Daman's present age?
 1. 48 years
 2. 78 years
 3. 84 years
 4. 96 years

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9. *A* is 3 years elder to *B*. *C* was 28 years of age when *E* was born while *D* was 26 years of age when *B* was born. If *E* was 4 years of age when *A* was born, then what was the age of *C* and *D* respectively when *A* was born?
1. 32 yrs, 23 yrs 2. 32 yrs, 29 yrs 3. 35 yrs, 29 yrs 4. 35 yrs, 33 yrs
10. A person was asked to state his age. His replied, “Take my age six years hence, multiply it by two and then subtract 4 times my age twenty four years ago and you will get my age.” What was the age of the person?
1. 36 years 2. 24 years 3. 28 years 4. 32 years

Directions for questions 11 to 13: *Each of the questions given below consists of a statement and/or a question and two statements numbered I and II given below it. You have to decide whether the data provided in the statement(s) is/are sufficient to answer the given question. Read both the statements and*

- Give answer (1) if the data in Statement I alone are sufficient to answer the question, while the data in Statement II alone are not sufficient to answer the question.
- Give answer (2) if the data in Statement II alone are sufficient to answer the question, while the data in Statement I alone are not sufficient to answer the question.
- Give answer (3) if the data either in Statement I or in Statement II alone are sufficient to answer the question.
- Give answer (4) if the data even in both Statements I and II together are not sufficient to answer the question.
- Give answer (5) if the data in both Statements I and II together are necessary to answer the question.

11. What is Anchit's present age?
I. Satnam's present age is $1/5^{\text{th}}$ of Anchit's present age.
II. 5 years ago, Satnam was $1/25^{\text{th}}$ of Anchit's age at that time.
12. Average age of employees working in a department is 60 years. In the next year, 5 workers will retire. What will be the average age in the next year?
I. Retirement age is 90 years.
II. There are 50 employees in the department.
13. Pankaj is twice as old as Himnit. Find the difference of their ages?
I. 5 years from now, the ratio of their ages would be 9 : 5.
II. 10 years earlier, the ratio of their ages was 3 : 1

Directions for questions 14 and 15: *Each of these questions is followed by three statements. You have to study the question and all the three statements given to decide whether any information provided in the statement(s) is redundant and can be dispensed with while answering the given question.*

14. What will be the ratio between ages of Sameer and Abhishek after 5 years?
I. Sameer's present age is more than Abhishek's present age by 4 years.
II. Abhishek's present age is 20 years.
III. The ratio of Abhishek's present age to Sameer's present age is 5 : 6.
1. Any two of I, II and III 2. II only 3. III only
4. I or III only 5. II or III only
15. What is the difference between the present ages of Santosh and Chandni?
I. The ratio between Santosh's present age and his age after 8 years is 4 : 5.
II. The ratio between the present ages of Santosh and Chandni is 4 : 3.

III. The ratio between Chandni's present age and his age four years ago is 6 : 5.

1. Any two of I, II and III
2. I or III only
3. Any one of the three
4. All I, II and III are required
5. Even with all I, II and III, the answer cannot be obtained.

Answer Key

Exercise 7.1

- | | | | | | |
|------|------|------|-------|------|------|
| 1. 2 | 2. 3 | 3. 3 | 4. 3 | 5. 2 | 6. 2 |
| 7. 3 | 8. 3 | 9. 2 | 10. 1 | | |

Exercise 7.2

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. 3 | 2. 3 | 3. 4 | 4. 1 | 5. 4 | 6. 3 |
| 7. 3 | 8. 2 | 9. 1 | 10. 1 | 11. 5 | 12. 5 |
| 13. 3 | 14. 1 | 15. 1 | | | |

Explanatory Answers

Exercise 7.1

3. Check options Ans 3

5. Let the number of red balls be R and blue balls be B

We are given, $(1/3)R = (1/4)B$ or $4R = 3B$ (1)

We are also given, $2(R + B) = 5R - 4$

$\Rightarrow 3R = 2B + 4$ (2)

Solving equations (1) and (2), we get,

So, $R = 12$. Ans 2

6. Let the original area = $l \times b$

According to the question,

$$(l-1)(b-1) = lb - 13$$

$$lb - b - l + 1 = lb - 13$$

$$\Rightarrow l + b = 14 \quad (1)$$

And also we are given,

$$(l+2)(b+1) = lb + 22$$

$$lb + 2b + l + 2 = lb + 22$$

$$\Rightarrow l + 2b = 20 \quad (2)$$

Solving equations, we get

$$l = 8, b = 6$$

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So original area of the rectangle = $lb = 8 \times 6 = 48$ sq. units.

Ans 2

7. Let the two numbers be x and y

We are given,

$$x + y = 16 \quad (1)$$

$$x^2 + y^2 = 130 \quad (2)$$

Substitute the value of x from equation (1) in equation (2), we get,

$$(16 - y)^2 + y^2 = 130$$

Solving this we get, $y = 7$ or 9

Ans 3

Trick: Substitute options in equations (1) and (2)

10. Let the two digit number be N whose unit's digit is b and ten's digit is a

$$\text{So, } N = 10a + b$$

$$\text{We are given, } 10a + b + 45 = 10b + a$$

$$9a - 9b = -45$$

$$b - a = 5 \quad (1)$$

Substitute all the options in equation (1)

We see that only option 1 satisfies.

Ans 1

Trick : We can directly check the options, $27 + 45 = 72$

Exercise 7.2

2. 2 equations: $a_1x + b_1y = c_1$ and $a_2x + b_2y = c_2$ give no solution when $a_1/a_2 = b_1/b_2 \neq c_1/c_2$

The two given equations are $8x - 40y = q$ and $px + 10y = r$

So the two equations give no solution when

$$8/p = (-40)/10 \neq q/r$$

$$\Rightarrow p = (-2).$$

Ans 3

4. Check from options.

$$8 + 4 = 12; 15 + 4 = 19; 8 + 15 = 23$$

Only 3 is left out.

Ans 1

5. Let the 3 parts be a, b, c

$$a + b + c = 400 \quad (1)$$

We are given,

$$(1/3)a = (1/2)b = (1/5)c \quad (2)$$

Let this equation (2) is equal to k , i.e. $(1/3)a = (1/2)b = (1/5)c = k$

So, $a = 3k, b = 2k, c = 5k$

Substituting these values in equation (1), we get,

$$3k + 2k + 5k = 400$$

$$k = 40$$

$$\text{So, } c = 5k = 5 \times 40 = 200.$$

Ans 4

9. Let present age of A, B, C, D, E be a, b, c, d, e respectively

We are given,

$$a = b + 3 \quad (1)$$

$$c = 28 + e \quad (2)$$

$$d = 26 + b \quad (3)$$

$$e = a + 4 \quad (4)$$

Substituting equation (4) in (2)

$$c = 28 + (a + 4) = 32 + a \quad (5)$$

Substituting equation (1) in (3)

$$d = 26 + (a - 3) = 23 + a \quad (6)$$

So when A was born, $a = 0$.

Equations show that when $A = 0$, C and D were 32 and 23 years old.

Ans 1

10. Let my present age be P

Six years hence my age will be $(P + 6)$ and twenty four years ago my age was $(P - 24)$

According to the question

$$2(P + 6) - 4(P - 24) = P$$

Solving this, we get, $P = 36$ years.

Ans 1

11. Statement I: $A = 5S$

Nothing can be said about Anchit's age

$$\text{Statement II: } (A - 5) = 25(S - 5)$$

Again nothing can be said about Anchit's age

Now taking both the statements together, we have 2 variables and 2 equations. So, both statements are required.

Ans 5

12. Statement I : no. of workers is not known

Statement II : age of workers retiring is not known

Using statements I and II together,

From statement II we get total age of all workers as $50 \times 60 = 3000$

From statement I we get total age of workers retiring as $5 \times 90 = 450$

For next year we have total age of workers left and the number of workers left

So average age = $(3000 + 45 - 450)/45$.

Ans 5

13. $P = 2H$

(1)

$$P - H = ?$$

$$\text{Statement I: } (P + 5)/(H + 5) = 9/5 \quad (2)$$

We have 2 equations (1), (2) and two variables H and P . So, statement I alone is sufficient

$$\text{Statement II: } (P - 10)/(H - 10) = 3/1 \quad (3)$$

We have 2 equations (1), (3) and two variables H and P . So, statement II alone is sufficient.

Ans 3

14. Statement I: $S = A + 4$

Statement II: $A = 20$

Statement III: $A/S = 5/6$

Taking any two statements together we have 2 equations and 2 variables. So, both A and S can be calculated.

Ans 1

Chapter 8

Venn Diagrams

8.1 Set Theory

A set is a collection of elements that satisfy a given property. We can say a set is a collection of similar objects.

A universal set is the collection of all the elements. A null set has no elements.

Union of sets: If set A satisfies property X , and set B satisfies property Y , then union of the sets A and B is the collection of elements that satisfy at least one of the properties, X or Y . (Represented by $A \cup B$)

Intersection of sets: If set A satisfies property X , and set B satisfies property Y , then intersection of the sets A and B is the collection of elements that satisfy both the properties X and Y . (Represented by $A \cap B$)

8.2 Two-sets Case

Suppose, we have 170 students in a class. 110 of them read *India Today*, 80 read *The Outlook*, 28 read both and 8 students read none of the magazines. The pictorial representation of the relationship between the sets is known as Venn Diagram. The above sets can be represented in a Venn Diagram as in Figure 1.

The Universal set, \cup is represented by the rectangle and contains 170 elements.

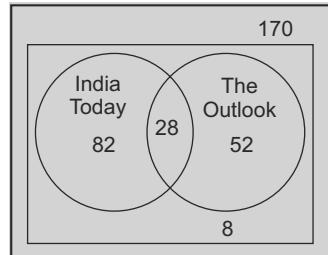


Figure 1

8.2.1 When to Consider Universal Set and When not?

When it is clearly mentioned in the question that there exist some elements that do not satisfy any of the properties or the same has been asked in question, then we need to consider universal set. In such a case we will make a Venn diagram as shown in Figure 2.

Here, Area I = Only X , Area III = Only Y , Area II = $n(X \cap Y)$

Area IV = $\cup - n(X \cup Y)$, $n(X \cup Y) = \text{Area I} + \text{Area II} + \text{Area III}$

If there is no mention of the elements that satisfy none of the properties (represented by Area IV), then we need to assume that Area IV has no elements, by default. In this case, the Venn diagram will simply be Figure 3.

Here, $\cup = n(X \cup Y)$

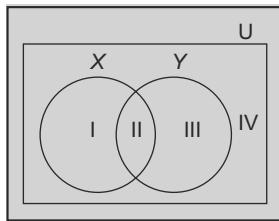


Figure 2

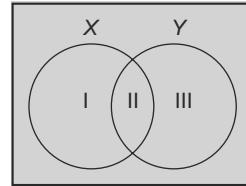


Figure 3

8.3 Three-set Case

In this case, formula becomes:

$$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$$

Those who satisfy none of the properties = $\cup - n(A \cup B \cup C)$

If there is no mention of the elements that satisfy none of the properties,

$$n(A \cup B \cup C) = \cup = \text{Universal set}$$

Problem solving approach

- The first step is to figure out the number of properties in the problem and then make as many sets for them.
- See if there is a requirement of a universal set, and then accordingly make the Venn diagram.
- Finally, ascertain the value of required quantity using the formula or by analysing the Venn diagram.
Both the approaches can be used to solve the problem, but analysis of Venn diagram is a better approach.

Example 1: Direction for example 1: Read the following information carefully to answer these question.

A result of 200 candidates gave the following information regarding three subjects.

28 passed both A and B .

98 passed topic A or B but not C . 42 passed topic B but not A or C . Around 122 passed in topic B or C but not A . Around 64 passed topic C but not A or B . Also, 14 passed topic A and C but not B .

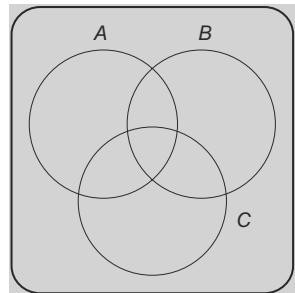


Figure 4

- How many candidates passed all the topics?
 1. 14 2. 8 3. 20 4. 16
- How many candidates passed in topic C irrespective of A or B ?
 1. 78 2. 102 3. 88 4. 86
- How many candidates passed in only one of the topic?
 1. 58 2. 78 3. 106 4. 142
- How many candidates passed in B and C but not A ?
 1. 16 2. 14 3. 42 4. 64

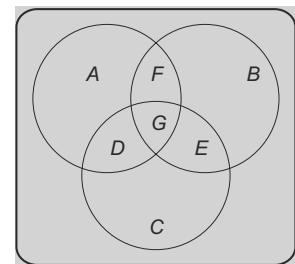


Figure 5

From the information, we can visualise (see Figure 5)

$$\text{Total Candidates} = 200 \quad A + B + C + D + E + F + G = 200 \quad (1)$$

$$28 \text{ passed both } A \text{ and } B. \quad F + G = 28 \quad (2)$$

$$98 \text{ passed topic } A \text{ or } B, \text{ but not } C. \quad A + F + B = 98 \quad (3)$$

$$42 \text{ passed topic } B, \text{ but not } A \text{ or } C. \quad B = 42 \quad (4)$$

$$122 \text{ passed in topic } B \text{ or } C \text{ but not } A. \quad B + E + C = 122 \quad (5)$$

$$64 \text{ passed topic } C, \text{ but not } A \text{ or } B. \quad C = 64 \quad (6)$$

$$14 \text{ passed topic } A \text{ and } C \text{ but not } B. \quad D = 14 \quad (7)$$

Using equations (4), (5) and (6)

We get, $E = 16$

Using Equations (1), (2), (5), and (7)

We get, $A = 36$

From Equations (3), we get $F = 20$

From Equations (2), we get $G = 8$

Using all these values, we get the Venn Diagram (Figure 6).

Solution 1: Candidates passing all three topics $A \cap B \cap C = 8$.

Ans 2

Solution 2: Candidates passing C irrespective of A or B or $C = 64 + 14 + 8 + 16 = 102$.

Ans 2

Solution 3: Candidates passing only one of the topic: A but not B or $C + B$ but not C or $A + C$ but not B or A

$$\equiv A \text{ only} + B \text{ only} + C \text{ only}$$

$$\equiv 36 + 42 + 64 = 142.$$

Ans 4

Solution 4: Candidates passing in B and C but not $A = B \cap C - B \cap C \cap A$

$$= 16 + 8 - 8 = 16.$$

Ans 1

Example 2: In an examination 70% of the candidates passed in Botany, 65% in Zoology, 27% failed in both the subjects and 496 passed in both the subjects. Find the total number of candidates.

Solution: Here, we have two properties, and there are some students who satisfy none of the properties (failed in both subjects).

Let total number of candidates = x

Candidates passed in Botany = 70% of $x = 0.7x$

Candidates passed in Zoology = 65% of $x = 0.65x$

Candidates failed both subjects = 27% of $x = 0.27x$

$$\therefore A = 0.7x, B = 0.65x, A \cap B = 496$$

$$\cup - (A \cup B) = 0.27x$$

$$x - (A \cup B) = 0.27x$$

$$A \cup B = 0.73x$$

we know,

$$A \cup B = A + B - A \cap B$$

$$0.73x = 0.7x + 0.65x - 496, 0.62x = 496, x = 800$$

$$\therefore \text{Total number of candidates} = 800.$$

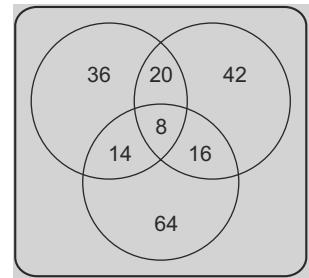


Figure 6

 **Exercise 8.1**

Directions for questions 1 to 4: 100 students of City A appear for management examination ACT, AXT and AMT. Around 38 and 51 students appear for AXT and ACT, respectively. Around 19 appear for both AMT and ACT. Also, 5 appear for all three and 12 appear for both AXT and ACT. Answer the following questions if 13 appear for both AXT and AMT.

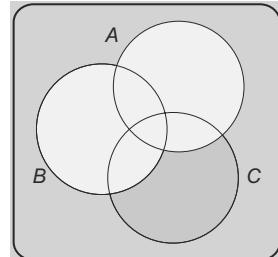
1. How many students appear for only two exams?
 1. 29 2. 30 3. 31 4. 32
2. How many appear for AMT only?
 1. 27 2. 26 3. 23 4. 24
3. How many appear for at least two exams?
 1. 34 2. 24 3. 23 4. 26
4. How many appear for AXT only?
 1. 16 2. 17 3. 18 4. 19
5. In SSC exam 70% of the candidates passed in Quant, 65% in English, 27% failed in both these subjects and 248 passed in both these subjects. Find the total number of candidates who appeared for the exam.
 1. 380 2. 400 3. 500 4. 350
6. In a class of 200 students, 70 played cricket, 60 played hockey and 80 played football; 30 played cricket and football, 30 played hockey and football, 40 played cricket and hockey. If 130 people played at least one game, find the number of people who played all the three games?
 1. 30 2. 20 3. 10 4. None of these
7. In a survey of 100 students, it was found that 50 ate in college canteen, 40 had their own tiffin and 30 ate in hostel mess. Of these 20 ate in college canteen and their own tiffin, 15 ate their own tiffin and also ate hostel mess and 10 ate in college canteen and hostel mess. How many students ate by all the three sources?
 1. 25 2. 22 3. 28 4. 20

Directions for questions 8 to 10: TRINITi Centre for Learning has 40 trainers working as freelancer and 30 as permanent. 20 workers work both as permanent and freelancers. Find:

8. How many trainers work as permanent alone?
 1. 15 2. 10 3. 25 4. 30
9. How many workers work as freelancer alone?
 1. 22 2. 15 3. 20 4. 30
10. Total number of trainers in TRINITi Centre for Learning is?
 1. 60 2. 40 3. 50 4. 70
11. In a group of 20 adults there are 8 females, 9 educated adults and 6 educated females. Find the number of uneducated males in the group?
 1. 7 2. 6 3. 11 4. 9
12. How many numbers between 1 and 100 are not divisible by 2, 3 or 5?
 1. 26 2. 39 3. 41 4. 29

90 Campus Placements

13. In a survey of 200 students in a hostel mess, it was found that 100 have breakfast, 80 have lunch and 60 have dinner. Of these 40 have breakfast and lunch, 30 have lunch and dinner and 20 breakfast and dinner. How many students have all three meals?
1. 50 2. 44 3. 56 4. 40
14. The shaded region Fig. 7 is represented by which of the following options?
1. $(A \cup B \cup C) - (A \cup B)$
2. $(A \cap B) \cup (A \cap C)$
3. $(A \cup B) \cap (A \cup C)$
4. None of these
15. 40% houses in the locality have two floors while 11% have both two floors and an open terrace. If 23 % houses have neither two floors nor open terrace then what is the percentage of houses having either two floors or open terrace but not both?
1. 65 2. 64 3. 66 4. 67

**Figure 7****Answer Key****Exercise 8.1**

1. 1 2. 3 3. 1 4. 3 5. 2 6. 2
7. 1 8. 2 9. 3 10. 3 11. 4 12. 1
13. 1 14. 1 15. 3

Explanatory Answers**Exercise 8.1**

5. Total number of passed students = $n(Q \cup E) = 73 = n(Q) + n(E) - n(Q \cap E) = 70 + 65 - x$
 $x = 62$

As 62% is 248, therefore 100% is 400.

Ans 2

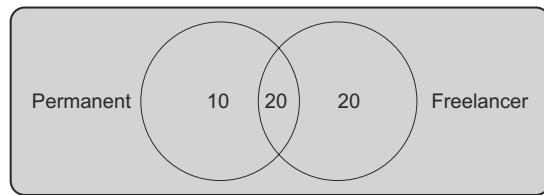
6. $n(c \cup h \cup f) = n(c) + n(h) + n(f) - n(c \cap h) - n(c \cap f) - n(h \cap f) + n(c \cap h \cap f)$
 $130 = 70 + 60 + 80 - 40 - 30 - 30 + x$
 $x = 20.$

Ans 2

7. $n(c \cup h \cup t) = n(c) + n(h) + n(t) - n(c \cap h) - n(c \cap t) - n(t \cap h) + n(c \cap h \cap t)$
 $100 = 50 + 30 + 40 - 10 - 20 - 15 + x$
 $x = 25.$

Ans 1

8.

**Figure 8****Questions 8 to 10 can be answered using (Figure 8) Venn diagram**

11. 20 are the total number of adults. 8 are females and 12 are males. 6 are educated females and 3 are educated males. Thus, uneducated males are 9. **Ans 4**
12. In 1 to 100, the 50 numbers are divisible by 2, 33 are divisible by 3, 20 are divisible by 5, 16 are divisible by 6(2 and 3), 6 are divisible by 15, 10 are divisible by 10 and 3 are divisible by 30.

$$\begin{aligned}n(2 \cup 3 \cup 5) &= n(2) + n(3) + n(5) - n(2 \cap 3) - n(2 \cap 5) - n(3 \cap 5) + n(2 \cap 3 \cap 5) \\&= 50 + 33 + 20 - 16 - 6 - 10 + 3 = 74\end{aligned}$$

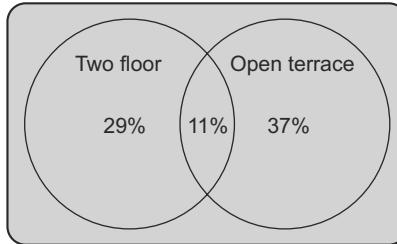
Therefore, number of numbers not divisible is $100 - 74 = 26$.**Ans 1**

13. $n(D \cup B \cup L) = n(D) + n(B) + n(L) - n(D \cap L) - n(B \cap D) - n(L \cap B) + n(D \cap L \cap B)$
 $200 = 60 + 100 + 80 - 30 - 20 - 40 + x$

$$x = 50.$$

Ans 1**Ans 3**

15.

**Figure 9**

Chapter 9

Permutations and Combinations

9.1 Fundamental Principles

Tossing a coin, rolling a dice, placing a ball in a box, selecting a particular person from a crowd are all physical processes that will have a number of possible outcomes. A ball can be placed in a box in one way, similarly when a coin is tossed either it will land up as “heads” or “tails”, i.e., a coin can be shown in two different ways; rolling a dice, has six possible outcomes 1, 2, 3, 4, 5 and 6; selecting a team of six from 14 people involves many possible outcomes.

9.1.1 Factorial

The product of first n natural numbers is denoted by $n!$ and is read as “ n factorial” or “factorial n ”.

Mathematically, $n! = n \times (n - 1) \times (n - 2) \times \dots \times 3 \times 2 \times 1$.

For Example, $6! = 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$

By definition $0! = 1$

9.1.2 Fundamental Principle of Addition

If one task can be done in x different ways and a second task can be done in y different ways, independent of the first, then either of them can be done in $(x + y)$ different ways.

Example 1: If there are 3 roadways from A to B and 2 railways from A to B then in how many ways can we travel from A to B ?

Solution: By fundamental principle of addition, the total number of ways = $3 + 2 = 5$ ways.

9.1.3 Fundamental Principle of Multiplication

If one task can be done in a different ways and a second task can be done in b different ways, independent of the first then both the tasks can be done together in $(a \times b)$ different ways.

Example 2: If there are three roadways from A to B and four railways from B to C then in how many ways can we travel from A to C ?

Solution: By fundamental principle of multiplication, the total number of ways = $3 \times 4 = 12$ ways.

9.2 Managing Permutations and Combinations

Before we get into the mathematical formulae of permutations and combinations, we need to understand that many students are confused about when to apply permutations and when to apply combinations. Also, sometimes they do not know how to use fundamental principles of addition and multiplication. We will look at a broad picture as to how to approach a problem of permutations and combinations. Before that, we need to make sure that we are well versed with all the formulae and factorial notations discussed earlier.

Suppose we have to choose a few items out of several, we need to analyze whether the items that have to be chosen give us a different outcome when taken in a different order. If the order in which they are represented (or in simple words, their internal arrangement) is important and makes a difference to the answer, we use permutations, and if the order is not important, we use combinations. If we look at a few basic examples, to select 4 football players out of 16 players, it does not make any difference if we select Scholes, Rooney, Ronaldo and Messi or Ronaldo, Scholes, Messi and Rooney or Messi, Scholes, Rooney and Ronaldo or any other order of these players. So, we use the combinations formula here. But, if we have to arrange 4 football players out of these 16, in a straight line then the order in which they stand becomes important and hence, we use permutations formula here.

Given below are some simple examples for practice where you can decide whether to use combinations or permutations:

- Making 4 digit numbers using 5, 6, 7, 8 and 9 without repeating a digit.
- Making triangles from a set of 15 points in a plane.
- Making 4 letter words with no alphabet occurring more than once.

Permutation of ' n ' different objects taken ' r ' at a time is an arrangement in a straight line of ' r ' objects from the given ' n ' objects. It is denoted by ${}^n P_r$ or ${}_nP_r$ or $P(n, r)$. Hence ${}^n P_r = n!/(n - r)!$

Combination of n objects taken r at a time is the selection of r objects from the given n objects. It is denoted by ${}^n C_r$ or ${}_n C_r$ or $C(n, r)$. The value of ${}^n C_r$ is given as:

$${}^n C_r = n!/(r!(n - r)!)$$

The other problem is about using fundamental principles. Most of the questions we deal with generally ask that in how many different ways a particular event can occur. If we analyze the problem carefully, we basically need to decide the total number of favourable ways that can lead to this particular event. For example, a question may be asked in how many ways can you take an exam in which you have to attempt 6 questions out of 8 questions. This is a fairly straight forward problem. Obviously, you can choose any 6 questions and the order in which they are attempted is unimportant. So, we use combinations here. Answer would be ${}^8 C_6 = 28$. If we analyze, what were the favourable cases in which this event could have happened. It could have happened only if you attempted 6 and only 6 questions, as you are required to attempt 6 questions.

Now let's see a slightly different problem. Now, a student has to attempt at least 6 questions. Now, this leads to 3 different favourable cases. The student can attempt 6 questions, 7 questions or 8 questions. In all the cases, purpose is being solved. But, can all these three cases happen together. NO. Only one of them occurs. When one happens, the others do not happen. (An example of Exclusive Events: A set of events out of which at most one can happen at a time.) In these kind of cases, we use fundamental principle of addition.

This means we simply add up the ways in which these three favourable cases can occur. We get the answer
 $= {}^8C_6 + {}^8C_7 + {}^8C_8 = 37$

Let us move on to a more complex example.

Suppose Abhay has to take a Maths exam with two sections, each having 5 questions. In total, he has to attempt 8 questions, attempting at least 3 from each section. Analyzing the favourable cases, this can be done in three ways: 5 from section 1 and 3 from section 2 or 4 from section 1 and 4 from section 2 or 3 from section 1 and 5 from section 2. At any point of time, either of the three events can occur. No two of these can occur together. So, all these three possibilities will use fundamental principle of addition. Now, if we look at possibility 1 in detail, we have two sub cases, selecting 5 questions from section 1 and selecting 3 from section 2. Can these two happen together? YES. We select 5 from section 1 and 3 from section 2, and the student attempts those 8 questions. So, these two cases can occur together and follow fundamental principle of multiplication.

Possibility 1: ${}^5C_5 \times {}^5C_3$

Possibility 2: ${}^5C_4 \times {}^5C_4$

Possibility 3: ${}^5C_3 \times {}^5C_5$

Now, using fundamental principle of addition on these 3 possibilities and adding them we get the answer 45.

9.3 Arranging Digits and Alphabets

To make r digit numbers from n different digits, where repetition of digits is not allowed,

r digit numbers that can be formed = $n \times (n - 1) \times (n - 2) \times \dots \times (n - r + 1)$

Special case: When $r = n$, r digit numbers that can be formed = $n!$

To make r digit numbers from n different digits, where repetition of digits is allowed,

r digit numbers that can be formed = $n \times n \times n \times \dots$ (r times) = n^r

However, the questions generally asked in tests will be of a higher difficulty level than these basic formulae, and will generally be based on multiple concepts.

Example 3: How many 6 digit numbers can be formed using digits 3, 4, 5, 7, 8 and 9 when repetition of digits is not allowed such that:

- I. Number formed is a multiple of 9.
- II. Number formed is a multiple of 2.

Solution:

- I. Since repetition of digits is not allowed, the only way we can form 6-digit numbers is by using all the available 6 digits. For a number to be divisible by 9, the sum of its digits should be divisible by 9. Here, sum of available 6 digits = $4 + 5 + 3 + 7 + 8 + 9 = 36$, which is divisible by 9. That means, any number formed using these 6 digits will always be divisible by 9, irrespective of the order of digits, as the sum will be 36 in all the cases. For Example, 534879, 937584, 853749, etc. So, answer will be $6! = 720$.
- II. Since repetition of digits is not allowed, the only way we can form 6-digit numbers is by using all the available 6 digits. For a number to be divisible by 2, the number should be even. Here, this is only possible if the digits at last place 4, 8. If we take up the first case the rest five can rearrange. For the first 5 places, we can place remaining 5 numbers in $5!$ ways. Similarly for the second case, and same goes for all of them. So, answer will be $2 \times 5! = 240$.

9.3.1 Forming Words using Some Alphabets where all the Alphabets are Different

If you are given n different alphabets and asked to form words of r alphabets with or without dictionary meaning, where $r \leq n$.

Words that will be formed = $n \times (n - 1) \times (n - 2) \times \dots \times (n - r + 1)$

Special case: When $r = n$, words that will be formed = $n!$

9.3.2 Forming Words using Some Alphabets where some of the Alphabets are Same

If you are given n alphabets out of which an alphabet occurs x times, a second alphabet occurs y times, a third alphabet occurs z times, and so on, and asked to form words of n alphabets with or without dictionary meaning.

Words that will be formed = $n!/(x! y! z!)$

Example 4: How many 11 lettered words can be formed using letters of word ‘TUTANKHAMUN’?

Solution: Using the formula, $n = 11$, T is occurring 2 times, U 2 times, A 2 times and N 2 times, the number of different words that can be formed = $11!/(2!2!2!2!) = 4989600$

9.3.3 Dictionary Rank

If we have a word with 5 alphabets for example, SAHIL. Using these 5 alphabets, we can form $5!$ different words. All these different words when put together in alphabetic or dictionary order, each of them will have a rank or position in the alphabetical list formed. The position of a particular word in that list is known as its dictionary rank. For example, the first word in the sequence will be AHILS, the second will be AHISL, the third will be AHLIS, and so on. The dictionary rank of these three words will be 1, 2 and 3 respectively.

In order to find the dictionary rank of a specific word, we need to follow a step-wise approach checking each alphabet one by one from left to right. For each alphabet, we will find an Individual Rank Weight-age (IRW). In general, if an alphabet is at n^{th} position from right, and among the rightmost n alphabets, it comes at r^{th} position in their alphabetical order, its IRW = $(n - 1)! \times (n - r)$

What you need to do is to calculate IRW for all alphabets and add them,

Dictionary Rank = Total different words – sum of IRWs

For example, if we need to form rank of ILASH, Total different words = $5! = 120$

Since I is at 5^{th} position from right, and among rightmost 5 letters, it comes at 3^{rd} position in alphabetical list.

$$\text{IRW of I} = (5 - 1)! \times (5 - 3) = 48.$$

$$\text{Now we are left with 4 letters, so IRW of L} = (4 - 1)! \times (4 - 3) = 6.$$

$$\text{Now we are left with 3 letters, so IRW of A} = (3 - 1)! \times (3 - 1) = 4.$$

$$\text{Now we are left with 2 letters, so IRW of S} = (2 - 1)! \times (2 - 2) = 0$$

$$\text{Finally IRW of H} = (1 - 1)! \times (1 - 1) = 0$$

Note: IRW of rightmost digit is always 0.

$$\text{Sum of IRWs} = 48 + 6 + 4 + 0 + 0 = 58$$

$$\text{So, dictionary rank of ILASH} = 120 - (58) = 62$$

Example 5: From a mixed group of 6 boys and 12 women, a basketball team is to be chosen. In how many ways this can be done if;

(i) Team has 2 boys and 4 women

(ii) Team has 4 members with at least a boy and a woman in the team

Solution: (i) Here, combinations will be used as internal ordering in the team is irrelevant. Also, selecting boys and women is independent of each other, so fundamental principle of multiplication will be used.

$$\text{Number of ways} = {}^6C_2 \times {}^{12}C_4 = 15 \times 495 = 7425$$

(ii) Here again, combinations will be used. But the favourable case can be achieved in 3 different ways, viz. 3 boys and 1 woman; 2 boys and 2 women; 1 boy and 3 women.

$$\text{Number of ways} = ({}^6C_3 \times {}^{12}C_1) + ({}^6C_2 \times {}^{12}C_2) + ({}^6C_1 \times {}^{12}C_3) = (20 \times 12) + (15 \times 66) + (6 \times 220) = 240 + 990 + 1320 = 2550$$

Example 6: How many 4 digit numbers that are divisible by 4 can be made using digits 1, 2, 3, 4, 5, 6 and 7, if repetition of digits is allowed.

Solution: For a number to be divisible by 4, the number formed by its last two digits must be divisible by 4. So, the last two digits of required number can be 12, 16, 24, 32, 36, 44, 52, 56, 64, 72 or 76. For the first digit, we have 7 options, for the second digit we have 7 options and for the last two digits in a combined way, we have 11 options.

$$\text{So, 4 digit numbers} = 7 \times 7 \times 11 = 539$$

9.3.4 Binary Selection

If we have n different items and we have to select items from these n items.

So there are following cases:

No item is selected: nC_0 Or 1 item is selected: nC_1 Or 2 items are selected: nC_2 Or

n items are selected: nC_n . Which means any number of items can be selected.

$$\text{So, number of ways} = {}^nC_0 + {}^nC_1 + {}^nC_2 + {}^nC_3 + {}^nC_4 + \dots + {}^nC_n = 2^n$$

Example 7: There are 10 different coloured balls; in how many ways can you select one or more balls out of these.

Solution: Total number of ways in which balls can be selected = 2^{10}

But if we have to select at least one ball then out of total ways subtract the case in which we do not select a ball = $2^{10} - {}^{10}C_0 = 2^{10} - 1$

Example 8: You are given three different jute bags and 12 different coins. What is the total number of ways in which you can put coins in these bags such that each bag has at least one coin?

Solution: If we have to put 12 coins in 3 bags, we will take first coin and put it in one of the three bags, then take second coin and put in one of the three bags, and so on.

So, the total ways possible are $3 \times 3 \times \dots 12 \text{ times} = 3^{12}$

But this would also include cases when one or more bags have zero coins (which are invalid cases as per our requirement). The invalid cases include:

(a) Bag 1 is empty, others two are not. This can be achieved in 2^{12} ways, as we have only two bags among options.

(b) Bag 2 is empty, others two are not. This can be achieved in 2^{12} ways, as we have only two bags among options.

- (c) Bag 3 is empty, others two are not. This can be achieved in 2^{12} ways, as we have only two bags among options.
- (d) Bags 1 and 2 are empty. This can be achieved in 1^{12} ways, as we have only one bag among options.
- (e) Bags 1 and 3 are empty. This can be achieved in 1^{12} ways, as we have only one bag among options.
- (f) Bags 2 and 3 are empty. This can be achieved in 1^{12} ways, as we have only one bag among options.

So, total ways possible = Total cases – Invalid cases = $3^{12} - 3 \times 2^{12} - 3 \times 1^{12}$

Important Points to Remember

1. If N people are supposed to sit on a round table with n chairs. The total possible ways in which they can sit = $(N - 1)!$ Because in a circle there is no reference point and hence one place has to be sacrificed in order to create a reference point. So, the remaining $N - 1$ people can now sit in $(N - 1)!$ ways.
2. If there are N different pearls and the total number of possible necklaces that can be made are $(N - 1)!/2$.

Example 9: There are 6 boys and 6 girls. They are supposed to sit on a round table with 12 chairs. In how many ways can they sit such that no two boys sit together.

Solution: Boys and girls should sit on alternate chairs. Around 6 boys will sit on six chairs in $(6 - 1)! = 5!$ ways.

6 girls can now sit in $6!$ ways. So total number of ways = $5! \times 6!$.

Example 10: In a meeting, everybody shook hands with each other. If in total there were 28 hand shakes in total, how many people were present in the meeting?

Solution: If there are n people so, total handshakes possible = ${}^nC_2 = n(n - 1)/2$
 $n(n - 1)/2 = 28$, on solving it $n = 8$.



Exercise 9.1

1. Out of 7 shopkeepers and 5 hawkers, how many committees with 3 shopkeepers and 2 hawkers can be formed?
 1. 350 2. 45 3. 750 4. 1050
2. In how many different ways can the letters of the word ‘MOTHERHOOD’ be arranged so that the vowels always come together?
 1. 4030 2. 10080 3. 20160 4. 50320
3. In how many ways can 5 monkeys and 6 dogs be arranged in a row so that no two monkeys are together?
 1. ${}^7P_5 \times 6!$ 2. ${}^7P_5 \times 5!$ 3. 7P_5 4. ${}^7P_5 \times 5!$
4. From a group of 6 men and 4 women, 7 persons are to be selected to form a committee so that at least 4 men and 2 women are there on the committee. In how many ways can it be done?
 1. 756 2. 108 3. 75 4. 96

5. A postman wants to deliver 15 letters to 6 different houses. If none of the letter contains postal address, in how many ways can he deliver these 15 letters to 6 houses, if he can deliver more than 1 letter to each house?
1. 6^{15} 2. 15^6 3. ${}^{15}P_6$ 4. ${}^{15}C_6$
6. In a party every person shakes hand with every other person. If there were 91 handshakes in all, how many persons were present at the party?
1. 14 2. 13 3. 12 4. 15
7. In a boat, there are 2 rows of seats facing each other with accommodation for 6 in each, 5 wish to sit facing one particular direction and 5 wish to face the other direction while the rest are indifferent. In how many ways can the 12 passengers be seated?
1. $12!$ 2. ${}^6C_5 \times {}^6C_5 \times {}^2C_2$ 3. ${}^6P_5 \times {}^6P_5 \times {}^2P_2$ 4. 47280
8. When five fair dice are rolled simultaneously, in how many outcomes will at least one of the dice shows 4?
1. 430 2. 5221 3. 3271 4. 4651
9. How many necklaces can be made using 10 pearls of different colours (necklace has to contain 10 pearls)?
1. $10!$ 2. $9!$ 3. $10!/2$ 4. $9!/2$
10. How many rectangles that can be made from a set of 4 equal parallel straight lines intersecting a set of 4 equal parallel straight lines = ?
1. 9 2. 12 3. 36 4. 18



Exercise 9.2

1. If the letters of the word POLITE are rearranged to form 6 letter words such that none of the word repeats and the result is arranged in ascending order as in a dictionary what is the rank of the word POLITE?
1. 566 2. 567 3. 568 4. 569
2. How many integers of four digits not greater than 5000, can be formed with the digits 0, 1, 2, 3 and 4, if repetition of digits is allowed?
1. 500 2. 501 3. 375 4. 376
3. There are 6 flags of different colours. How many different signals can be formed?
1. 3000 2. 1956 3. 720 4. 3200
4. In an 8×8 chessboard, in how many ways can we put two identical stones, one on the black square and one on a white square on the grid, such that they are not placed in the same row or in the same column?
1. 746 2. 654 3. 289 4. 768
5. A father wants to give toys to his 3 children. He has 5 toys in all and he wants to make sure that a child receives minimum one and at most two toys. In how many ways can he do this?
1. 180 2. 120 3. 60 4. 72
6. When we list the integers from 1 to 1001, how many times does the digit '7' occur?
1. 300 2. 240 3. 297 4. 304
7. 13 delegates have to attend a conference. There are two round tables with seating capacity of 8 and 5? In how many ways can they be seated?
1. ${}^{13}C_8 \times 5! \times 5!$ 2. $6! \times 5!$ 3. $2 \times {}^{13}C_8 \times 5! \times 7!$ 4. ${}^{13}C_8 \times 7! \times 4!$

8. A regular polygon has 35 diagonals. What is the number of sides of that regular polygon?
 1. 10 2. 11 3. 9 4. 12
9. There are 4 boxes numbered 1, 2, 3, 4. Each box is to be filled up either with a red or a blue ball in such a way that at least 1 box contains a blue ball and the boxes containing blue balls are consecutively numbered. Find the total number of ways in which this can be done.
 1. 10 2. 31 3. 27 4. 6
10. Palindrome is word that is same when read from left to right or right to left. For example, 'RADAR'. How many such 3 letter palindromes are possible?
 1. 676 2. 765 3. 656 4. 476

 **Answer Key**
Exercise 9.1

1. 1 2. 2 3. 1 4. 4 5. 1 6. 1
 7. 3 8. 4 9. 4 10. 3

Exercise 9.2

1. 3 2. 1 3. 2 4. 4 5. 1 6. 1
 7. 4 8. 1 9. 1 10. 1

 **Explanatory Answers**
Exercise 9.1

1. Number of ways of selecting 3 shopkeepers out of 7 and 2 hawkers out of 5
 $= ({}^7C_3 \times {}^5C_2) = 350.$ **Ans 1**
2. In the word 'MOTHERHOOD' we treat all the vowels as one unit.
 So, the number of ways of arranging 7 units M, T, H, R, H, D, (O, O, O, E) with H occurring two times
 $= 7!/2! = 2520$
 Four vowels, in which 'O' occurs 3 times, can be arranged in $4!/3! = 4$ ways.
 Required number of ways $= (2520 \times 4) = 10080.$ **Ans 2**
3. In this case, the number of ways in which all dogs can be arranged is $6!$ ways
 This creates 7 slots in between dogs-one on left end and one on the right end and 5 in between the dogs.
 Number of ways in which 5 monkeys can be arranged in these 7 slots $= 7P_5$
 Total number of arrangements $= 7P_5 \times 6!$ **Ans 1**
4. The committee can be formed with (4 men and 3 women) or (5 men and 2 women)
 Required number of ways $= ({}^6C_4 \times {}^4C_3) + ({}^6C_5 \times {}^4C_2) = 96.$ **Ans 4**
5. Each of the 15 letters can be posted in any of the 6 houses.

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So, the first letter has 6 options, so does the second letter and so on and so forth for all of the 15 letters, i.e., $6 \times 6 \times 6 \times \dots \times 6$ (up to 15 times) = 6^{15} . **Ans 1**

6. Let total number of persons present in the party be x .

Then, ${}^x C_2 = 91$ or $x(x - 1)/2 = 91$, i.e. $x = 14$. **Ans 1**

7. The five persons who wish to sit in one direction can be seated in: ${}^6 P_5$ ways and 5 who wish to sit facing the other direction can be seated in: ${}^6 P_5$ ways and the remaining 2 can be seated in the remaining 2 seats in ${}^2 P_2$ ways.

Total number of ways = ${}^6 P_5 \times {}^6 P_5 \times {}^2 P_2$. **Ans 3**

8. When 5 dice are rolled simultaneously, total number of outcomes = $6^5 = 7776$.

The number of outcomes in which none of the 5 dice show 4 = $5^5 = 3125$.

Therefore, the number of outcomes in which at least one die will show 4 = $7776 - 3125 = 4651$.

Ans 4

9. Number of necklaces that can be made using n different beads = $(n - 1)!$ /2

So it is $9!/2$. **Ans 4**

10. To form a rectangle, we need 2 pairs of equal parallel lines.

Selecting a pair from each of the sets of equal parallel lines we get ${}^4 C_2 \times {}^4 C_2 = 36$. **Ans 3**

Exercise 9.2

1. The word contains 6 different letters which can be arranged in a total of $6! = 720$ ways.

Arranging them in ascending order,

No. of words beginning with 'E' = $5! = 120$

Similarly, no. of words beginning with 'I', 'L', 'O' = $5! = 120$ each

Total words = $4 \times 120 = 480$.

The 481st word will begin with P

No. of words beginning with 'PE', 'PI', 'PL' = $4! + 4! + 4!$

Total words = $480 + 24 + 24 + 24 = 552$

The 553rd word will begin with 'POE'

No. of words beginning with 'POE', 'POI' = $3! + 3!$

Total words $552 + 6 + 6 = 564$

The 565th word will be 'POLEIT'

The 566th word will be 'POLETI'

The 567th word will be 'POLIET'

The 568th word will be 'POLITE'. **Ans 3**

2. The smallest number in the series is 1000. The largest number is 4444

The left most digit (thousands place) of each of the 4 digit numbers can take one of the 4 values 1 or 2 or 3 or 4.

The next 3 digits (hundreds, tens and units place) can take any of the 5 values 0 or 1 or 2 or 3 or 4.

Total possible numbers = $4 \times 5 \times 5 \times 5 = 500$ from 1000 to 4444.

Including 4000, there will be 500 such numbers.

Ans 1

3. Taking 6 flags at a time, number of possible arrangements = $6P_6$

Similarly taking 5, 4, 3, 2, 1 flags at a time.

Required number of possible arrangements = $6P_1 + 6P_2 + 6P_3 + 6P_4 + 6P_5 + 6P_6 = 1956$.

Ans 2

4. In an 8×8 grid of a chessboard, each row and each column contains 4 white and 4 black squares placed alternatively. There are a total of 32 black and 32 white squares.

For every black square chosen to put one stone, we cannot choose any white square present in its row or column.

There are 4 white squares in its row and 4 white squares in its column for every black square. Hence for every black square chosen, we have 24 white squares. It means there are $32 \times 24 = 768$ ways.

Ans 4

5. Possible ways in which 3 children get one toy each = $5 \times 4 \times 3$

Remaining 2 two can be distributed in $N = (5 \times 4 \times 3) \times (3 \times 2)$ ways

But the above number of cases are redundant hence total cases = $N/2 = 180$

Because let's say there are 5 toys A, B, C, D, E.

Hence it can be divided among 3 children in this way – (A, B), (C, D), (E) but it is not different from (B, A), (D, C), (E).

6. Any number between 1 and 999 can be expressed in the form of xyz where $0 \leq x, y, z \leq 9$.

Case 1: The numbers in which 7 occurs only once, e.g 7, 37, 743 etc.

This means that one digit is 7 and the remaining two digits will be any digit between 0 and 9 except 7.

We have $1 \times 9 \times 9 = 81$ such numbers. However, 7 could appear as the first or the second or the third digit. Therefore, there will be $3 \times 81 = 243$ numbers (1-digit, 2-digits and 3-digits) in which 7 will appear only once.

Case 2: The numbers in which 7 will appear twice, e.g. 771 or 77

In these numbers, one of the digits is not 7 and it can be any digit between 0 and 9 except 7.

There will be 9 such numbers. However, this digit which is not 7 can appear in the first or second or the third place. So there are $3 \times 9 = 27$ such numbers.

Case 3: The number in which 7 appears thrice – e.g. 777 – 1 number.

Therefore, the total number of times the digit 7 is written between 1 and 999 is $243 + 54 + 1 = 298$.

Ans 1

7. 'n' objects can be arranged around a circle in $(n - 1)!$.

Selecting 8 people to sit on the first table in ${}^{13}C_8$ ways.

Number of ways of arranging these 8 people on 8 seats on a round table = $(8 - 1)! = 7!$

The remaining 5 people can be made to sit around the second circular table in:

$(5 - 1)! = 4!$ ways.

Hence, total number of ways: ${}^{13}C_8 \times 7! \times 4!$

Ans 4

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8. The number of diagonals of a polygon are ${}^nC_2 - n = 35$

$$n(n-1)/2 - n = 35$$

Solving the quadratic, we get

$$(n-10)(n+7) = 0$$

So, $n = 10$.

Ans 1

Trick No. of diagonals of a n sided regular polygon are $n(n-3)/2$.

9. If only one of the boxes has a blue ball, it can be any of the 4 boxes. So, this can be achieved in 4 ways.

If two of the boxes have blue balls and then there are 3 arrangement possible, i.e., the two boxes can one of 1 – 2 or 2 – 3 or 3 – 4

If 3 of the boxes have blue balls, there will be 2 options in which the 3 boxes are in consecutive positions, i.e., 1 – 2 – 3 or 2 – 3 – 4

If 4 boxes have blue balls, there will be 1 option, i.e., 1 – 2 – 3 – 4

Total number of options = $4 + 3 + 2 + 1 = 10$.

Ans 1

10. The first letter from the right can be chosen in 26 ways because there are 26 alphabets.

The second letter can be chosen in 26 ways.

The third letter can be chosen in only 1 way.

All the three letters can be chosen in $26 \times 26 \times 1 = 676$ ways.

It implies that the maximum possible number of 3 letter palindromes is 676.

Ans 1

Chapter 10

Probability

10.1 Basic Terms Used

Probability is the chance of occurrence of a certain event when expressed quantitatively, i.e., probability is a quantitative measure of certainty.

10.1.1 Experiment

An operation which can produce some well defined outcomes is called an experiment. There are two types of experiments:

- **Deterministic Experiment:** An experiment which gives a definite result.
Example: Acid is added to a base of any scientific experiment performed under some conditions.
- **Random Experiment (Probabilistic):** An experiment which gives one or more results under identical conditions.
For example: Tossing of a coin, throwing of a dice, picking a card from a deck of cards.

10.1.2 Trial and Elementary Events

Let a random experiment be repeated under identical conditions. Then the experiment is called a trial and the possible outcomes of the experiment are known as elementary events or cases.

- For example:** Tossing of a coin is a trial and getting head or tail is an elementary event.
- **Compound Events:** Events obtained by combining together two or more elementary events are known as compound events.
For example: In a single throw of three dices the event of getting a triplet is a compound event because this event occurs if any one of the events (1, 1, 1), (2, 2, 2), (3, 3, 3), (4, 4, 4), (5, 5, 5), (6, 6, 6) occurs.
 - **Exhaustive Number of Cases:** The total number of possible outcomes (elementary events) of a random experiment in a trial is known as the exhaustive number of cases.
For example: In throwing a dice the exhaustive number of cases is 6, since any one of the six faces marked with 1, 2, 3, 4, 5 or 6 may come.

In drawing three balls from a box containing 5 red and 6 blue balls, the exhaustive number of cases is ${}^{11}C_3$, since 3 balls can be drawn out of 11 balls in ${}^{11}C_3$ ways.

- **Equally Likely Events** Events are said to be equally likely if one does not happen more often than the other.

For example: If an unbiased die is rolled, then each outcome is equally likely. A coin is tossed and it is equally likely that head or tail come.

10.1.3 Independent and Exclusive Events

- **Exclusive Events:** Events are said to be mutually exclusive or incompatible if the occurrence of anyone of them prevents the occurrence of all the others, i.e., if no two or more of them can occur simultaneously in the same trial.

However, if it is necessary that exactly one of them is always going to occur, we call them mutually exclusive events.

For example: In a single throw of a dice getting an even number and getting an odd number are mutually exclusive events.

- **Independent Events:** Events are said to be independent if the happening (or non-happening) of one event is not affected by the happening (or non-happening) of others.

For example: If two dice are thrown together, then getting an even number on first dice is independent of getting an odd number on the second dice. If coin is tossed twice, then getting a head in second toss is independent of getting a head or tail on first toss.

- **Favourable Number of Cases:** The number of cases favourable to an event in a trial is the total number of elementary events such that the occurrence of any one of them ensures the happening of the event.

For example: In throwing two dice, the number of cases favourable for getting 10 as the sum is i.e. (4, 6), (6, 4), (5, 5).

Important Points to Remember

1. If A is an event of the sample space S, the probability of A can be defined as:

$$P(A) = \text{Number of cases favourable of } A / \text{Total number of cases}$$

$$0 < P(A) < 1.$$

If 'a' cases are favourable to A and 'b' cases are not favourable to A, then $P(A) = a/(a + b)$

The event of not happening of A is called 'not A' and is represented as A' : The probability of A' is given by: $P(A') = 1 - P(A) = b/(a + b)$

$P(A) + P(A') = 1$, where $P(A') = \text{Probability of not happening of } A$.

Example 1: Find the chance of getting a sum more than or equal to 16 in one throw with 3 dice.

Solution: Either sum should be 16 or sum should be 17 or sum should be 18

Favourable cases for sum 16 = (6, 6, 4), (6, 4, 6), (4, 6, 6), (6, 5, 5), (5, 6, 5), (5, 5, 6)

Favourable cases for sum 17 = (5, 6, 6), (6, 5, 6), (6, 6, 5)

Favourable cases for sum 18 = (6, 6, 6)

Total number of cases = $6^3 = 216$

$$P(\text{sum} = 16) + P(\text{sum} = 17) + P(\text{sum} = 18) = 6/216 + 3/216 + 1/216$$

$$P = 10/216 = 5/108$$

10.2 Analyzing Situations for Problem Solving

The main objective here is to break the favourable cases into independent and exclusive events. Then the probabilities of independent events are multiplied while that of exclusive events is added. Generally, if you will break down the favourable condition into basic English language, the independent events will be separated by ‘and’ while exclusive events will be separated by ‘or’. You can then write the value of probabilities of individual events and replace ‘and’ by multiplication and ‘or’ by addition. Few examples given below will clarify this point.

Example 2: There are two boxes, one contains 5 screws and 7 nuts and the other contains 3 screws and 12 nuts. An item is to be drawn from one or other of the two boxes, find the chance of drawing a screw.

Solution: Favourable event is either first box is chosen and a screw is drawn or second box is chosen and a screw is drawn.

$$P = (\text{First box chosen and a screw drawn}) + (\text{Second box chosen and a screw is drawn}) \\ P = (1/2 \times 5/12) + (1/2 \times 3/15) = 37/120$$

Example 3: A coin is tossed 9 times. What is the probability that head appears an odd number of times?

1. $4/9$

2. $13/27$

3. $1/2$

4. $40/81$

Solution: If head appears odd number of times, i.e. 1, 3, 5, 7 or 9, tail would have appeared even number of times, i.e. 0, 2, 4, 6 or 8 and vice versa.

Favourable event:

Head appears 1 time and tail appears 8 times or Head appears 3 times and tail appears 6 times and so on

$$P(E) = {}^9C_1 \times (1/2)^1 (1/2)^9 + {}^9C_3 \times (1/2)^3 (1/2)^6 + \dots + {}^9C_9 \times (1/2)^9 (1/2)^1 = 1/2 \quad \text{Ans 3}$$

Example 4: A’s chances of hitting bull’s eye is $1/2$, that of B is $1/3$ and C can hit with 100% surely. What is the probability that at least 2 shots hit bull’s eye?

1. $1/2$

2. $2/3$

3. $1/3$

4. $5/6$

Solution: Favourable event is, at least two hit the target, i.e. All hit the target or only 2 hit the target. Probability all of them hitting the target $= (1/2 \times 1/3 \times 1)$

Probability that only two hit the target $= (A \text{ and } B \text{ hits but } C \text{ does not hit}) + (B \text{ and } C \text{ hit but } A \text{ does not hit}) + (A \text{ and } C \text{ hit but } B \text{ does not hit}) = (1/2 \times 1/3 \times (1 - 1)) + (1/3 \times 1 \times (1 - 1/2)) + (1/2 \times 1 \times (1 - 1/3))$

$$P(E) = (1/2 \times 1/3 \times 1) + (1/2 \times 1/3 \times (1 - 1)) + (1/3 \times 1 \times (1 - 1/2)) + (1/2 \times 1 \times (1 - 1/3)) \\ = 1/6 + 0 + 1/6 + 1/3 = 2/3$$

$P(E) = 2/3.$

Ans 2



Exercise 10.1

1. If two dice are tossed, the probability that the sum is 8 is:
 1. $7/36$ 2. $5/36$ 3. $5/6$ 4. $1/6$
2. A bag contains 6 blue, 5 green and 4 orange balls. If 4 balls are drawn and replaced by white ball one after the other. What is the probability that all the blue balls are replaced?
 1. $1/455$ 2. $3/1625$ 3. $3/25$ 4. $8/1125$

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3. The probability that a student is not a swimmer is $3/8$. Out of 8 students, the probability that exactly three are swimmers is:
1. ${}^8C_3 \times (5/7)^3$ 2. ${}^8C_3 \times (5/8)^3 \times (3/8)^5$ 3. $(5/8)^3 \times (3/8)^5$ 4. $(3/8)^5$
4. A consonant is selected from the word “STEPSISTER”. What is the probability that it is “S” ?
1. $1/3$ 2. $1/2$ 3. $1/10$ 4. $3/7$
5. A fair coin is tossed 70 times. The probability that tail occurs even number of times is:
1. $1/6$ 2. $1/10$ 3. $1/4$ 4. $1/2$
6. A four digit number is formed by using the digits 2, 3, 7, 8 without repetition. One number is selected from that numbers. What is the probability that it is an odd number?
1. $2/3$ 2. $1/3$ 3. $1/2$ 4. $1/4$
7. The odds against A to solve a problem are 2:7 and the odds in favour of student B to solve the problem are 4:5. The probability that the problem will be solved by both A and B is:
1. $1/81$ 2. $2/81$ 3. $28/81$ 4. $10/81$
8. In a bag, there are 10 bananas and 25 peaches. A fruit is drawn at random. What is the probability of getting a banana?
1. $1/10$ 2. $2/7$ 3. $2/5$ 4. $5/7$
9. Two packs of 52 cards each are mixed and one card is drawn at random. What is the probability that the card drawn is a face card (Jack, Queen and King only)?
1. $3/13$ 2. $2/13$ 3. $6/13$ 4. $1/4$
10. Two cards are picked from a pack of cards. What is the probability that both the cards picked are of different suits?
1. $13/17$ 2. $5/17$ 3. $4/17$ 4. $7/17$

**Exercise 10.2**

1. 6 boys and 6 girls are made to stand in a row. Find the probability that the boys and girls stand alternately.
1. $1/462$ 2. $5/462$ 3. $2/71$ 4. $7/126$
2. A bag contains 6 white balls and 7 green balls. Two balls are drawn from the bag one after the other, if the first ball is not replaced before drawing the second ball, the probability that the first ball is white and the second ball is green is
1. $8/26$ 2. $7/26$ 3. $5/13$ 4. $6/11$
3. Three numbers are selected from the first 21 natural numbers. What is the probability that the three numbers are in geometric progression?
1. $11/1330$ 2. $1/195$ 3. $1/190$ 4. $3/380$
4. One square is selected from an 8×8 chess board. What is the probability that it is a square of size 5×5 ?
1. $1/9$ 2. $2/17$ 3. $4/51$ 4. $25/204$
5. Two dice are rolled. The probability that the total score is not a prime number is:
1. $1/6$ 2. $7/12$ 3. $1/2$ 4. $7/9$
6. Ram and Shyam appear in an interview for two vacancies in an organization. The probability of Ram’s selection is $1/7$ and the probability of Shyam’s selection is $1/5$. What is the probability that only one of them is selected for the job.
1. $4/5$ 2. $8/15$ 3. $4/7$ 4. $2/7$

7. A lottery has 20 boxes, out of which 4 are “better luck next time”. Two boxes are opened at random. The probability that at least one of these is “better luck next time” is:
1. 7/19 **2.** 4/19 **3.** 12/19 **4.** 21/95
8. Four persons are chosen at random from a group of 3 actors, 2 directors and 4 producers. The chance that exactly 2 of them are producers is:
1. 1/12 **2.** 10/21 **3.** 1/5 **4.** 1/9
9. Two cards are drawn at random from a pack of 52 cards. What is the probability that either both are red or both are jack?
1. 22/221 **2.** 55/221 **3.** 6/17 **4.** 14/17
10. Tokens numbered 1 to 20 are mixed up and then a token is drawn at random. What is the probability that the token drawn has a number which is a prime factor of 30 or 210?
1. 8/15 **2.** 1/2 **3.** 1/5 **4.** 2/5

 **Answer Key**
Exercise 10.1

- | | | | | | |
|-------------|-------------|-------------|--------------|-------------|-------------|
| 1. 2 | 2. 4 | 3. 2 | 4. 4 | 5. 4 | 6. 3 |
| 7. 3 | 8. 2 | 9. 1 | 10. 1 | | |

Exercise 10.2

- | | | | | | |
|-------------|-------------|-------------|--------------|-------------|-------------|
| 1. 1 | 2. 2 | 3. 1 | 4. 3 | 5. 2 | 6. 4 |
| 7. 1 | 8. 2 | 9. 2 | 10. 3 | | |

 **Explanatory Answers**
Exercise 10.1

2. Probability that first ball drawn is blue is 6/15, Probability that second ball drawn is blue is 5/15, Probability that third ball drawn is blue is 4/15, Probability that fourth ball drawn is blue is 3/15.

$$\text{Required probability} = \frac{\text{Favourable cases}}{\text{Total Cases}} = (6/15)(5/15)(4/15)(3/15) = 8/(1125). \quad \text{Ans 4}$$

3. Select three students = 8C_3

The probability that each one of the selected is swimmer and the rest 5 are not swimmers

$$= {}^8C_3 \times (5/8)^3 \times (3/8)^5 \quad \text{Ans 2}$$

6. Total number of 4-digit number = $4! = 24$

If unit digit is 3 then number of 4-digit numbers = $3! = 6$

If unit digit is 7 then number of 4-digit numbers = $3! = 6$

So, total odd numbers = 12.

$$\text{So probability} = \frac{\text{Favourable cases}}{\text{Total Cases}} = 12/24 = 1/2$$

Shortcut Method

Since there are 2 odd digits and 2 even digits. So, the probability that the last digit is one of the odd digits is $2/4 = 1/2$. Ans 3

10. Select a suit 4C_1 and then one card from this suit ${}^{13}C_1$

$$\text{Probability} = \frac{\text{Favourable cases}}{\text{Total Cases}} = ({}^4C_1 \times {}^{13}C_1)/52$$

Now select the second card in the same way from 3 suits left

$$\text{Probability} = \frac{\text{Favourable Cases}}{\text{Total Cases}} = ({}^3C_1 \times {}^{13}C_1)/51$$

$$\text{Required probability} = ({}^4C_1 \times {}^{13}C_1)/52 \times ({}^3C_1 \times {}^{13}C_1)/51 = 13/17.$$

Ans 1

Exercise 10.2

1. Boys and girls can stand alternately in the following way

BGBGBGBGBGB or GBGBGBGBGB

The boys can be made to stand in any of the 6 positions and girls in the remaining 6 ways and there are two ways:

$$\begin{aligned}\text{Required probability} &= \frac{\text{Favourable Cases}}{\text{Total Cases}} = (2 \times 6! \times 6!)/12! \\ &= 2(6!)(6!)/(12)(11)(10)(9)(8)(7)(6!) \\ &= 1/462.\end{aligned}$$

Ans 1

3. There are total 11 possible GPs

(1, 2, 4) (1, 3, 9) (1, 4, 16) (2, 4, 8) (2, 6, 18) (3, 6, 12) (4, 8, 16) (5, 10, 20) (4, 6, 9) (8, 12, 18) (9, 12, 16)

$$\text{Required probability} = \frac{\text{Favourable Cases}}{\text{Total Cases}} = 11/{}^{21}C_3 = 11/1330.$$

Ans 1

4. Number of different square of $1 \times 1 = 64$, Number of different square of $2 \times 2 = 49$, Number of different square of $3 \times 3 = 36$, Number of different square of $4 \times 4 = 25$, Number of different square of $5 \times 5 = 16$, Number of different square of $6 \times 6 = 9$, Number of different square of $7 \times 7 = 4$, Number of different square of $8 \times 8 = 1$.

Total Number of different square = $64 + 49 + 36 + 25 + 16 + 9 + 4 + 1 = 204$

Probability of selecting a square of $5 \times 5 = 16/204 = 4/51$.

Ans 3

5. Clearly, $n(S) = (6 \times 6) = 36$.

Let E = Event that the sum is a prime number.

Then $E = \{(1, 1), (1, 2), (1, 4), (1, 6), (2, 1), (2, 3), (2, 5), (3, 2), (3, 4), (4, 1), (4, 3), (5, 2), (5, 6), (6, 1), (6, 5)\}$

$$\therefore n(E) = 15$$

$$\therefore P(E) = \frac{\text{Favourable Cases}}{\text{Total Cases}} = n(E)/n(S) = 15/36 = 5/12.$$

Probability of not getting a prime number is $P(NE) = 1 - P(E) = 1 - 5/12 = 7/12$

Ans 2

6. Case 1: Ram gets selected ($1/7$) and Shyam doesn't get selected ($1 - 1/5 = 4/5$)

$$\text{So probability} = 1/7 \times 4/5$$

- Case 2: Shyam gets selected ($1/5$) and Ram doesn't get selected ($1 - 1/7 = 6/7$)

$$\text{So probability} = 1/5 \times 6/7$$

$$\text{Required probability} = 1/7 \times 4/5 + 6/7 \times 1/5 = 2/7.$$

Ans 4

7. At least one is "better luck next time" mean we can find the probability of no "better luck next time" and subtract it from total probability, i.e. 1

$$\text{Probability if both the boxes are not better luck next time} = \frac{\text{Favourable Cases}}{\text{Total Cases}} = {}^{16}C_2 / {}^{20}C_2$$

$$= 16/20 \times 15/19 = 12/19$$

$$\text{So probability that at least one box is "better luck next time"} = 1 - 12/19 = 7/19.$$

Ans 1

8. There are three cases possible:

Case1: Selecting 2 producers, 1 actor, 1 director

Case 2: Selecting 2 producers and 2 directors

Case 3: Selecting 2 producers and 2 actors

$$\text{Required probability} = \frac{{}^4C_2 \times {}^3C_1 \times {}^2C_1 + {}^4C_2 \times {}^3C_2 + {}^4C_2 \times {}^2C_2}{{}^9C_4} = \frac{10}{21}.$$

Ans 2

9. Ways of selecting two red cards = ${}^{26}C_2$

$$\text{Ways of selecting 2 jacks} = {}^4C_2$$

$$\text{But we have to subtract all the cases where Red card is also a jack} = {}^2C_2$$

$$\text{Required probability} = ({}^{26}C_2 + {}^4C_2 - {}^2C_2) / {}^{52}C_2$$

Ans 2

10. Here, $S = \{1, 2, 3, 4, \dots, 19, 20\}$

Prime factor of $30 = 2 \times 3 \times 5$ and $210 = 2 \times 3 \times 5 \times 7$

Let E = event of getting a prime factor of 30 and $210 = \{2, 3, 5, 7\}$.

$$\therefore P(E) = \frac{\text{Favourable Cases}}{\text{Total Cases}} = \frac{n(E)}{n(S)} = \frac{4}{20} = 1/5$$

Ans 3

Chapter 11

Heights and Distances

11.1 Trigonometric Identities

11.1.1 Trigonometry

In a right angled ΔOAB , where $\angle BOA = \theta$,

- i. $\sin \theta = \text{Perpendicular}/\text{Hypotenuse} = AB/OB$
- ii. $\cos \theta = \text{Base}/\text{Hypotenuse} = OA/OB$
- iii. $\tan \theta = \text{Perpendicular}/\text{Base} = AB/OA$
- iv. $\operatorname{cosec} \theta = 1/\sin \theta = OB/AB$
- v. $\sec \theta = 1/\cos \theta = OB/OA$
- vi. $\cot \theta = 1/\tan \theta = OA/AB$

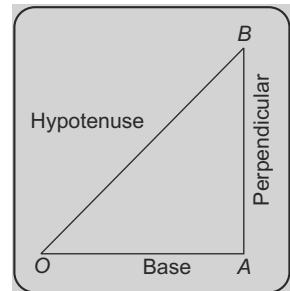


Figure 1

11.1.2 Trigonometric Identities

- i. $\sin^2 \theta + \cos^2 \theta = 1$
- ii. $1 + \tan^2 \theta = \sec^2 \theta$
- iii. $1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$

Values of Trigonometric ratios for commonly used angles (Students are advised to remember these values as they will be required in all the problems)

Table 1

	0°	30°	45°	60°	90°
sin value	0	1/2	$1/\sqrt{2}$	$\sqrt{3}/2$	1
cos value	1	$\sqrt{3}/2$	$1/\sqrt{2}$	1/2	0
tan value	0	$1/\sqrt{3}$	1	$\sqrt{3}$	∞

11.2 Angles of Elevation and Depression

In statement problems of heights and distances, a situation is given to you and a diagram is required to be made in order to solve the problem. The information provided in question generally revolves around the concept of angle of elevation and angle of depression.

If the observer is at point O and is looking at an object at point P above his horizontal level, then the angle that horizontal makes with the line of sight (angle QOP) is called angle of elevation.

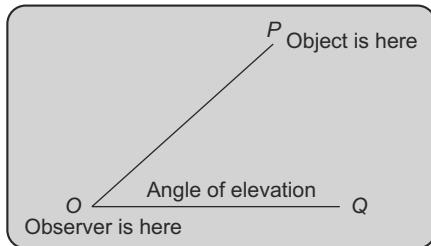


Figure 2

If the observer is at point O and is looking at an object at point P below his horizontal level, then the angle that horizontal makes with the line of sight (angle QOP) is called angle of depression.

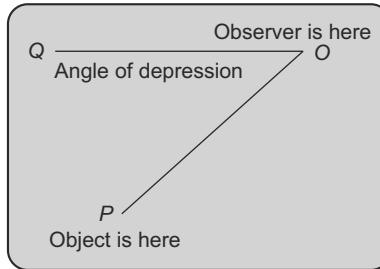


Figure 3

Example 1: From a point R on a flat surface, the angle of elevation of the top of the building is 30° . If the building is 100 feet high, the distance of point R from the base of the building is:

- 1. 149 feet
- 2. 156 feet
- 3. 173 feet
- 4. 200 feet

Solution: Let RQ be distance between base of building and the point R .

$$\begin{aligned} \text{Here, } \tan 30^\circ &= 1/\sqrt{3} = 0.577 = \text{Height of tower}/RQ \\ &= 100/x \end{aligned}$$

$$x = 173 \text{ feet}$$

Thus, the answer is option 3.

Example 2: From the top of a steep cliff the angle of depression of a point on the ground 150 feet away from the bottom of the cliff is 30° . What is the height of the cliff?

- 1. 50 ft.
- 2. $50\sqrt{3}$ ft.
- 3. $150\sqrt{3}$ ft.
- 4. $50/\sqrt{3}$ ft.

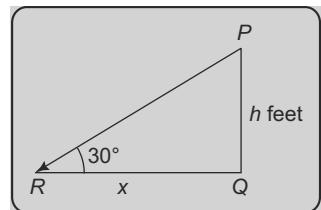


Figure 4

Solution: Let the height of cliff be h .

$$\text{Here } \tan 30^\circ = 1/\sqrt{3} = PQ/RQ = h/150$$

$$\text{Thus, } x = 50\sqrt{3}$$

Example 3: The upper part of an oak tree is broken and the top touches the flat ground making an angle of 30° . The distance of the point where the top of the tree touches the ground to the base of the tree is 50 feet. What was the height of the tree?

- 1. $50\sqrt{3}$ ft.
- 2. $50/\sqrt{3}$ ft.
- 3. 50 ft.
- 4. $25/\sqrt{3}$ ft.

Solution: As the tree has fallen so it will have two parts one which is perpendicular to ground of height X and other which is Y

$$\text{Here, } \tan 30^\circ = 1/\sqrt{3} = AB/BC = X/50$$

$$\text{Thus, } X = 50/\sqrt{3}$$

$$\text{Here, } \sin 30^\circ = 1/2 = X/Y$$

$$Y = 100/\sqrt{3}$$

$$\text{Total Height} = X + Y = 150/\sqrt{3} = 50\sqrt{3}$$

Thus, answer is option 1.

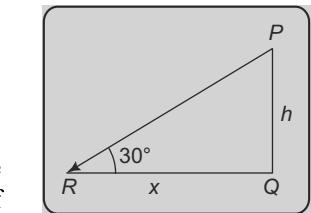


Figure 5

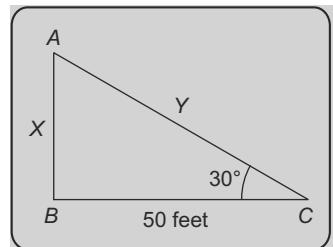


Figure 6

Example 4: In the figure 7, $PQ = 147$ cm, $\angle SPQ = 30^\circ$ and $\angle SQR = 45^\circ$. Find SR .

- 1. $147\sqrt{3}/(\sqrt{3} - 1)$
- 2. $147/\sqrt{3}(\sqrt{3} - 1)$
- 3. $147/(\sqrt{3} - 1)$
- 4. $147\sqrt{3}/(1 - \sqrt{3})$

Solution: Let $SR = x$ cm

$$\text{In given figure, } \tan 45^\circ = 1 = SR/RQ$$

$$\text{Here, } SR = RQ = x$$

$$\text{Also, } \tan 30^\circ = 1/\sqrt{3} = SR/SP = x/(x + 147)$$

$$\text{Here, } x = SR = 147/(\sqrt{3} - 1)$$

Thus, option 3 as the answer.

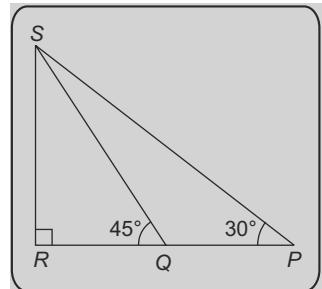


Figure 7

Example 5: The distance between two high rise electric towers is 60 m. The angle of depression of the top of the first electric tower as seen from the top of the second electric tower, which is 150 m high is 30° . The height of the first electric tower is:

- 1. 115.36 m
- 2. 116.85 m
- 3. 117.36 m
- 4. 128.34 m

Solution: Here, height of electric tower comprises of x .

Also, as angle of depression

$$= \angle PQR = \angle QRS = 30^\circ$$

$$\tan 30^\circ = 1/\sqrt{3} = QS/SR = 150 - x/60$$

$$x = 115.36 \text{ m}$$

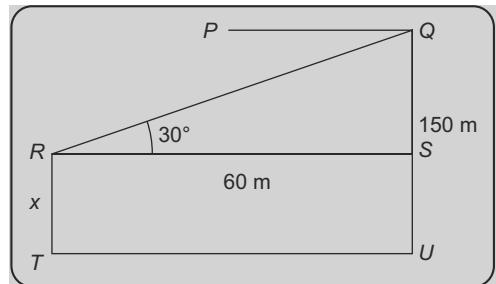


Figure 8

**Exercise 11.1**

- Two cars are running on a straight road on the two sides of a TV Tower. The angle of depression from the top of the TV Tower observing the cars is 30° and 45° respectively. If the TV Tower is 100 m high, the distance between the two cars is:
 1. 173 m 2. 200 m 3. 273 m 4. 300 m
- A monkey is climbing a 200 m long rope, which is tightly stretched and tied from the top of a vertical pole to the ground. Find the height of the pole, if the angle made by the rope with the ground level is 45° :
 1. 150 m 2. 120 m 3. 125.4 m 4. 141.42 m
- A balloon is flying at a height of 50 m above the ground. The string attached to the balloon is temporarily tied to a point on the ground. The inclination of the string with the ground is 45° . Find the length of the string, assuming that the string is stretched completely.
 1. $50\sqrt{2}$ 2. $10\sqrt{2}$ 3. 30 4. $25\sqrt{3}$
- A transmission antenna, 14.64 m tall, stands on the top of a building. From a point on the ground, the angle of elevation of the top of the antenna is 60° and from the same point the angle of elevation of the top of the building is 45° . Find the height of the building.
 1. 15 m 2. 12 m 3. 20 m 4. 17 m
- If the height of a house is 17.3 metres and the length of its shadow is 10 metres, find the angle of elevation of the sun.
 1. 30° 2. 45° 3. 60° 4. 90°
- Ankit is sitting in a chair on a level ground and watching an eagle sitting on the top of a tower, the angle of elevation of the top of tower is 30° . If the tower is 100 m high, the distance between Ankit and the foot of the tower is:
 1. 149 m 2. 156 m 3. 173 m 4. 200 m
- A man watching from the top of a tower, making an angle of depression of 30° with the point P on a ground. The man looks at some distance towards the tower and the angle of the depression becomes 60° . What is the distance between the base of the tower and the point P ?
 1. $4\sqrt{3}$ units 2. 8 units 3. 12 units 4. Data inadequate
- The angle of elevation of the top of an unfinished tower at a point 100 m from its base is 30° . If the angle of elevation at the same point is to be 45° , then the tower has to be raised to a height of how many metres?
 1. 99.4 m 2. 100.4 m 3. 115 m 4. 73.2 m
- A ladder 25 m long is leaning against a wall which is perpendicular to the level ground. The bottom of the ladder is 24 m from the base of the wall. If distance between the foot of the ladder and the base of wall is reduced by 17 m, how much will the top of the ladder slips up?
 1. 7 m 2. 17 m 3. 10 m 4. 15 m
- The shadow of a man 6 ft high is 15 ft long and at the same time the shadow of a tree is 35 ft long. What is the height of the tree?
 1. 21 ft 2. 10 ft 3. 35 ft 4. None of the above

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11. Suppose the angle of elevation of the top of a tree at a point A due east of the tree is 60° and that at a point B due west of the tree is 30° . If the height of tree is 60 feet, then what is the distance AB ?
1. $80\sqrt{3}$ feet 2. 60 feet 3. $80/\sqrt{3}$ feet 4. 48 feet
12. A ladder of 29 m length reaches a window which is 20 m above the ground on one side of the road. Keeping its foot at the same point the ladder is turned to the opposite side of the road and now it reaches a window 21 m high. What is the width of the road?
1. 41 m 2. 35 m 3. 25 m 4. 30 m
13. A man is watching from the top of a building a car speeding towards the tower. The car makes an angle of depression of 45° with the man's eye, with height of tower being 60 m. Within 10 seconds the car crosses the base of tower, the angle of depression now becomes 30° . What is the approximate speed of the car?
1. 9.5 m/s 2. 8.50 m/s 3. 6.56 m/s 4. 4.85 m/s
14. The angles of elevation of the top of a tower from two points situated at distances 25 m and 81 m from its base and in the same straight line and it are complementary. What is the height of the tower?
1. 50 m 2. 45 m 3. 25 m 4. 24 m
15. The length of shadow of a tree is 23 m when the angle of elevation of the sun is 60° . What is the height of the tree?
1. 8 m 2. 16 m 3. $23\sqrt{3}$ m 4. $20/\sqrt{3}$
16. The top of a 15 m high tower makes an angle of depression of 30° with the bottom of a flag pole, which is posted on a level ground and angle of elevation of 60° with the top of the same pole. What is the height of the flag pole?
1. 56 metres 2. 28 metres 3. 60 metres 4. 42 metres
17. A man on the top of a vertical tower observes two cars moving at a uniform speed coming directly towards it, height of tower being 100 m. Car D and C makes an angle of depression of 30° and 45° respectively on the same side of the tower. Car C is moving at a speed of 20 m/s, both the cars reach at the base of the tower at same time. What is the speed of car D ?
1. 17.32 m/s. 2. 15.49 m/s. 3. 34.64 m/s. 4. 16.38 m/s.
18. The angle of elevation of the top of a tower from a certain point is 45° . If the observer moves 7.32 m away the tower, the angle of elevation of the top of the tower decreases by 15° . The height of the tower is:
1. 17.3 m 2. 24.5 m 3. 10 m 4. 20 m
19. An observer 2 m tall is $40\sqrt{3}$ away from a tower. The angle of elevation from his eye to the top of the tower is 30° . The height of the tower is:
1. 42 m 2. 38 m 3. 47 m 4. 49 m
20. If the angle of elevation of cloud from a point 250 m above a lake is 30° and angle of depression of its reflection is 60° then height of cloud above lake is:
1. 200 m 2. 300 m 3. 250 m 4. 500 m

 **Answer Key****Exercise 11.1**

1. 3 2. 4 3. 1 4. 3 5. 3 6. 3
7. 4 8. 4 9. 2 10. 4 11. 1 12. 1

13. 1
19. 114. 2
20. 415. 3
16. 3

17. 3

18. 3

 Explanatory Answers
Exercise 11.1

1. Herein distance between cars =
- $x + y$

$$X = 100/\tan 30^\circ$$

$$= 173 \text{ m}$$

$$Y = 100/\tan 45^\circ = 100 \text{ m}$$

Thus, distance = 273 m.

Ans 3

4. Here,
- AB
- = length of antenna = 14.64 m

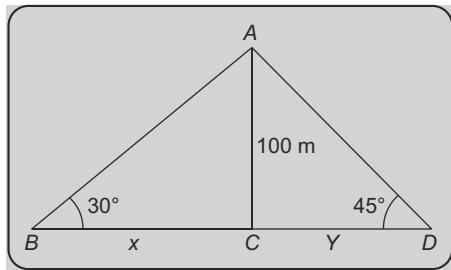
$$\text{Angle } ADC = 60^\circ$$

$$\text{Angle } BDC = 45^\circ$$

$$BC = CD = x$$

$$\text{Also } \tan 60^\circ = (x + 14.64)/x$$

$$X = 20 \text{ m.}$$

**Figure 9**

8. Herein, length of unfinished tower = 100 m

Also, Angle $ADC = 45^\circ$ (elevation angle after tower completion)

$$\text{Angle } BDC = 30^\circ$$

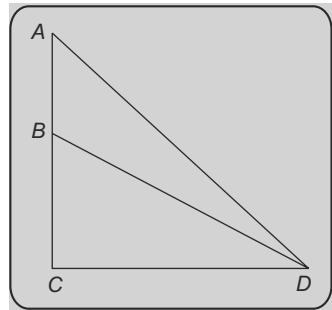
$$\tan 45^\circ = AC/CD$$

$$\text{Thus, } AC = CD$$

$$\tan 30^\circ = 1/\sqrt{3} = BC/CD$$

$$CD = 173.2 \text{ m}$$

$$AB = 73.2$$

Ans 3**Figure 10**

- 14.
- $\tan(\alpha) \times \tan(90 - \alpha) = 1$

So let height of tower = H

$$(H/25) \times (H/81) = \tan(\alpha) \times \tan(90 - \alpha) = 1$$

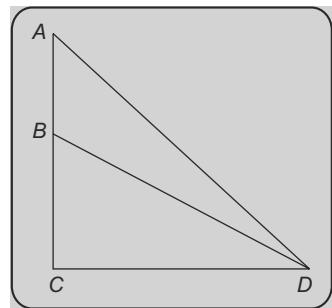
$$H = 5 \times 9 = 45 \text{ m.}$$

17. Angle
- $ADB = 30^\circ$

$$\text{Angle } ACB = 45^\circ$$

Let $AB = x = 100$

$$\tan 45^\circ = AB/BC \rightarrow BC = 100$$

Ans 4**Figure 11**

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Time taken by car C = $100/20 = 5$ s

$$\tan 30^\circ = AB/BD \rightarrow BD = 100\sqrt{3}$$

$$\text{Speed of car } D = 100\sqrt{3}/5 = 20\sqrt{3} = 34.64 \text{ m/s}$$

Ans 3

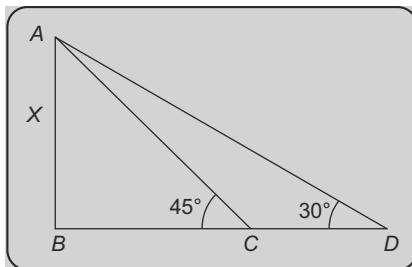


Figure 12

Chapter 12

Clocks and Calendars

12.1 Introduction

The problems of clocks and calendars are generally related with the time lag between two instances. For example:

Q: At what time after 5 a.m., angle between hour hand and minute hand will be 90° ?

Q: It was Thursday on 26 November 1987. What will be the day on 19 January 2023?

But, the problem solving approach is completely different for each of them. We will discuss each of them one by one.

12.1.1 Clocks

In a clock or watch, there are three hands viz. hour, minute and second hands. But, unless stated otherwise, we shall be considering only hour and minute hands by default.

The time on a clock is 31 minutes past 2. We represent it as 2 : 31. Similarly, we can represent any time instance in the day, e.g. 9 : 41, 12 : 22, 11 : 00, 8 : 29, etc. In general, we represent a time as h:m, which means m minutes past h hours.

Generally, we come across two types of problems in clocks.

- Relating to angle between hour and minute hand
- Relating to time gain and loss

■ **Angle between the Hands of a Clock:** Angle between hour hand and minute hand is given by x in degrees, (if time is represented as h:m)

$$x = |5.5m - 30h|$$

Since, we normally consider the smaller angle between hands, we take angle as x , if $0^\circ < x < 180^\circ$

$$360^\circ - x, \text{ if } 180^\circ < x < 360^\circ$$

The time in the clock shown is 3 o'clock. The angle between two hands may be stated as 90° or 270° .

But, as a convention, unless stated otherwise, we should take that angle between two hands which lies between 0° and 180° .

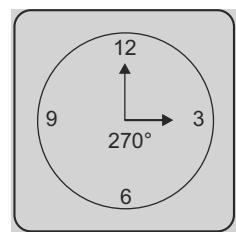


Figure 1

Example 1: What is the angle between hands of clock at 4 : 23 p.m.?

$$\begin{aligned}\text{Solution: } x &= |5.5 \times 23 - 30 \times 4| = 6.5^\circ \\ &= x [0^\circ < x < 180^\circ] \\ &= 6.5^\circ\end{aligned}$$

The angle formed at 4 : 23 is 6.5°.

Finding angle between hands of clock is an easy task. But, reverse is a bit lengthy approach. The reason is, for a time instance, there is a unique angle between hands of clock. But for a particular angle, the time instance may or may not be unique.

The approach that should be followed is:

- (i) Note down value of angle from the problem.
- (ii) Figure out if value of h or m is given.
- (iii) Solve this equation for the unknown variable.

$$\text{Angle} = |5.5 m - 30 h|$$

- (iv) Since, there is a modulus on R.H.S, you will get two values for the unknown variable.
- (v) If you get a value of h or m that can never occur, reject it. Select all the possible values and time instance will be known.
- (vi) If no possible value is found for m, (if h is unknown variable, a possible value will always be found), solve equation putting $h = h + 1$.

Example 2: At what time between 2 p.m. and 3 p.m., the angle between two hands is 45°?

Solution: Between 2 p.m. and 3 p.m., all time instances will be having $h = 2$, e.g., 2 : 12, 2 : 33, 2 : 43, 2 : 58, etc.

$$\theta = 45^\circ$$

$$\theta = |5.5 m - 30 h|$$

$$45 = |5.5 m - 30 \times 2|$$

$$45 = |5.5 m - 60|$$

$$5.5 m - 60 = 45 \text{ or } 5.5 m - 60 = -45$$

$$5.5 m = 105 \quad 5.5 m = 15$$

$$m = 19 \quad m = 3$$

Both values of m are possible.

So, time instances will be 2 : 03 and 2 : 19.

Example 3: How many minutes after 3 : 45 p.m., hands of clock will be perpendicular to each other?

Solution: $\theta = 90^\circ$

$$h = 3$$

$$\theta = |5.5 m - 30 h|$$

$$90 = |5.5 m - 30 \times 3|$$

$$5.5 m - 90 = 90 \quad \text{or} \quad 5.5 m - 90 = -90$$

$$5.5 m = 180 \quad 5.5 m = 0$$

$$m = 33 \quad m = 0$$

Time 3:33
Not possible because
this time is before 3:45.

So, solving equation for $h = h + 1$

$$h = 4$$

$$90 = |5.5 m - 30 \times 4|$$

$$5.5 m - 120 = 90 \quad \text{or} \quad 5.5 m - 120 = -90$$

$$5.5 m = 210$$

$$m = 38 \text{ (approx.)}$$

Time 4:38

Time 3:00
Not possible because this
time is before 3:45.

Time 4:05

At 4:05 pm, the hands will be first time perpendicular to each other after 3:45 p.m. So, after 20 minutes, hands will be perpendicular to each other.

- The hands of a clock meet after every $65\frac{5}{11}$ minutes.
- In an interval of 12 hours, from 12:00 a.m. to 12:00 p.m., hands of a clock meet 10 times (excluding 12:00 a.m. and 12:00 p.m.), or 12 times (including 12:00 a.m. and 12:00 p.m.).

12.2 Time Gain and Loss

We say that a watch or clock is moving fast when it runs faster than a correct watch; generally this is mentioned as “this watch or clock is gaining time”.

We say that a watch or clock is moving slow when it runs slower than a correct watch; generally this is mentioned as “This watch or clock is losing time”.

Let us see an example, we have three watches A (Shows correct time), B (gains 3 minutes in an hour) and C (loses 3 minutes in an hour). If they all are set at 10:00 a.m., we can make this table

Table 1

A	B	C
10:00 a.m.	10:00 a.m.	10:00 a.m.
11:00 a.m.	11:03 a.m.	10:57 a.m.
12:00 noon	12:06 p.m.	11:54 a.m.
1:00 p.m.	1:09 p.m.	12:51 p.m.

We see that after 3 hours, the faulty watches that do not show correct time, watches B and C gain 9 minutes and lose 9 minutes as compared to correct watch A respectively. We can arrive at following points that will help us solve problems.

- If a watch gains x minutes in one unit time it will gain nx minutes in n units of time.
- The comparison for time gain and loss of a default watch is always made with a correct time. A comparison can never be made between two default watches.
- This formula will be useful in solving the problems of time gain and loss.

$$\frac{\text{Time lapsed in one unit time in default watch}}{\text{Time lapsed in } n \text{ units time in default watch}} = \frac{\text{Time lapsed in one unit time in correct watch}}{\text{Time lapsed in } n \text{ units time in correct watch}}$$

Example 4: Meena's watch gains 2 minutes in an hour. It was set at correct time at 2:00 p.m. on Monday. What time it will show when it is 5:00 pm on next day in a correct watch?

Solution: From 2:00 p.m. Monday to 5:00 p.m. next day = 27 hours

Table 2

Default watch	Correct watch
Time lapsed after an hour	$60 + 2 = 62$ minutes
Time lapsed till 5.00 pm on next day	x minutes
	$27 \text{ hours} = 27 \times 60 \text{ minutes} = 1620 \text{ minutes}$

Using the formula

$$\frac{62}{x} = \frac{60}{1620}$$

$$\begin{aligned} x &= 27 \times 62 = 1674 \text{ minutes} \\ &= 27 \text{ hours and } 54 \text{ minutes} \end{aligned}$$

So, Meena's watch will show 5:54 p.m.

Example 5: The hands in a clock are meeting after every 65 minutes. How much time is it gaining or losing every hour?

Solution: We have seen that in actual the hands of a correct clock should meet after every $65\frac{5}{11}$ minutes.

But in this clock, the hands meet after 65 minutes. It means, when only 65 minutes lapse in a correct watch, this clock has lapsed $65\frac{5}{11}$ minutes and make the hands meet.

Table 3

Default watch	Correct watch
Time lapsed after 65 minutes	$65\frac{5}{11}$ minutes
Time lapsed in 1 hour	x
	60 minutes

Using the formula,

$$65\frac{5}{11}/x = 65/60$$

$$\begin{aligned} x &= 60.42 \text{ minutes} \\ &= 60 \text{ minutes } 25 \text{ seconds} \end{aligned}$$

The clock is gaining 25 seconds in an hour.

When a default clock works, it keeps on gaining or losing time. As more and more time passes by, the time lapse between default and correct watch also keeps on increasing. For example, if a clock, gains 5 minutes in one hour, after two hours it will be 10 minutes ahead of correct clock and so on. A time will come when the time lapse will become 12 hours, and the clocks will begin showing same time again. The main point to be noted here is that in a 12-hour clock, the clocks will show same time again when time lag becomes 12 hours,

but if we consider a 24-hour clock, the clocks will show same time again when time lag becomes 24 hours. We should assume clocks to be 12-hour clocks, unless otherwise mentioned.

Example 6: Clock Mitsubishi loses 3 minutes in an hour while clock Nintendo gain 2 minutes in an hour. They both are set to correct time at 11:00 a.m. When will both these clocks show the same time again?

Solution: After one hour Mitsubishi will show 11:57 am while Nintendo will show 12:02 p.m. The time lag becomes 5 minutes after one hour.

To show same time again, time lag should become 12 hours or 720 minutes.

5 minutes time lag in one hour

1 minutes time lag in $1/5$ hour

720 minutes time lag in $720 \times (1/5)$ hours = 144 hours

144 hours = 6 days

12.3 Calendars

12.3.1 Finding the Day of a Date in the Calendar

If the day on 1st May and 1 March was Tuesday, then what will be the day on 1 April?

How are you going to solve this problem?

If we approach in the simplest manner, 1 March being Tuesday, 2 March will be Wednesday, and so on; then 1 April will be Friday.

If we take an alternative approach, we know that there is a gap of 31 days between 1 March and 1 April.

Extra days or odd days, $E = 31 \text{ mod } 7 = 3$ [On dividing 31 by 7, remainder is 3]

Third day from Tuesday will be Friday. Hence, 1 April will be Friday. The following facts should be kept in mind while solving problems of calendars:

1. In an ordinary year there are 365 days, that is, 52 weeks + 1 day.

Therefore, an ordinary year contains 1 odd day.

2. A leap year contains two odd days.

3. $100 \text{ years} = 76 \text{ ordinary years} + 24 \text{ leap years}$

$$= \text{a number of week} + (76 + 2 \times 24) \text{ days}$$

$$= \text{a number of weeks} + 7 \text{ weeks} + 5 \text{ days}$$

So, 100 years contain 5 odd days.

4. $200 \text{ years} = 152 \text{ ordinary years} + 48 \text{ leap years}$

Therefore, 200 years contain 3 odd days.

5. $300 \text{ years} = 224 \text{ ordinary years} + 76 \text{ leap years}$

Therefore, 300 years contain 1 odd day.

6. $400 \text{ years} = 300 \text{ ordinary years} + 100 \text{ leap years}$

Therefore, 400 years contain no odd day.

7. 1 January, A.D. 1, was Monday. Therefore, the days can be described as following:

Sunday: 0, Monday: 1, Tuesday: 2, Wednesday: 3, and so on.

8. February consists of 29 days in a leap year.

9. Months having 31 days are as follows:

January, March, May, July, August, October and December have 3 extra days. ($E = 3$)

10. Months having 30 days are as follows:

April, June, September and November have 2 extra days ($E = 2$)

11. February having 29 days in a leap year consists of 1 extra day; i.e., ($E = 1$). February in a non-leap year consists of no extra day; i.e., ($E = 0$).

If we write the problem-solving approach in a stepwise manner,

Step-1: Two cases arise when day on a certain date is asked.

Case-I: When a reference date is given.

Example 7: If 26 January, 2014 was a Sunday. Then what day of the week was 15 August, 2014?

In such cases, we need to count the extra days.

Extra days in January ($27\text{th} - 31\text{th}$) = 5; February = 0; March = $31 \bmod 7 = 3$; April = $30 \bmod 7 = 2$; May = $31 \bmod 7 = 3$; June = $30 \bmod 7 = 2$; July = $31 \bmod 7 = 3$; August (till 15th) = $15 \bmod 7 = 1$

So, total extra days = $5 + 0 + 3 + 2 + 3 + 2 + 3 + 1 = 19$;

Overall extra days = $19 \bmod 7 = 5$

Hence, 15th August, 2014 will be Friday (5 days after Sunday).

Case-II: When a reference date is not given.

Example 8: What was the day on 2 January 2001?

In such a case, 1 January A.D. 1 is considered to be the reference date, which was a Monday.

Step-2: The two dates can be written as:

$$\begin{array}{lll} d_1 m_1 y_1 & d_2 m_2 y_2 & (\text{date}_1 \text{ occurs before date}_2) \\ \text{date}_1 & \text{date}_2 & \end{array}$$

Reach from date_1 to date_2 and count value of variable E .

Step-3:

- i) Cover years
- ii) Cover months
- iii) Cover days

Table 4

	i	ii	iii	
Case-i:	$m_1 < m_2, d_1 < d_2$	Reach $d_1 m_1 y_2$	Reach $d_1 m_2 y_2$	Reach $d_2 m_2 y_2$
Case-ii:	$m_1 < m_2, d_1 > d_2$	$m_1 < m_2, d_1 > d_2$	Reach $d_1 (m_{2-1}) y_2$	Reach $d_2 m_2 y_2$
Case-iii:	$m_1 > m_2, d_1 < d_2$	Reach $d_1 m_1 (y_{2-1})$	Reach $d_1 m_2 y_2$	Reach $d_2 m_2 y_2$
Case-iv:	$m_1 > m_2, d_1 > d_2$	$m_1 > m_2, d_1 > d_2$	Reach $d_1 (m_{2-1}) y_2$	Reach $d_2 m_2 y_2$

Solution: 1 January A.D. 1 = Monday, so 1 January 401 = Monday (400 years have no extra days)

1 January 801 = Monday, 1 January 1201 = Monday

1 January 1601 = Monday, 1 January 2001 = Monday

1 January 2001 = Monday,

Hence, 2 January 2001 = Tuesday.

Important Points to Remember

Conditions for a year to be a leap year divisible by 4 → Yes

Conditions for a year to be a leap year divisible by 4 and 100 → No

Conditions for a year to be a leap year divisible by 4, 100 and 400 → Yes

Maximum time between birthdays = 8 Years

Minimum time between birthdays = 365 days

Example 9: Today is Sunday. The day after 71 days will be:

- 1. Sunday 2. Monday 3. Tuesday 4. Friday

Solution: Extra days, $E = 71$; $E \bmod 7 = 71 \bmod 7 = 1$ So, after 71 days it will be Monday.

Example 10: What was the day of the week on 28 May 2007?

Solution: Here, no reference date is given, if we take 1 January A.D. 1 as reference date.

	date ₁	date ₂
	01/01/0001	28/05/2007
	Monday	?
Till	01/01/2001,	no extra day, $E = 0$
Till	01/01/2007,	5 ordinary years + 1 leap year $E = 5 + 2 = 7$
Till	01/05/2007,	$E = 7 + 3 + 0 + 3 + 2 = 15$
Till	28/05/2007,	$E = 15 + 27 = 42$ $E \bmod 7 = 42 \bmod 7 = 0$

So, 28 May 2007 will be six days after Monday, i.e., Monday.

Example 11: If 23 June 2006 was Friday, what will be the day of the week on 22 December, 2012?

Solution: Here, a reference date is given as following:

	date ₁	date ₂
	23/06/2006	22/12/2012
Till	23/06/2006	→ Friday
Till	23/06/2012	→ 4 ordinary years + 2 leap years $E = 4 + 4 = 8$
Till	23/11/2012	→ $E = 8 + 2 + 3 + 3 + 2 + 3$ $E = 21$
Till	22/12/2012	→ $E = 21 + 29$ From 23 November to 21 December $E = 50$ $E \bmod 7 = 50 \bmod 7 = 1$

So, 22 December 2012 will be Saturday.

Example 12: If 30 December 2012 is Sunday, what was the day on 12 March 1997?

Solution:

	date ₁	date ₂
	12/03/1997	30/12/2012
Till	12/03/2012	→ 11 ordinary years + 4 leap years $E = 11 + 8 = 19$

$$\begin{array}{lll} \text{Till } 12/12/2012 & \rightarrow & 19 + 3 + 2 + 3 + 2 + 3 + 3 + 2 + 3 + 2 = 42 \\ \text{Till } 30/12/2012 & \rightarrow & E = 42 + 18 \\ & & = 60 \end{array}$$

$$E \bmod 7 = 60 \bmod 7 = 4$$

So, 30 December 2012 is four days ahead of 12 March 1997 or 12 March 1997 is 4 days behind 30 December 2012.

So, 12 March 1997 will be Wednesday.

Example 13: Which calendar year is exactly the same as year 1998.

1. 2000 2. 2002 3. 2004 4. none of these

Solution: From 1998 to 2000 \rightarrow 2 ordinary years $E = 2$

$$\begin{array}{l} \text{From 1998 to 2002} \rightarrow 3 \text{ ordinary years} + 1 \text{ leap year} \\ E = 3 + 2 = 5 \end{array}$$

$$\begin{array}{l} \text{From 1998 to 2004} \rightarrow 5 \text{ ordinary years} + 1 \text{ leap year} \\ E = 5 + 2 = 7 \end{array}$$

$$\begin{array}{l} \text{From 1998 to 2003} \rightarrow 4 \text{ ordinary years} + 1 \text{ leap year} \\ E = 4 + 2 = 6 \end{array}$$

For option 3, $E \bmod 7$ is equal to 0. So, it seems that calendar of 2004 will be identical to calendar of 1998, but it is not true. Because 2004 is a leap year and 1998 is a non-leap year. Their calendars will be identical only for first two months, but not after that. As a practice, you can check the same in actual calendars.

Ans 4

Example 14: The first Thursday of October 1994 falls on:

1. 3 October 1994 2. 4 October 1994 3. 5 October 1994 4. 6 October 1994

Solution: If we first find day of week on 1 October 1994:

$$\begin{array}{lll} \text{date}_1 & \text{date}_2 & \\ 01/01/0001 & 01/10/1994 & \\ \text{Monday} & ? & \\ \text{Till } 01/01/1901 & \rightarrow & 1600 \text{ years} + 300 \text{ years} \\ & & E = 0 + 1 = 1 \\ \text{Till } 01/01/1994 & \rightarrow & 70 \text{ ordinary years} + 23 \text{ leap years} \\ & & E = 1 + 70 + 46 = 117 \\ \text{Till } 01/10/1994 & \rightarrow & E = 117 + 3 + 0 + 3 + 2 + 3 + 2 + 3 + 2 \\ & & E = 138 \end{array}$$

$$E \bmod 7 = 138 \bmod 7 = 5$$

So, 1 October 1994 will be Saturday. First Thursday will come five days after Saturday, i.e., on 6 October 1994.

Ans 4

Example 15: The maximum difference between a person's two consecutive birthdays is?

1. 1 year 2. 4 years 3. 8 years 4. 16 years

Solution: If a person's birthday falls on 29 February his birthday will come after every 4 years. So, initially it might seem that the answer is 4 years. But, sometimes the difference between two leap years could be 8 years. A year divisible by 4 is leap year, but if it is divisible by both 4 and 100, it is non-leap; e.g., 1900, 1800, etc. So, if a person had a birthday on 29 February 1796, then his next birthday will fall on 29 February 1804. So, the maximum difference between two consecutive birthdays can be 8 years.

Ans 3

**Exercise 12.1**

1. What are the two times between 7 p.m. and 8 p.m. when the hands of the clock are perpendicular to each other?
 1. 7:22 p.m., 7:55 p.m.
 2. 7:22 p.m., 7:32 p.m.
 3. 7:55 p.m., 7:47 p.m.
 4. 7:36 p.m., 7:46 p.m.

2. The angle between the hands of a clock at 3:30 is:
 1. 90°
 2. 75°
 3. 60°
 4. 120°

3. What is the first time after 4 p.m. when the hands are opposite to each other?
 1. 4:54
 2. 4:49
 3. 4:53
 4. 4:37

4. The hands of a clock meet every 65 min. Is the clock gaining or losing time and by how much?
 1. Lose $\frac{5}{11}$ min every h
 2. Gain $\frac{5}{11}$ min every h
 3. Gain $\frac{5}{11}$ min every 65 min
 4. Lose $\frac{5}{11}$ min every 65 min

5. There are two persons A and B whose watches are showing 3 o'clock on Tuesday. A's watch is gaining 2.5 min per hour and B's watch is losing 3.5 min per hour. When will both their watches show the same time again?
 1. After 24 h
 2. After 3 days
 3. After 5 days
 4. After 6 days

6. It is 7:30 p.m. After how many minutes will the hands be opposite to each other?
 1. 44 min
 2. 41 min
 3. 51 min
 4. 61 min

7. The time in a clock is 30 minutes past 2. Find the angle between the hands of the clock.
 1. 60 degrees
 2. 120 degrees
 3. 105 degrees
 4. 50 degrees

8. A man goes out between 9 and 10 p.m. and comes back between 10 and 11 p.m. and finds that the hands of the clock have exchanged their positions. What time did he go out?
 1. 9 : 54 : 7
 2. 9 : 42 : 18
 3. 9 : 52 : 16
 4. None of these

9. A clock loses 1 min per hour during the first week and then gains 2 min per hour during the next one week. If the clock was set right at 12 noon on a Monday, what will be the time that the clock will show exactly 2 weeks from the time it was set right?
 1. 1 : 48
 2. 2 : 48
 3. 2 : 40
 4. 12 : 48

10. By how many degrees does the hour hand move in the same time, in which the minute hand moves by 360 degrees?
 1. 30
 2. 36
 3. 60
 4. 90

11. It was Sunday on January 1 2006. What was the day of the week January 2, 2010?
 1. Wednesday
 2. Thursday
 3. Friday
 4. Saturday

12. What was the day of the week on 28 May 2008?
 1. Thursday
 2. Friday
 3. Saturday
 4. Wednesday

13. Given 27 December 2014 to be as Saturday. What was the day on 27 December 1614?
 1. Monday
 2. Saturday
 3. Sunday
 4. Tuesday

14. Find the number of leap years from 2001 to 2100.
 1. 26
 2. 25
 3. 23
 4. 24

15. Which year has the same calendar as 2014?
 1. 2025
 2. 2019
 3. 2020
 4. 2021

 **Answer Key**
Exercise 12.1

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. 1 | 2. 2 | 3. 1 | 4. 3 | 5. 3 | 6. 2 |
| 7. 3 | 8. 1 | 9. 2 | 10. 1 | 11. 4 | 12. 4 |
| 13. 2 | 14. 4 | 15. 1 | | | |

 **Explanatory Answers**
Exercise 12.1

2. Angle between hands of a clock = $|5.5m - 30h|$
 Angle at 3:30 = $|5.5 \times 30 - 30 \times 3| = 75$ degrees **Ans 2**
7. Angle between hands of a clock = $|5.5m - 30h|$
 Angle at 2:30 = $|5.5 \times 30 - 30 \times 2| = 105$ degrees. **Ans 3**
9. The clock loses 1 min time during the first week.
 In a day there are 24 hours and in a week there are 7 days. Therefore, there are $7 \times 24 = 168$ hours in a week. Hence the clock loses 168 min in first week.
 Subsequently, the clock gains 2 mins during the next week. The second week has 168 hours. Hence the clock gains $168 \times 2 = 336$ mins
 The net result will be $a - 168 + 336 = 168$ min gain in time.
 So the clock will show 2:48 p.m. **Ans 2**
11. On 31 December 2005 it was Saturday. Number of odd days from the year 2005 to the year 2009 = $(1 + 1 + 2 + 1) = 5$ days.
 On 31 December 2009, it was Thursday. Thus, on 2 January 2010 it is Saturday. **Ans 4**
12. 28 May 2008 = (2007 years + Period from 1.1.2008 to 28.5.2008)
 Odd days in 1600 years = 0
 Odd days in 400 years = 0
 $7 \text{ years} = (6 \text{ ordinary years} + 1 \text{ leap year}) = (6 \times 1 + 1 \times 2) 8 \text{ odd days}$
 Jan. Feb. March April May
 $(31 + 29 + 31 + 30 + 28) = 149 \text{ days}$
 $148 \text{ days} = (21 \text{ weeks} + 2 \text{ days}) = 2 \text{ odd day.}$
 Total number of odd days = $(8 + 2) = 10$ odd days. Hence, overall extra days = 3
 Given day is Wednesday. **Ans 4**
13. After every 400 years, the same day occurs. Thus, if 27 December 2014 is Saturday, before 400 years i.e., on 27 December 1614 has to be Saturday. **Ans 2**
14. 100th year is not a leap year. So there are 24 leap years. **Ans 4**

Part II

Logical Reasoning

-
- Chapter 13: Coding and Decoding
 - Chapter 14: Blood Relations
 - Chapter 15: Direction Test
 - Chapter 16: Series Completion
 - Chapter 17: Linear Arrangement
 - Chapter 18: Complex Arrangement
 - Chapter 19: Cubes, Dices and Matchsticks
 - Chapter 20: Conditionalities and Grouping
 - Chapter 21: Numerical Logic
 - Chapter 22: Data Interpretation
 - Chapter 23: Data Sufficiency
 - Chapter 24: Puzzles and Brain Teasers

Chapter 13

Coding and Decoding

13.1 Introduction

Coding is a way of sending a message from one place to another. Decoding is the ability to decipher codes of various types.

In questions based on coding and decoding, certain code values are assigned to a word or a group of words and we have to figure out the original words.

Following are some useful points on the basic knowledge required for these tests:

1. Forward Order of Letters

A	B	C	D	E	F	G	H	I	J	K	L	M
1	2	3	4	5	6	7	8	9	10	11	12	13

N	O	P	Q	R	S	T	U	V	W	X	Y	Z
14	15	16	17	18	19	20	21	22	23	24	25	26

2. Reverse Order of Letters

A	B	C	D	E	F	G	H	I	J	K	L	M
26	25	24	23	22	21	20	19	18	17	16	15	14

N	O	P	Q	R	S	T	U	V	W	X	Y	Z
13	12	11	10	9	8	7	6	5	4	3	2	1

3. Opposite Letters

A-Z	B-Y	C-X	D-W	E-V	F-U
G-T	H-S	I-R	J-Q	K-P	L-O
M-N					

13.2 Letter Coding

Here the real alphabets in a word are replaced by some other alphabets according to some rule to form its code. You are required to detect this rule and solve the question.

Example 1: In a certain code MEGHALAYA is written as NDHGBKBXB. How is NAGALAND written in that code?

1. OBHBMBOC
2. OZHMZMZOC
3. MZFZMZOC
4. MZFZMZCO

Solution:

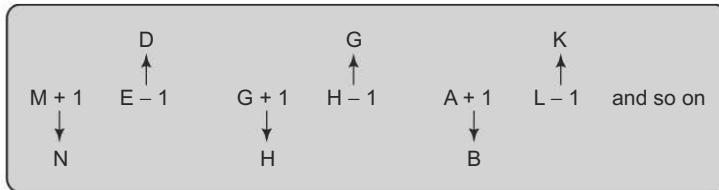


Figure 1

Clearly, the letters in the word MEGHALAYA are moved alternately one step forward and one step backward to obtain the letters of the code. So in NAGALAND, *N* will be coded as *O*, *A* as *Z*(as there is no letter before *A* so we can consider *Z*), *G* as *H*, *A* as *Z*, *L* as *M*, *A* as *Z*, *N* as *O*, and *D* as *C*. Thus the code becomes OZHMZMZOC. **Ans 2**

Example 2: If in a certain language KAREENA is coded as LCUIJTH, which word will be coded a KATRINA?

1. LCUXNTH
2. LCWVVOUI
3. LCWVNTH
4. LCWVNNTI

Solution:

Here *K* is coded as *L*, *A* as *C*, *R* as *U* and so on. After *K* + 1 = *L*, *A* + 2 = *C*, *R* + 3 = *U*, *E* + 4 = *I*, *E* + 5 = *J*, *N* + 6 = *T* AND *A* + 7 = *H*. Therefore, code for KATRINA will be *K* + 1 = *L*, *A* + 2 = *C*, *T* + 3 = *W*, *R* + 4 = *V*, *I* + 5 = *N*, *N* + 6 = *T* AND *A* + 7 = *H*. **Ans. 3**

13.3 Number Coding

Example 3: If *A* = 2 and *TAC* = 48, then *ABT* will be equal to

1. 39
2. 41
3. 44
4. 46

Solution:

In the given code *A* = 2, *B* = 4, *C* = 6, ..., *Z* = 52

So, *TAC* = 40 + 2 + 6 = 48

ABT = 2 + 4 + 40 = 46. **Ans. 4**

Example 4: If THAMES is coded as 26 – 14 – 7 – 19 – 11 – 25, how will you code DEDUCT?

1. 10 – 11 – 10 – 27 – 9 – 26
2. 10 – 9 – 13 – 27 – 9 – 26
3. 10 – 11 – 10 – 28 – 10 – 26
4. 10 – 11 – 10 – 26 – 9 – 24

Solution:

Putting *A* = 7, *B* = 8, *C* = 9 *X* = 30, *Y* = 31, *Z* = 32 we have,

THAMES = 26 – 14 – 7 – 19 – 11 – 25

Similarly, DEDUCT = 10 – 11 – 10 – 27 – 9 – 26. **Ans 1**

13.4 Mathematical Coding

In this coding, the numbers are coded as letters. Mathematical Operations like multiplication, division, addition or subtraction are performed on these coded numbers. Given code can be decoded by using basic number logic.

Example 5: In the correctly worked out addition problem in Figure 2, each letter represents a different digit. What is the value of P ?

1. 9

2. 8

3. 5

4. 4

Solution: As two numbers of two digits are added, the value of S must be 1. Also, the addition $2 + Q$ generates a carry over that implies the value of Q is 9 and there is carry over from previous operation i.e., $P + 2 = R$. To generate a carry-over value of A can be 8 or 9. But it cannot be 9 as this will give value of R as 1. In that case R and S will have same value. Hence, $P = 8$ and $R = 0$. The operation is $28 + 92 = 120$.

$$\begin{array}{r} 2P \\ +Q2 \\ \hline S2R \end{array}$$

Figure 2

Ans 2

Example 6: In the correctly worked out multiplication problem in figure 3, each letter represents a different digit. What is the value of E ?

1. 5

2. 4

3. 3

4. 2

Solution: C has to be 0. Since $C + C = C$, $2C = C$, $C = 0$. As $B + B$ gives last digit as C , which is now known to be 0, $B = 5$.

Also $B \times A$, i.e., $5 \times A$ gives units digit as 0 and the number $A5 \times A$ is a two digit number. A is 2. The problem becomes

$$\begin{array}{r} 25 \\ \times 52 \\ \hline 50 \\ 1250 \\ 1300 \end{array}$$

$\therefore E = 3$.

$$\begin{array}{r} AB \\ \times BA \\ \hline BC \\ DABC \\ \hline DECC \end{array}$$

Figure 3

Ans 3

13.5 Word Coding

In such type of questions, some particular objects are assigned code names and then a question is asked, which is to be answered in the code language.

In such type of questions, few complete messages are given in the coded language and the code for a particular word or sentence is needed.

Example 7: If ‘peach’ is called ‘chesse’, ‘chesse’ is called ‘bubble’, ‘bubble’ is called ‘surf’, ‘surf’ is called ‘sugar’ and ‘sugar’ is called ‘peach’, which of the following is used for washing clothes?

1. Surf

2. Chesse

3. Sugar

4. Kin

Solution: Clearly, ‘surf’ is used for washing clothes. Since, it is given that Surf is called ‘sugar’, ‘sugar’ is used for washing clothes. Hence, the answer is sugar.

Ans 3

Example 8: In a certain code, ‘pee ko pam’ means ‘girls are dancing’, ‘ce pam xam’ means ‘grapes are sweet’ and ‘sim ko ce’ means ‘girls eat grapes’. Which of the following is the code for ‘sweet’ in that language?

1. xam

2. pam

3. ce

4. None of these

Solution: We are required to find the code for 'sweet'. For this we try to find out the code for 'grapes' and 'are' first, and then eliminate the corresponding codes for them. The remaining code would be the representative code for 'sweet'.

On comparing the codes 'pee ko pam' and 'ce pam xam' and 'sim ko ce', we get 'ce' as code for 'grapes' and 'pam' as code for 'are'. Now as 'grapes are sweet' is coded as 'sim ko ce' and 'ce' and 'pam' represent 'grapes' and 'are', then 'xam' represents the code for 'sweet'. Ans !

13.6 Operator Coding

In such type of questions mathematical operations like multiplication, division, addition, subtraction, etc., are represented by symbols different from the usual ones. You have to solve the questions as per the given directions.

Some examples are given below:

$$(15 \div 3) - 4 + (8 \times 9)$$

Example 9: What will be the value of the expression $15 + 3 \div 4 \times 8 - 9$, If + means \div , \div means $-$, $-$ means \times , \times means $+$?

Solution: Using correct symbols the given expression becomes

$$\begin{aligned} 15 \div 3 - 4 + 8 \times 9 \\ = 5 - 4 + 8 \times 9 = 5 - 4 + 72 = 73. \end{aligned}$$

$$\begin{array}{r} 5 - 4 + 72 \\ 20 - 6 \end{array}$$

Example 10: If $-$ means \times , $+$ means $-$ and \times means \div , find the value of $\underline{\underline{5}} - \underline{\underline{4}} + \underline{\underline{18}} \div \underline{\underline{3}}$.

Solution: When we use correct symbols, the given expression becomes $= 5 \times 4 - 18 \div 3$
 $= 5 \times 4 - 6 = 20 - 6 = 14.$

$$\begin{array}{r} 14 \\ \hline 20 - 6 \end{array}$$

$$\begin{array}{r} 5 \times 4 \\ \hline 14 \end{array}$$



Exercise 13.1

- In a certain language, if NORWAY is coded as OPSXBZ, how is FINLAND coded?
 1. GJOMBNE 2. GJOMBOE 3. HKOMBOE 4. HKNMBOE
- If ARGENTINA is written as 417236034 and MISSISSIPPI is written as 80550550990, how is PARIS coded as?
 1. 94501 2. 94105 3. 84105 4. 71405
- If HIMNIT is coded as IHNMTI, how is DEVIKA coded?
 1. DVEKIA 2. EDIVKA 3. EDVIAK 4. EDIVAK
- If GREGARIOUS is coded as 100 and AGHAST as 36, what is the code number for RUTHLESS?
 1. 48 2. 68 3. 64 4. 49
- If NASCENT is written QBTDFOU, then how would STULTIFY be written in this code?
 1. ZUVMUJGZ 2. TUVMUJGZ 3. TUVMGJUZ 4. TMVUUJGZ
- If LONDON is coded as 74, what will be the code number for PARIS?
 1. 75 2. 55 3. 73 4. 63
- If 'Air' is called 'Root', 'Root' is called 'Fruit', 'Fruit' is called 'Seed', 'Seed' is called 'Leaf', Apple is?
 1. Air 2. Root 3. Fruit 4. Seed

8. In a certain code language, 'com gul ta' means 'bring hot food', 'gul tir sop' means 'food is good', and 'tak da sop' means 'good bright boy'. Which of the following means 'hot' in that language?

1. com
2. gul
3. ta
4. Cannot be determined

9. Given interchanges: 'signs \times and \div '; 'numbers 8 and 4'. Which relation is correct?

1. $2 \div 4 \times 4 = 9$
2. $8 \div 4 \times 2 = 16$
3. $2 \times 4 \div 3 = 6$
4. $4 \div 2 \times 5 = 10$

10. If '+' means 'divided by', '-' means 'multiplied by', ' \times ' means 'minus' and ' \div ' means 'plus', which of the following will be the value of the expression $18 + 9 - 3 \div 7 \times 6$?

1. 5
2. 7
3. 6
4. 8

11. If \div means $+$, $-$ means \div , \times means $-$ and $+$ means \times , then $\frac{(50 \times 8) - 6 \times 3}{4 + 2 \times 8 \div 2} = ?$

1. 2
2. 8
3. 4
4. 16

12. If X stands for $+$, Y stands for $-$, Z stands for \times , then what is the value of $78 Y 38 X 2 Z (3 X 7)$?

1. 80
2. 56
3. 60
4. 76

Exercise 13.2

1. If TRAITOR is coded as 2919269, then SPARTAN will be coded as:

1. 1712216
2. 1819217
3. 1719215
4. 1719815

2. If COBRA is written BDNPACQSZB, then how would KING be written in that code?

1. JLHJHFOM
2. JLHJOMFH
3. LJHJMOFH
4. JLHJMOPFH

3. In the correctly worked out multiplication problem below, each letter represents a different digit. What is the value of Q ?

$$\begin{array}{r} PP \\ \times PQ \\ \hline QQ \\ PPR \\ \hline P3Q \end{array}$$

1. 1
2. 2
3. 4
4. 5

4. In the correctly worked out multiplication problem below, each letter represents a different digit. What is the value of Y ?

$$\begin{array}{r} Y2S \\ \times S \\ \hline 212S \end{array}$$

1. 3
2. 4
3. 5
4. 6

Directions for questions 5 and 6: Refer to the following data and answer the following questions.

Given below is a representation of a mathematical addition of two numbers, where numbers have been replaced with specific alphabets. Each alphabet stands for a specific single digit number and none of the numbers are represented by more than one alphabet.

$$\begin{array}{r} CBD \\ + BBX \\ \hline BXDD \end{array}$$

5. The digit represented by B is:
 1. 2 2. 1 3. 0 4. 9
 6. What is the value of $CBXB$?
 1. 9101 2. 1090 3. 9010 4. 1909

Directions for questions 7 to 10: Refer to the following data and answer the following questions.

P, Q, R, S, T, U and V are consecutive integers, not necessarily in that order, such that the lowest is greater than 40 and highest is less than 50. Further

- (a). $R - P + 10 = S/4$ (b). Q, R and U are prime numbers.
 (c). V is a multiple of 5 (d). P is even number and R is odd number
 (e). Q is the greatest number

7. The smallest number is:
 1. S 2. U 3. P 4. R
 8. $Q - S = ?$
 1. 4 2. 2 3. 3 4. 1
 9. The largest even number is:
 1. P 2. S 3. T 4. Q
 10. $P + R - S = ?$
 1. 41 2. 42 3. 43 4. 44
 11. In a certain code, DIWALI is coded as 216 and CHRISTMAS is coded as 729. What will be a code for EKADASHI?
 1. 448 2. 512 3. 64 4. 500
 12. If $57 + 38 = 23$, $48 + 72 = 21$, $53 + 36 = 17$, then find $19 + 23$?
 1. 18 2. 43 3. 42 4. 15

Answer Key

Exercise 13.1

- | | | | | | |
|------|------|------|-------|-------|-------|
| 1. 2 | 2. 2 | 3. 4 | 4. 3 | 5. 2 | 6. 4 |
| 7. 4 | 8. 4 | 9. 2 | 10. 2 | 11. 1 | 12. 3 |

Exercise 13.2

- | | | | | | |
|------|------|------|-------|-------|-------|
| 1. 3 | 2. 4 | 3. 2 | 4. 2 | 5. 2 | 6. 1 |
| 7. 2 | 8. 3 | 9. 3 | 10. 1 | 11. 2 | 12. 4 |

 **Explanatory Answers**
Exercise 13.1

1.

$$\begin{array}{ccccccc}
 N & O & R & W & A & Y \\
 + 1 & \downarrow & & & & & \\
 O & P & S & X & B & Z
 \end{array}$$

Clearly, each letter in the word Norway is moved one step forward to obtain the corresponding letter of the code. So in Finland, *F* will be coded as *G*, *I* as *J*, *N* as *O*, *L* as *M* and so on. Thus, the code becomes GJOMBOE.

Ans 2

2. Clearly the alphabets are coded as shown:

$$A - 4, R - 1, G - 7, E - 2, N - 3, T - 6, I - 0, M - 8, S - 5, P - 9$$

P is coded as 9, *A* as 4, *R* as 1, *I* as 0 and *S* as 5.

Hence, PARIS is coded as 94105.

Ans 2

3. The first and the second letter; the third and the fourth letter and fifth and the sixth letter of the word are interchanged to obtain the code.

Ans 4

4. Code for the given word = Square of number of letters of the word.

$$\text{Code of RUTHLESS} = 8^2 = 64.$$

Ans 3

5. Each letter is coded as next alphabetic letter. So, *N* is coded as *O*, *A* as *B*, *S* as *T* and so on. STULTIFY will be written as TUVMUJGZ.

Ans 2

6. By their natural position numbers,

$$L \rightarrow 12, O \rightarrow 15, N \rightarrow 14, D \rightarrow 4, O \rightarrow 15, N \rightarrow 14$$

$$\text{Hence, LONDON} = (12 + 15 + 14 + 4 + 15 + 14) = 74$$

$$\text{So PARIS} = (16 + 1 + 18 + 9 + 19) = 63.$$

Ans 4

7. Clearly, Apple is a fruit. Fruit is called as ‘Seed’.

Ans 4

8. By proceeding as in solved example 8 of Section 1.4, food-gul to find hot, we need to find bring, which is not possible.

Ans 4

9. After incorporating the interchanges, expression on L.H.S of option (2) becomes

$$4 \times 8 \div 2 = 16.$$

Ans 2

10. Given expression is $18 + 9 - 3 \div 7 \times 6$

Making the changes as mentioned,

$$18 \div 9 \times 3 + 7 - 6$$

$$= 2 \times 3 + 7 - 6$$

$$= 7.$$

Ans 2

11. After incorporating the changes, it becomes

$$\frac{(50 \times 8) - 6 \times 3}{4 + 2 \times 8 \div 2}$$

Ans 1

12. Given expression is

$$\begin{aligned} & 78 Y 38 X 2 Z (3 X 7) \\ \Rightarrow & 78 - 38 + 2 \times (3 + 7) \\ = & 78 - 38 + 20 \\ = & 78 - 18 \\ = & 60 \end{aligned}$$

Ans 3

Exercise 13.2

1. Let $A = 1, B = 2, C = 3, \dots, Z = 26$.

Add the digits of the number corresponding to the letters occurring in the alphabetic series till you get a single digit number.

For example, $Z = 26 = 2 + 6 = 8$.

$$T = 20 = 2 + 0 = 2; R = 18 = 1 + 8 = 9; A = 1; I = 9; T = 2; O = 15 = 1 + 5 = 6; R = 1 + 8 = 9$$

Hence, SPARTAN = 1719215.

Ans 3

2. Each letter is coded as a pair of letters, one preceding it and the other next to it.

$$K \rightarrow JL$$

$$I \rightarrow HJ$$

$$N \rightarrow MO$$

$$G \rightarrow FH$$

Ans. 4

3. $Q + R = Q \therefore R = 0$

$$\text{As } PP \times Q = QQ \Rightarrow (10P + P) \times Q = (10Q + Q) \Rightarrow (10P + P)Q = Q(10 + 1) \therefore P = 1$$

Now $Q + P = 3$ and $P = 1$

$$\therefore Q = 3 - 1 = 2$$

$$\therefore \text{The problem is } 11 \times 12 = 22 + 110 = 132.$$

Ans 2

4. As $S \times S$ gives last digit as S , S can take value as 1, 5 or 6. But if S is 1, then the multiplication will yield a 3 digit number. As the product is a four digit number, S can take value as 5 or 6. If S is 6, then the tens digit of product comes out to be 5 whereas this digit of the product is 2. Hence, $S = 5$. Now, $Y \times 5 + 1 = 21$.

$$\therefore Y = 4.$$

Ans 2

5. Largest possible 3 digit no. is 999. Adding 999 to 999 gives 1998. $\therefore B$ has to be 1 in the sum which is a four digit no. \therefore The digit represented by B is '1'.

Ans 2

6. The value of $CBXB$ is 9101. $[X + D = D \text{ or } 10 + D]$. But X cannot be equal to 10. Since, it is single digit. Therefore, $X = 0$.

Ans 1

Tip: From $Q - 5$, it is clear that $B = 1$. By getting $X = 0$, we can easily point the answer amongst all options without solving the question further.

Answers for questions 7 to 10.

These types of questions require application of simple mathematical fundamentals. A step-wise approach is the best tool to solve such questions.

* A range has been given in the statement in which the numbers will lie. All these alphabets are representing numbers lying in the range 40 to 50.

* Q, R and U are the prime number and only prime numbers between 40 and 50 are 41, 43 and 47.

Since Q is the highest, it will be 47 (as numbers are consecutive so numbers will be between 41 and 47).

$$\therefore Q = 47.$$

* Given $R - P + 10 = S/4$

$\therefore S$ is multiple of 4. The only multiple of 4 in this series = 44. $\therefore S = 44$

$\therefore R - P = 1$. Also as R is prime and P is even so $R = 43$ and $P = 42$

* As V is multiple of 5. So, $V = 45$. As U is prime so $U = 41$.

The only possible even value for T is 46.

Thus, the final sequence is:

$$\begin{array}{ccccccc} 41 & 42 & 43 & 44 & 45 & 46 & 47 \\ U & P & R & S & V & T & Q \end{array}$$

7. From the derived sequence, the smallest number is 41. Ans 2
8. $Q - S = 47 - 44 = 3$. Ans 3
9. From the derived sequence, the largest even number is 46. Ans 3
10. $P + R - S = 42 + 43 - 44$
 $= 41$. Ans 1
11. Herein, DIWALI has 6 letters and code for it is $6^3 = 216$. Similarly, CHRISTMAS has 9 letters so code for it is 729. On similar lines code for EKADASHI would be cube of 8, i.e. 512. Ans 2
12. Ignore the '+' sign and add all individual digits, eg. $57 + 38 = 5 + 7 + 3 + 8 = 23$. Ans 4

Chapter 14

Blood Relations

14.1 Introduction

The logical problems of family tree are generally based on the hierarchical structure of a family which comprises grandparents, parents, children, nephews, niece, etc. Various relationships between the family members of different generations are presented here. The complete family tree is formed by joining the various relationships together.

The most common relationships which are seen in the problems based on family tree are Grandparent-Grandchild, Parent-Child, Husband-Wife, Uncle/Aunt-Nephew/Niece, Brother-in-law/Sister-in-law/Parents-in-law.

14.2 Important Relations

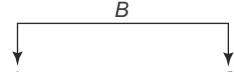
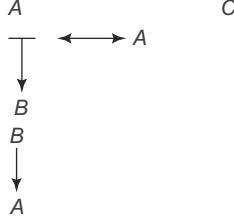
Following is a list of the important relations which are mostly asked in the examinations:

- | | | |
|-----|-----------------|---|
| 1. | Brother | Son of Mother or Father |
| 2. | Sister | Daughter of Mother or Father |
| 3. | Cousin | Son of Uncle or Aunt or Daughter of Uncle or Aunt |
| 4. | Grandmother | Mother of Father or Mother |
| 5. | Grandfather | Father of Father or Mother |
| 6. | Aunt | Sister of Mother or Father |
| 7. | Uncle | Brother of Mother or Father |
| 8. | Brother-in-law | Sister's Husband, Brother of Wife or Husband |
| 9. | Sister-in-law | Brother's Wife, Sister of Wife or Husband |
| 10. | Daughter-in-law | Wife of the Son |
| 11. | Niece | Daughter of the Brother or Sister |
| 12. | Nephew | Son of the Brother or Sister |
| 13. | Son-in law | Husband of the Daughter |

To develop a family tree, there are certain standard notations which have been used in this book to indicate a relationship between the different members of the family. It is not necessary to follow them implicitly, you can formulate your own notations to draw the family tree quickly and accurately.

14.3 Notations

Following is a list of notations:

1. If A is a male, it is represented as \boxed{A}
2. If A is a female, it is represented as \circled{A}
3. If Sex of A is not known, it is represented as A
4. If A and B are married to each other, it is represented as $A \# B$
5. If A and B are siblings, it is represented as $A \longleftrightarrow B$
6. If A and C are B 's children, it is represented as B 
7. If A is the uncle/aunt of B , it is represented as A 
8. If A is the only child of B , it is represented as B 

Example 1: Abha, Bina, Chetan, Deepak, Emam and Fathima are related to each other. Bina is Fathima's daughter-in-law. Deepak is Abha's only grandchild. Chetan is Deepak's only uncle. Abha has only two children Fathima and Chetan, one male and one female (not necessarily in the same order). Emam is the father of Chetan.

- (i) Who is the grandmother of Deepak?
- (ii) Who is the mother-in-law of Bina?
- (iii) If a girl Gagan is married in the family, what will be the relationship between Gagan and Deepak?

Solution:

Step I

The persons Abha, Bina, Chetan, Deepak, Emam and Fathima can be represented as A, B, C, D, E , and F .

We can determine the males/females in the above group by having a look at the following points:

1. B is the daughter-in-law of F . \circled{B}
2. C is the only uncle of D . \boxed{C}
3. A has two children F and C , one male and one female. Since C 's gender is male, F is female. \circled{F}
4. E is the father of C . \boxed{E}

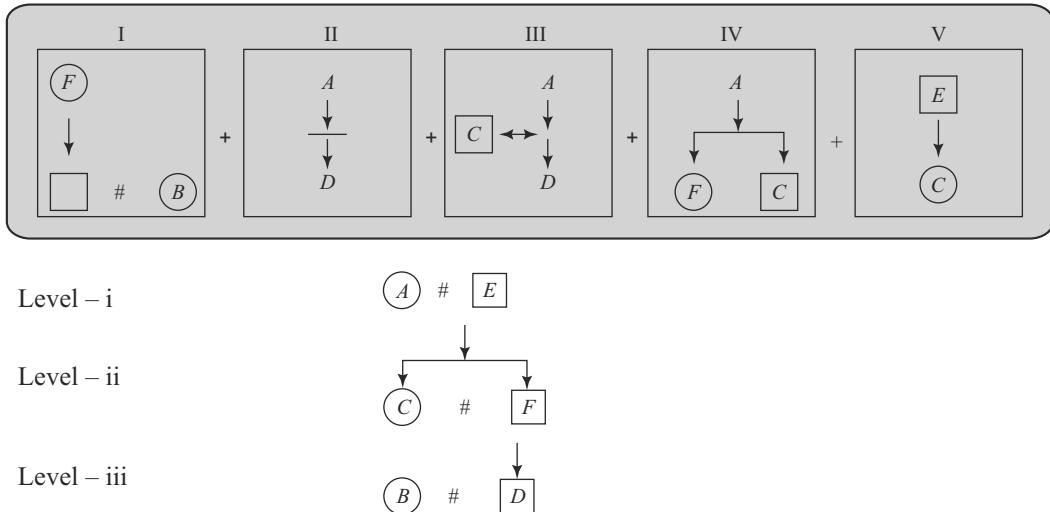
Step II

You should try to determine the positions of the members in the family tree. For this, you should analyze the statements and determine the number of generations involved in the family tree. D is A 's only grandchild. Therefore, we know that there are three generations involved in this family tree.

Step III

Use the conditions to arrange *A*, *B*, *C*, *D*, *E* and *F* in these three generations.

- Bina (B)* is *Fathima's (F)* daughter-in-law (as shown in Figure I)
- Deepak (D)* is *Abha's (A)* only grandchild (as shown in Figure II)
- Chetan (C)* is *Deepak's (D)* uncle (as shown in Figure III)
- Abha (A)* has only two children *Fathima (F, female)* and *Chetan (C, male)* (as shown in Figure IV)
- Emam (E)* is *Chetan's (C)* father (as shown in Figure V)



Question number (1) and (2) can be answered easily by looking at the family tree. *Abha* is the grandmother of *Deepak* and *Fathima* is the mother-in-law of *Bina*. For answering question (3), *Chetan* is the only male in the family who is unmarried. Hence, *Gagan* will be married to *Chetan* and will be *Deepak's* aunt.

Exercise 14.1

Directions for questions 1 to 3: Refer to the data below and answer the questions that follow:

Ankita is *Shiv's* daughter. *Shivani* is *Shiv's* sister. *Shivani's* daughter and son are *Heena* and *Harsi*, respectively. *Sahiba* is *Heena's* maternal Aunt.

- | | | | | |
|-----------------------|-----------|-----------|-----------|------------------|
| 1. Ankita is Sahiba's | 1. Aunt | 2. Nephew | 3. Uncle | 4. None of these |
| 2. Heena is Shiv's | 1. Nephew | 2. Niece | 3. Uncle | 4. Cannot say |
| 3. Harsi is Sahiba's | 1. Niece | 2. Aunt | 3. Nephew | 4. None of these |

Directions for questions 4 to 5: Refer to the data below and answer the questions that follow:

A, B, C, D, E, F and G are seven members of a family. *B* is grandmother but not of *C* and *G*. There are two married couples. *D* and *C* are the male members in these couples. *F* is *G's* unmarried Uncle and *D's* brother.

G is still in search of a suitable groom. D has two children C and G. The family is having 3 generations. A is the youngest boy. D is not married to E.

4. How many male members are there in the family?
 1. 3 2. 2 3. 4 4. Either [1] or [3]
5. D is
 1. F's brother 2. C's sister 3. A's grandfather 4. Both [1] or [3]

Directions for questions 6 to 8: Read the following information carefully and answer the questions that follow:

$X - Y$ means X is the husband of Y.

$X + Y$ means X is the daughter of Y.

$X \times Y$ means X is the brother of Y.

6. If Anu + Ben \times Cia, which of the following is true?
 1. Anu is the daughter-in-law of Cia 2. Anu is the aunt of Cia
 3. Anu is the niece of Cia 4. Anu is the daughter of Cia
7. If Anu + Ben - Cia, which of the following is true?
 1. Cia is the mother-in-law of Anu 2. Cia is the aunt of Anu
 3. Cia is the mother of Anu 4. Cia is the sister-in-law of Anu
8. If Anu \times Ben + Cia, which of the following is true?
 1. Anu is the father of Cia 2. Anu is the uncle of Cia
 3. Anu is the brother of Cia 4. Anu is the son of Cia
9. If Param is the mother of Quershi and Rita, and Sam is the husband of Rita, how is Param related to Sam?
 1. Mother 2. Aunt 3. Son-in-law 4. Mother-in-law
10. A man while looking at the photograph of a woman said, "She is the maternal grandmother of the children of my wife's sister". How is the man related to the woman?
 1. Father 2. Son-in-law 3. Grandson 4. Brother-in-law
11. A mature woman said that she is B's mother and A is B's brother. B's father is D and D's mother is E. How is A related to the woman's mother?
 1. Granddaughter 2. Grandson
 3. Great Grandson 4. Can't be determined
12. How is Leena related to Meena if her father's sister is Meena's grandmother?
 1. Mother 2. Sister 3. Aunt 4. Sister-in-law
13. A mature lady while looking at a photograph said, "This boy is the brother of the son of my sister's husband". How is the person in the photograph related to the lady?
 1. Sister 2. Brother 3. Niece 4. Nephew



Exercise 14.2

1. Rita told Sita that Tim is her father's nephew. Uni is Rita's cousin but not the brother of Tim. How is Uni related to Tim?
 1. Mother 2. Father
 3. Aunt 4. Can't be determined

2. A smart girl puzzled a woman by saying that, "Your only sister is the daughter of my father's father-in-law". "How is the girl's mother related to the woman?"
1. Daughter
 2. Sister
 3. Cousin
 4. Can't be determined
3. If $A \times B$ means A is the mother of B , $A \circ B$ means A is the brother of B , $A \circledast B$ means A is the father of B and $A \circledcirc B$ means A is the sister of B , which of the following shows that P is the maternal uncle of Q ?
1. $Q \circ N \times M \circ P$
 2. $P \circ M \circ N \circ Q$
 3. $P \circ M \times N \circ Q$
 4. $Q \circ M \circ N \circ P$
4. G is the brother of H and I , J is the mother of H and K is the father of G . Which of the following statement is definitely not true?
1. G is the son of J
 2. G is the father of I
 3. H is the brother of I
 4. G is the son of K
5. P, Q, R, S, T and U are the members of an association. There are two married couples in the group. P is the brother of S 's husband. R is the president of Women's Association. U is a bachelor sitar player. Q 's wife is not a member of the club. Four of them belong to the same family. Q and U are colleagues in the club. How is U related to Q ?
1. Wife
 2. Husband
 3. Father
 4. Can't be determined

Answer Key

Exercise 14.1

- | | | | | | |
|-------|------|------|-------|-------|-------|
| 1. 4 | 2. 2 | 3. 3 | 4. 3 | 5. 4 | 6. 3 |
| 7. 3 | 8. 4 | 9. 4 | 10. 2 | 11. 2 | 12. 3 |
| 13. 4 | | | | | |

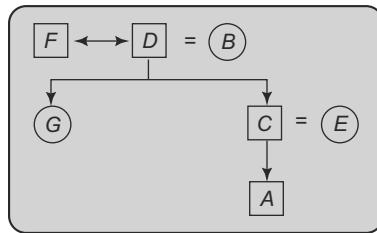
Exercise 14.2

- | | | | | |
|------|------|------|------|------|
| 1. 4 | 2. 4 | 3. 3 | 4. 2 | 5. 4 |
|------|------|------|------|------|

Explanatory Answers

Exercise 14.1

1. Ankita can be Sahiba's niece or daughter. Ans 4
2. Heena is Shiv's niece. Ans 2
3. Harsi is Sahiba's nephew. Ans 3
4. Family Chart can be drawn as shows in the Figure 1
The male members in the family are F, D, C and A . Ans 3

**Figure 1**

5. *D* is *F*'s brother and *A*'s grandfather. Ans 4
6. Anu is the niece of Cia. Ans 3
7. Cia is the mother of Anu. Ans 3
8. Anu is the son of Cia. Ans 4
9. Param is the mother-in-law of Sam. Ans 4
10. Son-in-law Ans 2
11. Grandson Ans 2
12. Aunt Ans 3
13. Nephew Ans 4

Exercise 14.2

1. Uni and Tim could be Rita's cousins and might not be related to each other. Ans 4
2. Cannot be determined. Ans 4
3. Statement 3 says that *P* is the brother of *M* who is the mother of *N* who is the sister of *Q*. This proves that *Q* and *N* are siblings and their mother is *M*. *M* has a brother named *P* who is the maternal uncle of *Q*. Ans 3
4. *G*, *H* and *I* are brothers, sisters. *K* and *J* may be husband and wife. *G* is the son of *K* and *J*. Ans 2
5. According to the data, there are two female members of the club named *R* and *S*. Data is not sufficient in respect to *Q* and *U*. Ans 4

Chapter 15

Direction Test

15.1 Introduction

In the questions involving directions, always assume the starting point of journey as the origin and name it as O. You can then trace the journey as per the given directions and answer the relevant questions.

The direction chart given in Figure. 1 is used in solving questions based on direction test.

15.2 Direction Chart

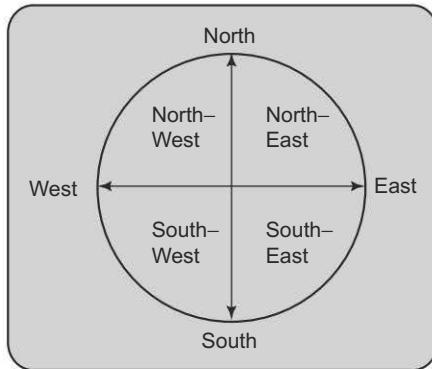


Figure 1

Example 1: Asha starts from her office and walks 3 km toward North. She then turns right and walks 2 km and after that turns to the right and walks for a distance of 5 km. She then turns right and walks 2 km and then again turns right and walks 2 km. In which direction is she from the starting point?

1. South
2. North-east
3. South-east
4. She is at the starting point

Solution: The movement is as shown in Figure. 2

Hence, she is at the starting point.

Ans 4

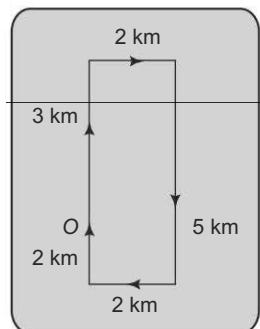


Figure 2

Example 2: Ram while facing West walks 100 m, then turns right and walk 100 m and turns left and walks 50 m and reaches a point X. In which direction is Ram from the starting point?

- 1. North-west
- 2. West
- 3. North
- 4. South

Solution: The movement is like (Figure. 3)

Therefore as shown in (Figure. 3), Ram is in the North-west direction from the starting point.

Ans 1

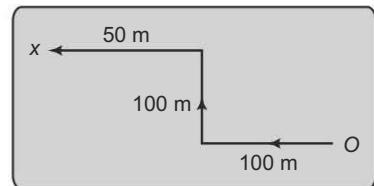


Figure 3



Exercise 15.1

1. Asin started moving in the East and walked 10 km straight. After taking a left turn she moved 4 km, then she took another left turn and walked 13 km straight. Can you tell how far she is from the starting point and in which direction is she right now?
 1. 5 km, NW 2. 5 km, NE 3. 6 km, NW 4. 6 km, NE
2. Pravi is standing on White Lake. Akram is West of Pravi. Tina is East of Akram but West of Pravi, Karan is East of Bopu but West of Tina and Akram. If they are all in the same line, who is the farthest from Pravi?
 1. Tina 2. Karan 3. Akram 4. Bopu
3. Rama and Seema are standing 10 m apart with Rama on left of Seema. Both start travelling toward North, walk for about 30 m and then turn right to travel 40 m more. Rama, then takes a left turn, travels 20 m and stops but Seema takes a right turn to travel 10 m. Seema again turns right, travels 10 m and stops. How far are they from each other?
 1. 10 m 2. 20 m 3. 30 m 4. 50 m
4. Binaah walks southward, then takes a half-right turn and then a right turn. In which direction is he walking now?
 1. South 2. East 3. North-west 4. North
5. Vasudha travels 20 km to the north, turns left and travels 8 km and she again turns right and covers another 10 km and then turns right and travels another 8 km. How far is she from the starting point?
 1. 8 km 2. 40 km 3. 30 km 4. 20 km
6. What will be the angle between North direction and North-West-West?
 1. 45° 2. 67.5° 3. 90° 4. 15°
7. Rohit starts from his home and starts walking in the East direction for 20 minutes. Then, he turns right and walk for 6 minutes. Then again he turns right and walks for 12 minutes. Now, he wants to go to his home directly along a straight line. For how many minutes he will walk to reach his home, assuming his speed to be constant throughout?
 1. 10 minutes 2. 12 minutes 3. 14 minutes 4. 15 minutes

Directions for questions 8 to 10: Refer to the following data and answer the following questions:

Akshay is standing 1 km North of Viraj. Raj is standing 1 km East of Viraj. Kriti is standing 1 km North of Raj and East of Akshay.

8. As seen by Kriti, in which direction is Viraj standing?
 1. South-West 2. North 3. North-East 4. East

9. Which geometric figure is formed by Akshay, Viraj, Kriti and Raj?
 1. Triangle 2. Square 3. Circle 4. Pentagon
10. If Karun is standing $\sqrt{2}$ km North-west of Viraj and West of Akshay, Which geometric figure is formed by Akshay, Viraj, Karun and Raj?
 1. Parallelogram 2. Square 3. Circle 4. Hexagon

Exercise 15.2

1. A cat is taken out every morning by an angry owner whose house faces North. They walk 200 m straight, turn right at an angle of 45° and travel 100 m. They then turn right at an angle of 45° , travel 200 m, and again turn 45° toward right, travel 100 m. Then they take a final 45° turn toward right, travel 200 m and stop. How far are they from the house?
 1. 200 m 2. $200\sqrt{2}$ m 3. $200 \frac{1}{\sqrt{2}}$ m 4. $200(1 + \frac{1}{\sqrt{2}})$ m
2. Four cars are standing as Ata is east of Bantro but south east of Caruti. Caruti is north-east of Bantro. Diat is north-east of Caruti and north of Ata but in line with Bantro and Caruti. In which direction of Bantro is Diat located?
 1. North-east 2. South 3. East 4. North-west
3. Aman started moving toward south. After taking 128 turns in toward his right, which can be the opposite direction at the end of Aman's facing?
 1. South 2. West 3. North 4. East
4. Binu has gone mad over past few days. Every night he changes his sleeping direction by 45° anticlockwise. On 12th June, his head faces toward North. On 6th July, where his feet would be pointing toward?
 1. South 2. North-west 3. North 4. South-east

Directions for question 5: Refer to the given data and answer the questions that follow:

Akram is standing 2 m North of Vimal. Rahul is standing 2 m east of Vimal. Kiran is standing 2 m North of Rahul and east of Akram.

5. Which geometric figure is formed by Akram, Vimal and Rahul?
 1. Scalene triangle 2. Isosceles triangle 3. Equilateral triangle 4. None of these

Directions for questions 6 and 7: Refer to the given data and answer the questions that follow:

In a certain direction system, there are only three directions, Aka, Bka and Cka, 120° apart from each other, just like the blades of a fan. Bka is 120° anticlockwise of Cka.

6. With respect to Aka, in which direction Bka lies?
 1. 120° anticlockwise 2. 120° clockwise
 3. Any of these 4. None of these
7. A, B and C are standing in Aka, Bka and Cka directions of X, respectively, such that A, B and C are forming an equilateral triangle of 346 metres side. What is the distance between A and X?
 1. 300 m 2. 200 m
 3. 100 m 4. Cannot be determined

Directions for questions 8 to 10: Ritesh starts from his home in North direction at a speed of 5 m/s. After 10 minutes, he turns right and runs at same speed for another 10 minutes. Then, he turns left and runs at same speed for another 10 minutes and reaches a point P.

8. How far is he from his home now?
 1. 6.71 km 2. 6.81 km 3. 6.86 km 4. 6.91 km
9. Suppose wind was blowing at a speed of 3 m/s in South direction for the time he was travelling.
 How far is he from his home now in this case?
 1. 3.64 km 2. 3.74 km 3. 3.84 km 4. 3.94 km
10. How much time will it take him to reach back home if he travels along straight line at the same speed of 5 m/s?
 1. 22 minutes 22 seconds 2. 13 minutes 48 seconds
 3. 14 minutes 48 seconds 4. 15 minutes 48 seconds

Answer Key

Exercise 15.1

- | | | | | | |
|------|------|------|-------|------|------|
| 1. 1 | 2. 4 | 3. 3 | 4. 3 | 5. 3 | 6. 2 |
| 7. 1 | 8. 1 | 9. 2 | 10. 1 | | |

Exercise 15.2

- | | | | | | |
|------|------|------|-------|------|------|
| 1. 4 | 2. 1 | 3. 3 | 4. 1 | 5. 2 | 6. 2 |
| 7. 2 | 8. 1 | 9. 3 | 10. 1 | | |

Explanatory Answers

Exercise 15.1

1.

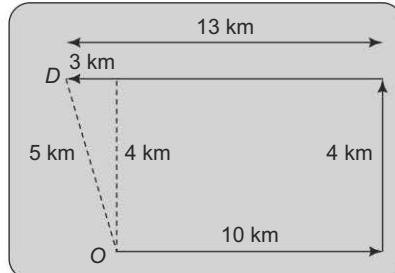


Figure 4

$OD = 5 \text{ km, NW.}$

Ans 1

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2. The location of persons from West to East is in the following order:

Bopu – Karan – Akram – Tina – Pravi.

Ans 4

3.

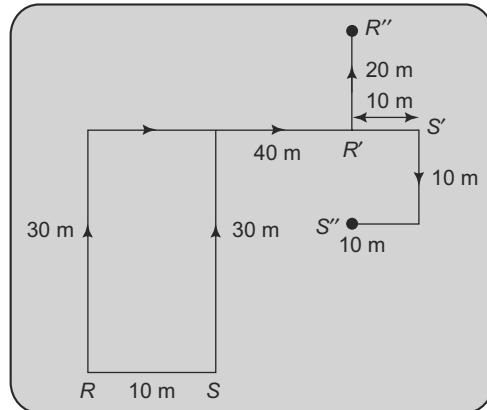


Figure 5

Here R and S are Rama's and Seema's starting position but R'' and S'' are their final positions. $R''S'' = R''R' + S''R' = 20 + 10 = 30$ m.

Ans 3

4.

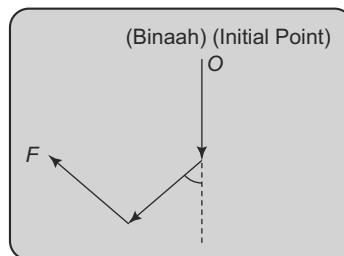


Figure 6

Binaah is moving towards North-west.

Ans 3

5.

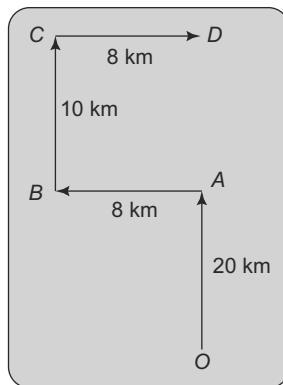


Figure 7

The path traversed by Vasudha is $OABCD$.

The distance from O to D is $OA + AD$, because $AD = BC = 10 \text{ km}$

Therefore, $OD = OA + AD = 20 \text{ km} + 10 \text{ km} = 30 \text{ km}$.

Ans 3

6.

$$1 = 45^0$$

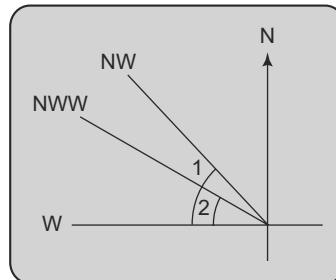


Figure 8

$$2 = \frac{45^0}{2} = 22.5^0$$

Angle between N and NWW is $45^0 + 22.5^0 = 67.5^0$

Ans 2

7.

Suppose Rohit walks k metres in 1 min.

So Speed = k m/min

So, distance and direction is as shown in above diagram

From Figure. 9:

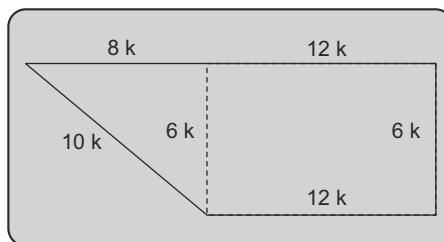


Figure 9

Direct path to his house is of $\sqrt{[(6k)^2 + (8k)^2]}$ metre, which is $10k$

So, time taken would be $10k/k = 10 \text{ min}$

Ans 1

Answers for questions 8 to 10:

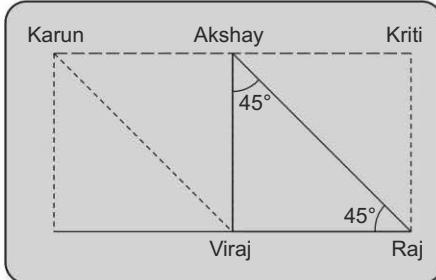


Figure 10

8. Refer to Figure. 10. Ans 1
 9. Refer to Figure.10. Ans 2
 10. Refer to Figure.10. Ans 1

Exercise 15.2

1. The path is shown in Figure. 11:

Here $OABCDE = \text{Path}$

$O = \text{Starting Position}$

$E = \text{Final Position}$

To find OE :

$$OE = AD = AM + MN + ND$$

$$AM = 100 \cos 45^\circ = \frac{100}{\sqrt{2}} \text{ m}$$

$$MN = 200 \text{ m}$$

$$\text{And } ND = 100 \cos 45^\circ = \frac{100}{\sqrt{2}} \text{ m}$$

$$OE = \frac{100}{\sqrt{2}} + 200 + \frac{100}{\sqrt{2}} = 200 \left(1 + \frac{1}{\sqrt{2}}\right) \text{ m.} \quad \text{Ans 4}$$

2. Representing cars with their first initials. Figure 12 will help in arriving at the answer.

D is to the North-east of B . Ans 1

3. The logic is, after every four right turns, Aman will be facing the same direction and as 128 is a multiple of 4, therefore he will be facing South. Therefore, opposite direction of facing is North. Ans 3

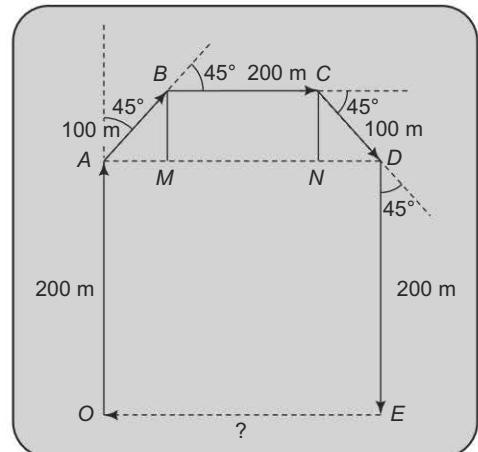


Figure 11

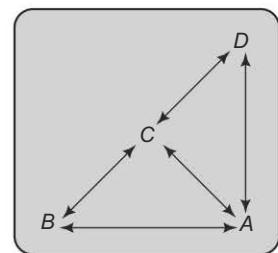


Figure 12

4. After every 8 days, he will resume his original position since he would have rotated by 360° ($8 \times 45^\circ = 360^\circ$),

Therefore, on 20th June, 28th June and 6th July he will be sleeping with his head facing North. So his feet would be facing South.

Ans 1

5.

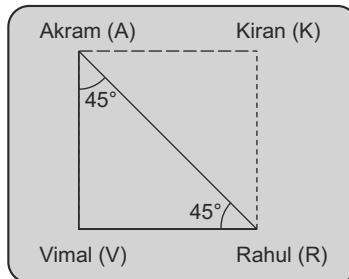


Figure 13

AVR form an isosceles triangle as $\angle VAR = \angle ARV$ and $AV = VR$.

Ans 2

Directions for questions 6 and 7:

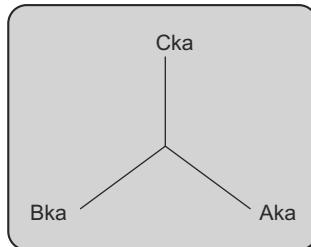


Figure 14

6. Refer to Figure 15.

Ans 2

7. Area of equilateral triangle

$$= \frac{\sqrt{3}}{4} a^2$$

Also area of $\Delta = \frac{1}{2}$ base \times ht

Let $CX = x$ and $CD = y$

From (i) and (ii)

$$CD = \frac{\sqrt{3}a}{2} \therefore CD = \frac{\sqrt{3} \times 346}{2} \text{ Also } CX : CD = 2 : 3$$

$$\therefore \frac{2}{3} \times \frac{\sqrt{3} \times 346}{2} = 200 \text{ m.}$$

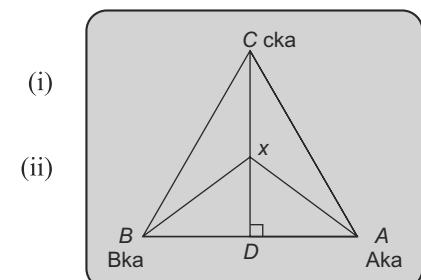


Figure 15

Ans 2

8. Ritesh moves in north direction at speed of 5 m/s for 10 min. So, distance travelled by him is Speed \times Time = 3 km. Then he moves to right at same speed for 10 min. So, the distance moved in that direction is also 3 km. Similarly, he turns left and moves with same speed for 10 min. Again, his distance will be 3 km.

So, his position from home to point P is the line HP shown in the Figure. 16.

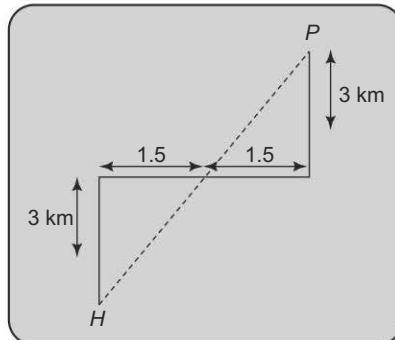


Figure 16

We have two right angled triangles, so length of $HP = (3^2 + 1.5^2)^{1/2} + (3^2 + 1.5^2)^{1/2}$

$$HP = 6.71 \text{ km.}$$

Ans 1

9. As the wind is blowing in south direction so it will affect his speed while he is moving in north direction so from above question. Now he moves at a relative speed of 2 m/s for 10 min. So, he covers 1.2 km then he moves right and moves at 5 m/s for 10 min. So distance covered = 3 km. Again when he turns left his direction is north so he travels at 2 m/s. so, Distance covered = 1.2 km.

$$\text{In this case, } HP = (1.2^2 + 1.5^2)^{1/2} + (1.2^2 + 1.5^2)^{1/2} = 3.84 \text{ km.}$$

Ans 3

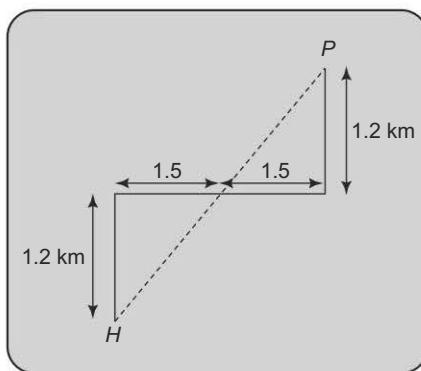


Figure 17

10. The distance from his home to point P = 6.71 km

Now if he travels back home along a straight line, he will follow the path PH.

$$\text{So, time taken to travel } 6.71 \text{ km at } 5 \text{ m/s} = 6710 / (5 \times 60) \text{ minutes}$$

$$= 22.37 \text{ minutes} = 22 \text{ minutes } 22 \text{ seconds.}$$

Ans 1

Chapter 16

Series Completion

16.1 Series

A series is a sequence of numbers obtained by some predefined rule and by applying this rule it is possible to find out the next term of the series.

A series can be formed in different ways. Hence it is not possible to use a general approach to solve any sort of question based on series. However if you can understand the underlying thought behind a series, it can be helpful in solving such problems.

Depending upon the logic applied for creating the series, they can be categorized into different categories which have been discussed in subsequent sections in this chapter.

16.1.1 Direct Series

A direct series is a series in which any term is estimated by performing a certain operations on the previous term (the operation remains same throughout the series). Operations like arithmetic progression (A.P.), geometric progressions (G.P.), etc., are some examples which we study routinely.

Example 1: 601, 595, 589, 583, 577, ...

Solution: This is a direct series in which the next term is predicted by subtracting 6 from the previous term. So, next few terms in the above series will be: 571, 565, 559, and so on.

Example 2: 115, 117, 121, 129, 145, ...

Solution: Now, this is not an arithmetic or geometric series. The difference between consecutive terms forms a series when each term is obtained by multiplying previous difference by 2, i.e., 2, 4, 8, 16,.... There can be more than 1 way to solve the series.

16.1.2 Indirect Series

An indirect series is a series which is derived using another series. Such series are formed by performing a set operation on some standard series. Following examples will further clarify the point:

Example 3: 1, 4, 9, 16, ...

Solution: By simply looking at the series you can determine that the series is made up of squares of natural

numbers, $1^2, 2^2, 3^2, 4^2$. So the next term should be $(5)^2 = 25$.

Example 4: 0, 4, 18, 48, 180, 294

Solution: This is slightly tricky, if you examine carefully you will find each term being $n^3 - n^2$.

For example: $2^3 - 2^2 = 4$ and so on. So, the middle term would be 100.

16.1.3 Twin Series

A twin series is a series which is made by merging two series. Generally in such series, alternate terms, i.e., even and odd terms form two different series. To solve this series, we will look at the given series as two series.

Example 5: 2, 13, 6, 8, 10, 3, 14, -2, ...

Solution: The above series is a twin series where odd terms form a series, which has a difference of 4 between the terms and even terms form a series in which successive terms are formed by subtracting 5 from the earlier term.

The next few terms of this series will be: 18, -7, 22, -12...

Example 6: 218, 468, 245, 495, 272, 522, 299, 549, ...

Solution: There are two series, first series starts with 218 and each term is found by adding 27. Similarly, second series starts with 468 and again each term is found by adding 27. So, the next few terms will be 326, 576, 353, 603, and so on.

16.1.4 Random Series

Example 7: 10, 80, 72, 521, 612...

Solution: Now, this series does not fall into any of the above-mentioned categories. The logic of above series is that it is the inverse of the cubes of natural numbers, eg: $1^2 = 01$; would be written as 10. So, the next few terms will be: 343, 215, 927, 0001, and so on.

16.1.5 Number Series

Example 8: Where the difference between two consecutive terms involves various arithmetic operations.

i. 417, 443, 469, 495, 521 ...

The common difference is +26, so the next term will be 547.

ii. 7, 14, 42, 210, ...

Here the series is the previous term multiplied by prime numbers 2, 3 and 5, and so on... So, the next term will be $210 \times 7 = 1470$

Example 9: Where the difference between the consecutive numbers are in some progression, i.e., A.P. or G.P.

i. 16, 37, 64, 97, 136, ...

Here the difference between the terms is +21, +27, +33, which are in A.P. So, the next difference will be +45. Hence, next term will be 181.

- ii. 13, 14, 17, 26, 53, 134, ...

Here the difference between the terms is +1, +3, +9, +27, +81. Here, these terms are in G.P. So, the next difference will be +243. Hence, next term will be 377.

Example 10: Where series numbers differ by each other by perfect squares or cubes or they themselves are perfect squares or cubes.

- i. 22, 23, 31, 58, 122, ...

122 58 31 23 22

The common difference between the terms of the series is $-(4)^3 - (3)^3 - (2)^3 - (1)^3$

So, the next difference will be $+(5)^3 = 125$. Hence, next term will be 247.

16.1.6 Letter Series

The letter series are almost based on the similar patterns as in case of numbers, except the numbers are replaced by the letters in these series.

Example 11: Which of the following letters would come in place of the question mark (?) in the given series: S, P, M, J, ?

1. I

2. F

3. G

4. H

Solution: Here, each letter differs by three places in the reverse direction from the previous one. Therefore, next letter after J would be G. **Ans 3**

Example 12: Which of the following letters would come in place of the question mark (?) in the given series?

BE, FJ, KP, QW, ?

1. VW

2. WX

3. XE

4. WV

Solution: The first of subsequent groups have a difference of 4, 5 and 6 places respectively, whereas the second letter of the subsequent groups have a difference of 5, 6 and 7 places respectively. Therefore, on following the same pattern, we get 'XE' as the next term which would replace the question mark. **Ans 3**

16.2 Finding the Missing Term

In this type of reasoning questions, a candidate has to look for the missing terms in the MATRIX which is given by using some relation in all the rows and the columns. This relation should be obeyed in all the rows and the columns necessarily. Basically, it is a check of one's ability to understand and analyze the given relation and use logics to establish the same relation to find the missing term.

Example 13: Given in Table 1 is a matrix with a missing term. Identify the missing term.

1. 8

2. 7

3. 4

4. 2

Solution: Sum of the first three elements added to the unit place to get the fourth element of that row.

$$8 + 7 + 8 = 23 \Rightarrow 2 + 3 = 5$$

$$5 + 3 + 7 = 15 \Rightarrow 1 + 5 = 6$$

$$4 + 7 + 7 = 18 \Rightarrow 1 + 8 = 9$$

Ans 2

Table 1

8	7	8	5
5	3	7	6
4	?	7	9

Table 2

8	6	48	14
12	3	36	15
4	?	28	11

Example 14: Identify the missing term.

1. 1
3. 5

2. 0
4. 7

Solution: In each row

3rd column = 1st column \times 2nd column
4th column = 1st column + 2nd column.

Ans 4

Example 15: Identify the missing term.

1. 10
3. 15

2. 6
4. 18

Solution: Number in the lower half is the square of the number plus the number itself facing it in the upper half. **Ans 2**

Note

There is another approach to solve the above question. The number in the lower half is equal to the number in the upper half multiplied by its immediate successor in the number line. The answer remains unchanged.

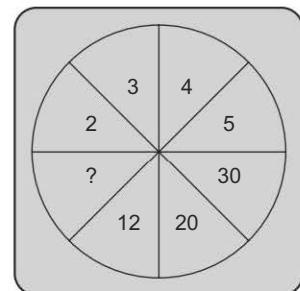


Figure 1

16.2.1 Visual Reasoning

Questions based on visual reasoning make use of figures, diagrams or designs to evaluate one's mental ability, differentiation and speed of reasoning, etc., rather than pure academic knowledge. Most visual reasoning questions follow a certain pattern, etc. A variety of questions is less important than the basic understanding of visual reasoning. The following set of solved examples will create a basic understanding of visual reasoning questions.

Example 16:

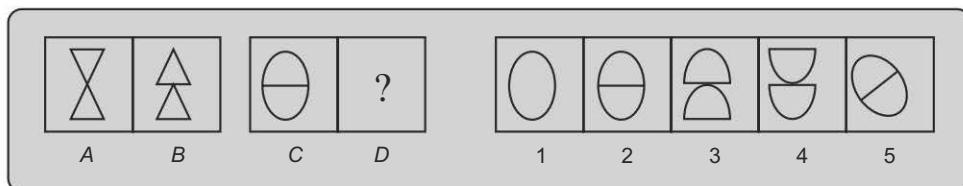


Figure 2

Solution: In the given pair of Figure 2, the upper part of the A gets inverted to get B. **Ans 4**

Example 17:

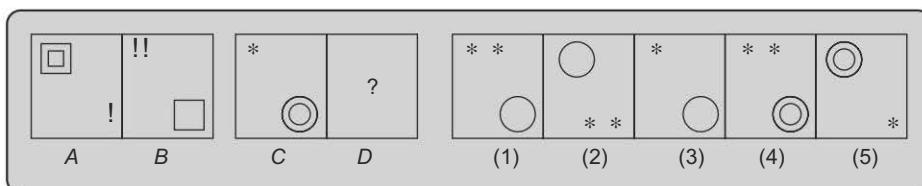


Figure 3

Solution: The elements interchange positions. The double figure is reduced to one while the singlet gets doubled.

Ans 2



Exercise 16.1

Directions for questions 1 to 3: In each of the following examples, five figures are given. Four of them are similar in one way but one figure is not like the other four. Point out which figure does not belong to the group.

1.

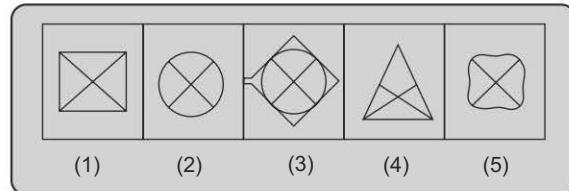


Figure 4

2.

*	!	%	*	#	%	!	#	!	#
#	%	!	#	*	!	%	*	@	*
(1)	(2)	(3)	(4)	(5)					

Figure 5

3.

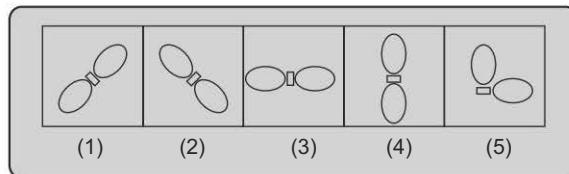


Figure 6

4. Find the number of different squares in the Figure. 7.

- | | |
|-------|-------|
| 1. 28 | 2. 30 |
| 3. 32 | 4. 26 |

5. Identify the missing term in Figure. 8.

- | | |
|-------|-------|
| 1. 35 | 2. 28 |
| 3. 17 | 4. 29 |

6. $a_a_ab_ba_ab$

- | | |
|---------|---------|
| 1. bbab | 2. bbba |
| 3. aabb | 4. aaaa |

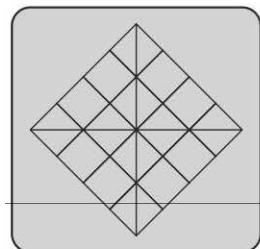


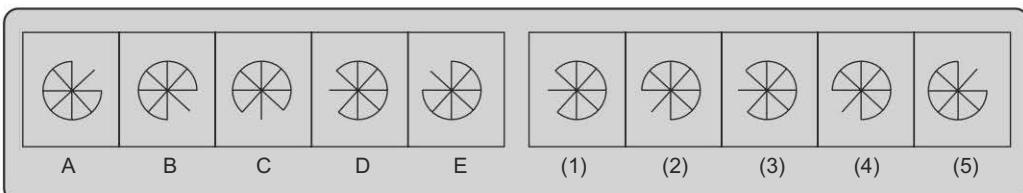
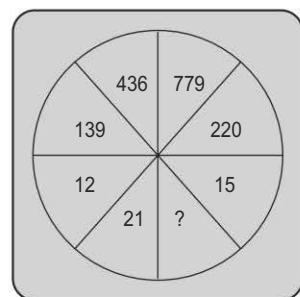
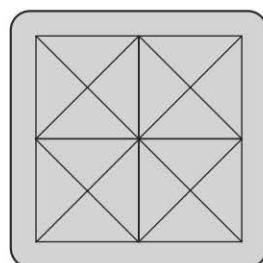
Figure 7

7. Which of the following will come in the blank of given series: $np\ r_f$
1. $suybdf$
 2. $xzzceg$
 3. $tvxzbd$
 4. $mvyace$
8. $CiNrUw?$
1. X
 2. Z
 3. s
 4. v
9. Rohit's nephew has made sketches on this square cardboard. When Rohit looks at his cardboard he is annoyed at first but he is equally amazed that how many squares can be made out from this cardboard?
1. 6
 2. 8
 3. 16
 4. 10
10. 9, 9, 20, 18, 31, 27, ?
1. 44
 2. 42
 3. 56
 4. 54
11. 1, 4, 27, 16, 125, 36, ?, ?
1. 49, 64
 2. 49, 512
 3. 343, 64
 4. 343, 512
12. 5, 35, 7, 56, 8, 16, ?
1. 8
 2. 2
 3. 10
 4. 15
13. 5, 26, 65, 122, ?
1. 199
 2. 198
 3. 197
 4. 200
14. $D, G, I, L, N, ?$
1. Q
 2. S
 3. P
 4. U
15. $A, J, B, K, C, ?$
1. M
 2. D
 3. K
 4. L

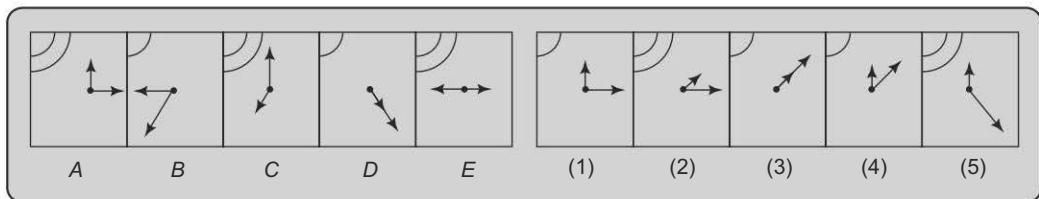
**Exercise 16.2**

Directions for questions 1 to 3: Each of the following examples consists of five figures marked A, B, C, D and E, called the Problem Figures followed by five other figures marked 1, 2, 3, 4 and 5, called the Answer Figures. Select a figure from amongst the Answer Figures which will continue the same series as established by the five Problem Figures.

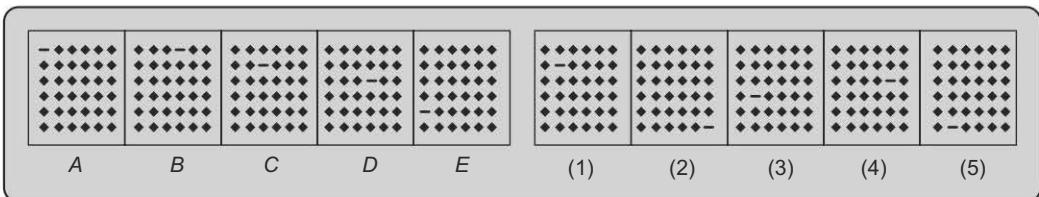
1.

**Figure 10****Figure 8****Figure 9**

2.

**Figure 11**

3.

**Figure 12**

4. Find the missing number (see Table 3)

1. 4
3. 12

2. 8
4. 16

Table 3

30	20	15	34
22	16	11	33
16	8	?	2

5. Identify the missing term (see Table 4)

1. 33
3. 30

2. 36
4. 43

Table 4

3	13	?
7	12	79
4	25	89
2	83	165

6. Identify the missing term (see Table 5)

1. 36
3. 30

2. 49
4. 40

7. Find the missing term (see Table 6)

Table 6

2	3	5	7
11	13	?	19
23	29	31	37

1. 15
3. 7

2. 17
4. 5

Table 5

4	8	18
14	10	27
20	10	?

8. *pqr _ pqr _ pqzz _ zz _*
1. *szpz* 2. *spzz* 3. *szpp* 4. *szps*
9. *_ b c _ _ b b _ aa b c*
1. *ba b c* 2. *a ca c* 3. *a ba b* 4. *aa c c*
10. *ab _ cbb _ a _ cca _ ba*
1. *acbc* 2. *bbca* 3. *aacb* 4. *ccab*

Directions for question 11: Study the following Figure. 13 carefully to answer these questions.

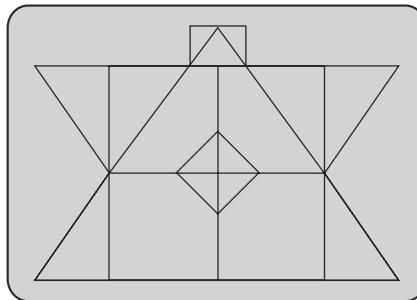


Figure 13

11. Count the number of triangles in the Fig. 13

- | | |
|-------|-------|
| 1. 14 | 2. 16 |
| 3. 21 | 4. 28 |

12. How many triangles does the Figure. 14 contain?

- | | |
|-------|-------|
| 1. 15 | 2. 13 |
| 3. 9 | 4. 14 |

13. 304, 409, 516, 625, ?, 849

- | | | | |
|--------|--------|--------|--------|
| 1. 736 | 2. 748 | 3. 686 | 4. 516 |
|--------|--------|--------|--------|

14. 209, 425, 649, 881, ?

- | | | | |
|--------|---------|---------|----------|
| 1. 981 | 2. 1048 | 3. 1021 | 4. 10121 |
|--------|---------|---------|----------|

15. 1, 10, 44, 135, ?

- | | | | |
|--------|--------|--------|--------|
| 1. 272 | 2. 216 | 3. 192 | 4. 207 |
|--------|--------|--------|--------|

16. 17, 17, 68, 612, ?

- | | | | |
|---------|---------|---------|------------------|
| 1. 9792 | 2. 9736 | 3. 9820 | 4. None of these |
|---------|---------|---------|------------------|

17. ZAB, DEF, HIJ, LMN, ?

- | | | | |
|--------|--------|--------|--------|
| 1. STU | 2. RST | 3. PQR | 4. QRS |
|--------|--------|--------|--------|

18. PT, LP, HL, DH, ?

- | | | | |
|-------|-------|-------|-------|
| 1. HD | 2. ZD | 3. AD | 4. ZO |
|-------|-------|-------|-------|

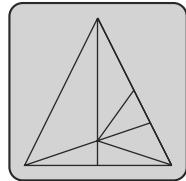


Figure 14

Answer Key

Exercise 16.1

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. 3 | 2. 5 | 3. 5 | 4. 2 | 5. 2 | 6. 1 |
| 7. 3 | 8. 1 | 9. 4 | 10. 2 | 11. 3 | 12. 2 |
| 13. 3 | 14. 1 | 15. 4 | | | |

Exercise 16.2

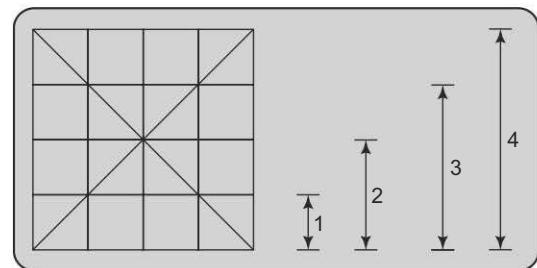
- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. 5 | 2. 4 | 3. 2 | 4. 2 | 5. 2 | 6. 3 |
| 7. 2 | 8. 1 | 9. 2 | 10. 4 | 11. 3 | 12. 4 |
| 13. 1 | 14. 4 | 15. 1 | 16. 1 | 17. 3 | 18. 2 |

 **Explanatory Answers**
Exercise 16.1

- All the given figures are divided in four directly except the third which has circle inside. **Ans 3**
- All the figures have same geometrical symbols except the fifth which has @ instead of %. **Ans 5**
- In all the given figures, the shapes are linear (180°) except in 5. **Ans 5**
- Tilt the figure and then start counting in the sequence of the size of the squares. **Ans 4**

Table 7

Size of the squares	Number of squares
1×1	16
2×2	9
3×3	4
4×4	1
Total	30

**Figure 15**

- Number in the upper half is the square of the number facing it in the lower half minus 5. **Ans 2**
- The series is $a\ b\ a\ b\ a\ b\ a\ b\ a\ b\ a\ b$. **Ans 1**
- One letter is skipped to obtain the next letter of the series. $t\ v\ x\ z\ b\ d$ **Ans 3**
- The letters are alternatively capital and small. The terms are obtained by skipping 6, 5, 4, 3, 2, 1 letters moving in forward direction. $C + 6 = i, i + 5 = N, N + 4 = r, r + 3 = U, U + 2 = w$ and $w + 1 = X$. **Ans 1**
- The right option is 4 **Ans 4**
- The even term is an integral multiple of 9, i.e.
 $9 \times 1, 9 \times 2, 9 \times 3, \dots$
The odd terms have a common difference of 11, i.e. 20, 31, 42,...
Hence, next term = 42. **Ans 2**
- Odd positioned digits are cubes of 1, 3, 5, and so on, i.e. $1^3 = 1, 3^3 = 27, 5^3 = 125$, and so on. Similarly, even positioned digits are squares of 2, 4, 6, etc. It means $2^2 = 4, 4^2 = 16, 6^2 = 36$. Therefore, the next term would be 7^3 , i.e., 343 and $8^2 = 64$ respectively. **Ans 3**

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12. Every even term is the product of the preceding and succeeding terms, i.e., $5 \times 7 = 35$, $7 \times 8 = 56$, Logically, the next term would be $8 \times 2 = 16$. Hence, 2 will replace the question mark. **Ans 2**
13. The terms are written as:
 $5 = 1 \times 2 + 3$; $26 = 4 \times 5 + 6$; $65 = 7 \times 8 + 9$, and so on.... So the fifth term will be $197 = 13 \times 14 + 15$. **Ans 3**
- 14.

**Figure 16**

Hence, next term = Q . **Ans 1**

15. The letters are a twin series : $A = 1, J = 10$, $B = 2, K = 11$, $C = 3, L = 12$.

1, 10, 2, 11, 3, 12.

So the missing term is L . **Ans 4**

Exercise 16.2

1. The figure rotates sequentially 90° and 45° alternately in a clockwise direction. **Ans 5**
2. You can clearly eliminate the options which have two curves on the left top corner. While the smaller arrow rotates anticlockwise through 90° and 45° alternately while the big arrow rotates through 135° clockwise the each step. **Ans 4**
3. If first place is empty and then 4^{th} , then 9^{th} and so on. **Ans 2**
4. In each column 3^{rd} row = $2 \times (1^{\text{st}} \text{ row} - 2^{\text{nd}} \text{ row})$. **Ans 2**
5. First digit of 3^{rd} column = first column \times first digit of second column, second digit of 3^{rd} column = first column + 2nd digit of 2nd column.
So 1st digit of missing term = $3 \times 1 = 3$, 2nd digit of missing term = $3 + 3 = 6$
Hence, the missing term is 36. **Ans 2**
6. In each row, divide the first element by 2, multiply the second element by 2 and add the outcomes of the first and second operations to obtain the third term. **Ans 3**
7. The matrix consists of all the prime numbers starting from 2. The missing one is 17. **Ans 2**
8. The pattern is $pqr\ s, pqr\ z, pq\ zz, p\ zzz$. **Ans 1**
9. $a\ b\ c$ are rearranged every time in cyclic order as follows:
 $abc\ cab\ bca\ abc$. **Ans 2**
10. The series follows the following pattern:
 $a\ b\ c, c\ b, b\ c\ a, a\ c, c\ a\ b, b\ a$ **Ans 4**
11. The right option is 3 **Ans 3**

12. The right option is 4 Ans 4

13. 304, 409, 516, 625, ..., 849

Each number is divided in two parts; the first part is sequence of numbers with difference + 1 like 3, 4, 5, 6, 7, 8.

The second part is the square of consecutive numbers from 2.

$$(2)^2 \quad (3)^2 \quad (4)^2 \quad (5)^2 \quad (6)^2 \quad (7)^2$$

Hence, the required number is 736. Ans 1

14. Each term in the series is in two parts. The first part is a series 2, 4, 6, 8, The second part is square of consecutive odd integers 9, 25, 49, 81 ...

$$\text{That is, } (3)^2, (5)^2, (7)^2, (9)^2,$$

Hence, next term is 10121 Ans 4

15. The series is $\times 5 + 5, \times 4 + 4, \times 3 + 3, \times 2 + 2$

Hence, the next term = 272. Ans 1

16. Each term is equal to previous term multiplied by square of each term of the natural number series 1, 2, 3, 4,... Hence, the next term = $612 \times 16 = 9792$. Ans 1

17.

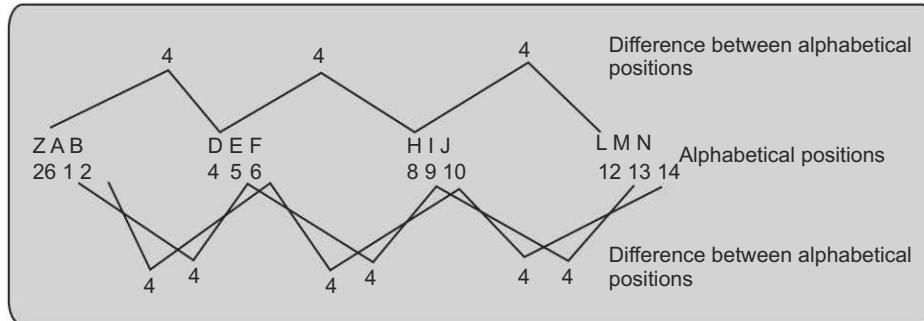


Figure 17

First letters of each group have a common difference of four letters. Similarly, the second letter of each group has a common difference of four letters. Therefore, the next choice would be PQR. Ans 3

18. The letters of each group have three letters between them and the first letter of the first group is the last letter of the second group. The next group of letters would be having D at the last position. Hence, ZD would be the answer. Ans 2

Chapter 17

Linear Arrangement

In the logical questions of linear arrangement, information is being provided about a few things, be it things or persons. Herein, we have to fix only one attribute to these objects. Hence, the name linear arrangements arises. So, the information being provided is analyzed and put in a suitable form before answering the questions.

17.1 Arranging

17.1.1 Objects in a Row

These problems are related to arranging objects in a row based on their position, ranking, height, weight, etc. We often give ranks which can be based on any attribute such as time, distance, weight, height, marks, etc. Required information like comparison of objects would be provided. For example: *A* is heavier than *B* or *A* comes after *B* and so on.

17.1.2 Objects on a Table

These questions involve problems based on arranging objects around a table. The table could be circular, hexagonal, square, oval, triangular, and rectangular shaped, and so on. The information provided could be in terms of directional places of the objects, i.e., immediate, opposite left, right, and so on.

17.1.3 Objects in Cottages

These type of problems generally involve people living in rooms/cottages and these rooms/cottages may be in one row or two rows opposite to each other or may be arranged around in a circular format.

17.2 Scheduling

17.2.1 Scheduling in a Week

These type of problems generally include scheduling activities to be done, subjects to be studied, sessions to be taken, meetings to be prioritized, etc., for a particular week.

17.2.2 Scheduling a Trip

A trip may include countries, monuments or cities to be visited, and so on.

17.2.3 Drama/Movies to be Played/Screened

These problems include certain number of dramas/movies or dance program which are presented by a combination of given performers or actors.

17.3 Notations

- There can be conditions for the positions that A can take.

a. A does not live next to anybody. $X \quad A \quad X$

b. A cannot occupy position 3. $\sim A$

1	2	3	4	5
---	---	---	---	---

c. A is always at position 4 $1 \quad 2 \quad 3 \quad 4 \quad 5$
 A

Note: The symbol ‘~’ denotes ‘not’.

- We can also consider the various positions that a person A can take with respect to another person B .

a. A and B are adjacent to each other or A and B are always together. AB or BA

b. A and B are not adjacent to each other. AB^x or BA^x

c. There is a vacant place between A and B . $A \quad \text{---} \quad B$

d. There is a vacant place between A and B which cannot be occupied $A \quad X \quad B$

e. A must precede B . $A \quad \dots \dots \dots \quad B$

f. A is older than B or A is taller than B . $A \quad > \quad B$.

-

a. If A is at position 1 then B must be at position 3. $A1 \rightarrow B3$

b. If A is not at position 2 then B must be at position 3. $A \sim 2 \rightarrow B3$

c. Position 1 is empty. $1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6$

X

d. Position 1 could be empty/occupied. $1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6$

?

Directions for examples 1 to 4: Refer to the given information and answer the questions that follow.

Six friends went to attend Nobel Prize ceremony in Sweden. They need to be accommodated in a row of eight chairs, each occupying one chair. Organizers have put screens on rightmost seats for person with weak eyesight. The number of chairs between Babita and Naina is same as the number of chairs between Naina and Devi and are 2. There is a person adjacent to Babita. Devi has two neighbours, Seema and Rama. It must be noted that Rama has weak eyesight.

Example 1: Who has empty seats on both sides?

1. Babita 2. Devi 3. Naina 4. Seema

Example 2: Who is in the sixth seat from left?

1. Seema 2. Devi 3. Babita 4. Nobody

Example 3: If Babita takes the nearest vacant seat and person sitting at seat number 7 moves to Babita's earlier seat and seat number 7 is occupied by person sitting at seat number 4, then who is sitting at seat number 7?

1. Naina 2. Devi 3. Meena 4. Seema

Example 4: What is the maximum number of consecutive chairs that are occupied?

1. 2 2. 4 3. 1 4. 3

For answers to examples 1 to 4:

Step I

Identify the positions: These 6 friends have

1 2 3 4 5 6 7 8

Who have to sit in 8 chairs?

Most important step in solving this question is reading the conditions and drawing conclusions from interconnected conditions.

Step II

Using the conditions:

- | | |
|--|--|
| a. Rama has weak eyesight and
Organizers have put screens at the rightmost
Seats | 1 2 3 4 5 6 7 8 |
| b. Devi has two neighbours Seema and
Rama | 1 2 3 4 5 6 7 8 |
| c. There are two persons between Devi and
Naina; between Naina and Babita | 1 2 3 4 5 6 7 8 |
| d. Lastly, only Meena (from option) is left.
Babita has adjacent person | B M N S D R |

Solution 1: Only Naina has empty seats on both the sides.

Ans 3

Solution 2: Seema is in the sixth seat.

Ans 1

Solution 3: Neglecting other changes, the seat number 7 is occupied by person sitting at seat number 4, i.e., Naina.

Ans 1

Solution 4: Maximum three consecutive chairs are occupied.

Ans 4

Directions for questions 5 to 7: Refer to the information below and answer the questions that follow.

Three women named Ameen, Maya and Fathima; and two men named Eshan and Harman are the only dancers in a function that has six program. The program are in the order: a duet; a duet; a solo; a duet; a solo; a duet. No dancer is in two consecutive program or in more than two program. The first program in which Eshan appears is one that comes before the first program in which Fathima appears. The second program in which Eshan appears is one that comes after the second program in which Fathima appears. Eshan performmes in the first program.

Example 5: Which of the following is a complete and accurate list of program that could be the last one in which Fathima performs?

1. Three
2. Four
3. Five
4. Four or Five

Example 6: All of Maya's appearances must be duets if:

1. Fathima is in program two
2. Fathima is in program five
3. Fathima is in program three
4. Eshan is in program six

Example 7: If Harman is in program five, program four must consist of the following:

1. Two women
2. Two men
3. Maya and a man
4. Fathima and a man

For answers to examples 5 to 7:

Step I

Identify the elements:	Women	Men
	Ameen (<i>A</i>)	Eshan (<i>E</i>)
	Fathima (<i>F</i>)	
	Maya (<i>M</i>)	Harman (<i>H</i>)

Step II

Identify the positions:	1	2	3	4	5	6
	Duet	Duet	Solo	Duet	Solo	Duet

Step III

Conditions:

- a. No dancer is in 2 consecutive program or in more than two program.
There are 4 duets and 2 solos that means that in all there will be 10 performances. Therefore, each of the 5 dancers will give 2 performances.
- b. The first program in which Eshan appears is one that comes before the first program in which Fathima appears. $E_1 \quad F_1$
- c. The second program in which Eshan appears is one that comes after the second program in which Fathima appears. $F_2 \quad E_2$
- d. E_1 is at position 1. $1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6$
 E_1
- e. A duet consists of 2 men or 2 women or a woman and a man. The above condition implies that we can have any combination of dancers for the duet.
- f. After fixing position of Eshan's first program at position 1, we conclude that Eshan's second program cannot be at position 2, 3 or 4 (condition (a), (b), (c)). Also, Fathima's second program cannot come at position 3. For if, it is at 3, Fathima's first program has to be at position 2 which will violate condition (a). Also Fathima's second program cannot be at position 6, otherwise condition (c) will be violated. Apart from this we cannot come to any conclusive arrangement on the basis of the above conditions, we go directly to the questions.

Solution 5: If the last one in which Fathima performs, is program 3, then the first one must be program 2 (if condition (b) is to be satisfied). But this violates condition (a) which says that no dancer is in 2 consecutive program. Therefore, the last one in which Fathima performs is not number 3. Hence, choice [1] is ruled out.

Now, the arrangement shown here, satisfies all conditions. Fathima can perform her last dance

in program 4 or 5. Therefore, the correct choice

1	2	3	4	5	6
---	---	---	---	---	---

E	F_1	F_2
-----	-------	-------

1	2	3	4	5	6
---	---	---	---	---	---

(E_1)	F_1	F_2	E_2
---------	-------	-------	-------

1	2	3	4	5	6
---	---	---	---	---	---

(E_1)	F_1	F_2	E_2
---------	-------	-------	-------

Solution 6: For Maya's appearance to be in duets, we have to find out if any of the choices results in both the solo program to be performed by anybody else other than Maya.

1. Fathima is in program two.

1	2	3	4	5	6
---	---	---	---	---	---

(E_1)	F_1
---------	-------

2. Fathima is in program five.

1	2	3	4	5	6
---	---	---	---	---	---

(E_1)	F_2	E_2
---------	-------	-------

3. Fathima is in program three.

1	2	3	4	5	6
---	---	---	---	---	---

(E_1)	F_1
---------	-------

4. Eshan is in number six.

1	2	3	4	5	6
---	---	---	---	---	---

(E_1)	E_2
---------	-------

If Fathima is in program two, the third and the fifth program, i.e., the solo program are not blocked and we cannot say for sure whether Maya has performed in the solo or duet.

Similar arguments hold true when Fathima is in program five and Eshan is in program six.

If Fathima is in program three, then as

$\sim E_2$

$F_2 < E_2$ and no dancer is in two consecutive program, the second performance of Fathima

1	2	3	4	5	6
---	---	---	---	---	---

will be in the fifth program. Hence, both

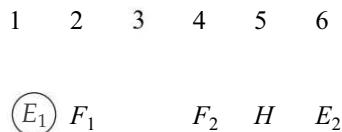
(E_1)	F_1	F_2	E_2
---------	-------	-------	-------

the solo program are blocked.

Ans 3

Solution 7: Harman cannot perform in 2 consecutive numbers (condition (a)). Hence, Harman does not perform in number 4 and 6. Also, since

Eshan is performing in numbers 1 and 6, the partner for Fathima in number 4 must be a woman (Eshan and Harman being the only 2 men).



Ans 1

Exercise 17.1

Directions for questions 1 to 3:

- Six friends P, Q, R, S, T and U are sitting along the sides of a hexagonal table for playing a game, though not necessarily in the same order.
- Q , who is sitting exactly opposite of P , is to the immediate right of S .
- U is between Q and T .
 - P is sitting between which of the following pairs of persons?
 1. R and T
 2. U and Q
 3. U and R
 4. None of these
- Who is sitting opposite R ?
 1. U
 2. P
 3. T
 4. S
- Three of the following are alike in a certain way on the basis of sitting positions and so form a group. Which is the one that does not belong to the group?
 1. T, Q
 2. Q, P
 3. S, T
 4. R, U

Directions for questions 4 to 9: I, J, K, L, M and N are six numbers lying between 30 and 45 (both included). None of the number is multiple of 8 and 9. L, M and I are even numbers. N is the only prime number less than 36, but is not the smallest number. J is the largest and I is the smallest number. L is not the multiple of 11, 19 and 17. M is a multiple of 17 and is greater than K .

- The value of J is:
 1. 37
 2. 44
 3. 30
 4. None of these
- The sum of I and N is:
 1. 61
 2. 54
 3. 76
 4. None of these
- The greatest number has the value:
 1. 45
 2. 38
 3. 33
 4. 44
- The value of the M is:
 1. 36
 2. 32
 3. 38
 4. None of these
- The $I - N + K - M$ is:
 1. -2
 2. 2
 3. 4
 4. None of these
- What is the positive difference between the lowest and the highest integers?
 1. 12
 2. 22
 3. 14
 4. Data inadequate

Directions for questions 10 to 12: There are six cages in a zoo. Namely P, Q, R, S, T and U. Seven animals named A, B, C, D, E, F and G are to be accommodated in them. B and C do not share their cage. Out of 7 animals, D, E and F are females. Females do not share cage with male animals. A shares his cage with one animal. No female lives in cage R, S and U. R and U can accommodate only one animal. C does not live in cage U. E does not live in P and Q. F does not live in Q.

10. Who among the following will stay in cage Q?
 1. C 2. B 3. D 4. Data inadequate
11. Which cage has two animals?
 1. Q 2. R 3. P 4. S
12. Which of the following animals are staying together?
 1. A, C 2. A, G 3. G, C 4. Data inadequate



Exercise 17.2

Directions for questions 1 to 4:

- i. A group of five boys—Amit, Badal, Charan, Dev and Eshan and a group of five girls—Pyra, Queen, Riya, Saira and Tiara are standing in rows facing each other (not in the same order).
The group of girls is facing north. Eshan is not at any of the ends. Charan is to the immediate right of Badal and Dev is to the immediate left of Amit, who is facing Pyra. There are as many girls between Pyra and Queen as between Riya and Saira. Amit is second to the left of Badal. Saira and Riya are not facing either Badal or Dev.

1. Which pair of boys is standing at the ends of the row?
 1. Charan and Dev 2. Badal and Amit 3. Dev and Badal 4. Data inadequate
2. Which of the following is definitely true?
 1. Charan is third to the right of Dev 2. Dev is facing Pyra
 3. Charan is facing Saira 4. None of these
3. Who is standing to the immediate right of A?
 1. Eshan 2. Charan 3. Dev 4. Data inadequate
4. Who is facing Badal?
 1. Riya 2. Saira 3. Queen 4. Data inadequate

Directions for questions 5 to 9: Amit, Bina, Chintu, Deep, Esha, Farukh and Gopi are seven persons whose pet dogs are standing in a row. The pets are numbered 1 to 7 from left to right.

1. Neither Amit's pet nor Farukh's pet are at the end of row
2. Chintu's pet is right of Deep's pet
3. Bina and Esha's pet are adjacent to each other
4. Gopi's pet is among three middle pets in a row
5. Bina's pet is not adjacent to Chintu's pet but it is one of the two pets between Chintu's and Gopi's pets
5. Whose among the following can be pet number. 2?
 1. Esha 2. Amit 3. Bina 4. Deep

6. Which pet belongs to Farukh?
 1. 2 2. 3
 3. 4 4. Cannot be determined
7. If it is known that Deep's pet is Amit pet's immediate neighbour, then whose pet is to the immediate right of Amit pet?
 1. Farukh 2. Gopi 3. Deep 4. Chintu
8. Among the following, whose pet is nearest to D's pet?
 1. Chintu 2. Gopi 3. Farukh 4. Deep
9. Among the following whose pet is nearest to Chintu's pet?
 1. Deep 2. Amit 3. Farukh 4. None of these

Directions for questions 10 to 13: Seven actors—A, B, C, D, E, F and G are to be awarded for achievements at Filmdust awards. The actors will be seated on in a row. A and G have to catch the flight for their live performances and so must be seated at the extreme right. B, the Best Actor recipient must be in the centre. C and D are bitter rivals and therefore must be seated as far apart as possible.

10. Which of the following cannot be seated at either end?
 1. C 2. D
 3. F 4. Cannot be determined
11. Which of the following pairs cannot be seated together?
 1. B and D 2. C and F 3. D and G 4. E and A
12. Which of the following pairs cannot occupy the seats on either side of B?
 1. F and D 2. E and G 3. D and E 4. None of these
13. What can be the position of C from the right side?
 1. Third 2. Seventh
 3. Third or seventh 4. Cannot be determined

Answer Key

Exercise 17.1

- | | | | | | |
|------|------|------|-------|-------|-------|
| 1. 1 | 2. 1 | 3. 1 | 4. 2 | 5. 1 | 6. 4 |
| 7. 4 | 8. 1 | 9. 3 | 10. 3 | 11. 4 | 12. 2 |

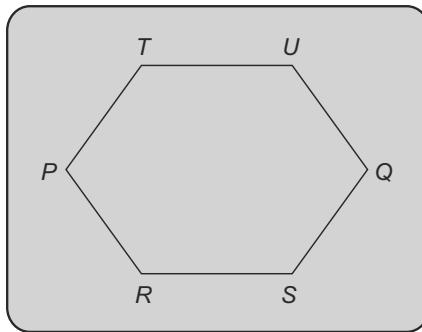
Exercise 17.2

- | | | | | | |
|-------|------|------|-------|-------|-------|
| 1. 1 | 2. 4 | 3. 1 | 4. 3 | 5. 2 | 6. 4 |
| 7. 1 | 8. 3 | 9. 4 | 10. 3 | 11. 4 | 12. 2 |
| 13. 3 | | | | | |

 Explanatory Answers
Exercise 17.1

Answers for questions 1 to 3: As per the conditions given in the question, the sitting arrangement will look as shown in Figure. 1:

1. The right option is 1 Ans 1
2. The right option is 1 Ans 1
3. The right option is 1 Ans 1

**Figure 1**

Answers for questions 4 to 9: Values are as shown in Table 1:

Table 1

I	J	K	L	M	N
30	44	33	42	34	31

4. The right option is 2 Ans 2
5. The right option is 1 Ans 1
6. The right option is 4 Ans 4
7. The right option is 4 Ans 4
8. The right option is 1 Ans 1
9. The right option is 3 Ans 3

Answers to questions 10 to 12: As per the question, we have 6 cages and 7 animals. Thus, 1 cage has more than one animal and that cage cannot be R and U. As A is a male and can share cage with fellow males B, C or G. But B and C are alone in their cage so A shares cage with G. Males live in cage R, S and U out of which only S is big enough to accommodate two animals. So, A and G lives in S and C lives in U. E lives in T. Also D, E and F are females and F lives in P.

Table 2

Cages	P	Q	R	S	T	U
Animals	F	D	C	A, G	E	B

10. The right option is 3 Ans 3
 11. The right option is 4 Ans 4
 12. The right option is 2 Ans 2

Exercise 17.2**Answers for questions 1 to 4:****Table 3**

Boys	C	B	E	A	D
Girls	R/S	Q	R/S	P	T

1. The right option is 1 Ans 1
 2. The right option is 4 Ans 4
 3. The right option is 1 Ans 1
 4. The right option is 3 Ans 3

Answers for questions 5 to 9:

Let us denote Amit by A, Bina by B, Chintu by C, Deep by D, Esha by E, Farukh by F and Gopi by G.

A's and F's Pet do not occupy 1 and 7.

C's pet is right of D's Pet.

This means, C's pet cannot occupy 1 and D's pet cannot occupy 7.

BE or EB is the placement.

G's pet sits on any of the 3, 4 or 5

BC or CB not possible

C _ _ G or G _ _ C

Now, B's pet comes with G's pet as it is between C's and G's pets but not adjacent to C's pet.

This means, EBG or GBE is the sitting arrangement as B and E come together.

Table 4

1	2	3	4	5	6	7	Possibility
D	C	E	B	G	A	F	Not Possible
D	A	C	E	B	G	F	Not Possible
D	A	F	C	E	B	G	Not Possible
D	A	F	G	B	E	C	Possible
D	F	A	G	B	E	C	Possible

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- | | |
|--------------------------|--------------|
| 5. The right option is 2 | Ans 2 |
| 6. The right option is 4 | Ans 4 |
| 7. The right option is 4 | Ans 1 |
| 8. The right option is 3 | Ans 3 |
| 9. The right option is 4 | Ans 4 |

Answers for questions 10 to 13:

C/D E/F E/F B C/D A/G A/G

- | | |
|---------------------------|--------------|
| 10. The right option is 3 | Ans 3 |
| 11. The right option is 4 | Ans 4 |
| 12. The right option is 2 | Ans 2 |
| 13. The right option is 3 | Ans 3 |

Chapter 18

Complex Arrangement

18.1 Introduction and Theory behind Complex Arrangement

The questions in complex arrangements involve fixing of two or more than two attributes to any object. Thus, it is called *complex arrangements*. For example: six bungalows having different colours in Kolkata, where six married couples stay with their kids. [Names of husbands being given.]

Here, the following things have to be assigned to the husbands:

1. Name of their wives
2. Name of the bungalows
3. Colour of the bungalow
4. Name of their kids

All complex arrangement questions can be solved if the given information is analyzed and put in a matrix form, so as to make it easy-to-understand. This becomes imperative because of the fact that questions will mostly be inclined toward indirect information.

One of the most important points to be kept in mind while doing complex arrangements is to understand the problem and draw a matrix illustrating all the given points of the basic structure of the argument. Here, we will discuss the different methods to draw a matrix. For reference, we will use the Example 1.

Example 1: There are six friends—Pankaj, Rajiv, Dixit, Vishesh, Shailav and Anshul. Two of them are married to Engineers, others with Doctor, CA, Professor and Housewife but not necessarily in the same order. The couples enjoy the following hobbies – reading, writing, travelling, playing, singing and dancing. Following information is given:

1. Rajiv is married to an engineer, but does not like either travelling or playing.
2. Anshul and the doctor do not enjoy singing and dancing, respectively.
3. Dixit is not married to either doctor or CA, but his wife is not a housewife either.
4. One of the Engineers enjoys Playing.
5. Dixit, Vishesh and Pankaj like travelling, dancing and writing respectively.
6. The lady who sings is a housewife.

Questions based on the text above:

- i. Who is married to Dixit?
- ii. What does the doctor enjoy as a hobby?
- iii. Who is married to Anshul?
- iv. Which hobby does Shailav like?
- v. What does Rajiv do to pass his time?

The given problem can be classified as a three parameter problem in which two attributes are assigned to a given parameter. Here, we are required to match correctly the males with the female professionals enjoying different hobbies. Our objective should be very clear.

For example, here our objective can be represented as:

Male → Profession of wife → Hobby

18.1.1 Method 1

In this method, we fix any given parameter, called reference parameter, in a column and place other two parameters in row getting a matrix of the kind $6 \times 6 \times 6$. Ideally, the parameter about which maximum information is given should be used as the reference parameter. Hence, we get a matrix like.

Table 1

Profession of Wife						Hobbies						
Male	Eng.	Eng.	Doctor	CA	Prof.	HW	Reading	Writing	Travelling	Playing	Singing	Dance
Pankaj												
Rajiv												
Dixit												
Vishesh												
Shailav												
Anshul												

Using the given conditions put a cross or tick in the respective blocks. Using condition (1) and (2), since Rajiv is married to an engineer, the corresponding box is ticked and all other boxes in the corresponding row and column are crossed. Also the corresponding blocks of travelling and playing and singing are crossed.

Table 2

Male	Eng.	Eng.	Doctor	CA	Prof.	HW	Reading	Writing	Travelling	Playing	Singing	Dance
Pankaj	X											
Rajiv	✓	X	X	X	X	X			X	X		
Dixit	X											
Vishesh	X											
Shailav	X											
Anshul	X											X

Using condition (3) we get

Table 3

Male	Eng.	Eng.	Doctor	CA	Prof.	HW	Reading	Writing	Travelling	Playing	Singing	Dance
Pankaj	X											
Rajiv	✓	X	X	X	X	X			X	X		
Dixit	X		X	X		X						
Vishesh	X											
Shailav	X											
Anshul	X											X

Using condition (5)

Table 4

Male	Eng.	Eng.	Doctor	CA	Prof.	HW	Reading	Writing	Travelling	Playing	Singing	Dance
Pankaj	X						X	✓	X	X	X	X
Rajiv	✓		X	X	X	X		X	X	X		X
Dixit	X		X	X		X	X	X	✓	X	X	X
Vishesh	X						X	X	X	X	X	✓
Shailav	X							X	X			X
Anshul	X							X	X		X	X

Now, using condition (2), the Doctor cannot dance but Vishesh enjoys dance, so Vishesh is not married to the doctor. So, strike out the block of the doctor corresponding to Vishesh. The second Engineer plays, thus she cannot be married to Pankaj, Rajiv, Dixit or Vishesh as they do not play. Also, the Housewife enjoys singing, so Rajiv and Dixit cannot get married to the housewife as they do not enjoy singing. After striking out the corresponding blocks, we are only left with the option of Shailav who likes singing so the housewife must be married to Shailav and the second Engineer to Anshul, which in turn will leave the only option for the doctor who will get married to Pankaj. Hence, the CA will get married to Vishesh and Dixit will marry the professor. Hence, we get the final complete matrix with the help of which all the questions can be answered.

Table 5

Male	Eng.	Eng.	Doctor	CA	Prof.	HW	Reading	Writing	Travelling	Playing	Singing	Dance
Pankaj	X	X	✓	X	X	X	X	✓	X	X	X	X
Rajiv	✓	X	X	X	X	X	✓	X	X	X	X	X
Dixit	X	X	X	X	✓	X	X	X	✓	X	X	X
Vishesh	X	X	X	✓	X	X	X	X	X	X	X	✓
Shailav	X	X	X	X	X	✓	X	X	X	X	✓	X
Anshul	X	✓	X	X	X	X	X	X	X	✓	X	X

18.1.2 Method II

This technique is more compact than the previous one and takes less working space. It is advisable to the students to adapt themselves with this method. Here we draw a matrix as shown in Table 6,

Table 6

Male Players	Profession of Wife	Hobby

Unlike the previous method, the blocks in the matrix are filled with the respective parameters following the given conditions. Here also we fix a parameter taking it as a reference.

Using conditions 1, 2, 3, and 5 we get.

Table 7

Male	Profession Wife	Hobby
Rajiv	Eng.	~ Travelling, ~ Playing
Pankaj		Writing
Dixit		Travel ~ Doc, ~ CA, ~ HW
Vishesh		Dance ~ Doc
Shailav		
Anshul		~ Singing

On the right hand side of the matrix, the negation symbol means that the particular object cannot be associated with the reference parameter.

Using conditions (4) and (6), only possibility for placing Housewife + singing and engineer + Playing is with Shailav or Anshul. But Anshul does not like Singing, thus it should be associated with the engineer who likes playing and Shailav with housewife.

Hence we get,

Table 8

Male	Profession Wife	Hobby
Rajiv	Eng.	~ Travelling, ~ Playing
Pankaj		Writing
Dixit		Travelling ~ Doc, ~ CA, ~ HW
Vishesh		Dance ~ Doc
Shailav	HW	Singing
Anshul	Eng.	Playing ~Singing

Now, Dixit and Vishesh cannot be married to the doctor. Thus, the only option left with doctor is Pankaj. Also Dixit cannot be married to the CA hence, Vishesh will be married to the CA and Dixit with the professor. Hence, we get the final matrix as,

Table 9

Male	Profession Wife	Hobby	
Rajiv	Eng.	Reading	~ Travelling, ~ Playing
Pankaj	Doctor	Writing	
Dixit	Prof.	Travelling	~ Doc, ~ CA, ~ HW
Vishesh	CA	Dance	~ Doc
Shailav	HW	Singing	
Anshul	Eng.	Playing	~ Singing

18.1.3 Method III

Another way in which the matrix can be made is described as follow:

For the question given, we take the 6 males as the fixed parameter, in 6 columns. Then we put remaining parameters in two rows. The rows are further divided into 2 rows. We put a cross and tick in both the rows which are split (as shown in Table 10).

Table 10

	Rajiv	Vishesh	Shailav	Anshul	Dixit	Pankaj
Wives	X					
Hobbies	X					
	✓					

The whole idea is to fit the given information into this matrix, so that we can find the unknown elements in the remaining cells. Whatever combinations are not possible, we put them in the crossed rows, and whatever combinations are possible are put in ticked row.

Statement 1: Rajiv is married to an Engineer but does not enjoy either travelling or playing.

Application for matrix formation: Engineer into ticked row corresponding to wives, and 'T' and 'P' in the crossed row of hobbies. As soon as we know an element in any cell in ticked rows, we totally cross the corresponding crossed cell.

Statement 2: Doctor does not like dance, Anshul does not enjoy singing.

Application – This information cannot be put into matrix at this stage, hence we will put it separately.

Statement 3: Dixit is not married to any one of Doctor, CA or housewife.

Application – We will put D, CA and HW in the crossed sub-row under the wives row, in Dixit player's column.

Statement 4: One of the engineer plays.

Application – Again information cannot be put directly in the matrix, but we know from the matrix, that this engineer is not married to Rajiv because Rajiv cannot play, hence this engineer is married to someone else.

Statement 5: Dixit, Vishesh and Pankaj like travelling, dancing and writing respectively.

Application – We put T, D and W in the ticked sub row under the hobbies row of Dixit, Vishesh and Pankaj column respectively.

Statement 6: Lady who likes singing is a housewife. Now as Anshul cannot sing (St. 2), he must be playing and thus is married to the engineer. Shailav must enjoy the only remaining hobby, i.e., singing and his wife is a housewife. Rajiv likes reading.

Application: – Hence we end up with the matrix, by looking at which we can easily answer all the questions.

NA – Not Applicable

Table 11

	Rajiv	Vishesh	Shailav	Anshul	Dixit	Pankaj
Wives	X	NA	NA	NA	D,CA,HW	
	✓	ENGG.	HW	Eng		
Hobbies	X	T & P	NA	NA	NA	
	✓	R	D	S	P	T
						W

So by using either of the methods we get the same answers.

- Dixit is married to professor.
- Doctor enjoys writing as a hobby.
- One of the engineers is married to Anshul.
- Shailav likes singing.
- Rajiv likes reading.



Exercise 18.1

Directions for questions 1 to 3: Five subjects – Physics, Chemistry, Maths, English and Hindi each to be taught for one month from July to November one after the other though not necessarily in the same order by lecturers Palak, Vaishali, Esha, Tisha and Apurva. Palak teaches course ‘Chemistry’ but not in the month of October or November. Vaishali teaches ‘Physics’ in the month of September. Esha teaches in the month of July but does not teach ‘Maths’ or ‘English’

- Which subject is taught by Tisha?
 - Maths
 - Hindi
 - Either Math’s or English
 - English
- Which lecturer’s subject immediately follows after course Chemistry?
 - Vaishali
 - Palak
 - Tisha
 - Apurva
- Which course is taught in the month of July?
 - Maths
 - English
 - Hindi
 - Data inadequate

Directions for questions 4 to 6:

- Five friends Aman, Gurbinder, Bishal, Vasudha and Hanish wear shirt of different colours—red, yellow, blue, white and green (not necessarily in the same order).

- Each one of them lives in different city – Agra, Chandigarh, Delhi, Bangalore and Hyderabad.
 - Gurbinder, who lives in Bangalore does not wear yellow shirt. Bishal wears red shirt and does not live in Agra or Hyderabad. Hanish stays in Chandigarh and does not wear blue or yellow shirt. Aman lives in Hyderabad and Vasudha do not wear yellow or green shirt.
4. What is the colour of Gurbinder's shirt?
 1. White 2. Blue 3. Green 4. Data inadequate
5. Where is Bishal's home?
 1. Hyderabad 2. Delhi 3. Agra 4. Data inadequate
6. Which of the following combinations of person – color – liking is definitely correct?
 1. Vasudha – Blue – Agra 2. Hanish – White – Chandigarh
 3. Aman – Yellow – Hyderabad 4. None of these

Directions for questions 7 to 11: Refer to the data and answer the questions that follow:

- There are four friends – Ajay, Utkarsh, Hitesh and Rahul. They drink two soft drinks – Frooti and Lassi with favourite sports being cricket and football. They drive a bike and a car.
 - Ajay drives a bike but not a car, drinks frooti and lassi and likes cricket.
 - Utkarsh drives both and drinks lassi and likes football.
 - Hitesh drives car and drinks nothing but likes both cricket and football.
 - Rahul drives nothing, drinks nothing but likes both cricket and football.
7. Ajay and Rahul always go together so they watch _____ match and go by _____.
 1. Football, car 2. Football and cricket, bike
 3. Football, bike 4. Cricket, bike
8. If Rahul has to watch a football match, and has a bike, who does he go with?
 1. Hitesh 2. Ajay 3. Utkarsh 4. Either (1) or (2)
9. Which of the following is true?
 i. Ajay drinks Frooti, because he likes cricket.
 ii. Among the four friends, those who love football drink lassi.
 iii. Among the four friends, those who drink lassi drive a bike.
 1. i 2. ii 3. iii 4. i and ii
10. Which of the following is/are true?
 i. The person driving a car has lassi.
 ii. The person who likes football drives a bike.
 1. Only i is true 2. Only ii is true 3. Both are true 4. Neither are true
11. If Hitesh goes for cricket match on bike, then he goes with:
 1. Ajay 2. Utkarsh 3. Rahul 4. Ajay and Rahul



Exercise 18.2

Directions for questions 1 to 5: Refer to the data below and answer the questions that follow.

Six students: four boys and two girls study in 7th, 8th, 9th and 10th standards. They like six different eatables: Pizzas, Burger, Sandwich, Macaroni, Pasta, Eggs. They like 6 different colours blue, orange, green, yellow, brown and red, not necessarily in the same order. Following things are known about their choices.

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- Students in 7th standard like Pizza and Eggs and they are the only students in standard 7th.
- Students who like Green and Brown colors do not like Pasta and Pizza, respectively.
- Two boys, who are the only students in their respective standards, like Orange and Green.
- Students of 8th and 10th standard like Sandwich and Pasta, respectively.
- None of the boys like Burger or Eggs.
- Girls are in the 7th and 9th standards.

1. The student in 8th standard likes:

1. Brown 2. Red 3. Green 4. Orange

2. The girl in 7th standard likes:

1. Yellow 2. Red 3. Green 4. Data insufficient

3. One of the 9th standard students prefers:

1. Eggs 2. Macaroni 3. Pizza 4. Pasta

4. The student who likes orange is in standard:

1. 10th 2. 9th 3. 7th 4. 8th

5. If a boy likes brown, then one of the girls must like

1. Blue 2. Red
3. Yellow 4. Any of (1), (2) or (3)

Directions for questions 6 to 10: Refer to the data below and answer the questions that follow.

There are 6 Airlines, namely: Air Asia, Air India, Indigo, Spice Jet, Kingfisher and Malaysian Airlines. These six depart from six different cities – Delhi, New York, Berlin, Jakarta, Bangalore, and London; not necessarily in the same order for 6 different destinations: Toronto, Hyderabad, Kuala Lumpur, Bangkok, Colombo and Boston. The pilots are Mike, John, Tushar, Kunal, Steve and Mark. Following additional information is also given:

- John and Tushar do not depart from Berlin, Delhi and New York.
 - Mike's flight lands in Toronto.
 - Air Asia and Indigo are scheduled to reach Bangkok and Colombo respectively.
 - Kingfisher and Spice Jet take off from Bangalore and London, respectively, but neither land in Toronto.
 - Steve and Tushar will land in Bangkok and Hyderabad, respectively.
 - Kingfisher lands in Kuala Lumpur.
 - There is a flight from Jakarta to Boston.
6. If Malaysian Airlines go from Berlin to Toronto, then Air India's pilot is:
1. Mark 2. Steve 3. Mike 4. Tushar
7. Which is the departure destination for flight landing in Hyderabad?
1. Bangalore 2. London 3. Jakarta 4. Berlin
8. Air Asia departs from:
1. Delhi 2. Jakarta 3. Berlin 4. [1] or [3]
9. Who is the pilot of Spice Jet?
1. Tushar 2. John 3. Mike 4. Kunal

10. Who reached Boston?

1. Mike

2. Tushar

3. Mark

4. Steve

 **Answer Key**
Exercise 18.1

1. 3

7. 4

2. 1

8. 3

3. 3

9. 3

4. 4

10. 4

5. 2

11. 1

6. 3

Exercise 18.2

1. 3

7. 2

2. 4

8. 4

3. 2

9. 1

4. 1

10. 3

5. 4

6. 1

 **Explanatory Answers**
Exercise 18.1

Answers for questions 1 to 3:

Table 12

Month	July	August	September	October	November
Teacher	Esha	Palak	Vaishali	Tisha/Apurva	Tisha/Apurva
Course	Hindi	Chemistry	Physics	Maths/English	Maths/English

1. The right option is 3 Ans 3
 2. The right option is 1 Ans 1
 3. The right option is 3 Ans 3

Answers for questions 4 to 6:

4. The right option is 4 Ans 4
 5. The right option is 2 Ans 2
 6. The right option is 3 Ans 3

Table 13

Friends	Aman	Gurbinder	Bishal	Vasudha	Hanish
Colours	Yellow	Blue/White/Green	Red	Blue/White	Green/White
City	Hyderabad	Bangalore	Delhi	Agra	Chandigarh

Answers for questions 7 to 11:**Table 14**

	Drink	Match	Vehicle
Ajay	F & L	Cricket	B
Utkarsh	L	Football	B & C
Hitesh	X	Cricket & Football	C
Rahul	X	Cricket & Football	X

7. Rahul does not drive any vehicle, but Ajay can drive a bike and the common sport that they like is Cricket. Ans 4
8. The only person who can drive a bike and likes Football is Utkarsh. Ans 3
9. Only (iii) is true. Ans 3
10. Neither of the statements is true. Ans 4
11. The only person who likes cricket and drives a bike is Ajay. Ans 1

Exercise 18.2**Answers for questions 1 to 5:****Table 15**

Gender	Standard	Eatables	Colours
M	7	Pizza	Blue/Yellow/Red ~ Burger ~ Eggs ~ Brown
F	7	Eggs	Blue/Yellow/Red/Brown
M	8	Sandwich	Green ~ Burger ~ Eggs
F	9	Burger	Blue/Yellow/Red/Brown
M	10	Pasta	Orange ~ Burger ~ Eggs ~ Green
M	9	Macaroni	Blue/Yellow/Red/Brown ~ Burger ~ Eggs

1. The student in the 8 standard likes Green colour. Ans 3
2. The data is insufficient to answer the question. Ans 4
3. One of the 9 standard students prefers Macaroni. Ans 2
4. The student who likes orange is in standard 10. Ans 1
5. The females can choose any of the colours out of blue, yellow and red. Ans 4

Answers for questions 6 to 10: The aircrafts can have pilots: John, Tushar, Mark, Steve, Kunal or Mike and they have to fly to Bangkok, Hyderabad, Kuala Lumpur, Toronto, Boston and Colombo.

Air Asia ≡ Bangkok ≡ Steve

Indigo ≡ Colombo

Kingfisher ≡ Kuala Lumpur ≡ Bangalore

Spice Jet departs from London and also, he does not land in Toronto.

There is a flight from Jakarta to Boston.

⇒ Spice Jet does not go to Boston.

⇒ Spice Jet goes to Hyderabad (Tushar). Air India goes to either Toronto or Boston.

Table 16

Air Asia	Air India	Indigo	Kingfisher	Malaysian Airlines	Spicejet
Departure			Bangalore		London
Destination	Bangkok	Colombo	Kuala Lumpur		Hyderabad
Pilot	Steve				Tushar

6. If Malaysian Airlines goes from Berlin to Toronto, then mike is not the pilot of Air India. Also Steve and Tushar are already occupied by Air Asia and Spice Jet, respectively. Ans 1
7. Clearly, there is a flight from London to Hyderabad. Ans 2
8. Air Asia cannot depart from Jakarta. Ans 4
9. Tushar is pilot of spice jet. Ans 1
10. Tushar ≡ Hyderabad, Steve ≡ Bangkok, Mike ≡ Toronto. Ans 3

Chapter 19

Cubes, Dices and Matchsticks

19.1 Cubes and Cuboids

A cube is a 3-dimensional solid figure of six equal square plane faces, each set at right angles to the four sides adjacent to it. Each cube has 8 vertices, 6 square faces and 12 edges. Sometimes, it is also called regular hexahedron. All the above mentioned properties apply to the cuboids as well, except the fact that they have rectangular faces instead of square ones.

Figure 1 represents a cube.

19.1.1 Faces

In Figure 1, there are six faces which are as follows:

$ABCD$ – Front face

$PQRS$ – Rear face

$APQB$ – Top face

$DSRC$ – Bottom face

$APSD$ – Left face

$BQRC$ – Right face

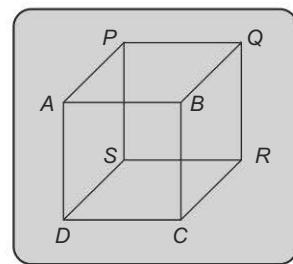


Figure 1

19.1.2 Vertices

The point where three or more planes of a solid figure intersect is known as a *vertex*. There are eight vertices in a cube. In the above-mentioned cube, the eight vertices are as follows:

A, B, C, D, P, Q, R and S .

19.1.3 Edges

The line where two surfaces of a solid meet is called an *edge*. It is the distance between two vertices. There are twelve edges in a cube. In the above-mentioned cube, the twelve edges are as follows:

AB, BQ, QP, PA

DC, CR, RS, SD

AD, PS, BC, QR

A cube or a cuboid has a total of 6 faces, 8 vertices and 12 edges. A cube has same length, breadth and height while in cuboid these are different. In a cube, the number of unit cubes = $(\text{side})^3$.

In a cuboid, the number of unit cubes = $(l \times b \times h)$.

19.1.4 General Method and Theory about Problems on Cubes

Now, let us consider a cube given with an edge of unit N . It is painted on all faces. It is cut into smaller cubes of edge of unit n .

Herein, first of all let us find out the number of smaller cubes. A number of smaller cubes can be found by first calculating the ratio of edge of the bigger cube to edge of smaller cube. It will be N/n . Let us denote this ratio by k . The number of smaller cubes will be $(N/n)^3$, i.e., k^3 .

Now, the next required thing is to find out the number of smaller cubes whose different number of faces is painted. Here, none of the smaller cube will have all or 5 or 4 faces painted as at most only 3 faces of a few smaller cube is exposed outside. These will be the smaller cubes that emerge from the corners of the big cube. As cube has 8 corners so such cubes will also be 8 in number. These will always be 8 as any cube irrespective of size will have 8 corners.

Next for smaller cubes with 2 faces painted, we need to look at those smaller cubes which are located on the edges of the big cube (leaving out the corners). The smaller cubes on every edge except corner cubes will be $\left(\frac{N}{n} - 2\right)$, i.e., $(k - 2)$. There are 12 edges in a cube. So, a number of smaller cubes with 2 faces painted will be $12(k - 2)$.

Next for smaller cubes with 1 face painted, we can look at those located on the face of the big cube (leaving out the corners and the edges). After removing the corner and edge cubes, we will basically be left with cubes that lie completely in the middle of any face. So, the smaller cubes having 1 face painted will be $6 \times \left(\frac{n}{n} - 2\right)^2$ or $6(k - 2)^2$. Here, 6 is multiplied because cube has 6 faces.

Next for no face painted, we will have to consider the smaller cubes that are located completely inside the bigger cube (leaving out the outer surface which was painted). View this as taking a knife and cutting a slice of width n from every face of the cube. After this, we will be left with a smaller cube with an edge of $N - 2n$.

A number of smaller cubes that you can make from the resulting cube is $\left(\frac{N - 2n}{n}\right)^3$.

Formulae so learnt can be tabulated as follows:

Table 1

Number of faces painted	Number of smaller cubes
3 faces painted	8
2 faces painted	$12 \left(\frac{N}{n} - 2\right)$ or $12(k - 2)$
1 face painted	$6 \left(\frac{N}{n} - 2\right)^2$ or $6(k - 2)^2$
No face painted	$\left(\frac{N - 2n}{n}\right)^3$

Now, let us illustrate this with the help of an example.

Example 1: A painted cube is given with an edge of 20 cm. Smaller cubes are cut out from it with an edge of 5 cm each. How many cubes will have 3 faces painted, 2 faces painted, 1 face painted and no face painted?

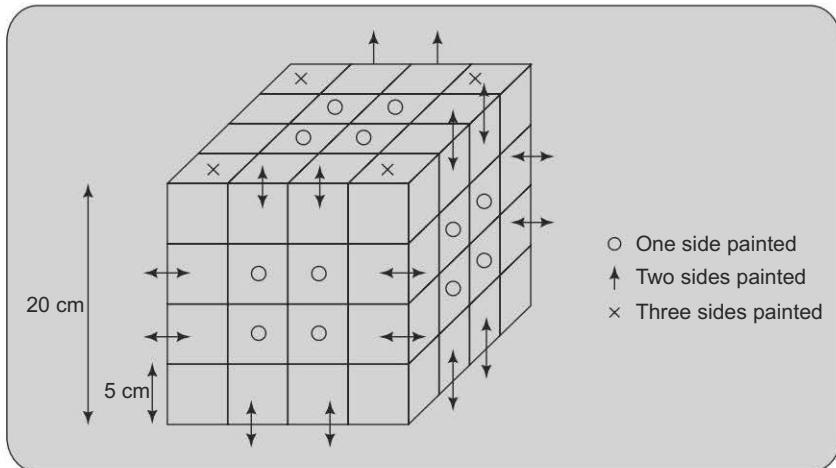


Figure 2

Solution: Total number of smaller cubes = $(20/5)^3 = 64$

3 faces painted: 8 cubes. As shown in the figure these cubes will be 8 in number.

2 faces painted: As 2 face painted cubes will not be there on corners, so we can remove them from the edges of the above cube. On removing corner cube from both ends of the edges, we are left with 2 smaller cubes on each edge. There are 12 edges. So, there will be $2 \times 12 = 24$ cubes.

1 face painted: Consider a face. If we remove 5 cm from each edge of the face of the above cube, we will be left with a square of side 10 cm or area 100 sq. cm. From this area of 100 sq. cm, we can have 4 smaller cubes. These 4 smaller cubes will be having 1 face painted. There are 6 faces. So, there will be $6 \times 4 = 24$ cubes.

No face painted: Imagine cutting slices of 5 cm each from above cube. We will be left with a smaller cube of side 10 cm. Number of smaller cubes that can be formed from it is $\left(\frac{10}{5}\right)^3 = 8$.

So, 8 cubes will have no faces painted.

Above formulae can also be verified by putting values directly. Also, 8 (3 sides painted cubes) + 24 (2 sides painted cubes) + 24 (1 sides painted cubes) + 8 (no side painted cubes) = 64 (total number of smaller cube) which verifies the answer.

Example 2: A student of grade 4 has recently learned about cubes and cube cutting. He has a cube of edge 5 cm which he paints red, yellow and blue on opposite faces. He cuts them into smaller cubes of edge 1 cm. What will be the answer to the following question:

- What is the number of small cubes formed after cube cutting is complete?

As each cube is of 1 cm here so ratio $k = N/n = N$ ($n = 1$)

Total number of cubes = $(K)^3 = (N/n)^3 = (5)^3 = 125$.

2. How many small cubes will have three faces painted?

As discussed above, cubes with three sides painted will lie on the corners and cube has 8 corners. So, number of cubes with three faces painted will be 8.

3. How many small cubes will have only two faces painted?

From the Figure 4 it is clear that each edge of the big cube has 5 cubes of which 2 are in the corner. Thus, every edge has three small cubes after excluding corner cubes which will have two faces painted.

Hence, the number of small cubes with two faces coloured = $12 \times 3 = 36$

(or) Number of small cubes with two faces coloured = $12(k - 2) = 12 \times 3 = 36$

4. How many small cubes are painted only with either red or yellow or blue colour?

Herein, the examiner is basically asking for cubes with only one side painted. The cubes which are painted on one face only are those that lie at the centre of each face (as shown in the Figure 5) of the big cube. As shown, each face has 9 such cubes.

Hence, in all there will be $6 \times 9 = 54$ such small cubes (or) $6(k - 2)^2$.

5. What is the number of cubes having no face painted?

Number of small cubes having no face painted = $(k - 2)^3$
= $(5 - 2)^3 = 27$.

6. How many small cubes will have only two faces painted in blue and yellow and all other faces unpainted?

These will be the cubes lying on the edges shared by blue and yellow painted face. There will be 4 such sides. Only thing is that we do not have to count corner cubes. So, there will be 3 such cubes on each of these edges. Required number of such small cubes = $4 \times 3 = 12$.

7. How many small cubes will have only two faces painted blue and red?

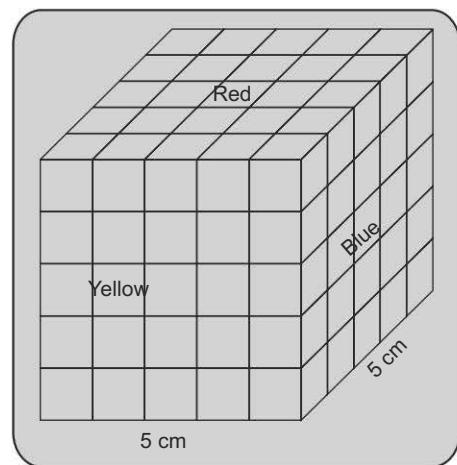


Figure 3

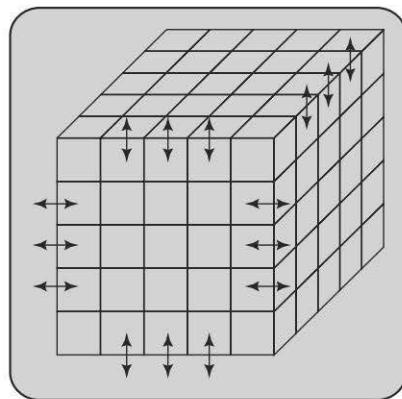


Figure 4

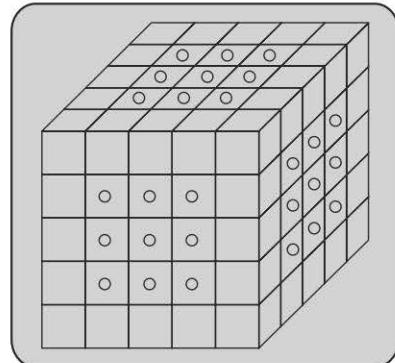


Figure 5

The answer to this question is same as above. So, we will have 12 such cubes.

8. How many small cubes will have only yellow paint?

As we have 2 faces painted yellow, so answer to above question will be the number of smaller cubes with 1 face painted which are lying on these faces. Such small cubes = $2 \times 9 = 18$.

9. How many small cubes will have at least one face painted?

Herein, we will be counting cubes which have one face painted, two faces painted and three faces painted.

$$= 54 + 36 + 8 = 98.$$

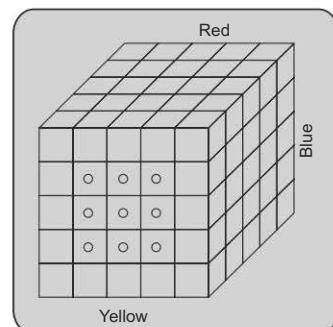


Figure 6

19.2 DICES

A dice is a cube. There are 6 faces in a cube. Following are some important points:

1. There are 6 faces in the cube – $ABCD$, $EFGH$, $BCGF$, $ADHE$, $CDHG$ and $ABFE$.
2. Always four faces are adjacent to one face.
3. $ABCD$ and $EFGH$; $BCGF$ and $ADHE$; $CDHG$ and $ABFE$ are pair of opposite faces.
4. $EFGH$ is the upper face of the cube and $ABCD$ is the lower face of the cube.

There are certain scenarios with the help of which questions on dices can easily be solved.

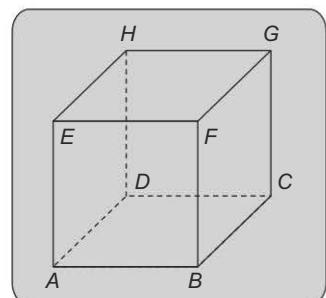


Figure 7

19.2.1 Scenario 1

Adjacent faces cannot be opposite to each other.

Consider two different positions of a dice as shown Figure 8. Find out the number that will appear opposite to the face with number 1.

In both the positions location of face having 1 is same. In such cases, the other four faces shown in Figure 8 (here numbered with 6, 5, 2 and 3) will be adjacent to the face with no. 1. Therefore, the remaining face with number 4 will be the opposite of the face with no. 1.

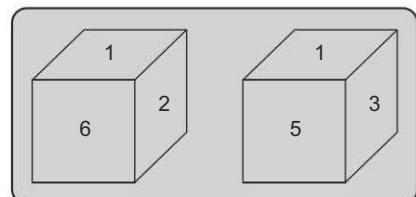


Figure 8

19.2.2 Scenario 2

Consider two different positions of a dice in which position of the common face is not same as shown below. In such cases, opposite face of the common face will be one which is not shown on any face.

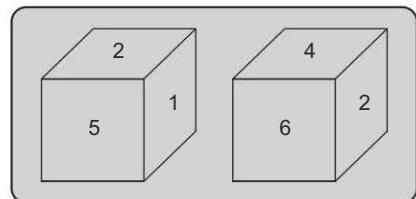


Figure 9

Here in two positions of a dice the common face with number 2 is not in the same position.

The face with number 3 is not shown.

Hence the face opposite to the face with number 2 is 3.

19.2.3 Scenario 3

If in two different positions of a dice, one of the two common faces is in the same position then the remaining faces will be opposite to each other.

Two different positions of a dice are shown in Figure 10.

Herein both shown positions two faces 3 and 2 are common and 3 have same position.

The remaining faces are 5 and 6 and they will be opposite to each other.

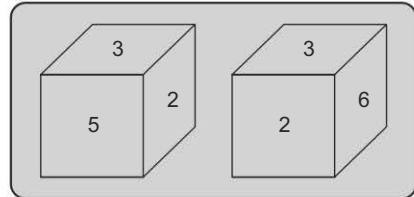


Figure 10

19.2.4 Scenario 4

If in two different positions of dice, the position of a common face is same, then each of the opposite faces of the remaining faces will be in the same position.

Herein both positions of common (6) is same.

Therefore, opposite of 3 is 1 and opposite of 4 is 2.

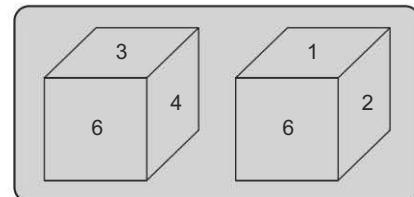


Figure 11

19.3 Construction of Boxes

The details of the cube formed when we fold a sheet to form a box are given as follows:

Case I (Figure 12)

When we pack the given sheet into a box, we observe that 3 will be opposite to 6, 5 will be opposite to 1 and 2 will be opposite to 4.

Case II (Figure 13)

Again, when we pack the given sheet into a box, we observe that 2 will be opposite to 4, 3 will be opposite to 5 and 1 will be opposite to 6.

And so on, we can construct cubes from other sheets.

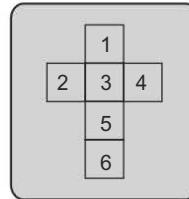


Figure 12

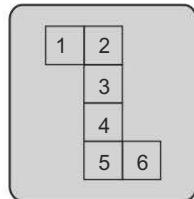


Figure 13

19.4 MATCHSTICKS GAME

These types of questions, though found seldom in the placement exams, are tricky in nature. So let us see how we do these types of questions. Herein, we have n matchsticks. When a player on his turn can pick any number of matchsticks up to z (z is very small compared to n). Also, the loser is one who picks last matchstick. The question is generally of the form that how many matchsticks a person having first turn should pick so that he always wins.

First remove 1 matchstick which the loser will pick at last and lose the game.

Find out Remainder of $[(n - 1)/(z + 1)]$ and take it as y .

You should pick y matchsticks in the first turn.

After that if opponent picks x sticks, you should pick $z + 1 - x$ sticks and you will win the game.

Example 3: There are 91 matchsticks in a box and a person can pick any number of matchsticks from 1 to 7. The loser is one who picks the last matchstick. How many matchsticks should you pick at first turn to win the game definitely?

Solution: Remainder of $[(91 - 1)/(7 + 1)] = 2$ matchsticks to win the game.

Let us look at few scenarios, in which you have picked 2 sticks and there are 89 sticks left in the box. It is opponents turn now.

Table 2

Turn	Opponents Sticks	Sticks Left	You Pick	Sticks Left
Turn 1	5	$89 - 5 = 84$	$7 + 1 - 5 = 3$	$84 - 3 = 81$
Turn 2	4	$81 - 4 = 77$	$7 + 1 - 4 = 4$	$77 - 4 = 73$
Turn 3	7	$73 - 7 = 66$	$7 + 1 - 7 = 1$	$66 - 1 = 65$
Turn 4	2	$65 - 2 = 63$	$7 + 1 - 2 = 6$	$63 - 6 = 57$
Turn 5	7	$57 - 7 = 50$	$7 + 1 - 7 = 1$	$50 - 1 = 49$
Turn 6	7	$49 - 7 = 42$	$7 + 1 - 7 = 1$	$42 - 1 = 41$
Turn 7	6	$41 - 6 = 35$	$7 + 1 - 6 = 2$	$35 - 2 = 33$
Turn 8	5	$33 - 5 = 28$	$7 + 1 - 5 = 3$	$28 - 3 = 25$
Turn 9	7	$25 - 7 = 18$	$7 + 1 - 7 = 1$	$18 - 1 = 17$
Turn 10	6	$17 - 6 = 11$	$7 + 1 - 6 = 2$	$11 - 2 = 9$
Turn 11	5	$9 - 5 = 4$	$7 + 1 - 5 = 3$	$4 - 3 = 1$

As only 1 stick is left, which your opponent will have to pick and lose the game.



Exercise 19.1

Directions for questions 1 and 2: Refer to the following information and answer the following questions.

A Teakwood cube is painted violet on all sides. This cube is further cut into cubes of smaller size in such a way that each edge of the smaller cube is half of the edge of original cube.

1. What is the number of smaller cubes?
 1. 6 2. 8 3. 4 4. 2
2. How many of the smaller cubes will have two faces coloured?
 1. 8 2. 4 3. 0 4. 2
3. Two different views of a dice are shown in Figure 14. Find out the number opposite to 2?

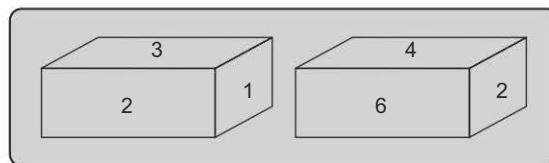


Figure 14

1. 1
2. 6
3. 5
4. 4

Directions for questions 4 to 8: A cuboid made of rosewood ($7 \times 5 \times 3$ unit) is painted in a certain pattern.

- Two smallest opposite faces are painted red.
 - The other two opposite faces are painted in yellow.
 - The remaining faces (i.e. top and bottom) are painted in blue.
 - The cuboid is then cut into 105 small cubes.
- | | |
|--|---|
| 4. Number of cubes having 3 faces coloured is: | 1. 8 2. 10 3. 16 4. None of these |
| 5. How many cubes are there having two faces coloured? | 1. 36 2. 40 3. 45 4. None of these |
| 6. How many cubes have one face coloured? | 1. 46 2. 52 3. 60 4. None of these |
| 7. How many cubes are such that no face is coloured? | 1. 25 2. 35 3. 15 4. None of these |
| 8. How many cubes have only red colour on their face? | 1. 14 2. 6 3. 10 4. None of these |

Directions for questions 9 to 12: Read the given information to answer these questions.

- A cube has six sides, each of which has a different colour: pink, yellow, green, blue, white, red
 - The white side is opposite the pink.
 - The blue side is between the white and the pink.
 - The yellow side is adjacent to the red.
 - The green side is adjacent to the yellow.
 - The white side is the bottom face.
- | | |
|--|--|
| 9. Which of these colours are adjacent to blue: | 1. Pink, yellow, green, white 2. Pink, yellow, green, red
3. Pink, yellow, white, red 4. Pink, green, white, red |
| 10. Which of the following can be deduced from the statements A, B and F? | 1. Pink is on the top 2. Yellow is on the top
3. Green is on the top 4. Green is opposite to back |
| 11. Which of the following statements given above adds no information that is not already given by the other statements? | 1. B 2. C 3. E 4. F |
| 12. If the white side is exchanged for the blue side and the yellow is swapped for pink, then which of the following is false? | 1. White is opposite to pink 2. Red is adjacent to green
3. Blue is opposite to yellow 4. Red is adjacent to yellow |
| 13. Three views of the same cube are shown in Figure 15. | |

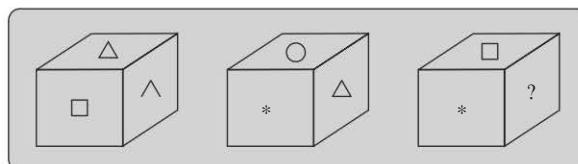


Figure 15

The figure on the face opposite the triangle is:

1. Star 2. Square 3. Question Mark 4. Circle

14. Three views of a dice are given in Figure 16. What is the number on the face opposite to 1?

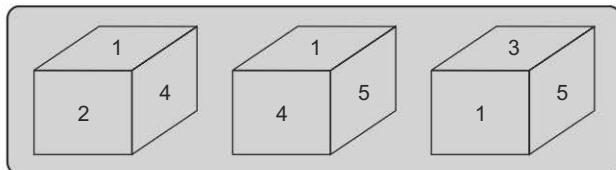


Figure 16

1. 6 2. 2 3. 3 4. 4

15. Two views of a dice are shown in Figure 17. Which number in the cube is opposite to 4:

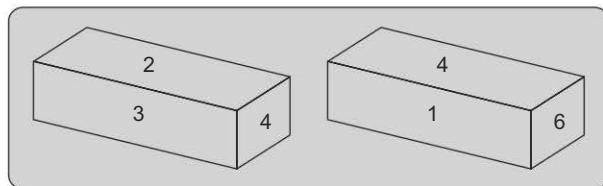


Figure 17

1. 3 2. 5 3. 6 4. Either 2 or 3

Exercise 19.2

1. Using the sheet of paper given in Figure 18, which of the box can be made?

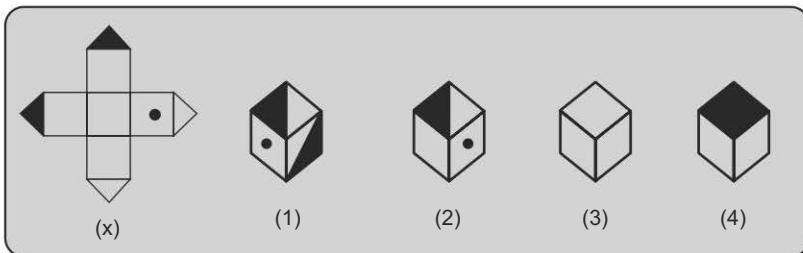


Figure 18

1. 1 and 2 only 2. 2 and 4 only 3. 2 and 3 only 4. 1 and 4 only
2. A dice is numbered from 1 to 6 in different ways. If 4 is opposite to 3 and adjacent to 1 and 2, then which of the following statements is necessarily true?
1. 2 is adjacent to 3 2. 2 is adjacent to 1
3. 4 is opposite to 6 4. 5 is opposite to 3

3. Choose the box that can be formed from the given sheet of paper.

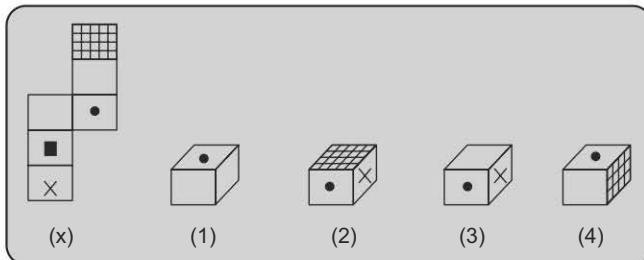


Figure 19

1. 1 only 2. 2 and 3 only 3. 1 and 3 only 4. 1, 2 and 4 only

Directions for questions 4 to 6: Four dices with upper faces erased are as shown in Figure 20.

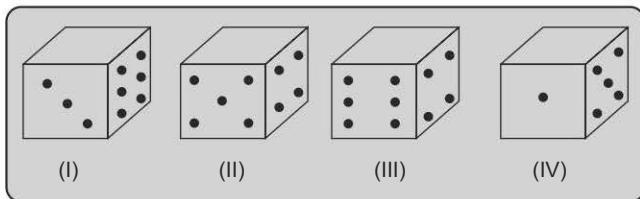
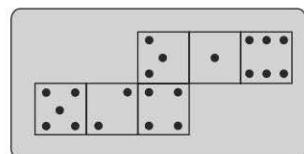


Figure 20

The sum of the numbers of dots on the opposite face is 7.

4. If the dots on the bottom of even numbered dice are odd, then find out the sum of dots on top of the dices?
 1. 8 2. 12 3. 10 4. 14
5. If odd numbered dice have even number of dots on their top faces, then what would be the total number of dots on the top faces of the dice?
 1. 4 2. 6 3. 8 4. 2
6. If the even numbers of dice have odd number of dots on their top faces and odd numbered dice have even of dots on their bottom faces, then what would be the total number of dots on top faces of all the dices?
 1. 8 2. 12 3. 14 4. 15
7. Kalpana's daughter while playing with a cube unfolded it (as shown in Figure 21). On forming the cube back, how many dots will lie opposite to the face having four dots?
 1. 2 2. 4 3. 6



Directions for questions 8 to 12: Mani has a cuboid ($6 \times 4 \times 4$) which he cuts along 4×4 plane such that it results in two cuboids of $3 \times 4 \times 4$. One piece he colours blue on the two larger faces and yellow on the remaining, while the other he colours yellow on two smaller adjacent faces and blue on the remaining. Each is then cut into 48 cubes of same size and mixed up. Now, answer following questions based on it.

Figure 21

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8. How many cubes have only one coloured face each?
1. 18 2. 16 3. 32 4. 30
9. What is the number of cubes with at least one yellow face each?
1. 52 2. 50 3. 57 4. 48
10. How many cubes have 2 faces painted one blue and another yellow?
1. 16 2. 8 3. 24 4. 26
11. How many cubes have two blue and one yellow face?
1. 0 2. 8 3. 16 4. 4
12. How many cubes have no coloured face at all?
1. 0 2. 6 3. 16 4. 8

 **Answer Key****Exercise 19.1**

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. 2 | 2. 3 | 3. 3 | 4. 1 | 5. 1 | 6. 1 |
| 7. 3 | 8. 2 | 9. 4 | 10. 1 | 11. 2 | 12. 2 |
| 13. 3 | 14. 1 | 15. 2 | | | |

Exercise 19.2

- | | | | | | |
|------|------|------|-------|-------|-------|
| 1. 3 | 2. 1 | 3. 3 | 4. 3 | 5. 1 | 6. 3 |
| 7. 4 | 8. 3 | 9. 3 | 10. 4 | 11. 4 | 12. 4 |

 **Explanatory Answers****Exercise 19.1**

- The number of smaller cubes formed is 8 and all of them lie in the corner so will have 3 sides painted. Hence, the correct answer is 8. **Ans 2**
- All eight cubes have three faces coloured. Hence the number of smaller cubes having two faces coloured is zero. So, the answer is 0. **Ans 3**
- As 2 is common between the two figures and adjacent numbers to 2 are 1, 3, 4 and 6. Therefore, the number opposite to 2 will be 5. **Ans 3**

Answers for questions 4 to 8: You can draw a cuboid and proceed by counting.

Total number of cubes = $7 \times 5 \times 3 = 105$

No. of cubes having 3 coloured faces = 8 (as cube has 8 corners)

Each 7 cm edge will have 5, 5 cm edge will have 3 and 3 cm edge will have 1 cube painted only on 2 sides. As each edge is there in cube four times, so total number of cubes with two sides painted will be = $4 \times (5 + 3 + 1) = 36$.

Number of cubes having 2 faces coloured = 36.

No face coloured = $(7 - 2) \times (5 - 2) \times (3 - 2) = 15$

One face coloured = $105 - (8 + 36 + 15) = 46$

Alternatively, you can use this formula to save time.

3 faces coloured cubes = 8 (always)

2 faces coloured = $4 [(m - 2) + (n - 2) + (b - 2)]$

1 face coloured = $2 [(m - 2)(n - 2) + (n - 2)(b - 2) + (b - 2)(m - 2)]$

No face coloured = $(m - 2)(n - 2)(b - 2)$ where m, n and b are dimensions of cuboid.

4. The right option is 1 Ans 1
5. The right option is 1 Ans 1
6. The right option is 1 Ans 1
7. The right option is 3 Ans 3
8. Red painted face has 3×5 as dimensions. So, cubes painted only red will be $= 1 \times 3 \times 2$ (Two such faces) = 6. Ans 2

Answers for questions 9 to 12: From the given data, it can be interpreted that

$ABCD$ = White, $EFGH$ = Pink, $ABEF$ = Green, $BEHC$ = Blue, $ADGF$ = Yellow, $CDGH$ = Red

9. As it is clear, colours adjacent to blue are pink, green, white, red. Ans 4

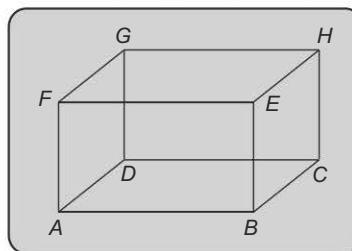


Figure 22

10. Clearly from A, B, F it can be deduced that pink is on the Top. Ans 1
11. If Statement C is not there it does not create any difference. Ans 2
12. On swapping the given sides, it is clear that red is not adjacent to green. Ans 2
13. From the first two views, we can see that faces adjacent to the triangle are circle, cross, rectangle and pentagon. Therefore, the face opposite to the triangle has to be 'Question Mark'. Ans 3
14. From the first three views, we can see that faces adjacent to 1 are 3, 2, 4 and 5. Therefore, the face opposite to 1 has to be '6'. Ans 1
15. From the given two views, we can see that faces adjacent to 4 are 3, 2, 6 and 1. Therefore, the face opposite to 4 is 5. Ans 2

Exercise 19.2

1. When a cube is formed by folding the sheet shown in X , then \blacksquare is one of the faces of the cube. This face is present two times in Figure 1 (wrong figure) and fully shaded face is present in the Figure 4 (wrong figure). So the given sheet when folded can be presented as shown in Figs. 2 and 3 only. Ans 3
2. If 1 is opposite to 2, then 2 cannot lie opposite to any of the numbers 3, 4, 5 or 6. Hence, 2 necessarily lies adjacent to 3. Ans 1

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3. When the sheet shown in \times , is folded to form a cube, then the face with shading lies opposite to the face with the dot on it, the face bearing a cross lies opposite to a blank face and the face bearing a Dark square also lies opposite to another blank face. Hence, only cubes in Figures (1) and (3) can be formed.

Ans 3

4. Even numbered dice are: (II), (IV)

No. of dots on the top face of (II) dice = 6

No. of dots on the top face of (IV) dice = 4

Therefore required total = $6 + 4 = 10$

Ans 3

5. Odd numbered dice are: (II), (III)

No. of dots on the top faces of these dice are 2 and 2, respectively.

Required total = $2 + 2 = 4$.

Ans 1

6. Number of dots on the top faces of the dice (II) and (IV) is 1 and 3 respectively.

Number of dots on the top faces of the dice (I) and (III) is 5 and 5 respectively.

Required total = $5 + 1 + 5 + 3 = 14$.

Ans 3

7. On folding this figure the face bearing five dots will lie opposite the face bearing four dots.

Ans 4

Answers for questions 8 to 12:

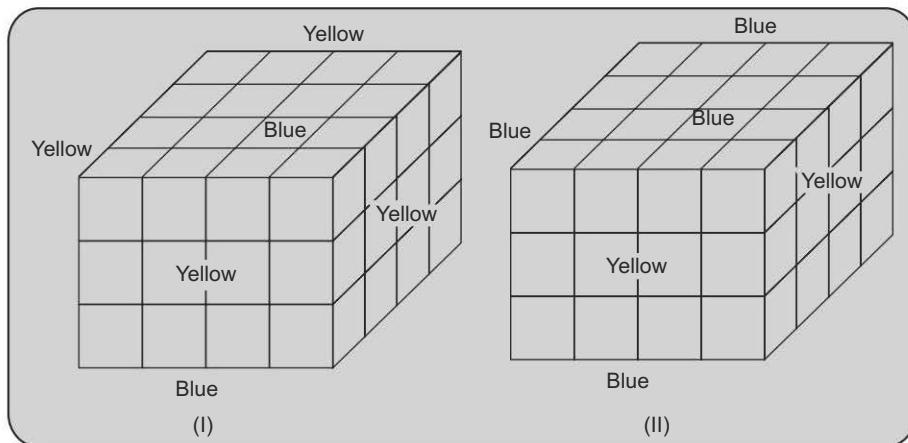


Figure 23

8. 16 from (I) and 16 from (II) in Figure 23.

Therefore, 32 in total.

Ans 3

9. 36 from (I) and 21 from (II) in Figure 23. Therefore, 57 in total.

Ans 3

10. 16 from (I) and 10 from (II) in Figure 23.

Ans 4

11. None from (I) and 4 from (II) in Figure 23.

Ans 4

12. 4 from (I) and 4 from (II) in Figure 23.

Ans 4

Chapter 20

Conditionalities and Grouping

20.1 Introduction

Questions based on conditionalities and grouping make use of a complicated set of conditions and an individual is expected to answer the questions while considering these conditions. These questions are analytical in nature, so an individual is required to reason out the answers.

The best way to solve analytical questions is by using various modelling techniques. These techniques are used to facilitate the analytical work. These logical reasoning questions require three basic skills to analyze solve them – the ability to structure a given question, willingness to try different methods to solve a problem, and the ability to reason out the question logically.

20.2 Model Technique

Few important points to be kept in mind before you start using the modelling techniques are as follows:

- Read the clues very carefully.
- Interpret the given set of clues or conditions thoroughly and completely.
- Convert the interpretations into visual inference.
- It is advised that you use initial alphabets and symbolic shorthand instead of full word or sentence.
If Rahul is given in the clue, use R to denote Rahul. If Rahul is taller than Salil, use $R > S$.
- Wherever possible highlight the key words used in the clues or conditions, such as always, can be, every, exactly, can be, cannot be and so on, these are quite critical.
- Observe the conditions given not just for what they state, but also for what they imply.
- Please do not make your own assumptions.

Analytical reasoning cases are basically of following two types:

- I. In these cases, the given hints are sufficient to create a certain arrangement; i.e., it is possible to come at a unique solution based on which questions can be answered.
- II. In these cases, the given hints do not lead to a particular solution. There are several possible situations and questions generally throw different situations. The clues/hints act as the basic rules that are to be applied to certain situations. The way to solve these questions is to clearly understand the clues that are

stated and if possible translate them to a language that is easy to understand (often some kind of visual/diagrammatic representation helps).

In the formation of groups, or for an event to occur or for a particular arrangement, certain conditions are imposed. These conditions have to be taken into account during the formation of the groups or for the particular event to occur.

20.3 Conditional Statements

In questions based on conditionality, we find that the occurrence of an event depends on the occurrence of another event. For example, if Anil is standing at position 1 then Bishal must be positioned at 2. Thus the position of Bishal is affected by the position of A . But converse is not true, i.e., if Bishal is at position 2 it is not necessary that Anil should be at position 1. If the converse is also true then the statement is called *biconditional*. For example, if Anil is at position 1 then Bishal must be at position 2 and if Bishal is at position 2 then Anil must be at position 1.

Conditional statements can be classified into four groups which are as follows:

1. If X occurs then Y will also occur.

$$X \rightarrow Y$$

The reverse implication of this statement is, that, if Y has not occurred X will also not occur. The not statement we denote by the symbol ‘~’, i.e., not Y will be denoted as $\sim Y$.

$$\sim Y \rightarrow \sim X$$

It is not necessary that $Y \rightarrow X$.

2. If X occurs then Y will not occur.

$$X \rightarrow \sim Y$$

The reverse implication is

$$Y \rightarrow \sim X$$

It is not necessary that $\sim Y \rightarrow X$

3. If X has not occurred then Y will occur.

$$\sim X \rightarrow Y$$

The reverse implication is

$$\sim Y \rightarrow X$$

It is not necessary that $Y \rightarrow \sim X$

4. If X has not occurred then Y will also not occur.

$$\sim X \rightarrow \sim Y$$

The reverse implication is

$$Y \rightarrow X$$

It is not necessary that $\sim Y \rightarrow \sim X$.

Few more examples of conditional statements are as given which are as follows:

1. Symptoms of disease A are cough and cold but not rash or fever.

2. E occurs only if C occurs. A causes B or C , but not both.
3. There are 3 strains of Virus which can be positive or negative. Antibiotic M is the only drug that kills virus of class negative, but it does not kill virus of class positive.

20.4 Notations

The various notations used in conditionalities and group formation are as follows:

- | | |
|---|---|
| 1. A belongs to B | $A \in B$ or $A \subset B$ |
| 2. A does not belong to B | $A \notin B$ or $A \not\subset B$ |
| 3. If A belongs to Group I then B belongs to Group II | $A \in I \Rightarrow B \in II$ |
| 4. A and B do not belong to the same group. | AB^x or  |
| 5. A and B belong to the same group. | AB |

Directions for examples 1 to 5: Two selectors of Cricket Board, Amarnath and Pietersen, are each selecting a group of 3 skilled players from a group of 7 people Tim, Umesh, Vijay, Wasim, Xavier, Yasir and Zaheer. No player is in both the groups. The selections made by Amarnath and Pietersen are subject to the following restrictions:

1. If Umesh is in Amarnath's group, Wasim must be in Pietersen's group.
2. If Xavier is in Amarnath's group, Zaheer must be in the Pietersen's group.
3. Tim and Zaheer cannot be in the same group.
4. Wasim and Yasir cannot be in the same group.

Example 1: If Xavier is in Amarnath's group, any one of the following could be in Pietersen's group except:

1. Tim 2. Umesh 3. Vijay 4. Wasim

Example 2: Which of the following pairs of groups selected by Amarnath and Pietersen confirm to the restriction?

Amarnath	Pietersen
1. Tim, Umesh, Vijay	Wasim, Xavier, Yasir
2. Tim, Umesh, Zaheer	Vijay, Wasim, Xavier
3. Umesh, Xavier, Zaheer	Tim, Wasim, Yasir
4. Vijay, Wasim, Xavier	Umesh, Yasir, Zaheer

Example 3: If Umesh is in Amarnath's group, which of the following is true?

1. Tim must be in Amarnath's group.
 2. Yasir must be in Amarnath's group.
 3. Vijay must be in Pietersen's group.
 4. Yasir cannot be in Pietersen's group.

Example 4: If Umesh and Xavier are in Amarnath's group, Pietersen's group must consist of the following:

1. Tim, Wasim and Yasir
 2. Tim, Yasir and Zaheer
 3. Vijay, Wasim and Zaheer
 4. Vijay, Yasir and Zaheer

Example 5: If Tim is in Pietersen's group, which of the following is true?

- | | |
|--|--|
| 1. Umesh cannot be in Amarnath's group. | 2. Xavier cannot be in Amarnath's group. |
| 3. Yasir cannot be in Pietersen's group. | 4. Zaheer must be Pietersen's group. |

Answers for examples 1 to 5:

Step 1: Identify the elements. Seven Players – Tim (T), Umesh (U), Vijay (V), Wasim (W), Xavier (X), Yasir (Y) and Zaheer (Z).

Step 2: Identify the groups. Amarnath (A) and Pietersen (P)

Conditions:

1. If U is in A 's group, W must be in P 's group. i.e., $U \subset A \rightarrow W \subset P$.
2. If X is in A 's group, Z must be in P 's group. i.e., $X \subset A \rightarrow Z \subset P$.
3. T and Z cannot be in the same group, i.e., TZ^x .
4. W and Y cannot be in the same group, i.e., WY^x .

Solution 1: From condition (2), $X \subset A \rightarrow Z \subset P$. Z must be in Pietersen's group. Since TZ^x from (3), T cannot be in Pietersen's group. **Ans 1**

Solution 2: Choices [1] and [3] are ruled out since condition (4) is violated. Choice [2] is ruled out since condition (3) is violated. **Ans 4**

Solution 3: Since $U \subset A \rightarrow W \subset P$ and since WY^x , Y is not in Pietersen's group, but at the same time it is not necessary that Y should be in Amarnath's group. **Ans 4**

Solution 4: $U \subset A \rightarrow W \subset P$ and $Y \not\subset P$

$X \subset A \rightarrow Z \subset P$ and $T \not\subset P$

Choice [3] satisfies these two conditions. **Ans 3**

Solution 5: If Tim is in Pietersen's group, then Zaheer cannot be in Pietersen's group as Tim and Zaheer cannot be together. This means that X cannot be in Amarnath's group because $X \subset A \rightarrow Z \subset P$. **Ans 2**

Directions for examples 6 to 9: Refer to the data below and answer the questions that follow.

A five member team goes for an exchange programme for which three boys and two girls are to be selected.

Abhishek, Bishal, Chander, Dinesh, and Ekank are boys and Palak, Tina, Ritu and Sakshi are girls.

- Abhishek will not go if Chander goes.
- Palak will go only if Tina goes.
- Tina will not go if Ritu goes.
- Bishal will go only if Ekank goes.
- Dinesh will not go if Sakshi goes.
- Ekank will not go with Palak.
- Bishal will not go with Ritu.

Example 6: What is the largest number of Boys and Girls combinations possible?

- | | | | |
|------|------|------|------|
| 1. 1 | 2. 2 | 3. 3 | 4. 4 |
|------|------|------|------|

Example 7: If Bishal is selected which other students may be selected?

- i. Abhishek, Ekank
- ii. Dinesh, Ekank
- iii. Chander, Ekank

1. (i) only 2. (i) and (iii) 3. (i) or (ii) 4. (ii) only

Example 8: If Tina is selected, the only other girls may be selected?

1. Palak 2. Ritu 3. Sakshi 4. Ritu or Sakshi

Example 9: Which of the following are not necessarily selected?

1. Tina 2. Abhishek 3. Ekank 4. Sakshi

Answers for examples 6 to 9:

The given conditions may be written as follow:

- i. If Chander $\rightarrow \sim$ Abhishek \Rightarrow Abhishek $\rightarrow \sim$ Chander
- ii. Palak will go if Tina goes $\Rightarrow \sim$ Tina $\rightarrow \sim$ Palak
- iii. If Ritu $\rightarrow \sim$ Tina \Rightarrow Tina $\rightarrow \sim$ Ritu
- iv. Bishal will go if Ekank goes $\Rightarrow \sim$ Ekank $\rightarrow \sim$ Bishal
- v. If Sakshi $\rightarrow \sim$ Dinesh \Rightarrow Dinesh $\rightarrow \sim$ Sakshi
- vi. Ekank and Palak cannot go together.
- vii. Bishal and Ritu cannot go together.

Combination of Boys possible using the given conditions are as follows:

(Abhishek, Bishal, Ekank) (Abhishek, Dinesh, Ekank) (Bishal, Ekank, Chander) (Bishal, Ekank, Dinesh) and (Chander, Dinesh, Ekank)

The above mentioned are the five ways in which the boys can be selected. This is keeping in mind that Abhishek and Chander do not come together and Bishal would follow if Ekank is one of the members. Combination of Girls possible using conditions (ii) and (iii) are Palak & Tina, Ritu & Sakshi and Tina & Sakshi.

Using conditions (v), (vi) and (vii) the possible combinations are as follows:

Abhishek, Bishal, Ekank, Tina, Sakshi and Bishal, Ekank, Chander, Tina, Sakshi.

Solution 6: The largest number of Boys and Girls combinations possible is 2. Ans 2

Solution 7: Referring to the above combinations Abhishek, Bishal, Ekank, Tina, Sakshi and Bishal, Ekank Chander, Tina, Sakshi from the given options; Abhishek, Ekank and Chander, Ekank are the other boys that could be chosen. Ans 2

Solution 8: If Tina is selected, the only other girl that could be selected is ‘Sakshi’ [Abhishek Bishal Ekank, Tina, Sakshi and Bishal, Ekank, Chander, Tina, Sakshi]. Ans 3

Solution 9: Tina, Ekank and Sakshi are selected in both the combinations. The combinations do not necessarily contain Abhishek. Ans 2



Exercise 20.1

Directions for questions 1 to 5: Refer to the data below and answer the questions that follow.

There are five sports Aerobics, Basketball, Cricket, Football and Tennis that can happen. The occurrence of every sport is governed by few rules and regulations, which are as follows:

- If Aerobics occurs then either of Basketball or Cricket or both must occur
- If Basketball occurs then Football cannot occur.
- If Cricket occurs then Tennis must occur.

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Directions for questions 6 to 10: Refer to the data below and answer the questions that follow.

Three thieves Pankaj, Vivek and Satnam each has been terrorising three different boys Moksh, Simar and Harpreet not necessarily in that order.

Each of these boys lives in different city Chandigarh, Panchkula and Mohali not necessarily in that order.

Each of the thieves favours a different mode of transport, horses, jeeps and boats, again not necessarily in that order.

- Vivek and his horsemen do not terrorize Harpreet.
 - Satnam is not waterborne and does not operate in Panchkula.
 - Neither Harpreet nor Simar has anything to do with Satnam.
 - Harpreet and Simar do not belong to Mohali and thieves of this region by jeeps.
 - Pankaj is not from Chandigarh.

6. Satnam's mode of transport is:

1. Horse	2. Jeep
3. Boat	4. Cannot be determined

7. Harpreet has been terrorised by:

1. Pankaj	2. Vivek
3. Satnam	4. Cannot be determined

8. The bandit on horseback is the terror of:

1. Panchkula	2. Mohali
3. Chandigarh	4. Cannot be determined

9. Satnam has been terrorising:

1. Harpreet	2. Moksh
3. Simar	4. Cannot be determined

10. Panchkula has been terrorized by:
1. Pankaj
 2. Vivek
 3. Satnam
 4. Cannot be determined



Exercise 20.2

Directions for questions 1 to 5: Refer to the data below and answer the questions that follow:

There is a group of 6 guys Anant, Bharath, Chahat, Durjoy, Kunal and Farishta and 5 girls Leena, Meena, Nitika, Olisa and Panika, a basketball team of 6 members is chosen under the following conditions:

- Olisa and Panika want to play together or they won't play.
- Chahat cannot go with Olisa.
- Anant and Durjoy have to be together.
- Durjoy cannot go with Leena.
- Chahat and Meena have to be together.
- Bharath and Nitika have to be in same team.
- Bharath and Kunal cannot be in same team.

1. If the team to be selected has two boys and four girls, the members are:

1. Bharath, Kunal, Leena, Nitika, Olisa, Panika	2. Kunal, Farishta, Leena, Nitika, Olisa, Panika
3. Bharath, Farishta, Leena, Nitika, Olisa, Panika	4. Bharath, Chahat, Leena, Nitika, Olisa, Panika
2. The team has only one girl and 5 boys, then the girl selected is:

1. Leena	2. Meena	3. Nitika	4. Olisa
----------	----------	-----------	----------
3. Kunal is the captain of the team which has 4 boys in total, the other team members should be:

1. Anant, Durjoy, Farishta, Olisa, Panika	2. Anant, Bharath, Durjoy, Olisa, Panika
3. Anant, Chahat, Durjoy, Leena, Meena	4. Anant, Bharath, Durjoy, Nitika, Meena
4. Now Leena is given a chance to lead the side which has 3 girls including her, the team members should be:

1. Anant, Bharath, Durjoy, Nitika, Olisa	2. Bharath, Chahat, Farishta, Nitika, Olisa
3. Anant, Durjoy, Kunal, Olisa, Panika	4. Bharath, Chahat, Farishta, Meena, Nitika
5. Chahat has been a national level player and has to be included in the side and the team has 2 girls. Please name the other teammates.

1. Anant, Durjoy, Kunal, Olisa, Panika	2. Anant, Bharath, Durjoy, Meena, Nitika
3. Anant, Bharath, Durjoy, Leena, Meena	4. Anant, Bharath, Durjoy, Leena, Nitika

Directions for questions 6 to 10: Refer to the given data and answer the questions that follow:

Five boys Abhinav, Binod, Chetan, Dharamveer and Eshant are going out for a wedding wearing five different coloured shirts. The colours of the shirts are blue, red, green, yellow and white. The boys will wear the shirts following few rules, which are:

- If Abhinav wears the red shirt, then Chetan must wear the yellow shirt.
- Binod will wear the yellow shirt only if Dharamveer wears the white shirt.
- If Dharamveer is not wearing the blue shirt, then Abhinav must wear the red shirt.
- Eshant will not wear the blue shirt only if Chetan will wear the yellow shirt.
- If Chetan does not wear the red shirt then Eshant will not wear the green shirt.
- Binod can never wear the blue shirt.
- If Eshant does not wear the white shirt, then Dharamveer must wear the green shirt.

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- It is possible that more than one person can wear the same coloured shirt but nobody can wear two shirts (seems obvious though).
6. If Abhinav wears a red shirt and Dharamveer does not wear a green shirt and no two of them are wearing the same coloured shirts, then Binod must wear which coloured shirt?
1. Blue 2. Green 3. White 4. Yellow
7. Dharamveer does not wear a blue shirt and no two of them are wearing the same coloured shirts, which coloured shirt he must wear?
1. Green 2. White 3. Red 4. Yellow
8. If Eshant does not wear a white shirt, then Abhinav must wear which coloured shirt?
1. Blue 2. Yellow 3. Red 4. White
9. Which of the following is/are not possible?
I. Eshant is wearing a green shirt.
II. Binod is wearing a yellow shirt and Eshant a white shirt.
III. Dharamveer is not wearing a white shirt.
1. I only 2. II only 3. I and II only 4. II and III only
10. If Abhinav does not wear a red shirt, then Binod can wear any coloured shirt except:
- I. Blue II. Yellow III. Red IV. White
1. I only 2. III only 3. I and II only 4. I, III and IV only

 **Answer Key****Exercise 20.1**

1. 4 2. 3 3. 4 4. 4 5. 2 6. 2
7. 1 8. 3 9. 2 10. 1

Exercise 20.2

1. 3 2. 2 3. 1 4. 4 5. 2 6. 2
7. 1 8. 3 9. 1 10. 3

 **Explanatory Answers****Exercise 20.1****Answers for questions 1 to 5:**

Let us symbolize the given condition and interpret their reverse implications.

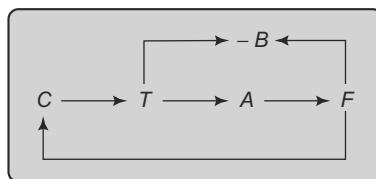
- Aerobics, Basketball or Cricket or both

If both of Basketball and Cricket are not played then Aerobics will not occur but this is not true for the case that any of Basketball or Cricket has not occurred.

- Basketball → ~Football ⇒ Football → ~Basketball

- Cricket \rightarrow Tennis $\Rightarrow \sim$ Tennis $\rightarrow \sim$ Cricket
- Football \rightarrow Cricket $\Rightarrow \sim$ Cricket $\rightarrow \sim$ Football
- Tennis \rightarrow Aerobics $\Rightarrow \sim$ Aerobics $\rightarrow \sim$ Tennis
- Tennis $\rightarrow \sim$ Basketball \Rightarrow Basketball $\rightarrow \sim$ Tennis
- \sim Football $\rightarrow \sim$ Aerobics \Rightarrow Aerobics \rightarrow Football

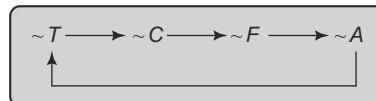
1.

**Figure 1**

Thus Aerobics and Football must occur.

Ans 4

2.

**Figure 2**

I. True

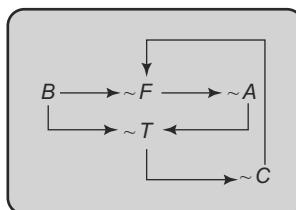
II. We cannot say

III. True

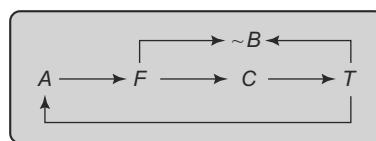
IV. True

Ans 3

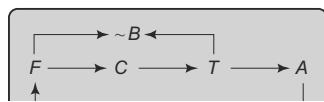
3.

**Figure 3****Ans 4**

4.

**Figure 4****Ans 4**

5.

**Figure 5****Ans 2****Answers for questions 6 to 10:**

Step 1:	Identify the Thieves	Pankaj	Vivek	Satnam
Step 2:	Identify the Boys	Moksh	Simar	Harpreeet
Step 3:	Identify the city	Chandigarh	Panchkula	Mohali
Step 4:	Identify the modes of transport	horse	jeeps	boats

Conditions

- a. Vivek's mode of transport is horse and does not terrorize Harpreet.

Vivek → horses, Vivek → ~ Harpreet

- b. Satnam does not operate in Panchkula and his mode of transport is not the boat.

Satnam → ~ boat, Satnam → ~ Panchkula

- c. Harpreet and Simar do not belong to Mohali and thieves of this region travel by jeeps.

Harpreet → ~Mohali, Simar → ~Mohali, Mohali → jeep.

Using the conditions, we get:

Table 1

Thief	Type of transport	Boys	Area
Pankaj	Boat	Harpreeet	Panchkula
Vivek	Horse	Simar	Chandigarh
Satnam	Jeep	Moksh	Mohali

6. The right option is 2 **Ans 2**
7. The right option is 1 **Ans 1**
8. The right option is 3 **Ans 3**
9. The right option is 2 **Ans 2**
10. The right option is 1 **Ans 1**

Exercise 20.2**Answers to questions 1 to 5:**

1. Olisa and Panika have to be together. Therefore, Chahat won't be there, according to (ii) and hence Meena won't be there according to (v). So the four girls would be Leena, Nitika, Olisa and Panika.

Hence, Durjoy and Anant won't be there according to (iv) and (iii). Hence, one of either Bharath and Kunal will be there according to (vii). Since Bharath and Nitika have to be together, the members of the team would be Bharath Farishta Leena Nitika Olisa Panika. **Ans 3**

2. The only team where 5 boys are selected is Anant Chahat Durjoy Kunal Farishta. The only girl would be Meena according to (v). Note that Anant Bharath Chahat Durjoy Farishta is not possible as two girls Meena and Nitika will have to be selected. **Ans 2**
3. The team cannot include Bharath according to (vii). The girls in the team can only be Olisa and Panika. Hence, Chahat won't be there according to (ii). Hence, the boys in the team will be Anant Durjoy Kunal Farishta. Hence, the team other than Kunal is Anant Durjoy Farishta Olisa Panika. **Ans 1**
4. The team will not include Anant and Durjoy, according to (iii) and (iv). The only boys in the team would be Bharath Chahat Farishta and the girls would be Meena and Nitika. **Ans 4**
5. The only team possible including Chahat is Anant Bharath Durjoy Meena Nitika. **Ans 2**

Answers for questions 6 to 10:

Symbolizing the given statements and their reverse implications we get,

Abhinav – A; Binod – B; Chetan – C; Dharamveer – D; Eshant – E.

- $A(R) \rightarrow C(Y) \Rightarrow \sim C(Y) \rightarrow \sim A(R)$
- $B(Y) \rightarrow D(W) \Rightarrow \sim D(W) \rightarrow \sim B(Y)$
- $\sim D(B) \rightarrow A(R) \Rightarrow \sim A(R) \rightarrow D(B)$
- $\sim E(B) \rightarrow C(Y) \Rightarrow \sim C(Y) \rightarrow E(B)$
- $\sim C(R) \rightarrow \sim E(G) \Rightarrow E(G) \rightarrow C(R)$
- $\sim E(W) \rightarrow D(G) \Rightarrow \sim D(G) \rightarrow E(W)$
- $B \neq \text{Blue}$

6. $A(R) \rightarrow C(Y)$

If C is wearing yellow shirt, then he is not wearing red shirt.

$$\therefore \sim C(R) \rightarrow \sim E(G)$$

$$A(R) \rightarrow C(Y) \rightarrow \sim E(G)$$

$$\sim D(G) \rightarrow E(W)$$

Table 2

B	R	G	Y	W
D	A	B	C	E

Ans 2

7. $\sim D(B) \rightarrow A(R) \rightarrow C(Y) \rightarrow \sim C(R) \rightarrow \sim E(G)$

Table 3

B	R	G	Y	W
E	A	D	C	B

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Since D and B cannot wear blue shirt, E must wear it. Also, if D is not wearing green shirt then E must wear a white shirt which will contradict the previous statement. Therefore, D must wear a green shirt.

Ans 1

8. $\sim E(W) \rightarrow D(G) \rightarrow A(R) \rightarrow C(Y) \rightarrow \sim E(G)$

$$\qquad\qquad\qquad \longrightarrow \sim B(Y)$$

Ans 3

9. I. $E(G) \rightarrow D(G)$

$$\left| \begin{array}{l} \longrightarrow C(R) \\ \longrightarrow C(Y) \end{array} \right.$$

Since E is wearing a green shirt, he is not wearing a blue or a white shirt. Thus, C must wear a red shirt and also a yellow. But this contradicts our statement that no person can wear two different colored shirts at the same time. Hence, it is not possible.

II. $B(Y) \rightarrow D(W) \rightarrow A(R) \rightarrow C(Y) \rightarrow \sim E(G)$

$$\downarrow$$

$$E(W)$$

Hence, possible

III. $\sim D(W) \rightarrow \sim B(Y)$. Hence, possible.
Therefore, only 1 is not possible.

Ans 1

10. $\sim A(R) \rightarrow D(B) \rightarrow E(W) \rightarrow C(Y) \rightarrow \sim E(G)$

$$\qquad\qquad\qquad \longrightarrow \sim B(Y)$$

Thus, B cannot wear yellow and blue coloured shirts.

Ans 3

Chapter 21

Numerical Logic

21.1 Introduction

Numerical logic is considered as the main areas of focus in most of the competitive exams these days. It requires basic knowledge of Mathematical concepts. You may be required to apply conditionalties, if required, in order to crack the logic. It requires you to think analytically as the basic applied is cryptic. You cannot make a set algorithm or a matrix to solve the problem. The numerical logic problems can vary greatly in context of difficulty. Some are easy to crack while few may require extensive analysis and a thorough thinking to unravel. A few of the numerical logic type of problems are as follows:

- i. Odd ball or weight problems: You are given (n) identical balls but 1 ball is slightly less or more in weight so calculate in how many minimum weighing one can sort out the lighter or heavier ball.
- ii. Data is fed in a computer and the computer processes it through few steps on input data finally giving an output.
- iii. Distribution of money/cash considering few constraints.
- iv. A game of gambling with the cards.
- v. To arrange different numbers in a matrix form considering few constraints. This involves basic understanding of numbers.

21.2 Weighing Scales and Pan Balance

Once we understand the basic concept and formulae to be used in the weighing machines and pan balancing problems, then the question becomes very easy. Try to understand the logic and do not just dwell at the literal meaning. This might help you in certain situations but will not work always.

We have two logics to understand before we get on to solving a problem which are as follows:

1. Weighing machine based problems
2. A two-pan balance based problems

First, we understand how these devices measure and then jump on to the examples.

Weighing Scale or Weighing Machine measures the weight of an object. It displays a reading of the weight that is put on it.

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Pan Balance, the first mass measuring instrument, traditionally consists of a pivoted horizontal lever of equal length arms known as beam. These have a weighing pans hanging from each arm. The object of unknown mass is placed on one pan and standard weights are added on the other to the point of equilibrium.

Concept: Comparison of weights.

Example: Rigging of standard weights by shopkeepers for profit. The actual weight and balancing weights do not match.

Purpose: Profit.

21.2.1 Number of Weighing Required to Find the Faulty Weight in a Weighing Machine

Out of 10 equal weights of 1 kg, one is faulty.

Divide the weights in 2 equal parts of 5 each. One will be on the weighing machine and the other will be separately taken.

The following scenarios can occur:

- **Scenario 1:** The possible readings are 5 kg or less something like 4.9 kg. If it is 5 kg, the remaining weights are faulty. If it is 4.9 kg, the measured weights are faulty.
- **Scenario 2:** The possible readings are 5 kg or something like 5.1 kg. If it is 5 kg, the remaining weights are faulty. If it is 5.1 kg, measured weights are faulty.
- **Scenario 3:** The possible readings are 5 kg or something else. If it is 5 kg, the remaining weights are faulty. If it is something else, the measured weights are faulty.

With this one weighing, we have identified the set of 5 weights which has the faulty weight.

After the second and third weighing, we will be able to identify the faulty set and with the fourth weighing, we will identify the faulty weight.

So, in any of the three cases, number of weighing required is 4.

This was easy! We had an even number which we divided into two equal parts very easily.

What if we have a number which we cannot divide equally?

Let us assume, 23 weights initially, which has 1 faulty weight to be identified.

Split 1: $23 = 11$ and 12.

Taking Worst case, we observe the faulty weight is in the set of 11.

Split 2: $11 = 5$ and 6.

Taking Worst case, we observe the faulty weight is in the set of 5.

Split 3: $5 = 2$ and 3.

Taking Worst case, we observe the faulty weight is in the set of 3.

Split 4: $3 = 2$ and 1. We will be able to identify the weights 2 and 1 separately.

After the **fifth split**, we will be able to identify the faulty weight.

Note: Throughout the problem we are considering the worst case scenario.

Here are some key observations, which you can verify for yourself, that will give you the pattern required for the formula:

- 1 split is required to find out the faulty weight from 2 weights.
- 2 splits are required to find out the faulty weight from [3, 4] weights.

- 3 splits are required to find out the faulty weight if the no. of weights are from 5 to 8.
- 4 splits are required to find out the faulty weight if the no. of weights are from 9 to 16.
- Or, ' n ' splits are required to find out the faulty weight from $[2^{n-1} + 1, 2^n]$ weights in the case of a weighing machine or scale.

21.2.2 Number of Weightings Required to Find the Faulty Weight in a Two-Pan Balance

- **Case 1:** Out of 9 equal weights of 1 kg, one is faulty and it is given it is lighter/heavier. We will solve the case assuming that we are given the faulty weight is lighter (same reasoning applies to heavier case).
- **Case 2:** Out of 9 equal weights of 1 kg, one is faulty and it is not given whether it is lighter or heavier.
- **Case 1:** The weights will be divided into three parts, two would go on the pan balance for measurement and one would be kept for later. This will be the first weighing. Two scenarios might arise.
 - **Scenario 1:** The 2 sets measured are equal, and then we know that the faulty weight lies in the 3rd set and is lighter. We will then split the 3rd set in sets of 1 and measure any 2 out of them. This will be the 2nd weighing. If the pan is unbalanced then the faulty weight is the one which goes up. If the pan is balanced then the remaining weight is the faulty weight. So total number of weightings required in this case is two.
 - **Scenario 2:** The 2 sets measured are unequal, and then we know that the faulty weight lies in the set which goes up (since it is given that it is lighter). We will then split this set in sets of 1 and measure any 2 out of them. This will be the 2nd weighing. If the pan is unbalanced then the faulty weight is the one which goes up. If the pan is balanced then the remaining weight is the faulty weight. So total number of weightings required in this case is also 2.
- **Case 2:** The weights will be divided into three parts, two would go on the pan balance for measurement and one would be kept for later. This will be the first weighing. Firstly, we need to determine that whether the faulty is heavier or lighter. This will be the first weighing.

We weigh any 2 sets of 3 weights each on the pan. Two scenarios might arise.

- **Scenario 1:** The 2 sets measured are unequal. In this case the faulty weight is in one of the 2 sets. We will compare the lighter set with the 3rd one. This is the 2nd weighing.
- **Sub Case 1:** If they weigh equal then the remaining set kept aside is the faulty one and the weight of the faulty one is heavier. We will split this into 1 – 1 – 1 and measure any two out of these, in case the balance is equal then the remaining weight is faulty. This is the third weighing. In case the balance is unequal the heavier is the faulty one.
- **Sub Case 2:** If they weigh unequal then the set which is lighter (compared with both) is the faulty one. We will split this into 1 – 1 – 1 and measure any two out of these, in case the balance is equal then the remaining weight is faulty. In case the balance is unequal the lighter is the faulty one. This is the third weighing.

So the total number of weightings required is 3.

- **Scenario 2:** The 2 sets measured are equal. Using similar logic as above we can find out the faulty weight in three weightings.

Key learning points, to verify as well as to devise a formula to solve the questions when we know that faulty is heavier or lighter:

- 1 comparison is required to find out the faulty weight from 3 weights.
- 2 comparisons are required to find out the faulty weight from [4, 9] weights.
- 3 comparisons are required to find out the faulty weight from [10, 27] weights.

'n' comparisons are required to find out the heavier / lighter faulty weight from $[3^{n-1} + 1, 3^n]$ weights.

1 extra comparison is required if the fault is unknown.

Directions for examples 1 to 5: Refer to the given data and answer the questions that follow.

Four friends Ajay, Rajiv, Vivek and Sahil are playing a card game called 'Showdown', in which each player is given 3 cards. The value of each card is the number written on it. The face cards Jack, Queen and King are given with values 11, 12 and 13 respectively. The Ace card has value one. The players are not allowed to look at each other's cards. Once a player sees his cards, he can decide whether to continue or quit. If a player has each card with value less than or equal to 5, he has to quit from the game. The remaining players will continue and the game can have any number of rounds. There is a showdown and (i.e., the cards are shown to the other players) then the player with maximum card value is declared the winner. If a player quits the game in any round, he does not pay any penalty. A showdown can be demanded by any player in any round. If no one demands a showdown, the game continues to the next round. In the showdown, the losers will pay penalty to the winner. If the showdown happens in the first round, the losers have to pay the winner an amount equal to their total card value. But, if the showdown is in the second round, the amount losers have to pay to the winner will be twice their total card value and so on.

Example 1: In the game, Ajay and Rajiv quit in the first round while Vivek and Sahil go into the second round, Vivek calls for a showdown, in which Sahil is declared the winner. What is maximum amount that Sahil could receive from Vivek?

1. Rs. 37 2. Rs. 74 3. Rs. 36 4. Rs. 36

Solution: Sahil is declared the winner. The maximum total value he can have is $13 + 13 + 13 = 39$, while the maximum total value of Vivek's cards can be $13 + 12 + 12 = 37$. Hence, the maximum amount that Sahil can win from Vivek is $37 \times 2 = 74$. Ans 2

Example 2: In a game, no one quits, the showdown is in the first round and Rajiv is the winner. What is the minimum amount that Rajiv can win?

1. 15 2. 25 3. 27 4. 26

Solution: Since no one quits the game, each person should have at least one card of value more than 5. Thus, all the three persons will have only one card of face value 6 each and the remaining cards with each person will be any two from 1, 1, 1, 1, 2 and 2. Therefore, minimum amount that Rajiv can win is 26. Ans 4

Example 3: In a game, Ajay takes a look at his cards and quits. The total value of Vivek's cards is twice that of Rajiv's total card value. Sahil wins the game. What is the maximum total card value that Rajiv can have?

1. 36 2. 19 3. 18 4. 15

Solution: The maximum total card value possible any person can have is 39. Vivek's total card value has to be an even number as it is twice that of Rajiv's total card value. Now, assuming Sahil has a maximum of 39 points, Vivek can have maximum of 36 points, then Rajiv's maximum total card value will be 18. Ans 3

Example 4: In a game, Ajay quits. The total card value of Sahil is double that of Vivek and the total card value of Vivek is double that of Rajiv. What is the Vivek's total card value?

1. 7

2. 17

3. 16

4. 12

Solution: The question can be solved by checking the options.

Vivek's total card value has to be an even number as it is two times (double) the total card value of Rajiv. So, option (1) and option (2) is invalid.

Option (4): If Vivek's total card value is 12, then Rajiv's total card value will be 6. But Rajiv cannot be in the game with this card value as a person with each card value less than or equal to five has to quit.

Option (3): If Vivek's total card value is 16, then Rajiv's total card value is 8, i.e. $6 + 1 + 1$, which is possible and Sahil's total will be 32 which is again possible. **Ans 3**

Example 5: In a game, Rajiv quits, as his cards are not up to the basic requirement whereas Ajay, Vivek and Sahil proceed toward the third round. In the third round Vivek calls for a showdown. Sahil had a total of 30 points and wins the game. There are no face cards with any player. Two players had two cards of value 9 each and Sahil won a total of 141. If Vivek has a card of value one, what are the cards with Ajay?

1. 9, 9, 6

2. 9, 9, 5

3. 9, 9, 1

4. 9, 9, 10

Solution: Sahil has a total of 30 points which does not include any face cards. Therefore, the card with Sahil has to be 10, 10 and 10. Sahil has won a total of Rs. 141, which implies that the total card value of Ajay and Vivek together is $\frac{141}{3} = 47$. Ajay and Vivek each has two 9 cards each, which adds to a total of 36 points. Of the remaining 11 points, one point is accounted for by Vivek's 1 ace card. Therefore, the third card Ajay has is 10.

Sahil	10	10	10
Ajay	9	9	10
Vivek	9	9	1

Ans 4

Directions for examples 6 to 8: Refer to the data below and answer the following questions.

Aman, Raj and Vicky are three friends, having Rs. 320, Rs. 240 and Rs. 160 respectively. They are playing a game in which the person with maximum money gives to both the persons an amount which is calculated as half the difference between his amount and the respective person's amount. The game ends when any two persons have a difference of less than Rs. 10 in their amounts.

Example 6: Amount left with Aman at the end of the game?

1. 235

2. 245

3. 240

4. 250

Example 7: What would be the amount with Raj at the end of the game?

1. 230

2. 235

3. 240

4. 245

Example 8: What would be the amount with Vicky at the end of the game?

1. 230

2. 235

3. 240

4. 245

Answers for examples 6 to 8:

Table 1

	Aman (320)	Raj (240)	Vicky (160)
First Round	$320 - (40 + 80) = 200$	$240 + \frac{320 - 240}{2} = 280$	$160 + \frac{320 - 160}{2} = 240$
Second Round	$200 + \frac{280 - 200}{2} = 240$	$280 - (40 + 20) = 220$	$240 + \frac{280 - 240}{2} = 260$
Third Round	$240 + \frac{260 - 240}{2} = 250$	$220 + \frac{260 - 220}{2} = 240$	$260 - (20 + 10) = 230$
Fourth Round	$250 - (5 + 10) = 235$	$240 + \frac{250 - 240}{2} = 245$	$230 + \frac{250 - 230}{2} = 240$

The game stops here.

6. Amount left with Aman at the end is ₹ 235 Ans 1
7. Amount left with Raj at the end is ₹ 245 Ans 4
8. Amount left with Vicky at the end is ₹ 240 Ans 3



Exercise 21.1

Directions for questions 1 and 2: Refer to the given data and answer the questions that follow.

Arun buys 800 bags of Rice. All bags weigh 100 g except one bag. To determine the lighter bag he uses a two pan balance.

Satvir buys 40 bags of Rice. All bags weigh 1 kg except one bag. To determine the bag which is light he uses a spring balance.

1. What is the minimum number of weighing that Arun requires to determine the faulty bag?
 1. 6 2. 7 3. 8 4. 10
2. What is the minimum number of weighing that Satvir requires to determine the faulty bag?
 1. 5 2. 6 3. 8 4. 16
3. In his daily life a local shopkeeper had to weigh items ranging from 1 kg to 121 kg (rounded off to nearest kg). What is the minimum number of weights required and what is the weight of the heavier one?
 1. 5, 81 2. 6, 64 3. 7, 121 4. 10, 27
4. Amit has eighty-one Footballs in his shop; one of these is faulty (heavier than all the others), which weigh the same. In how many weighings on the balancing scales, can Amit come to know which the faulty one is?
 1. 5 2. 3 3. 2 4. 4
5. How many minimum weighings are required if only one weight of 1 kg is available to measure 127 kg of Maize?
 1. 21 2. 7 3. 3 4. 9

6. In a deck of cards, what is the least amount of cards you must take to be guaranteed at least one four-of-a-kind?
 1. 39 2. 40 3. 27 4. 14
7. When Rohan was travelling to Mumbai he met a young guy who had three cards from a standard deck face down. Rohan asked him what the three cards were. He tells Rohan, "To the left of the King, are one or two Aces. To the right of the Ace, are one or two Aces. To the right of the Spade, are one or two Hearts. To the left of the Hearts, are one or two hearts." What are the three cards?
 (There is more than one solution!)
8. There is a magical rectangular Strap which always shrinks its length to half and breadth to 1/3rd whenever Amit wishes something. After three such wishes, its surface was 4 cm^2 . What was the length initially, if originally the breadth was 18 cm?
 1. 48 2. 50 3. 56 4. 100
9. Its winters and Sahil needs to boil eggs for exactly 9 minutes, or else the visiting customer will complain, and he will lose his job as head chef. But he has only 2 Hourglasses, one measures 7 minutes, and the other measures 4 minutes. How can he correctly measure 9 minutes?
10. Ram runs a stationarey shop and he also sells wheat. He has a balance and the following items of which he knows the weights: a 5 Re coin weighing 5 g, a pencil which weighs 10 g, an eraser weighing 20 g, a duster weighing 40 g, a diary which is 80 g and a geometry box weighing 160 g. How many different possible weights can you measure with these items?
 1. 32 2. 64 3. 63 4. 50



Exercise 21.2

Directions for questions 1 to 6: Refer to the given data and answer the questions that follow.

In the semifinals of Champions Trophy cup, eight different football teams qualified. The teams were Argentina, Brazil, Croatia, Denmark, England, France, Germany and Holland. These teams were divided in two groups having equal number of teams. Each team in a group will play a match against other teams of the same group. Four points were given to a winning team, two point for a draw and no points were given to the losing side. The team in a group having the maximum points after the semifinals will reach the finals. If two teams have the same points at the top of the table then the team having maximum Goal difference (Goals Scored – Goals Received) would go through. Argentina and Brazil, Croatia and Denmark were not in the same group. The match between Brazil and Croatia was a draw and the score was 3 each. Against the two other teams, Brazil scored equal number of goals and received one goal less and two goal less than what it had scored. Brazil scored maximum number of goals and received goals equal to the goals scored by Croatia. The total goals scored by Croatia were 12 and the total goals received by it were equal to the goals received by England against Brazil plus two. Both England and France lost their matches against Croatia. The match between Argentina and Denmark was a draw but both won against Holland. Holland was unable to score any point and Argentina and Denmark had equal points.

1. Which of the following statements can be true?
 - I. Brazil qualified for the finals.
 - II. Croatia qualified for the finals.
 - III. Germany qualified for the finals.
 - IV. Argentina qualified for the finals.
 - V. Denmark qualified for the finals.
1. II, III, V only 2. III, IV, V only 3. I, II, IV only 4. All except I

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2. How many goals were scored by England against Brazil?
1. 4 2. 5 3. 4 or 5 4. 4 or 6
3. How many goals were scored by Brazil against France?
1. 6 2. 5 3. 4 4. Cannot say
4. If Brazil won the cup, then minimum how many goals it should have scored in the semifinals; keeping all other conditions same?
1. 15 2. 17 3. 16 4. 18
5. If Germany won the cup, then how many points it must have scored in the semifinals.
1. 8 2. 10 3. 12 4. Cannot say
6. How many points did France get after the semifinals?
1. 2 2. 4 3. 0 4. Cannot say

Directions for questions 7 to 12: Refer to the given data and answer the questions that follow.

There are two types of Metro trains which run in the city of New York; one being the fast and other one being the slower one. The slow trains need to halt at every stop consecutively and the fast trains only at selected stops in any order. There are ten stops, numbered from 0 to 9, located in a consecutive order. All the fast trains have to start from station 0 and the slow trains can start from any station. All the trains must go from a lower numbered station to a higher numbered one. The sum of the numbers of the stations touched by the fast train should always be equal to 9 including the starting stop and for the slow trains it should be a multiple of 3, including the starting station.

7. How many different fast trains are possible?
1. 9 2. 8 3. 12 4. More than 15
8. How many different slow trains are possible as per the given conditions?
1. 21 2. 25 3. 27 4. 24
9. If due to some technical reason, train service after station 5 is completely stopped, then how many slow trains are possible?
1. 15 2. 7 3. 18 4. 9
10. If due to some technical reason fast trains cannot stop at station 5, then how many different fast trains are possible?
1. 6 2. 7 3. 8 4. 11
11. If the fast trains cannot stop at any two consecutive stations, then how many different fast trains are possible?
1. 7 2. 3 3. 12 4. 5
12. If the slow trains can only start from station 1, then how many different slow trains are possible?
1. 12 2. 6 3. 4 4. 8
13. You are playing cards and you have four cards in your hand facing you: 6, 7, 8 and 9 (not in this order). You want the cards to be placed in descending order from your right to your left. In order to achieve this you take the leftmost card and put it in the last. You then take the third card from the right and put it in last place. What was the previous order of the cards from your perspective?
1. 8, 6, 9, 7 2. 9, 6, 7, 8 3. 6, 8, 9, 7 4. 8, 7, 6, 9

14. Hanish is a chef, he wanted to cook his meal for exact 15 minutes but he is not wearing watch and has just two hourglasses instead. One could measure 7 minutes while the second one can measure 11 minutes. While his dinner was being cooked he turned the hourglasses only 3 times. How can he ensure his dinner is cooked properly?
15. Anshul is 6 year old and has mixed up the bananas. You are the elder sibling and you need to find the solution to this problem. Read carefully what he has done.
- Bananas are kept in 10 baskets.
 - Number of bananas in each basket range from 10 to 20.
 - There are 9 of the baskets which contain bananas weighing 40 g each.
 - There is a single basket in which each banana weighs 50 g.
 - The physical attributes of bananas are same.
 - You have 2 equipment to determine the solution, i.e., an empty basket and a set of scales.
 - You need to go somewhere and you have just enough time to make a single measurement using the scales.
16. Rajesh has a balance scale with 4 weights. With the help of these weights he wants to weigh any weight (whole number) from 1 kg to all the way up to 40 kg. Which 4 weights should he use to achieve this? (He can place weights on both the sides of the scale simultaneously.)
17. Anil has eight baskets, all of which contain 48 coins. Out of these only five baskets contain true coins, while three contain fake coins. Real coins weigh 1 gram more than the fake coins. He does not know what baskets have real coins and what baskets have fake coins. He has a scale which can weigh with a precision of 1 gram. He is allowed to make only one weighing and by using the minimum number of coins, how can he ensure he knows which basket has fake and which real?
18. Your friend has challenged you with a task. He presents 6 balls which look exactly the same but have different labels (which display the weight of the ball). These balls weigh 10, 20, 30, 40, 50 and 60 grams. How can you win the task by determining whether the labels are correct on all of them, but the condition is you can use the balance scale only twice?

 **Answer Key**
Exercise 21.1

- | | | | | | |
|------|-------|------|------|------|------|
| 1. 2 | 2. 2 | 3. 1 | 4. 4 | 5. 2 | 6. 2 |
| 8. 1 | 10. 3 | | | | |

Exercise 21.2

- | | | | | | |
|-------|------|------|-------|-------|-------|
| 1. 4 | 2. 3 | 3. 1 | 4. 2 | 5. 4 | 6. 4 |
| 7. 2 | 8. 3 | 9. 4 | 10. 1 | 11. 2 | 12. 2 |
| 13. 1 | | | | | |

 **Explanatory Answers**
Exercise 21.1**Answers for questions 1 and 2:**

1. 800 bags can be divided into groups of

→ 267 267 266
 → 89 89 89
 → 30 30 29
 → 10 10 10
 → 3 3 4
 → 2 2
 → 1 1

Thus, 7 weighings are required.

Ans 2

2. The 40 bags can be distributed in 2 groups of

→ 20 20
 → 10 10
 → 5 5
 → 2 2 1

At the last step 3 weighings are required as a spring balance is used.

∴ Minimum number of weighings = 6.

Ans 2

3. The minimum number is 5 and they should weigh 1, 3, 9, 27 and 81 kg.

Ans 1

4. Divide the balls into three groups of 27 balls each. Balance one such group against another. If the scales balance we know that the heavy ball is in the third group; if they do not balance the side that goes down contains the wanted ball. Thus, in either case, the first weighing helps us in determining the group of 27 balls, which contains the heavy ball. Next, we take the group with the heavy ball and split it further into three sub-groups of nine balls each. Balancing one sub-group against another would, with identical reasoning, tell which set of nine contains the heavy ball and do the same with nine balls to get a set of three. Finally, by balancing any two balls of the concerned subgroup against each other, the fourth weighing, would enable us to determine the heavy ball.

Ans 4

5. When 1 weight of 1 kg is there with that we can weigh 1 kg. Next time we can weigh 2 kg. Next time we can weight 4 kg. Next time 8 kg can be weighed. After that we can weight 16 kg and so on. And after 7 weighing operations the whole wheat would be weighed.

Ans 2

6. Any card drawn will be a A, 2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, or K, so there are 13 possibilities each time a card is drawn. The fastest way to draw a four of a kind is if the first four cards all have the same “value.” The slowest way, which provides the solution, is to first draw 13 three of a kind, and then one more card. Since $13 \times 3 + 1 = 40$, if 40 cards are drawn it is guaranteed that those forty cards contain at least one four of a kind.

Ans 2

7. From left to right: the Ace of spade, Ace of heart, and King of hearts. OR: Ace of hearts, Ace of spade, King of hearts, OR: Ace of spade, King of hearts, Ace of hearts

8. Every time area reduces by a factor of 6.

So original area is $= 4 \times 6 \times 6 \times 6 = 864 \text{ cm}^2$.

Breadth = 18 cm, thus length = 48 cm.

Ans 1

9. Put the eggs on to boil and start both hourglasses running. When the 4-minute one runs out, turn it over immediately so it starts counting 4-minutes again. When the 7-minute one runs out, turn it over so it starts counting again. The moment the 4-minute one runs out for the second time, turn the 7-minute hourglass over – it will have only been running exactly one minute. Let the sand run back again (1 minute more) and then take the eggs off straight away, because they will have boiled for 9 minutes. (4 minutes twice, plus one more minute = 9 minutes!)

10. He could list all combinations, but noticing the doubling of each weight (5,10, 20, 40, 80) we can see what happens as we introduce each weight (I include “0 g” as a weighing on purpose): 5 g: can weigh 0 g or 5 g (2 possibilities); 5 g and 10 g: can weigh 0 g or 5 g or 10 g or 15 g (4 possibilities); 5 g, 10 g and 20 g: can weigh 0 g or 5 g or 10 g or 15 g or 20 g or 25 g or 30 g or 35 g (8 possibilities); It doubles each time! So with 4 weights there are 16 possibilities. And with 5 weights there are 32 possibilities.

And with 6 weights there are 64 possibilities. If you don’t like “0 g” as a weighing, just subtract one, for an answer of 63.

Ans 3

Exercise 21.2

Answers for questions 1 to 6:

Table 2

Group I	Points	G.S	G.R
Brazil	10	15	12
Croatia	10	12	8
England			
France	—		

Group II	Points	G.S	G.R
Argentina	6 or 8 or 10		
Denmark	6 or 8 or 10		
Germany	12 or 8 or 4		
Holland	0		

Let x goals were scored by Brazil against England and France. Therefore, goals received will be, $x - 1$ and $x - 2$.

$$\therefore x - 1 + x - 2 + 3 = 12 \Rightarrow x = 6$$

Goals received by Croatia = Goals scored by Brazil against England + 2 = 6 + 2 = 8

1. I. This statement is false as Croatia will reach the finals as the difference in its goals scored and received is the highest.

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- II. This is true.
- III. This can be true, if it wins all the three matches against Argentina, Denmark and Holland.
- IV. This can be true if Argentina's difference between goals scored and received is maximum.
- V. This can be true if Denmark's difference between goal scored and received is maximum. **Ans 4**
2. Brazil received one less and two less against England and France not necessarily in the given order. Thus, England scored 4 or 5 goals against Brazil. **Ans 3**
3. Brazil scored 6 goals against France. **Ans 1**
4. If Brazil won the cup, then its difference in goals scored and received must have been maximum as it has equal point to Croatia. Croatia's difference is 4 and Brazil's difference is 3. Hence, Brazil should have a difference of 5. Hence, Brazil should have scored 17 goals. **Ans 2**
5. If Germany won the cup, it must have earned 12 points in the semifinals or earned 8 points and qualified on goal difference. **Ans 3**
6. We cannot say anything about this as we do not know the result of the match which France played against England. **Ans 4**

Answers for questions 7 to 12:

7. Different possibilities of fast trains will be,

$0 \rightarrow 9, 0 \rightarrow 1 \rightarrow 8, 0 \rightarrow 2 \rightarrow 7, 0 \rightarrow 3 \rightarrow 6,$
 $\rightarrow 4 \rightarrow 5, 0 \rightarrow 1 \rightarrow 3 \rightarrow 5, 0 \rightarrow 1 \rightarrow 2 \rightarrow 6,$
 $0 \rightarrow 2 \rightarrow 3 \rightarrow 4.$

Ans 2

8. Different possibilities of slow trains will be,

$0 \rightarrow 1 \rightarrow 2$
 $0 \rightarrow 1 \rightarrow 2 \rightarrow 3$
 $0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5$
 $0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6$
 $0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8$
 $0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9$
 $1 \rightarrow 2$
 $1 \rightarrow 2 \rightarrow 3$
 $1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5$
 $1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6$
 $1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8$
 $1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9$
 $2 \rightarrow 3 \rightarrow 4$
 $2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7$
 $3 \rightarrow 4 \rightarrow 5$
 $3 \rightarrow 4 \rightarrow 5 \rightarrow 6$

$3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8$

$3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9$

$4 \rightarrow 5$

$4 \rightarrow 5 \rightarrow 6$

$4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8$

$4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9$

$5 \rightarrow 6 \rightarrow 7$

$6 \rightarrow 7 \rightarrow 8$

$6 \rightarrow 7 \rightarrow 8 \rightarrow 9$

$7 \rightarrow 8$

$7 \rightarrow 8 \rightarrow 9.$

Ans 3

9. If slow trains service at station 6, 7, 8 and 9 is stopped. There, the only possibilities are,

$0 \rightarrow 1 \rightarrow 2, 2 \rightarrow 3 \rightarrow 4, 1 \rightarrow 2, 3 \rightarrow 4 \rightarrow 5,$

$4 \rightarrow 5, 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5,$

$0 \rightarrow 1 \rightarrow 2 \rightarrow 3, 0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5,$

$1 \rightarrow 2 \rightarrow 3.$

Ans 4

10. If fast trains cannot stop at station 5, then the possibilities are,

$0 \rightarrow 9, 0 \rightarrow 1 \rightarrow 8, 0 \rightarrow 2 \rightarrow 7, 0 \rightarrow 3 \rightarrow 6, 0 \rightarrow 1 \rightarrow 2 \rightarrow 6, 0 \rightarrow 2 \rightarrow 3 \rightarrow 4.$

Ans 1

11. If fast trains cannot stop at any two consecutive stations, then the possibilities are,

$0 \rightarrow 9, 0 \rightarrow 2 \rightarrow 7, 0 \rightarrow 3 \rightarrow 6$

Ans 2

12. If the slow trains can only start from station 1, then the possibilities are,

$1 \rightarrow 2, 1 \rightarrow 2 \rightarrow 3, 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5,$

$1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6,$

$1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8,$

$1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9.$

Ans 2

13. 8, 6, 9, and 7 from his perspective.

Ans 1

14. When the cooking began, Hanish started both hourglasses running. When the 7 min hourglass ran out, he turned it around. 4 minutes later, the 11 min hourglass ran out, and he promptly turned the 7 min hourglass around again, so the 4 min ran back again. $11 + 4 = 15$, and the meal was done.

Note: This could also have been done with one less flip:

* Start both (11-min and 7-min) hourglasses, but not the cooking.

* When the smaller one runs out, start the cooking. The bigger hourglass has 4 min to go.

* When the bigger hourglass also runs out, just flip it to measure out 11 more min.

* Dinner is cooked when the bigger hourglass runs out for the 2nd time.

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15. Number Each Basket from 1 to 10. Select 1 Banana from basket 1. Select 2 Bananas from basket 2 etc. You will now have $(1 + 2 + \dots + 10) = 55$ Bananas. If they all weighed 40 g, then the scales would show $55 \times 40 = 2200$ g. But if the weight was, say, 2250 g, then you would know that there 5 bananas that weigh an extra 10 g, so the basket with the heavier bananas must be basket 5.
16. He needs a 1 kg, 3 kg, 9 kg, and a 27 kg weight. He can achieve different weights by changing the sides of the weights. For instance, a 3 kg weight on the right and a 1 kg weight on the left would let you weigh 2 kg on the left.
17. This is an example of tribonacci series. Take out 0 (no coin from the first basket), 1 (one coin from the second basket etc.), 2, 4, 7, 13, 24, 44 coins (from the last, 8th, basket). Each triple is unique enabling an easy way to identify the baskets with fake coins (using only 95 coins).
18. First weigh the balls labelled 10, 20, 30 against the one labelled 60. In the absence of balance the problem is solved in 1 weighing. The only time when the weights may be equal is when 60 is labelled correctly. But not only that, if the first weighing shows a balance, the balls labelled 10, 20, 30 may only be misnamed among themselves, and so are the balls labelled 40, 50.

So assume that and move to a second weighing. Weigh balls 10, 60 against balls 30, 50. If the 40 labels are correct then all labels are correct and the pair {30, 50} outweighs the pair {10, 60}. This is the only case where that may happen. Indeed, mislabelling in the groups {10, 20, 30} and {40, 50} may only result in the weight of the pair {30, 50} to go down and the weight of the pair {10, 60} to go up.

Chapter 22

Data Interpretation

22.1 Introduction

Data interpretation as the name suggests includes reading, understanding, organizing and most importantly interpreting the data provided so as to derive meaningful conclusions. The four most important ways of representation of data, i.e., Tables, Bar Charts, $X - Y$ charts and Pie-Charts are dealt within this unit.

1. Tables
2. Bar Charts
 - i. Simple bar chart
 - ii. Component bar chart
 - iii. Multiple bar charts
 - iv. Deviation bar chart
3. $X - Y$ charts
 - i. Single dependent variable
 - ii. More than one dependent variable
 - iii. Graphs with two scales
 - iv. Range Graphs
 - vii. Band graphs
4. Pie Charts

22.2 Tables

In a table, all the data is arranged systematically in rows and columns. A benefit of tabular representation is that it makes complicated information easier to understand. It helps not only to make comparisons, but also to draw quick conclusions.

22.2.1 Understanding of Tables

In case of a table, you are required to observe closely row headings and column headings. If you understand them well, then the significance of any number written in any cell can be understood.

For example: Table 1 gives the data of the number of call-getters in different years in five different colleges.

Table 1

Sr. No.	Name of College	2001	2002	2003	2004
1.	MDI	229	229	190	187
2.	IIFT	105	151	234	222
3.	UBS	97	201	73	58
4.	IMT	137	170	180	195
5.	NMIMS	166	201	182	174

- The number of call-getters in IIFT in the year 2001 is 105.
- The difference between the number of call-getters in IIFT 2003 and the number of call-getters in NMIMS in 2004 = $234 - 174 = 60$.

One of the drawbacks with tables is that the given data calls for much closer reading in comparison to other forms of graphical data presentation and so it takes more time to make comparisons.

Directions for example 1 to 3: Refer to Table 2 and answer the following questions.

Table 2 depicts the daily wages of freshers and experienced employees (in Rupees) of two different Industrial units for 6 different years.

Table 2

Year	Industrial unit A		Industrial unit B	
	Experienced	Fresher	Experienced	Fresher
2007	90	90	100	140
2008	155	125	130	180
2009	95	115	150	170
2010	225	208	240	200
2011	170	140	140	160
2012	220	180	280	170

Example 1: What is the difference between the daily wages of experienced workers of industrial unit A and industrial unit B in the year 2011?

1. Rs. 55 2. Rs. 30 3. Rs. 50 4. Rs. 45

Solution: Daily wages of experienced workers of industrial unit B in 2011 = Rs. 140.

Daily wages of experienced workers of industrial unit A in 2011 = Rs. 170.

$$\therefore \text{Difference in wages} = 170 - 140 = 30.$$

Ans 2

Example 2: What is the ratio of the daily wages of fresher workers of industrial unit A to that of industrial unit B in the year 2010?

1. 25 : 27 2. 20 : 27 3. 26 : 25 4. None of these

Solution: Daily wages of fresher's of industrial unit A in 2010 = Rs. 208.

Daily wages of freshers of industrial unit B in 2010 = Rs. 200.

$$\therefore \text{Required ratio} = 208 : 200 = 26 : 25.$$

Ans 3

Example 3: The daily wages of the fresher's of industrial unit *B* in all the given years exceed the daily wages of the fresher's of industrial unit *A* in all the given years by

1. Rs. 162 2. Rs. 136 3. Rs. 168 4. Rs. 186

Solution: Total daily wages of fresher's of industrial unit *B* = Rs. 1020.

Total daily wages of fresher's of industrial unit *A* = Rs. 858.

$$\therefore \text{Required difference} = 1020 - 858 = \text{Rs. } 162.$$

Ans 1

22.3 Bar Charts

A bar chart as the name suggests consists of bars. In a bar chart, the height of the bar is a measure of the quantity that it represents. Bars may be vertical or horizontal. They may be separated from each other by spaces or may be placed adjacent to each other. Bar charts can be categorized as following:

22.3.1 Simple Bar Chart

These types of bar charts can be represented by horizontal bars or vertical. For example, in Figure 1, bar chart shows the number of migrants in the state *X* (in thousands).

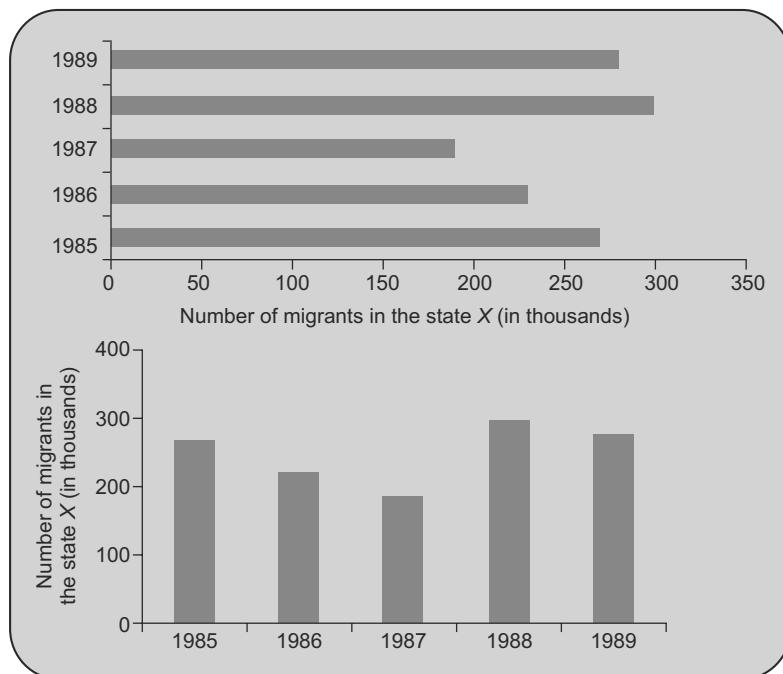


Figure 1

■ Understanding of Simple Bar Chart:

To read the corresponding value of a period on *Y*-axis, we imagine a line parallel to *X*-axis from the top of the bar and the point where it coincides the *Y*-axis is the value on *Y*-axis. For example, the value for the year 1986 depicts the value 230,000 on *Y*-axis. While reading the *Y*-axis the unit on *Y*-axis also plays an important role. Hence, the value for year 1988 is 300,000 migrants.

22.3.2 Component Bar Chart

These types of charts have bars comprising various components.

This type of graph is also sometimes called stacked or cumulative bar graph. Here, the bars which are used to indicate the individual categories are stacked to reach a total, either in absolute data terms or percentage terms.

■ Understanding of Component Bar Chart:

Reading of this type of chart is similar to simple bar chart, but as the bars are stacked one over the other, full bar gives the total value of the bar and from the shaded components we can find out the individual values. Hence in the given graph for year 2001 in Figure 2, X represents 5, Y represents $(12 - 5) = 7$ and Z represents $(20 - 12) = 8$.

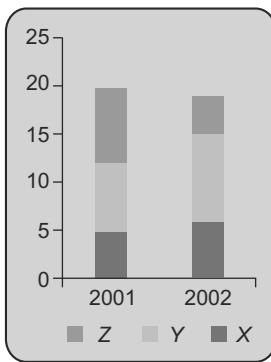


Figure 2

22.3.3 Multiple Bar Chart

These type of bar charts as shown in the Figure 3 have two or more sets of interrelated variable.

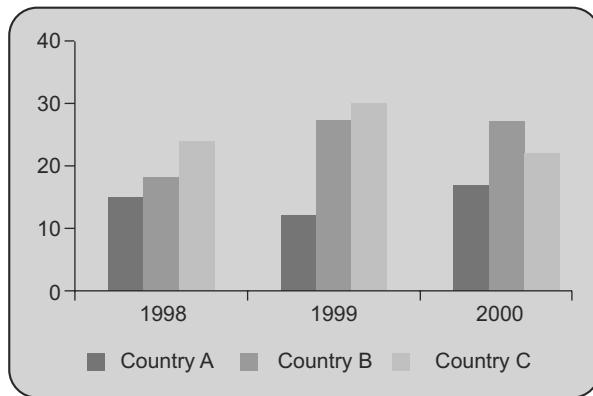


Figure 3

■ Understanding of Multiple Bar Chart:

This type of graph simultaneously gives the value of multiple items in one graph. In the graph shown in Figure 3, the GDP of three different countries A , B and C are given in the year 1998, 1999 and 2000. The reading

of such graph is same as that to simple graph but if the gridlines are not given, like in the above case making it sometimes difficult to read. In such type of graphs you should draw or imagine a line parallel to X -axis from the top of the bar with a pencil and read the respective values on Y -axis. In the graph in Figure 3, the country A depicts the value 17 and B represents value 27 for year 2000.

22.3.4 Deviation Bar Chart

It represents the aspect of data representation wherein we have to depict both positive and negative values. These are specially used to graphically present the net quantities, i.e., surplus and deficit, profit and loss, net of import and exports, temperature, etc. Positive values are shown above the baseline and negative below the baseline.

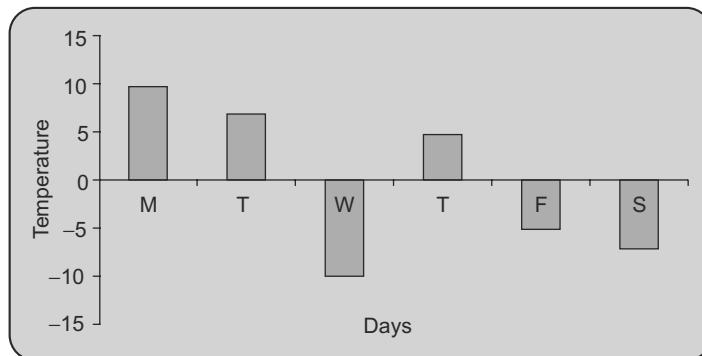


Figure 4

■ Understanding of Deviation bar chart

As shown in the above deviation bar chart (Figure 4) are the temperatures on various days of the week. You can read this graph in the same way as simple graph but here the values on Y -axis are both negative and positive, whereas in simple graph, only positive values are given.

22.3.5 Broken Bar Chart

Sometimes the values to be represented are very large. These are used for representing very large values along with small values, which is not possible to represent as per scale. Such charts have a broken mark integrated in them.

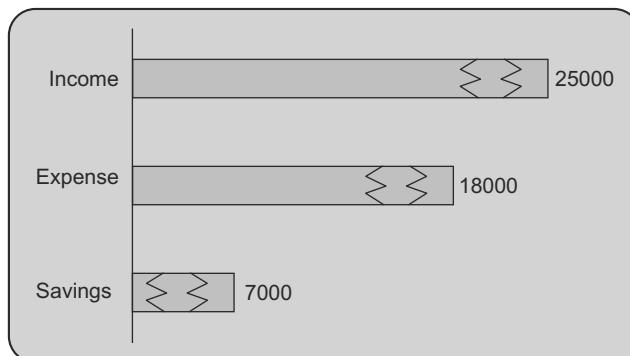


Figure 5

Directions for examples 4 to 7: Refer to the following bar graph and answer the following questions.

In the graph given in Figure 6, the X-axis represents the years and Y-axis represents the rainfall in centimetres.

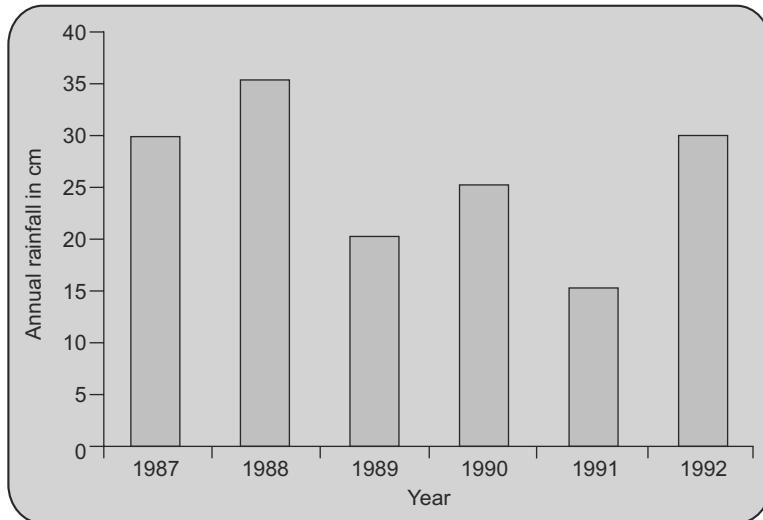


Figure 6

Example 4: The sum of rainfall in the years 1989 and 1991 is equal to that in

1. 1987 2. 1988 3. 1990 4. 1992

Solution: Sum of rainfall in 1989 and 1991 = $(20 + 15)$ cm = 35 cm = rainfall in 1988.

Ans 2

Example 5: The difference of rainfall for the years 1988 and 1992 is

1. 50 2. 10 3. 5 4. 10

Solution: Difference in rainfall in 1988 and 1992 = $35 - 30 = 5$ cm.

Ans 3

Example 6: The percentage increase in rainfall from 1991 to 1992 was

1. 15% 2. 30% 3. 50% 4. 100%

Solution: Rainfall in 1991 = 15

Rainfall in 1992 = 30

$$\therefore \text{Percentage increase} = \frac{30 - 15}{15} \times 100 = 100\%.$$

Ans 4

Example 7: The two years between which the rate of change of rainfall is minimum are

1. 1987 and 1988 2. 1989 and 1990 3. 1990 and 1991 4. 1991 and 1992.

Solution: Rate of change of rainfall:

$$\text{In 1988: } \frac{35 - 30}{30} \times 100 = 16 \frac{2}{3} \%$$

$$\text{In 1990: } \frac{25 - 20}{25} \times 100 = 20 \%$$

$$\text{In 1991: } \frac{15 - 25}{25} \times 100 = 40\%$$

$$\text{In 1992: } \frac{30 - 15}{15} \times 100 = 100\%$$

So the change is minimum between 1987 and 1988.

Ans 1

Directions for examples 8 to 11: Refer to the following bar graph and answer the following questions.

The following bar chart gives the percentage of five different types of motorcycles produced by a company during two years. Total number of motorcycles produced in 2006 = 450000 and total number of motorcycles produced in 2007 = 520000.

Example 8: What was the difference in the production of C type motorcycles between 2006 and 2007?

- | | |
|----------|----------|
| 1. 50000 | 2. 31000 |
| 3. 10000 | 4. 25000 |

Solution: Production of C type motorcycles in 2006 = $0.3 \times 450000 = 135000$.

Production of C type motorcycles in 2007 = $0.2 \times 520000 = 104000$.

∴ required difference = $135000 - 104000 = 31000$.

Ans 2

Example 9: If 85% of E type motor cycles produced during 2006 and 2007 are being sold by the company, then how many E type motor cycles are left unsold by the company?

- | | | | |
|-----------|----------|----------|------------------|
| 1. 142800 | 2. 21825 | 3. 29100 | 4. None of these |
|-----------|----------|----------|------------------|

Solution: Number of E type motor cycles produced during 2006 = $0.2 \times 450000 = 90000$.

Number of E type motor cycles produced during 2007 = $0.1 \times 520000 = 52000$.

Total production = $90000 + 52000 = 142000$.

∴ Number of E type motor cycles left unsold by the company = $0.15 \times 142000 = 21300$.

Hence the answer is none of these.

Ans 4

Example 10: In which of the following types of motorcycles was the percentage increase from 2006 to 2007, maximum?

- | | | | |
|------|------|------|------|
| 1. A | 2. E | 3. D | 4. B |
|------|------|------|------|

Solution: From direct visualization, the correct answer is D.

Ans 3

Example 11: If the number of A type motorcycles manufactured in 2007 was the same as that of 2006, what would have been its approximate percentage share in the total production of 2007?

- | | | | |
|-------|-------|-------|------|
| 1. 11 | 2. 13 | 3. 15 | 4. 9 |
|-------|-------|-------|------|

Solution: Production of A type motorcycles in 2007 = Production of A type motorcycles in 2006 = $0.15 \times 450000 = 67500$.

$$\text{Required \% share} = \frac{67500}{520000} \times 100 \approx 13\%.$$

Ans 4

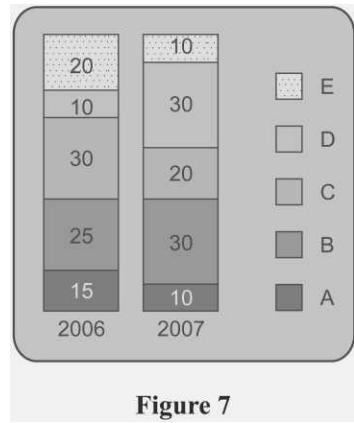


Figure 7

22.4 X-Y Charts

A line ($X-Y$) graph shows the variation of a given quantity with respect to the two parameters calibrated on the Y axis and X axis. In some of the cases, the quantity is measured with respect to time. It is a useful and simple method of presenting the data. These are useful for finding out the rate of change, determining trends and for illustrating comparisons. These are easier to understand than the bar chart and table.

- i. X -axis mostly represents the time parameter (may be year or month) and Y -axis represents any other parameter variable with respect to time.
- ii. The line going down indicates decrease in the quantity with time.
- iii. The line going up indicates increase in the quantity with time.
- iv. A horizontal line indicates no change or stagnation in the quantity over the period.

$X-Y$ charts can be classified as follows:

22.4.1 Single Dependent Variable

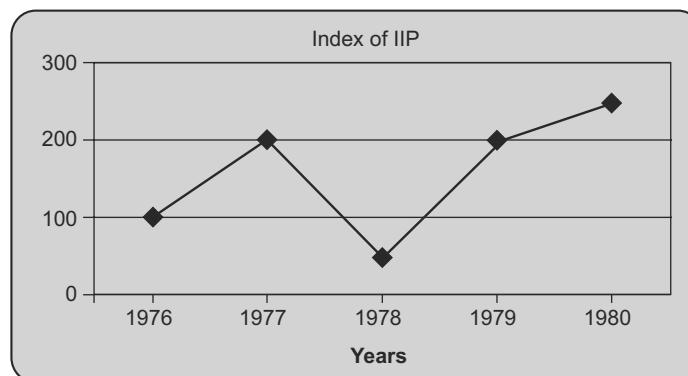


Figure 8

Understanding of single dependent variable chart

Line graph reading is similar to bar graph reading, but the only difference is that in bar graph, top point of the bar is read correspondingly on Y -axis; while in line chart the points plotted are read.

In this type of line graph only one single dependent is given on Y -axis. The corresponding value of IIP index in 1976 corresponds to 100 on Y -axis. Similarly, the index in various years can be read.

22.4.2 More than one Dependent Variable

■ Understanding of Charts with More than one Dependent Variable

The only difference between this type of graph and the previously shown graph is that the number of variables on Y axes is more than one. In this case there are two variables on Y -axis, Metal A and Metal B . The line joining the points plotted (\blacktriangle) shows the quantity of metal A and the line joining the points (\blacklozenge) shows the quantity of metal B . This graph is read in a similar way as the above graph. Production of metal A and metal B in 1997 is 500 tonnes and 300 tonnes respectively.

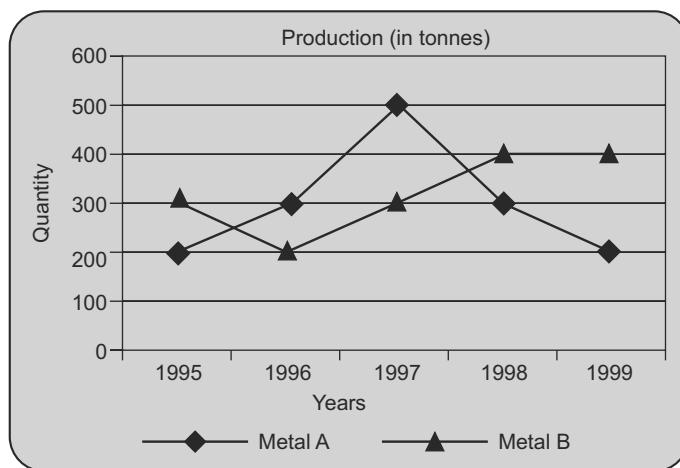


Figure 9

22.4.3 Range Graph–Difference between two Extreme Values

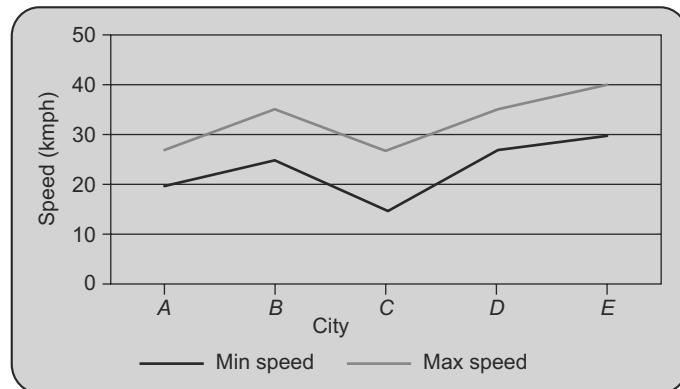


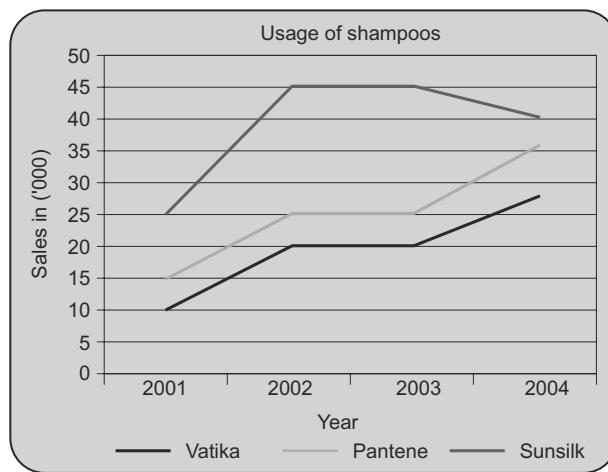
Figure 10

■ Understanding of Range Graph

This graph has more than one independent variable present in it. This type of graph can also be used to show the difference in ranges between two extreme values. In this graph, the example of permissible speed limits in different cities is considered. The difference in maximum and minimum speed in City B is $(35 - 25) = 10$ kmph. The unit of speed is given on Y-axis.

22.4.4 Band Graph

A band graph as the name suggests cumulates the value of various variables on one axis (i.e. one year). The following band chart (Figure 11) shows the number of women users in India, using three different varieties of shampoos in four different years.

**Figure 11**

■ Understanding of Band Graph

These are just like component bar charts which we have discussed above. Most important aspect of these graphs is that it is cumulative in form and the topmost line shows the total value of the variable on Y-axis.

It is due to their cumulative nature that they never cross each other.

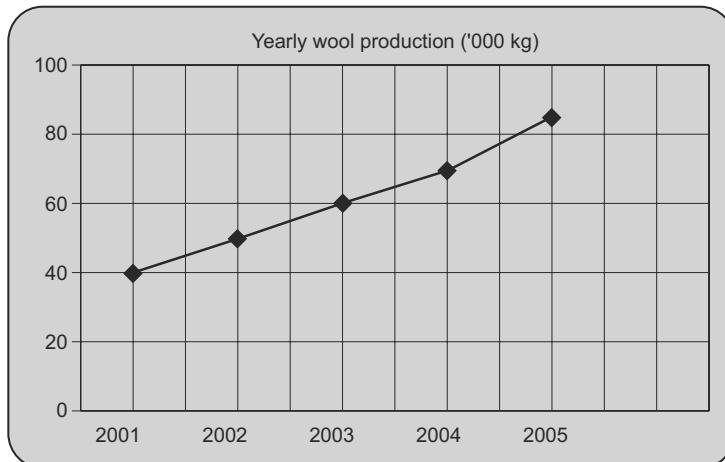
In the above band chart, in 2001, the number of women in India (in '000) using Sunsilk shampoo = 10; those using Pantene shampoo = 15 – 10 = 5 and those using Vatika shampoo = 25 – 15 = 10.

Also, the total number of women in India using shampoos, in 2003 = 45000 of which, 20000 use Vatika shampoo, 25000 – 20000 = 5000 use Pantene shampoo and 45000 – 25000 = 20000 use Sunsilk shampoo.

If there had been some fourth variable, then its value = (Total value – value of first variable – value of second variable – value of third variable).

Directions for example 12 to 14: Refer to the following graph and answer the following questions.

The graph given in Figure 12 depicts yearly wool production (in '000 kg).

**Figure 12**

Example 12: Which year recorded maximum percentage growth in wool production?

1. 2002 2. 2003 3. 2004 4. 2005

Solution: By comparing percentage increases of all the five years, answer will be obvious: Ans 1

Table 3

Year From – To	Increase in quantity	Increase in percentage
2001–2002	10,000	$\frac{10000}{40000} \times 100 = 25\%$
2002–2003	10,000	$\frac{10000}{50000} \times 100 = 20\%$
2003–2004	12,000 (Approx.)	$\frac{12000}{60000} \times 100 = 20\%$
2004–2005	13,000 (Approx.)	$\frac{13000}{72000} \times 100 = 18\%$

Example 13: Which year recorded least percentage growth in wool production?

1. 2002 2. 2003 3. 2004 4. 2005

Solution: From the calculations shown in the earlier example we can see that the least percentage growth is in year 2005, i.e. 18%. Ans 4

Example 14: Which two years have same percentage growth in wool production?

1. 2002 and 03 2. 2003 and 04 3. 2004 and 05 4. 2005 and 06

Solution: From the calculations shown in Example 12, we can say that in years 2003 and 2004, the percentage increase is same, i.e. 20%. Ans 2

Directions for example 15 to 19: Refer to the following chart and answer the following questions.

The following chart gives the percent of women employees in two companies in 6 years.

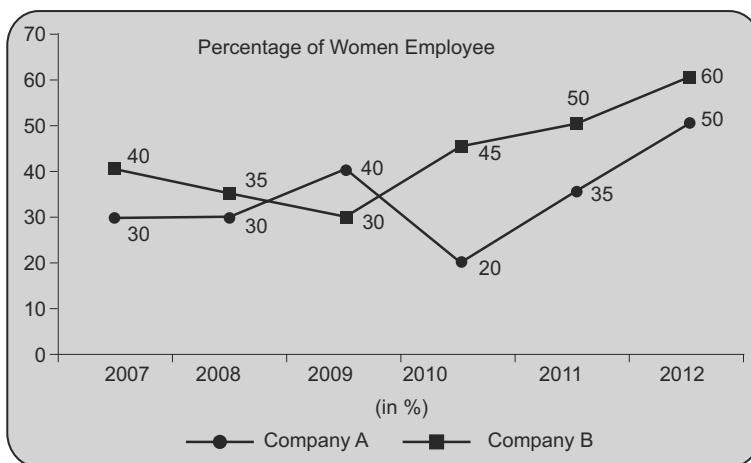


Figure 13

Example 15: If total number of employees are 200 in company B in year 2010 then what is the number of female employees?

1. 100 2. 90 3. 110 4. 120

Solution: Number of female employees = $200 \times \frac{45}{100} = 90$.

Ans 2

Example 16: If the number of employees of Company A in 2012 was 600, what was the number of male employees?

1. 360 2. 480 3. 300 4. 450

Solution: Number of male employees = $600 \times \frac{50}{100} = 300$.

Ans 3

Example 17: What is difference in number male employees of company B in 2008 and 2009?

1. 5 2. 15
3. 10 4. Cannot be determined

Solution: As total number of employees is not given, hence the answer cannot be determined.

Ans 4

Example 18: If total number of employees in both the companies in all the years is equal, then which year has least number of female employees?

1. 2009 2. 2008 and 2010 3. 2011 4. 2007

Solution: As the number of employees is same throughout, therefore year having least number of female employees will be one which has the least percentage of female employees. Herein both 2008 and 2010 has 32.5% ($45 + 20 / 2$) female employees.

Ans 2

Example 19: If in the year 2011, total number of employees in company B is 800 and 10% of females are at executive level positions, then what is the number of females occupying non-executive positions?

1. 360 2. 400 3. 420 4. 320

Solution: Number of female employees in 2011 in company B = $\frac{50}{100} \times 800 = 400$

90% of the 400 female employees has non-executive positions = 360.

Ans 1

22.5 Pie Charts

22.5.1 Understanding of Pie Charts

Pie chart refers to the representation of data in the circular form. When a person wants to read the data given in the form of pie-charts, he should start reading the chart from top position moving in the clockwise direction.

Sometimes the data in pie chart is given in absolute form or in degrees or percentage form. If no sign of degrees or percentage is mentioned with the values given then you should first check the total of the data given in the pie. Above Pie chart represents the sales of different products P, Q, R, S and T.

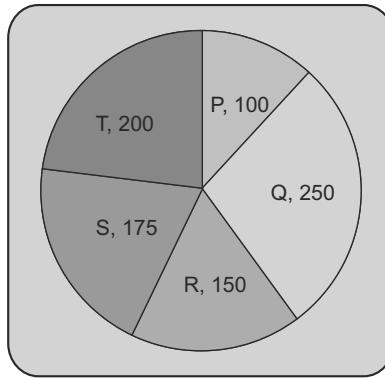


Figure 14

- If the total comes out to be 100 (i.e. if when $P + Q + R + S + T = 100$), then values are given in percentage.
- If the total equals 360 (i.e. when $P + Q + R + S + T = 360$), then the values are given in degrees.
- If the total comes out to be some other value as in this case (i.e. when $P + Q + R + S + T = 875(n)$, here n denotes a natural number), then the values are given in absolute term.

All the above forms, in which the values can be presented, can be used interchangeably, i.e., they can be converted from one form to the other.

For example, in the pie chart given above, the sales of product P are 100 and total sales are 875. We can convert this piece of information in

- **Degree terms:** $100\% = 360$ degrees
- **Absolute value:** Total sales = 875

$$\text{In percentage terms} = \frac{100}{875} \times 100 = 11.42\%$$

- The total of the angles of the circle is 360 degrees.
- 1% on a pie-chart will be represented by 3.6 degrees.

$$1\% = \frac{360^\circ}{100} = 3.6^\circ$$

In the pie chart shown in Figure 15, it is given that total number of drinks ordered in a month is 4200

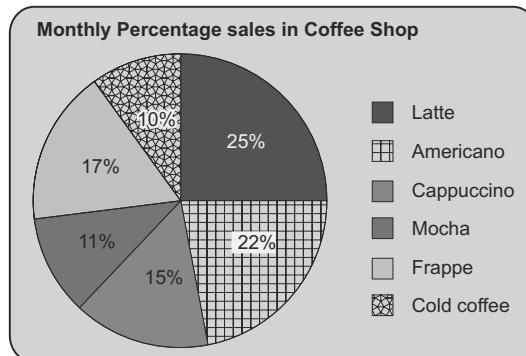


Figure 15

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- 15 % of 4200 is 630. Therefore, number of cappuccino sold in a month is 630.
- The difference between Americano and Mocha is $(22 - 11)\%$ 11% of 4200, i.e., 462.

22.5.2 Single pie charts

Directions for examples 20 to 23: Refer to the following pie chart and answer the following questions.

The following pie chart is depicting the total monthly budget of family 'X'.

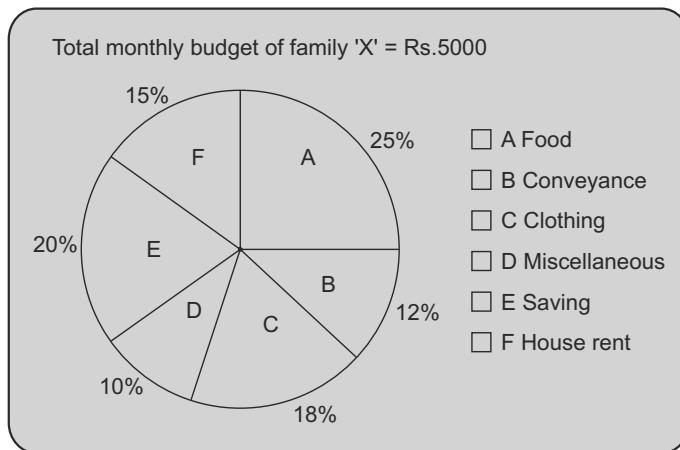


Figure 16

Example 20: How much amount is spent on conveyance per month by family X?

1. Rs. 650
2. Rs. 660
3. Rs. 600
4. Rs. 625

Solution: When a question based on pie chart comes, we should know which part of the data to take. In this question amount spent per month on conveyance by family 'X' is being asked. Therefore, the information which we require is the total income and the percentage of the total which is spent on conveyance. Total monthly income = Rs. 5000.

$$\% \text{ of total income spent on conveyance} = 12\%$$

$$\text{Hence the amount spent on conveyance} = \text{Rs. } 5000 \times 0.12 = \text{Rs. } 600.$$

Ans 3

Example 21: How much house rent is paid by the family per month?

1. Rs. 650
2. Rs. 760
3. Rs. 730
4. Rs. 750

Solution: The house rent is 15% of the total budget i.e. $5000 \times 0.15 = \text{Rs. } 750$.

Ans 4

Example 22: How many degrees should be there in the central angle of the sector for miscellaneous expenses?

1. 60°
2. 55°
3. 46°
4. 36°

Solution: Miscellaneous expenses are 10% of the budget. Hence the angle in the central sector representing miscellaneous expenses = $360 \times 0.10 = 36^\circ$.

Ans 4

Example 23: How much total expenses are incurred on food, clothing and conveyance every month?

1. Rs. 2200 2. Rs. 2750 3. Rs. 2000 4. Rs. 2500

Solution: Total expenses incurred on food, clothing and conveyance every month = $(25 + 18 + 12) \% = \text{Rs. } 55\% \text{ of } 5000 = \text{Rs. } 2750$.
Ans 2



Exercise 22.1

Directions for questions 1 to 5: Refer to the following table and answer the following questions.

The table given below gives the movement of share prices of few companies over a two-week period in DSE.

Table 4

Company	Nov 06	Nov 13
JCC	1227	1163.10
AK Cement	71.65	67.75
Scorts	78.05	69.45
Samiza	9.10	8.45
TMW	860	905
Lever	1550	1537
Ind Motors	10.70	10.10
ICI	27.80	27.20
CTI	644.50	605
CTL	5	95
Jyp	11.75	10.50
MLM	85.50	77.05
Tesle	404.80	363
Agrio	10.85	14
Axby	610.10	532
ISB	204.45	205
Colte	199	182.25
IUT Master	11	10.35

1. Which company's share price changed by the maximum percentage during the period from Nov 06 to Nov 13?
 1. CTL 2. CTI 3. Colte 4. Agrio

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2. Which company's shares increased by the minimum percentage during the given period?
 1. TMW
 2. ISB
 3. MLM
 4. Agrio
3. The value of shares of which company remained the steadiest during the given period?
 1. IUT Master
 2. Lever
 3. Samiza
 4. CTL
4. The number of companies whose performance improved during the given period is
 1. Four
 2. Three
 3. Two
 4. None of these
5. Which script was the best performer at The DSE during the given period? [A script is said to be the best performer if its share value has increased by the maximum amount.]
 1. ISB
 2. CTL
 3. Jyp
 4. TMW

Directions for questions 6 to 10: Refer to the following information and answer the following questions.

The following table records the performance of department of surgery of a hospital for the period of July to December of a certain year. The table shows the month of surgery, total successful operations done and the total number of operations performed. Department of Surgery does primarily two types of surgeries, i.e., Heart and Brain.

Table 5

Department of Surgery, MG Hospital

Month	Total Successful Operations		Total Number of Operations performed
	Heart	Brain	
July	12	31	50
August	13	19	40
September	13	12	34
October	14	21	42
November	21	12	45
December	11	22	44

6. How many successful operations were performed in this period?
 1. 201
 2. 202
 3. 205
 4. 210
7. What percentage of operations was successful during the given period?
 1. 75%
 2. 78%
 3. 68%
 4. 65%
8. Which month had largest number of unsuccessful surgeries as per data given?
 1. November
 2. October
 3. December
 4. July
9. Which month had largest number of successful surgeries?
 1. November
 2. October
 3. December
 4. July
10. If there are 50 more operations left to be performed, then how many operations must be successful in order to make the overall percentage of successful operations equal to 80?
 1. 39
 2. 35
 3. 43
 4. 34

Directions for questions 11 to 15: Refer to the following bar graph and answer the following questions.

The following bar graph gives the sales (in lakh Rs.) of three different types of drinks, i.e. milk shakes, soft drinks and fruit juice in 6 different years.

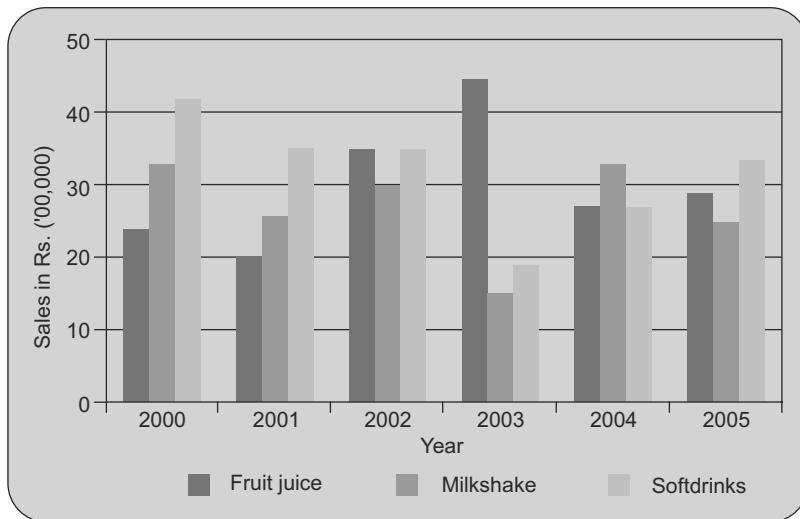


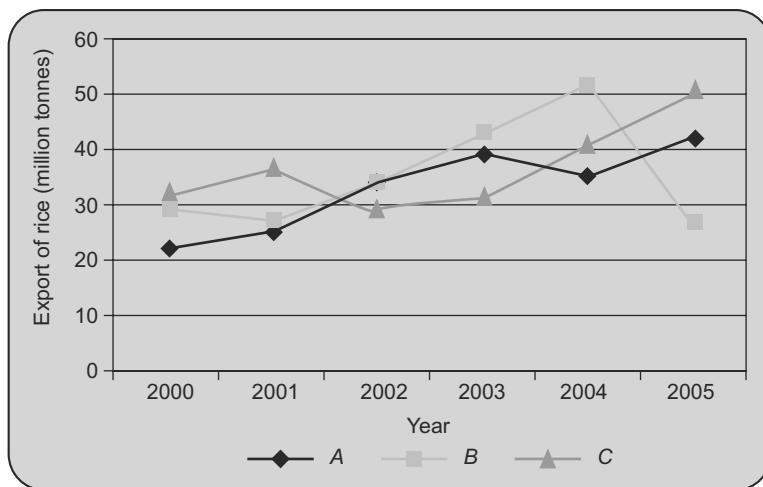
Figure 17

11. In which year was the sale of Fruit juice the maximum?
 1. 2003 2. 2001 3. 2002 4. 2001
12. Which drinks category has minimum average of the three in the given period?
 1. Soft drinks only 2. Fruit juice only
 3. Milkshake only 4. soft drinks and milkshake has same
13. In case of milkshakes, what was the approximate percent increase in sale in 2004 over its sale in 2003?
 1. 108 2. 120 3. 105 4. 115
14. In the year 2005, what was the difference between the sales of Fruit juice and soft drinks?
 1. Rs. 5000000 2. Rs. 1000000 3. Rs. 400000 4. Rs. 500000
15. What was the approximate percentage increase in sale of Fruit juice in 2003 over its sale in 2002?
 1. 28 2. 35 3. 38 4. 20

Directions for questions 16 to 20: Refer to the following chart and answer the following questions.

The following chart gives the exports of rice (in million tons) by three countries in 6 different years.

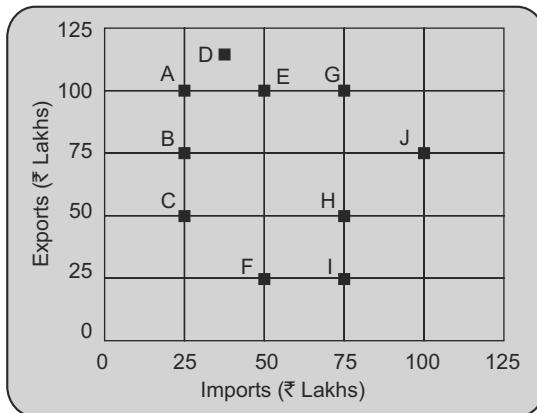
16. In which of the following years, the export made by country B was equal to the average exports made by it over the given years?
 1. 2002 2. 2003 3. 2004 4. 2005
17. In which of the following years was the difference between the exports made by country B and C the maximum?
 1. 2003 2. 2004 3. 2005 4. 2002
18. In which of the following years, was the exports made by country A and country B same?
 1. 2005 2. 2004 3. 2003 4. 2002

**Figure 18**

19. What was the percentage increase in exports of country B from 2001 to 2002?
 1. 20 2. 30 3. 26 4. 40
20. In which of the above 6 years, was the total exports made by all the three countries together the maximum?
 1. 2000 2. 2001 3. 2003 4. 2004

Directions for questions 21 to 22: Refer to the following questions.

Each point in the graph below shows the value of imports and exports in (Rs.) Lakh of countries named A, B, C, D, E, F, G, H, I and J.

**Figure 19**

21. For how many countries does the import exceed Rs. 70 lakhs?
 1. 1 2. 3 3. 2 4. 4
22. For how many countries, the export value is greater than imports?
 1. 3 2. 5 3. 6 4. 1

Directions for questions 23 to 27: Refer to the Figure 20 and answer the questions that follow. (Take $\pi = 22/7$)

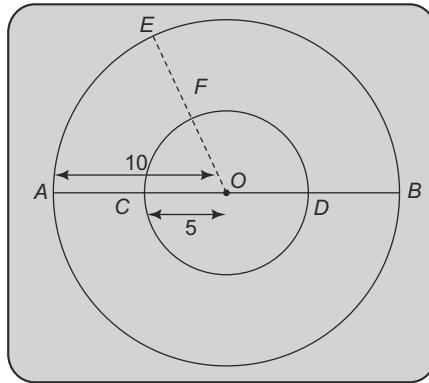


Figure 20

23. What is the ratio of the area of the inner circle to that of the outer circle?
 1. 1 : 4 2. 1 : 2 3. 5 : 4 4. 25 : 24
24. What is the approximate distance between O to D if one were to travel first from O to C and then from C to D along the curved path?
 1. 12 2. 21 3. 25 4. 28
25. If the road is required to be built on the ring route (between the outer and the inner circle), what would be the approximate area of the road?
 1. 200 2. 278 3. 283 4. 235
26. In how much time approximately will a person reach B from A along the curved path travelling at 3 units per minute
 1. 12 min 2. 16 min 3. 10 min 4. 14 min
27. If $AOE = 45^\circ$, which is the second longest among AE , EF , FD , DB , BA ?
 1. BA 2. FD 3. AE 4. EF

Directions for questions 28 to 30: Refer to the figure 21 and answer the questions that follow.

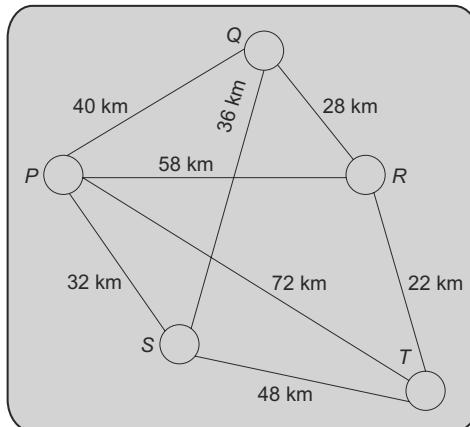


Figure 21

28. By what distance is the straight line journey from P to T shorter than via S ?
 1. 10 km 2. 8 km 3. 12 km 4. 6 km
29. If one drives from city P to city T via R only, with a speed of 40 km per hour, how much time it will take to reach T ?
 1. 1 h 20 min 2. 2 h 40 min 3. 2 h 4. 1 h 35 min
30. Assuming that one makes a round trip from P via Q , R , T and S in 5 hours, a man completes his journey up to T in a span of 3 hours. What should be his speed if he has to complete the rest of the journey in the stipulated time?
 1. 35 km/h 2. 40 km/h 3. 38 km/h 4. 32 km/h

Exercise 22.2

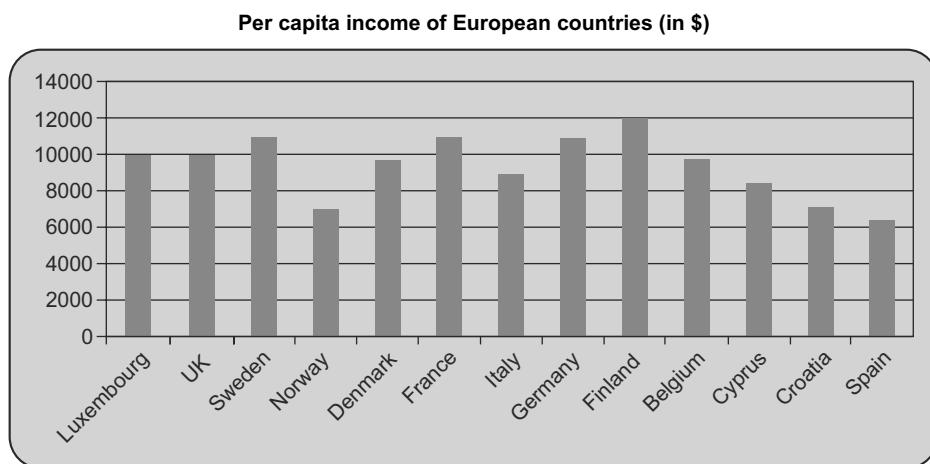
Directions for questions 1 to 4: The following table gives the percentage distribution of population in five years on the basis of poverty line and also on the basis of gender.

Table 6

Year	Percentage of Population below the Poverty Line	Proportion of Males and Females	
		Below Poverty Line	Above Poverty Line
		M : F	M : F
1990	35	5 : 6	6 : 7
1991	25	3 : 5	4 : 5
1992	24	1 : 2	2 : 3
1993	19	3 : 2	4 : 3
1994	15	5 : 3	3 : 2

- If the male population above poverty line in year 1992 is 1.9 million, then the total population in 1992 is?
 1. 4.5 million 2. 4.85 million 3. 5.35 million 4. 6.25 million
- What will be the number of females above the poverty line in the year 1993 if it is known that the population in year 1993 is 7 million?
 1. 3 million 2. 2.43 million 3. 1.33 million 4. 5.7 million
- What will be the male population above poverty line in year 1990 if the female population below poverty line in the same year is 2.1 million?
 1. 2.1 million 2. 2.3 million 3. 2.7 million 4. 3.3 million
- If the population of males below poverty line in 1991 is 2.4 million and in 1994 is 6 million, then the total populations in 1991 and 1994 are in the ratio?
 1. 1 : 3 2. 2 : 5 3. 3 : 7 4. 4 : 9

Directions for questions 5 to 9: Answer the following questions based on per capita income of European countries in year 2012

**Figure 22**

5. The ratio of the highest and the lowest per capita income of country is?
 1. 3.44
 2. 2.85
 3. 2.12
 4. 1.85
6. What is the average per capita income of Spain, Finland and Belgium?
 1. 9400 \$
 2. 11025 \$
 3. 10025 \$
 4. None of these
7. Which of the following countries has lowest per capita income as compare to other countries given in the options?
 1. France
 2. Luxembourg
 3. Denmark
 4. Sweden
8. What is the ratio of per capita income of Belgium and Cyprus?
 1. 2.03
 2. 1.15
 3. 0.80
 4. 0.95
9. What was the per capita income of Germany in year 2014?
 1. 11880\$
 2. 10080\$
 3. 10880\$
 4. Cannot be Determined

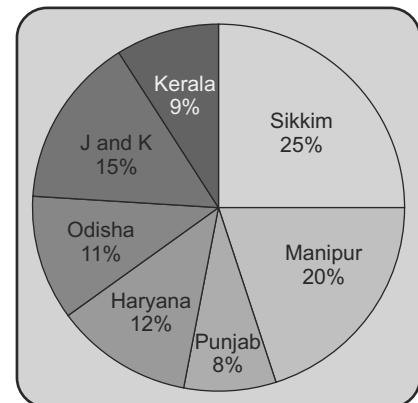
Directions for questions 10 to 14: Study the following graph and the table and answer the questions given below.

Data of different states regarding population of states in the year 1998.

Table 7

Total population of the given States = 3276000.

States	Sex and Literacywise Population Ratio			
	Sex		Literacy	
	M	F	Literate	Illiterate
Sikkim	5	3	2	7
Manipur	3	1	1	4
Punjab	2	3	2	1
Haryana	3	5	3	2
Odisha	3	4	4	1
J&K	3	2	7	2
Kerala	3	4	9	4

**Figure 23**

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10. What will be the percentage of total number of males in J&K, Manipur and Haryana together to the total population of all the given states?
1. 25% 2. 27.5% 3. 28.5% 4. 31.5%
11. What was the total number of illiterate people in Sikkim and Manipur in 1998?
1. 876040 2. 932170 3. 981550 4. 1161160
12. What is the ratio of the number of females in Kerala to the number of females in Punjab?
1. 7:5 2. 9:7 3. 13:11 4. 15:14
13. What was the number of males in J&K in the year 1998?
1. 254650 2. 294840 3. 321470 4. 341200
14. If in the year 1998, there was an increase of 10% in the population of J&K and 12% in the population of Manipur compared to the previous year, then what was the ratio of populations of J&K and Manipur in 1997?
1. 42 : 55 2. 48 : 55 3. 7 : 11 4. 4 : 5

Directions for Questions 15 to 19: Study the following line graph which gives the number of employees who joined and left the organization, from 1980 to 1985.

Initial number of employees in 1979 = 2000.

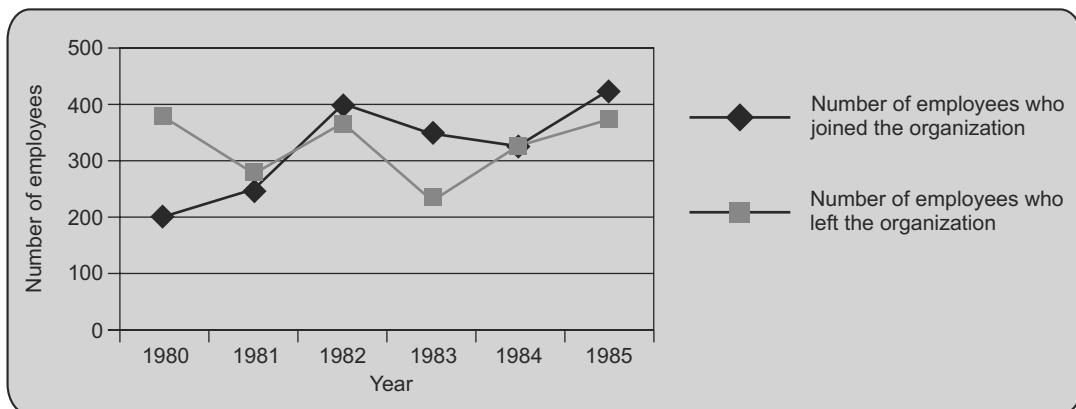


Figure 24

15. The number of employees in the organization in the year 1982 was?
1. 2000 2. 1825 3. 1935 4. 1925
16. For which year, the percentage rise/fall in the number of employees who left the organization compared to the previous year is maximum?
1. 1984 2. 1983 3. 1982 4. 1981
17. The percentage increase/decrease in strength of organization from 1984 to 1985 is ?
1. - 1.2% 2. 1.7% 3. 2.3% 4. - 2.4%
18. The number of employees in 1981 was what percent of the number in 1982?
1. 92.13% 2. 93.75% 3. 98.35% 4. 97.25%

Answer Key

Exercise 22.1

1. 1	2. 2	3. 2	4. 1	5. 2	6. 1
7. 2	8. 1	9. 4	10. 3	11. 1	12. 3
13. 2	14. 4	15. 1	16. 1	17. 3	18. 4
19. 3	20. 4	21. 4	22. 3	23. 1	24. 2
25. 4	26. 3	27. 2	28. 2	29. 3	30. 2

Exercise 22.2

1. 4	2. 2	3. 4	4. 2	5. 4	6. 1
7. 3	8. 2	9. 4	10. 3	11. 4	12. 4
13. 2	14. 1	15. 2	16. 1	17. 3	18. 3

Explanatory Answers

Exercise 22.1

1. Percentage change = $\frac{\text{Price on Nov 13} - \text{Price on Nov 06}}{\text{Price on Nov 06}} \times 100$

For the given options,

Table 8

Company	Change	% Change
Agrio	3.15	29%
CTI	39.5	6.1%
Colte	16.75	8.4%
CTL	90	1800%

Ans 1

2. In this question MLM can be rejected as MLM shares have decreased.

Now considering TMW & ISB & Agrio:

TMW's shares increased by $\frac{905 - 860}{860} \times 100 \approx 5.3\%$; Agrio's shares inc. by =29% from previous example

ISB's shares increased by $\frac{205 - 204.45}{204.45} \times 100 \approx 0.27\%$.

Ans 2

3. Most steady means the share which has lowest % change.

Table 9

Company	% Change
IUT Master	6%
Lever	0.83%
Samiza	7%
CTL	1800%

Lever has minimum % change.

Ans 2

4. From the given table, we can see that the performance of four companies —TMW, Agrio, CTL and ISB improved during the given period. **Ans 1**
5. By best performer we mean whose shares increased the most. CTL's share increased by Rs. 90 which is the highest. Hence the answer is CTL. **Ans 2**
6. Total number of successful operations = 201. **Ans 1**
7. Out of the total 255 operations performed, 201 were successful.

$$\text{Hence required percentage} = \frac{201}{255} \times 100 = 78\%.$$

Ans 2

8. November has the largest number of unsuccessful operations. **Ans 1**
9. July has the largest number of successful surgeries. **Ans 4**
10. To make 80% of 255 + 50 surgeries successful, we need 244 surgeries to be successful. Since there are already 201 successful operations performed, there should be $(244 - 201) = 43$ successful operations out of the next fifty to make overall percentage 80. **Ans 3**
11. Sale of Fruit juice was maximum in the year 2003. Hence the answer is option 1. **Ans 1**
12. Average annual sale of:

$$\text{Fruit juice} = \frac{24 + 20 + 35 + 45 + 27 + 29}{6} = \text{Rs. } 30,00,000;$$

$$\text{Soft drinks} = \frac{42 + 35 + 35 + 19 + 27 + 34}{6} = \text{Rs. } 32,00,000;$$

$$\text{Milk shakes} = \frac{33 + 26 + 30 + 15 + 33 + 25}{6} = \text{Rs. } 27,00,000$$

So lowest average sale is of Milk Shakes.

Ans 3

13. Required % = $\frac{33 - 15}{15} \times 100 = 120\%.$ **Ans 2**
14. Required difference = Rs. $3400000 - 2900000 = \text{Rs. } 500000.$ **Ans 4**
15. Required % = $\frac{45 - 35}{35} \times 100 = 28.56\%.$ **Ans 1**
16. Average exports made by country B = $\frac{29 + 27 + 34 + 43 + 52 + 27}{6} = 35.33.$

In the year 2002, the exports made by country B is equal to 34 which is approximately equal to 35.33. Hence, answer is 2002.

Ans 1

17. By visual observation, it is clear that 2005 is the required year. **Ans 3**

18. By direct observation, the required years is 2002. **Ans 4**

19. Required % increase = $\frac{34 - 27}{27} \times 100 = 25.92\%$. **Ans 3**

20. From the heights of the points of the three companies, we observe that the total heights of the three points are maximum either in 2005 or 2004. Thus, the value of exports in:

$$2005 = 42 + 27 + 51 = 120;$$

$$2004 = 35 + 52 + 81 = 128.$$

Ans 4

21. Imports exceed 70 lakhs for G, H, I, J. **Ans 4**

22. The export value of A, B, C, D, E and G is greater than the imports value. **Ans 3**

23. The area of the inner circle is $\frac{22}{7} \times (OC)^2 = \frac{22}{7} \times 5^2$

$$\text{The area of the outer circle is } \frac{22}{7} \times (OA)^2 = \frac{22}{7} \times 10^2$$

$$\text{Required ratio} = \frac{22}{7} \times (OC)^2 : \frac{22}{7} \times (OA)^2 = 5^2 : 10^2 = 1 : 4.$$

Ans 1

24. In this case the travel involves straight line travel from O to C and then the travel on the arc between C to D. The distance OC = 5. And the distance CD on the arc will be equal to half of the circumference of the inner circle.

$$\text{Length of arc } CD = \pi r = \frac{22}{7} \times (5) \approx 16$$

Hence the total distance to be travelled would be = 5 + 16 = 21.

Ans 2

25. Area of the ring = (Area of the outer circle) – Area of the inner circle)

$$= \frac{22}{7} \times (10)^2 - \frac{22}{7} \times (5)^2 = \frac{22}{7} \times (100 - 25) = \frac{22}{7} \times 75 \approx 235.$$

Ans 4

26. Distance from B to A = $\frac{22}{7} \times 10 = 31.4$ units. Time taken = ≈ 10 mins. **Ans 3**

27. $\angle AOE = 45^\circ$, Then $AE = \frac{45}{360} \times 2 \times \frac{22}{7} \times 10 = 7.85$; $EF = 5$;

$$FD = \frac{(180 - 45)}{360} \times 2 \times \frac{22}{7} \times 5 = 11.8; DB = 5; BA = 20. \text{ Therefore, the answer is } FD. \quad \text{Ans 2}$$

28. The straight line journey from P to T is 72 km. The journey via S has 2 parts. One is PS which is 32 km and the other part is ST which is 48 km. Thus the total is 80 km. Thus the journey is shorter by 8 km.

Ans 2

29. The total distance travelled = $(58 + 22) = 80$ km.

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Thus with the speed of 40 km per hour, one would reach in $80/40 = 2$ h

Thus the required time is 2 h.

Ans 3

30. The distance the man has covered in a span of 3 hours is $(40 + 28 + 22) = 90$ km. The remaining distance to be covered $= (48 + 32) = 80$ km.

So the distance of 80 km is required to be covered in a span of 2 h.

Hence the required speed is $80/2 = 40$ km/h.

Ans 2

Exercise 22.2

1. Let the total population in year 1992 be y million.

Then, population above poverty line

$$= [(100 - 24)\% \text{ of } y] \text{ million}$$

$$= 76y/100$$

And so, male population above poverty line

$$= \left[\frac{2}{5} \left(\frac{76}{100} \times y \right) \right] \text{ million}$$

But, it is given that male population above poverty line = 1.9 million.

$$\therefore \frac{2}{5} \left(\frac{76}{100} \times y \right) = 1.9 \Rightarrow y = \frac{5 \times 100 \times 1.9}{76 \times 2} = 6.25.$$

\therefore Total population in year 1992 is = 6.25 million.

Ans 4

2. Total population in year 1993 = 7 million.

\therefore Population above poverty line

$$= [(100 - 19)\% \text{ of } 7] \text{ million}$$

$$= (81\% \text{ of } 7) \text{ million}$$

$$= 5.67 \text{ million}$$

And so, the number of females above poverty line in 1993

$$\left(\frac{3}{7} \times 5.67 \right) \text{ million}$$

$$= 2.43 \text{ million.}$$

Ans 2

3. Female population below poverty line in 1990 = 2.1 million

Let the male population below poverty line in year 1990 be x million.

$$\text{Then, } 5 : 6 = x : 2.1 \Rightarrow x = \frac{2.1 \times 5}{6} = 1.75$$

\therefore Population below poverty line in year 1990 = $(2.1 + 1.75)$ million = 3.85 million.

Let the population above poverty line be y million.

Since, 35% of the total population is below poverty line, therefore, 65% of the total population is above poverty line, i.e., the ratio of population below poverty line to that above poverty line for State P is 35 : 65.

$$\therefore 35 : 65 = 3.85 : y \Rightarrow y = \frac{65 \times 3.85}{35} = 7.15$$

\therefore Population above poverty line = 7.15 million and so, male population above poverty line

$$\left(\frac{6}{13} \times 7.15 \right) \text{ million}$$

= 3.3 million.

Ans 4

4. In year 1991:

Male population below poverty line = 2.4 million.

Let the female population below poverty line be x million.

$$\text{Then, } 3 : 5 = 2.4 : x \Rightarrow x = \frac{5 \times 2.4}{3} = 4$$

\therefore Total population below poverty line = $(2.4 + 4) = 6.4$ million.

If N_q be the total population in 1991, then,

$$25\% \text{ of } N_q = 6.4 \text{ million} \Rightarrow N_q = \left(\frac{6.4 \times 100}{25} \right) \text{ million} = 25.6 \text{ million.}$$

In year 1994:

Male population below poverty line = 6 million.

Let the female population below poverty line be y million.

$$\text{Then, } 5 : 3 = 6 : y \Rightarrow y = \frac{3 \times 6}{5} = 3.6$$

\therefore Total population below poverty line = $(6 + 3.6) = 9.6$ million.

If N_t be the total population in 1994, then

$$15\% \text{ of } N_t = 9.6 \text{ million} \Rightarrow N_t = \left(\frac{9.6 \times 100}{15} \right) \text{ million} = 64 \text{ million}$$

$$\text{Thus, Required ratio} = \frac{N_q}{N_t} = \frac{25.6}{64} = 0.4 = \frac{2}{5}$$

Ans 2

5. The required answer will be equal to $\frac{12000 \text{ (Per Capita Income of Finland)}}{6400 \text{ (Per Capita Income of Spain)}} = 1.87$. (approximated to 1.85).

Ans 4

6. Required Average = $\frac{6400 + 12000 + 9800}{3} = 9400\$$.

Ans 1

7. Out of all the given options, Denmark has lowest per capita income.

Ans 3

8. The required answer is $\frac{9800}{8500} = 1.15$.

Ans 2

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9. The data given is for year 2012 and we cannot predict for year 2014.

Ans 4

$$10. \text{ Number of males in J\&K} = \left[\frac{3}{5} \text{ of } (15\% \text{ of } N) \right] = \frac{3}{5} \times \frac{15}{100} \times N = 9 \times \frac{N}{100}.$$

where $N = 3276000$.

$$\text{Number of males in Manipur} = \left[\frac{3}{4} \text{ of } (20\% \text{ of } N) \right] = \frac{3}{4} \times \frac{20}{100} \times N = 15 \times \frac{N}{100}.$$

$$\text{Number of males in Haryana} = \left[\frac{3}{8} \text{ of } (12\% \text{ of } N) \right] = \frac{3}{8} \times \frac{12}{100} \times N = 4.5 \times \frac{N}{100}.$$

$$\therefore \text{Total number of males in these three states} = (9 + 15 + 4.5) \times \frac{N}{100}$$

$$\left(28.5 \times \frac{N}{100} \right)$$

$$\therefore \text{Required Percentage} = \left[\left(28.5 \times \frac{N}{100} \right) \times \frac{100}{N} \right] \% = 28.5\%.$$

Ans 3

$$11. \text{ No. of illiterate people in Sikkim} = \left[\frac{7}{9} \text{ of } (25\% \text{ of } 3276000) \right] = 637000.$$

$$\text{No. of illiterate people in Manipur} = \left[\frac{4}{5} \text{ of } (20\% \text{ of } 3276000) \right] = 524160.$$

$$\therefore \text{Total number} = (637000 + 524160) = 1161160.$$

Ans 4

$$12. \text{ Required ratio} = \frac{\frac{4}{7} \text{ of } (9\% \text{ of } 3276000)}{\frac{3}{5} \text{ of } (8\% \text{ of } 3276000)}$$

$$= \frac{\left(\frac{4}{7} \times 9 \right)}{\left(\frac{3}{5} \times 8 \right)}$$

$$= \left(\frac{4}{7} \times 9 \times \frac{5}{3} \times \frac{1}{8} \right)$$

$$15/14.$$

Ans 4

$$13. \text{ Number of males in J\&K} \left[\frac{3}{5} \text{ of } (15\% \text{ of } 3276000) \right]$$

$$= \frac{3}{5} \times \frac{15}{100} \times 3276000$$

$$= 294840.$$

Ans 2

14. Let x be the population of J&K in 1997. Then,

$$\text{Population of J&K in 1998} = 110\% \text{ of } x = \frac{110}{100} \times x$$

Also, let y be the population of Manipur in 1997. Then,

$$\text{Population of Manipur in 1998} = 112\% \text{ of } y = \frac{112}{100} \times y$$

$$\text{Ratio of populations of J&K and Manipur in 1998} = \frac{\left(\frac{110}{100} \times x\right)}{\left(\frac{112}{100} \times y\right)} = \frac{110x}{112y}$$

From the pie-chart, this ratio is $\frac{15}{20}$

$$\therefore \frac{110x}{112y} = \frac{15}{20} \Rightarrow \frac{x}{y} = \frac{15}{20} \times \frac{112}{110} = \frac{42}{55}$$

Thus, ratio of populations of J&K and Manipur in 1997 = $x : y = 42 : 55$.

Ans 1

15. The number of employees in various years:

In 1979 = 2000 (given).

In 1980 = $2000 - 375 + 200 = 1825$.

In 1981 = $1825 - 280 + 250 = 1795$.

In 1982 = $1795 - 370 + 400 = 1825$.

In 1983 = $1825 - 230 + 350 = 1945$.

In 1984 = $1945 - 330 + 325 = 1940$.

In 1985 = $1940 - 380 + 425 = 1985$.

So, in 1982 number of employees = 1825.

Ans 2

16. The percentage rise/fall in the number of employees who left the organization (compared to the previous year) during various years is:

$$\text{For 1981} = \left[\frac{(375 - 280)}{375} \times 100 \right] \% = 33\% \text{ (fall).}$$

$$\text{For 1982} = \left[\frac{(370 - 280)}{280} \times 100 \right] \% = 32\% \text{ (rise).}$$

$$\text{For 1983} = \left[\frac{(370 - 230)}{370} \times 100 \right] \% = 37\% \text{ (fall).}$$

$$\text{For 1984} = \left[\frac{(330 - 230)}{230} \times 100 \right] \% = 43\% \text{ (rise).}$$

$$\text{For 1985} = \left[\frac{(380 - 330)}{330} \times 100 \right] \% = 15\% \text{ (rise).}$$

Clearly, the maximum percentage rise/fall is for 1984.

Ans 1

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17. Strength in 1984 = 1940

Strength in 1985 = 1985

Increase = 1985 – 1940 = 45

% Increase = $45 \times 100 / 1940 = 2.3\%$.

Ans 3

18. Required percentage = $\left(\frac{1795}{1825} \times 100 \right) \% = 98.35\%$

Ans 3

Chapter 23

Data Sufficiency

23.1 Introduction

A standard *data sufficiency (DS)* set would be like a question followed by two statements and you have to check that the data is sufficient to find the answer or not, i.e., whether one of the two or both the statements are sufficient to get a unique answer for the given question.

The DS questions are always solved in a systematic manner. By answering *three basic questions*, you can always arrive at the correct option. In addition, if you can answer any one of the three questions, the possibility of elimination of at least one of the choices exists and hence one can make intelligent guesses to get to the answer.

The three basic questions always remain as following:

- I. Is the FIRST statement alone sufficient to solve the problem?
- II. Is the SECOND statement alone sufficient to solve the problem?
- III. Are BOTH the statements together sufficient to solve the problem?

Answer to the above questions should be given in Yes or No only. As a general rule, try to answer the questions in order given above.

Example 1: Does Shubham earn more than Jatin?

- I. Shubham earns more than Rahul.
- II. Rahul earns more than Jatin

Solution: In this question, we can see that we have to establish a definite relationship between the incomes of Shubham and Jatin. With the help of statement I, we get a relationship that Shubham earns more than Rahul ($S > R$). But this statement is not sufficient in establishing the relationship between the income of Shubham and Jatin. Data statement II gives us that Rahul earns more than Jatin ($R > J$). This also does not give us the required relationship. But if we consider both the statements, we can see that $S > R$ and $R > J$. Thus, we can conclude that $S > J$, i.e., Shubham earns more than Jatin, and hence a unique answer can be obtained for the given question by using both the statements together.

Example 2: What is the value of M ?

- I. $M^2 - 6M + 9 = 0$
- II. $M^2 + Z^2 = 36$.

Solution: In this question, we can see that we need to find the value of M from the given data. Statement I gives us a quadratic equation which on solving gives $(M - 3)^2 = 0$. Thus, $M = 3$ is an answer that can be obtained from this statement. Data statement II does not help us conclude anything, because until the value of Z is also known, value of M cannot be found. Hence, only the first statement, i.e., statement I gives us an answer.

23.2 Overview

Types of DS questions

- 5 — Options DS
- 4 — Options DS (Direct)
- 4 — Options DS (Twister)
- 4 — Options DS (Guaranteed Answers)

23.2.1 5 – Options DS

The directions for these types of questions are given as follows:

- If statement I alone is sufficient to solve the question, but statement II alone is not.
- If statement II alone is sufficient to solve the question, but statement I alone is not.
- If neither statement I nor statement II is individually sufficient to solve the question, but a combination of both is sufficient to solve the question.
- If both the statements I and II are individually sufficient to solve the question.
- If neither of the statements alone, nor both the statements taken together are sufficient and more information is required to solve the question.

The above-mentioned statements can be summarized as per Table 1:

Table 1

Directions	Mathematical Representation	Answer
If statement I alone is sufficient to solve the questions, but statement II alone is not.	I ✓ and II ✗	1
If statement II alone is sufficient to solve the questions, but statement I alone is not.	I ✗ and II ✓	2
If neither statement I nor statement II is individually sufficient to solve the question, but a combination of both is sufficient to solve the question.	I ✗ and II ✗, but (I and II) ✓	3
If both the statements I and II are individually sufficient to solve the questions	I ✓ and II ✓	4
If both the statements taken together are not sufficient and more information is required to solve the question.	I ✗, II ✗ and (I and II) ✗	5

■ Understanding of the Three Basic Questions

If the answer to question I is *Yes*, then the only possible choice are (1) and (4). Now if the answer to question II is *Yes*, the choice must be (4) and if the answer to question II is *No*, the choice must be (1). If the answer to question I is *No*, then the only possible choice are (2), (3) or (5). Now if the answer to question II is *Yes*, then the choice must be (2), and if the answer to question II is *No*, the only possible choices are (3) or (5).

Finally if the answer to question III is *Yes*, the correct choice is (3) and if the answer to question III is *No*, the choice is (5).

The discussion above can also be understood by the flow in Figure 1.

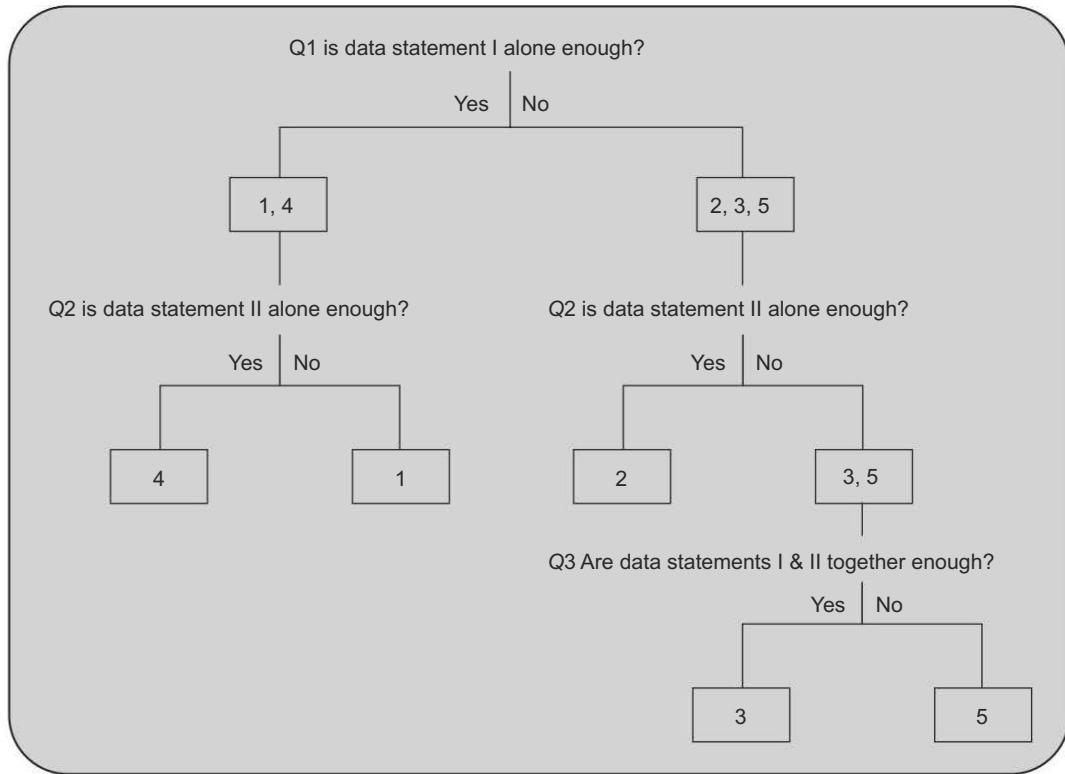


Figure 1

Example 3: Anuj, Barkha and Chandan score some marks in a Mathematics test. Does Anuj score more than Barkha? (Only these three students appear for the test)

- I. Barkha scores the same marks as Chandan.
- II. Chandan scores the lowest marks and at least one person scores different marks from the other two.

Solution: Statement I states that Barkha and Chandan score same marks in a test they take. But here nothing can be concluded as nothing is mentioned about the marks scored by Anuj. Thus, this statement alone cannot answer the question.

Statement II says that Chandan scores the lowest. This statement alone is also not sufficient to answer the question as it does not give us any information on marks scored by Anuj and Barkha. When we combine both the statements, we know that Barkha also scores the lowest marks and hence Anuj definitely scores more marks than Barkha.

Ans 3

Example 4: If K is an integer between 20 and 1200 (excluding these two numbers), what is the value of K ?

- I. One of K 's digits is 7 more than the other and the sum of its digits is 11.
- II. $K < 60$

Solution: Statement I: Let one of the digits of K be x . Then its other digit = $x + 7$.

$$\text{Also, } x + x + 7 = 11 \Rightarrow x = 2.$$

Thus, K can be 29 or 92. Since no unique answer can be obtained, hence this statement alone is not sufficient.

From statement II we know that K is less than 60. Here K can have any value between 20 and 60 (both excluding).

So, this statement alone is also not sufficient.

By combining both the statements, we can say that $K = 29$.

Ans 3

22.2.2 4 – Options DS (Direct)

The directions for these types of questions are given as follows:

1. If statement I alone is sufficient to solve the questions but statement II alone is not.
2. If statement II alone is sufficient to solve the question, but statement I alone is not.
3. If neither statement I nor statement II is individually sufficient to solve the question, but a combination of both is sufficient to solve the question.
4. If both the statements taken together are not sufficient and more information is required to solve the question.

The above-mentioned statements can be summarized as per Table 2.

Table 2

Directions	Mathematical Representation	Answer
If statement I alone is sufficient to solve the questions, but statement II alone is not.	I ✓ and II ×	1
If statement II alone is sufficient to solve the questions, but statement I alone is not.	I × and II ✓	2
If neither statement I nor statement II is individually sufficient to solve the question, but a combination of both is sufficient to solve the question.	I × and II ×, but (I & II) ✓	3
If both the statements taken together are not sufficient and more information is required to solve the question.	I ×, II × and (I & II) ×	4

■ Understanding of the three basic questions

If answer to I is *Yes*, the answer is (1), If the answer to I is *No*, either (2), (3) or (4) is the correct choice. Now if the answer to II is *Yes*, answer is (2), If *No*, answer is (3) or (4). If the answer to III is *Yes*, answer is (3) And if the answer to III is *No*, the answer is (4). The discussion can be summarized in the following flow-chart as shown in Figure. 2.

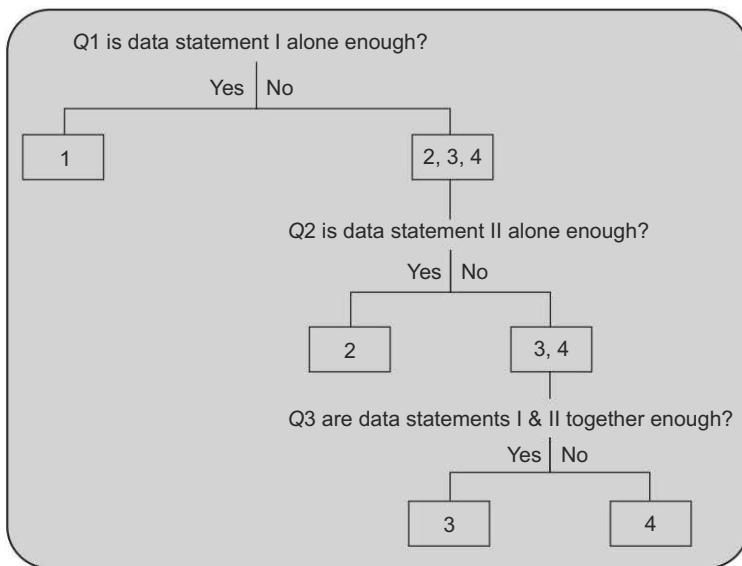


Figure 2

Example 5: What is the area of the triangle shown in Figure 3?

$$\text{I. } 30^\circ < x < 120^\circ \quad \text{II. } d^2 - 9 = 16$$

Solution: From statement I, no unique value of x can be obtained. Hence, this statement alone is not sufficient.

Statement II: $d = 5$. The sides of the triangle form a Pythagorean Triplet. Thus, $x = 90^\circ$. Now, we know that the given triangle is a right angled triangle. Hence, its area can be found out.

Thus, statement II alone is sufficient to answer the question. **Ans 2**

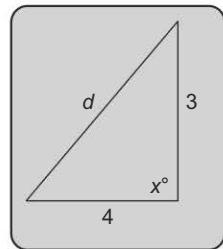


Figure 3

Example 6: What is the average speed of a car going from Lucknow to Delhi?

- I. The distance covered by the car is 450 km.
- II. The time taken to go from Lucknow to Delhi is 9 hours.

Solution: Statement I alone is not sufficient as it does not mention the time taken to cover the distance. Statement II alone is also not sufficient as it does not mention the distance covered. But by combining both the statements, we get the average speed of the car by the formula,

$$\text{Speed} = \frac{\text{DISTANCE}}{\text{TIME}}$$

Ans 3

23.2.3 4 – Options DS (Twister)

The directions for these type of questions are given as follows:

1. If the question can be answered by one of the statements alone but cannot be answered by using the other statement alone.

2. If the question can be answered by using either statement alone.
3. If the question can be answered by using both the statements together, but cannot be answered by using either statement alone.
4. If the question cannot be answered even by using both statements together.

The above-mentioned statements can be summarized as per Table 3.

Table 3

Directions	Mathematical Representation	Answer
If the question can be answered by one of the statements alone, but cannot be answered by using the other statements alone.	I ✓ and II ✗ or I ✗ and II ✓	1
If the question can be answered by using either statement alone.	I ✓ or II ✓	2
If the questions can be answered by using both the statements together, but cannot be answered by using either statement alone.	I ✗ and II ✗, but (I & II) ✓	3
If the question cannot be answered even by using Both statements together.	I ✗, II ✗ and (I & II) ✗	4

■ Understanding of the Three Basic Questions

If answer to I is *Yes*, the answer is (1) or (2). Now if the answer to II is *Yes*, the answer is (2). If the answer to II is *No*, the final answer is (1). If answer to I is *No*, the answer cannot be (2). It has to be (1), (3) or (4). Now if the answer to II is *Yes*, the answer is (1). If the answer to II is *No*, the answer is either (3) or (4). Now the answer to III is *Yes*, final answer is (3), else (4). The discussion can be summarized in the following flow chart in Figure 4.

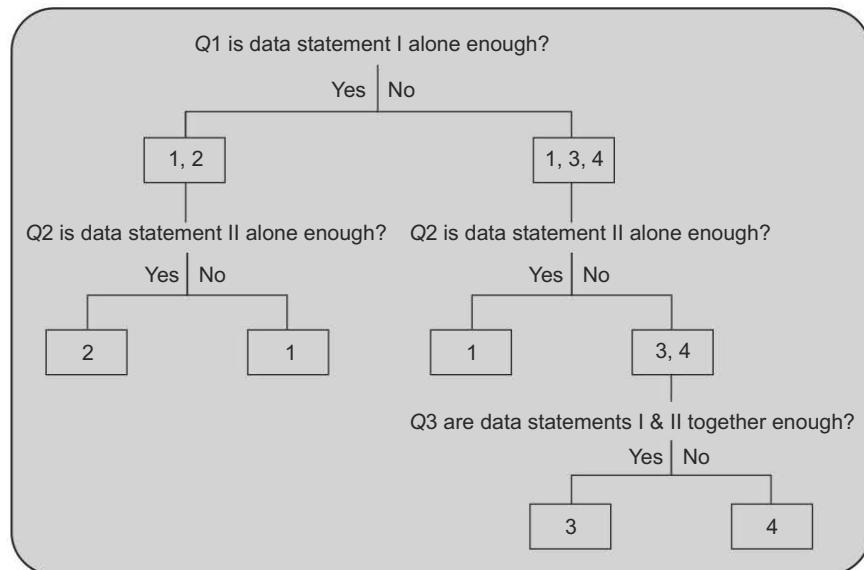


Figure 4

Example 7: In the given figure, A and B are the two transversals on a straight line m . Is $\angle P = 110^\circ$?

- $\angle Q = 130^\circ$
- $\angle S > 90^\circ$

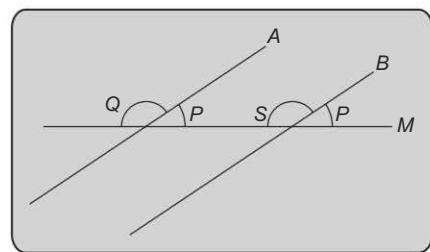
Solution: Statement I says that $Q = 130^\circ$. Thus, by linear pair property, $\angle P = 180 - 130 = 50^\circ$

Thus, statement I alone is sufficient to answer the question.

Statement II alone is not sufficient to answer the question.

Figure 5

Ans 1



Example 8: N is a sequence such that each term is 5 more than the preceding term. What is its fifth term?

- The middle term of N is 56.
- The first term of N is 2.

Solution: Statement I alone is not sufficient to answer the question as the first and the last term of the sequence is not known.

Statement II gives the first term of N as 2. Then, its fifth term will be $2 + 5 + 5 + 5 + 5 = 22$.

Ans 1

23.2.4 4 – Options DS (Guaranteed Answer)

The directions for these types of questions are given as follows:

- If the question can be answered by using statement I alone but not by using statement II alone.
 - If the question can be answered by using statement II alone but not by using statement I alone.
 - If the question can be answered by using either statement alone.
 - If the question can be answered by using both the statements together but not by either statement alone.
- The above-mentioned statements can be summarized as per the Table 4.

Table 4

Directions	Mathematical Representation	Answer
If the question can be answered by using Statement I alone but not by using II alone.	I ✓ and II ✗	1
If the question can be answered by using statement II alone but not by using I alone.	I ✗ and II ✓	2
If the question can be answered by using either statement alone	I ✓ or II ✓	3
If the question can be answered by using both the statements together but not by using either statement alone.	I ✗, II ✗ but (I & II) ✓	4

■ Understanding of the Three Basic Questions

If answer to I is Yes, the answer is (1) or (3). Now if the answer to II is Yes, the answer is (3). If the answer to II is No, the final answer is (1). If answer to I is No, the answer cannot be (1) and (3). It has to be (2) or (4). Now if the answer to II is Yes, the answer is (2). If the answer to II is No, the answer is (4).

The discussion can be summarized in the following flow chart in Figure. 6.

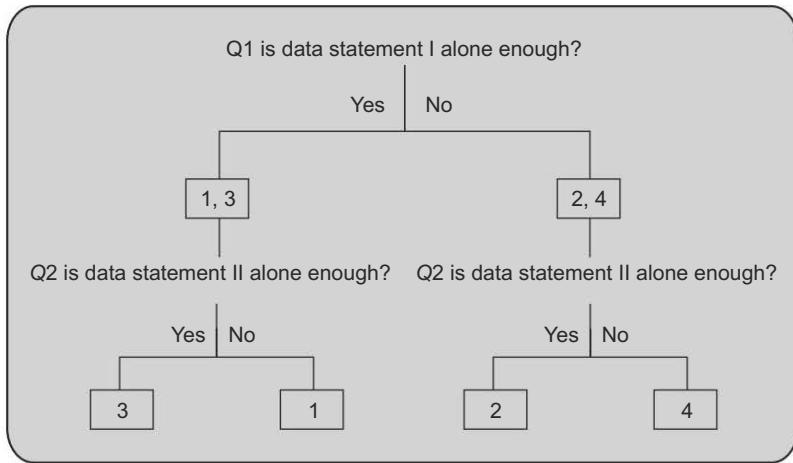


Figure 6

Example 9: During a charity event few members of Rotary Club made a total contribution of Rs. 12,000. Given that each paid equally. Calculate how much had each one to pay?

- Had there been ten members less, each one of the members would have to pay Rs. 100 more.
- Rotary Club has a minimum of 20 members, neither paying more than Rs. 600.

Solution: Statement I alone is sufficient to answer the question as explained in the following:

Let the members be n . So, each member contributes $\frac{12000}{n}$

Now, according to statement I, $\frac{12000}{n-10} - \frac{12000}{n} = 100$. On solving, we get the value of $n = 40$.

Statement II alone is not sufficient to answer the question.

Ans 1

Example 10: Meena takes a non-stop flight from Delhi to New York. She leaves Delhi at 09:00 p.m. on Wednesday. At what time will she reach New York? (Consider Indian Standard Time for New York)

- The average speed of the plane is 800 kmph.
- The distance from Delhi to New York by flight is 16000 km.

Solution: Statement I only gives the average speed of the plane. Hence, this alone is not sufficient to answer the question.

Statement II gives only the distance. Nothing is mentioned about the speed of the plane. Hence this statement alone also cannot answer the question.

On combining the two statements, we get that the time taken by the plane to reach New York from Delhi = $\frac{16000}{800} = 20$ h

Thus, Meena will reach New York at 5 p.m. on Thursday.

Ans 4



Exercise 23.1

Directions for questions 1 to 2: *Mark your answer as*

- If statement I alone is sufficient to solve the question, but statement II alone is not.
 - If statement II alone is sufficient to solve the question, but statement I alone is not.
 - If neither statement I nor statement II is individually sufficient to solve the question, but a combination of both is sufficient to solve the question.
 - If both the statements I & II are individually sufficient to solve the question.
 - If neither of the statement alone, nor both the statements taken together are sufficient and more information is required to solve the question.
1. Determine the value of $M^2 - N^2$?
 - I. $M - N = N + 4$
 - II. $M - N = 5/(M + N)$
 2. A Pen and Pencil cost Rs. 40. What is the cost of the Pencil alone?
 - I. The Pen costs Rs. 30.
 - II. The Pen costs three times as much as the Pencil.

Directions for questions 3 to 5: *Mark your answer as*

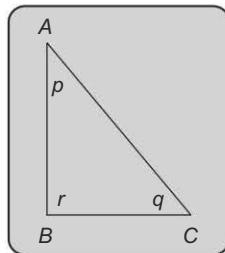
- If statement I alone is sufficient to solve the question but statement II alone is not.
 - If statement II alone is sufficient to solve the question, but statement I alone is not.
 - If neither statement I nor statement II is individually sufficient to solve the question, but a combination of both is sufficient to solve the question.
 - If both the statements taken together are not sufficient and more information is required to solve the question.
3. In an Economics test the average marks of students of class XI is 65. What is the total strength of Class XI?
 - I. The highest and the lowest marks by students of class XI are 90 and 40 respectively.
 - II. If we exclude the highest and the lowest marks, it does not change the average marks of the students.
 4. P, Q and R are real numbers. Is R the smallest of these numbers?
 - I. P is greater than at least one of Q and R .
 - II. Q is greater than at least one of P and R .
 5. Mukesh is fond of 3 subjects i.e. Math, English, Social Science. He keeps his books in the almirah. How many books of English does he have?
 - I. Number of English books is 3 times the number of Math books and the number of Math books is twice the number Social Science books.
 - II. Total number of books is 18.

Directions for question 6: *Mark your answer as*

- If the question can be answered by one of the statements alone but cannot be answered by using the other statement alone.
 - If the question can be answered by using either statement alone
 - If the question can be answered by using both the statements together, but cannot be answered by using either statement alone.
 - If the question cannot be answered even by using both statements together.
6. Calculate the area of triangle ABC .
- $p = y, q = 2y$ and $r = 3y$
 - The side opposite top is 8 and the side opposite q is 6.

Directions for questions 7 and 8: *Mark your answer as*

- If the question can be answered by using statement I alone but not by using statement II alone.
 - If the question can be answered by using statement II alone but not by using statement I alone.
 - If the question can be answered by using either statement alone.
 - If the question can be answered by using both the statements together but not by either statement alone.
7. Determine if g is less than 1? (Given g is a real number)
- $g^3 - 1 = 0$
 - $g^2 + 1 = 0$
8. Is P the square of an integer?
- $\sqrt{P} = 8/7$
 - $P = 225$

**Figure 7****Directions for questions 9 to 12:** *Each question is followed by two statements, I and II. Answer each question using the following instructions:*

Choose 1: If the question can be answered by using one of the statements alone, but cannot be answered using the other statement alone.

Choose 2: If the questions can be answered by using either of the statements alone.

Choose 3: If the question can be answered by using both statements together, but cannot be answered using either of the statements alone.

Choose 4: If the question cannot be answered even by using both statements together.

9. How many students of Triniti cleared CAT-07?
- Not less than 500 students of Triniti cleared CAT-07
 - Not more than 510 students of Triniti cleared CAT-07
10. Calculate X ?
- $73 + X = 205$
 - $X - 43 = 52$
11. What is the value of Z ?
- $Z = 3X^4 + 6X^2 - Y^2$
 - $X = -6, Y = 8$
12. Is P divisible by 2?
- P is divisible by 4.
 - $P = 13$.



Exercise 23.2

Directions for questions 1 to 7: Each question is followed by two statements, I and II. Answer each question using the following instructions:

Choose 1: If the question can be answered by using one of the statements alone, but cannot be answered using the other statement alone.

Choose 2: If the questions can be answered by using either of the statements alone.

Choose 3: If the question can be answered by using both statements together, but cannot be answered using either of the statements alone.

Choose 4: If the question cannot be answered even by using both statements together.

1. What is the area of the given quadrilateral?
I. Length of the diagonal = 30 II. $AB = 6$
2. How much time does a car take to go from Delhi to Chandigarh?
I. It takes 3 hours to go from Delhi to Karnal.
II. It takes 2 hours for car to go from Karnal to Chandigarh.
3. What is the value of M ?
I. $M^2 - 12M + 27 = 0$ II. $M^2 - 16M + 64 = 0$
4. What is the value of $f(f(5))$?
I. $f(x) = x^3 + 3$ for odd x . II. $f(x) = 8x + 3$ for even x .
5. In a class of 160 students, how many students passed in only Physics?
I. 120 students passed in Physics, History or both.
II. In the class, 80 students passed in History.
6. Is $x > 1/x$?
I. $x > 1$ II. $x < 5$
7. Determine if a natural number y , greater than 190, is prime?
I. The number has only five multiples less than 1000.
II. The number is odd and is not a multiple of 5.

Directions for questions 8 to 12: In each of the following problems, there is one question and three statements I, II and III given below the question. You have to decide whether the data given in the statements is sufficient to answer the question. Read all the statements carefully and find which of the statements is/are sufficient to answer the given question. Choose the correct alternative in each question.

8. Where does Meena rank from the top of the list in her class of 80 students?
I. Meena is 6 ranks below Vivek from the top of the list.
II. Vivek's rank from the bottom is 46.
III. Meena is 6 ranks above Vivek from the bottom.
 [1] Only I and II [2] Any two of the three
 [3] All I, II and III [4] Only II and III
 [5] Either I and II or II and III

9. Five Girls – Anukriti, Babita, Chetna, Diksha and Ena are watching a movie in a row. Who is sitting in 3rd spot?
- I. Babita is between Ena and Chetna.
 - II. Babita is to the right of Ena.
 - III. Diksha is between Anukriti and Ena.
- [1] Only I and III [2] Only II and III
[3] Only I and II [4] All I, II and III
[5] None of these
10. How is ‘READ’ written in the code language?
- I. DART is coded as “#* &”
 - II. RATE is coded as “&*)!”.
 - III. HEARD is coded as “@!*&#”.
- [1] Only I and II [2] Only II and III
[3] All I, II and III [4] Either I and II or only III
[5] None of these
11. In which year was Sahil born?
- I. Sahil is five years older than Pankaj.
 - II. Pankaj’s brother was born in 1987.
 - III. Sahil’s brother is three years younger than Pankaj’s brother who was seven years younger than Pankaj.
- [1] Only I and II [2] Only II and III
[3] Only I and III [4] All I, II and III
[5] None of these
12. Who among Salil, Nitin, Vaibhav and Mukesh is the youngest?
- I. Vaibhav is younger than Mukesh but older than Salil and Nitin.
 - II. Mukesh is the oldest.
 - III. Salil is older than Nitin.
- [1] Only I [2] Only I and II
[3] Only II and III [4] Only I and III
[5] None of these

 **Answer Key**

Exercise 23.1

- | | | | | | |
|------|------|------|-------|-------|-------|
| 1. 2 | 2. 4 | 3. 4 | 4. 3 | 5. 3 | 6. 4 |
| 7. 1 | 8. 3 | 9. 4 | 10. 2 | 11. 3 | 12. 2 |

Exercise 23.2

- | | | | | | |
|------|------|------|-------|-------|-------|
| 1. 4 | 2. 3 | 3. 1 | 4. 3 | 5. 3 | 6. 1 |
| 7. 3 | 8. 5 | 9. 1 | 10. 4 | 11. 4 | 12. 4 |

 Explanatory Answers
Exercise 23.1

1. Statement I alone is not sufficient to answer the questions.

On solving statement II, we get $(M - N)(M + N) = 5$, $M^2 - N^2 = 5$.

Ans 2

2. Statement I alone is sufficient to answer the question. From this statement, cost of Pencil = $40 - 30 = \text{Rs. } 10$.

From statement II, we get that cost of Pen (A) = $3 \times \text{cost of Pencil } (B)$.

Now, $A + B = 40 \Rightarrow 3B + B = 40 \Rightarrow B = \text{Rs. } 10$.

Ans 4

3. Statement I alone is not sufficient to answer the question.

Statement II alone is not sufficient to answer the question.

Even by combining both the statements, we do not get the answer.

Ans 4

4. Statement I alone is not sufficient to answer the question as the greater of the two, Q and R cannot be determined.

Statement II alone is not sufficient to answer the question because in this case also, the greater of the two, P and R cannot be determined.

But by combining both the statements, we can get the answer.

Ans 3

5. Let the number of Math, English and Social Science books be denoted by M , E and S respectively.

From statement I we get that $E = 3M$ and $M = 2S$. Thus, we have three unknowns whose value cannot be found out from this statement alone.

From statement II we know that the total number of books is 18. But this statement alone is also not sufficient to answer the questions.

On combining both the statements, we get that $S + 2S + 6S = 18 \Rightarrow S = 2$.

\therefore Number of English books = $6S = 6 \times 2 = 12$.

Ans 3

6. Statement I alone gives the three angles of the triangle as $p = 30^\circ$, $q = 60^\circ$ and $r = 90^\circ$. But here nothing is mentioned about the measure of the sides. Thus, statement I alone is insufficient to answer the question.

Statement II gives us two sides of the triangle, i.e. $BC = 8$ and $AB = 6$. Thus, this statement alone is also not sufficient to answer the question.

When we combine both the statements, there cannot be a triangle whose sides are 8 and 6 and the opposite angles are 30° and 60° . As $\tan 60^\circ = \sqrt{3} = 1.73$ and $8/6 = 1.33$.

Ans 4

7. From statement I, $g^3 = 1 \Rightarrow g = 1$. Thus, g is not less than 1.

From statement II, $g^2 = -1 \Rightarrow g = \sqrt{-1}$ which is not possible as it is given that g is real.

Ans 1

8. Statement I alone is sufficient to answer the question.

Statement II alone is also sufficient as P can be the square of both $+15$ or -15 and both are integers.

Ans 3

9. Statement I states that the number of Triniti students who cleared CAT-07 is more than or equal to 500. But this statement alone does not give us a unique answer.

Similarly statement II states that the number of Triniti students who cleared CAT-07 is less than or equal to 510 which alone is not sufficient to answer the question.

On combining both the statements we can derive that the number of Triniti students who cleared CAT-07 lies between 500 and 510. This number can be 500, 501, 502, 503, 504, 505, 506, 507, 508 or 509, 510. But no unique answer is obtained.

Thus, the given data is insufficient to answer the question.

Ans 4

10. Statement I alone is sufficient to give a unique value of X .

Statement II alone is also sufficient to give a unique value of X .

Thus, both statements individually are sufficient to answer the question.

Ans 2

11. Statement I alone is not sufficient to answer the question as the values of X and Y are not known.

Statement II alone is not sufficient as X and Y are given but there is nothing mentioned about Z .

On combining both the statements, substituting the values of X and Y from statement II in statement I, we will get the answer.

Ans 3

12. From statement I, as P is divisible by 4, it is also divisible by 2, hence we get a unique answer is *Yes*.

From statement II, it is clear that P is not divisible by 2. Hence the answer is *NO*. Here, *NO* does not mean that the answer is not found. It means that the answer to the question is *NO*.

Ans 2

Exercise 23.2

1. Most of the students assume the above given quadrilateral as a square and start their calculations. But here it is not specifically mentioned that the given figure is a square. Hence it cannot be assumed to be a square. Thus the data given is insufficient to answer the questions.

Ans 4

2. Statement I and II alone are not sufficient to answer the question.

But if we combine both the statements, we can calculate how many hours it would take from Delhi to Chandigarh, i.e. 5 hours.

Ans 3

3. Statement I gives the values of M as 3 and 9. But no unique value is obtained. Hence, this statement alone is not sufficient to answer the question.

Statement II gives the value of M as 8 and 8, i.e., a unique value. Hence, statement II alone is sufficient to answer the questions.

Ans 1

4. Statement I : $f(x) = x^3 + 3$ for odd x .

$$f(5) = 5^3 + 3 = 128.$$

$$f(f(5)) = f(128)$$

128 is an even number; we cannot use $f(x) = x^3 + 3$ as it is true only for odd values of x . Thus, Statement I alone is not sufficient.

Statement II: $f(x) = 8x + 3$ for even x

$f(5)$ cannot be calculated as 5 is odd.

Combining statements I and II,

$$f(5) = 128$$

$$f(f(5)) = f(128) = 8 \times 128 + 3 = 1027$$

Thus, statements I and II are together sufficient to answer the question asked.

Ans 3

5. Total students = 160

$P \rightarrow$ students passing in Physics

$H \rightarrow$ students passing in History

$$\text{From } I \rightarrow \sum P + \sum H - \sum (P \cap H) = 120$$

$$\text{To find } \rightarrow \sum P - \sum (P \cap H)$$

I is not sufficient

$$\text{From St. 2} \rightarrow \sum H = 80$$

St. 2 is not sufficient

$$\text{We get } = 120 - 80 = 40.$$

Ans 3

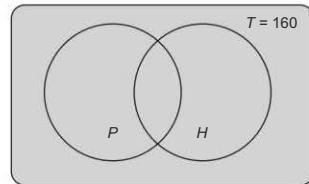


Figure 8

6. This is a classic example which requires you to understand that x , x^2 and $1/x$ behave differently in different intervals on the number line.

Using statement I, we can answer that $x > 1/x$ will be true as x is more than 1.

Using statement II, we cannot answer as $x > 1/x$ is true when x lies in interval $x > 1$ or $-1 > x > 0$ and false when x lies in interval other than this. But $x < 5$ lies in both the intervals so it is not sufficient to answer the question. Hence the question cannot be answered.

Ans 1

7. Statement I tell that the number is less than 200. So now we are looking at 10 numbers 190, 191..., 199. Since we do not get our answer from statement I alone we move onto Statement II.

Statement II alone does not give answer to the question as the number could be 191, 193, 197, 199, 201, 203, ...

When we use the information given in statements I and II together we realize that the number has to be an odd number greater than 189 but less than 200 and that it should not end in 5. There are only four such numbers 191, 193, 197 and 199 and incidentally all of them are prime. Hence, both the statements together can answer the question.

Ans 3

8. From II, we conclude that in a class of 80, Vivek ranks 46th from the bottom, i.e., 35th from the top.
From I and II, we find that Meena is 6 ranks below 35th rank from the top, i.e., she ranks 41st from the top.

From II and III, we find that Meena is 6 ranks above 46th rank from the bottom i.e. she ranks 40th from the bottom or 41st from the top.

Ans 5

9. From I, the order is: Ena, Babita, Chetna or Chetna, Babita, Ena.

From II, the order is: Ena, Babita.

From III, the order is: Anukriti, Diksha, Ena or Ena, Diksha, Anukriti

Combining I and III, we get the order as: Anukriti, Diksha, Ena, Babita, Chetna or Chetna, Babita, Ena, Diksha, Anukriti. In both the cases, Ena is sitting in the 3rd spot.

Ans 1

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10. Observing I, II and III, we find that similar letters have similar code symbols at the corresponding places in the code. So, this is direct-coding.

Thus, to find the code for *READ*, we need the code for *R* which can be obtained from I, II or III (i.e. &.) and the codes for *E*, *A* and *D* which can be obtained either from II or III (!, *, # respectively).

Ans 4

11. From II, we know that Pankaj's brother was born in 1987.

From III, we find that Pankaj's brother was 7 years younger to him, i.e. Pankaj was born in 1980.

From I, we find that Sahil is 5 years older than Pankaj. Thus, Sahil was born in 1975. **Ans 4**

12. From I, we have: $M > V, V > S, V > N$ (i)

From II, we have: Mukesh is the oldest (ii)

From III, we have: $S > N$ (iii)

Combining (i) and (iii), we get: $M > V, V > S > N$ or $M > V > S > N$. Clearly, Nitin is the youngest.

Ans 4

Chapter 24

Puzzles and Brain Teasers



Exercise 24.1

1. If you have iron which you want to float on water. What should you do?
2. Complete the following series:
 $E, D, T, C, P, C, \underline{\quad}, \underline{\quad}, \underline{\quad}$
3. Deepika has 5 boxes of chocolates having Cadbury, Nestle and Mars chocolates. Each box has same number of chocolates. She sells all the chocolates to 11 different people, each taking equal number of chocolates. They paid Rs. 17 each for Cadbury chocolates, Rs 2 each for Nestle and Rs 2 each for Mars. In all, she had Rs. 295 in her pocket. How many chocolates of each type did she have?
4. Rohit and Satish play a game of 2 players. They have 56 marbles. The game has certain rules. Each one has to pick up few marbles (at least 1 and maximum of 3), till there are no marbles left. Whoever picks up the last marble loses. If Rohit picks first, how can Rohit ensure his victory?
5. Divide Figure 1 in 4 parts in such a way that all are of same size and shape. Figure 1 is a square which is attached to half of another similar type of square and divided diagonally.
6. The sum of ages of Sahil and Vivek is 80 years and Sahil, the elder one is three times as old as Vivek was when Sahil was half as old as Vivek will be when Vivek is twice times as old as Sahil was when Sahil was four times as old as Vivek. How old is Sahil?
7. You need to place 10 balls in such a way that they lie in 5 straight lines and you need to ensure that each line has 4 balls.
8. Rajesh has a dining table (circular in shape), he pushes it to the corner of the room, so that it touched both the walls and then he accidentally spilled a spot of blue ink on the extreme edge. Then his mother told him that the spot is exactly 8 inches from one wall and nine inches from the other. How can he determine the radius of the table without measuring?

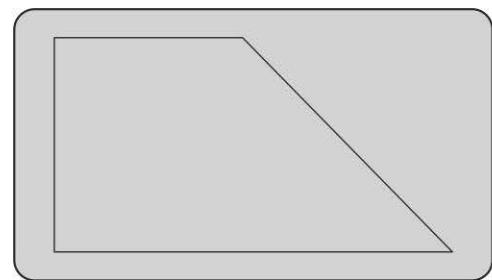


Figure 1

9. A king had 1000 Juice cans each can have 5 litres of apple juice. Someone added poison in one of the cans. The poison cannot be detected by mere looking at the can. The one who has it dies in 4 hours instantly. How many prisoners king needs to be sure about the can containing poison? The time we have to know it is:
1. 4 hours
 2. 8 hours
10. In a drawing room whose dimensions are $3 \text{ feet} \times 4 \text{ feet} \times 5 \text{ feet}$. An ant is lying at one corner of the floor which is $3 \text{ feet} \times 4 \text{ feet}$. The ant spots a food particle at the opposite corner on the ceiling. Tell the least possible distance which the ant needs to go to get that food particle.
11. We have a cheese cube of size $3 \times 3 \times 3 \text{ ft}$, it is cut into cubes of unit size. There is a mouse which starts eating the small cubes from the corner and then moving onto the adjacent cubes thereafter. Determine whether it is possible for the mouse to eat the cube in the centre at last? Justify your answer.
12. Rajesh is a chess master. He needs to place 8 queens on a chessboard such that no queen cuts any other queen. How can you help him do it?
13. An iron chain of 15 links is broken into 5 pieces equally. This chain is taken to Anil who is a blacksmith, to join these into a single continuous chain. How many links need to be opened to make it?
14. In a house party there are one grandmother, one grandfather, two mothers, two fathers, four children, one brother, two sisters, one father-in-law, one mother-in-law, and one daughter-in-law, three grandchildren, two sons, two daughters. Determine the number of people attending the party?
15. Divide 800 into two parts such that one part is multiple of 43 and other a multiple of 19.
16. There are three integers which are in arithmetic progression and have the product as a prime number. Determine the numbers?
17. Nine candidates are waiting in a room for a group task for selection in Airtel as a Management trainee. The invigilator told all the candidates that he has 9 hats and the hats are either white or orange in colour. He also added that he has at least one hat with white colour and the no. of orange hats is greater than the no. of white hats. The invigilator keeps those hats on their heads and asks them tell him how many white and orange hats the invigilator has? Obviously students cannot talk to each other or no written communication, or looking into each other eyes; no such stupid options and no tricks. Invigilator goes out and comes back after 20 minutes but nobody was able to answer the question. So he gave the candidates 15 more minutes but the result was still the same. So he decides to give them final 10 minutes. When he comes back everybody was able to answer him correctly. What could be the answer? Justify.
18. In a living room there is a tubelight and the switch for the tube is in the other room. The issue is that there are three switches instead of one, 2 being useless. You need to tell which switch is for the tube by going from the room of the switches to the living room only once.
19. You have 14 five Rs. coins, out of which 8 show head and 6 tails currently. Now, a black cloth is tied to your eyes so that you cannot see anything. Now the coins are shuffled without changing the number of heads or tails. You need to divide the coins in 2 groups such that each group has equal number of tails. (*Note: You cannot make out about the coin by touching etc*). You can flip any coin any number of times but you won't know that it has changed from head to tail or tail to head. How can you achieve this? Explain.
20. There are 100 people, out of them 75 eat Icecream, 82 eat Brownie and 70 eat Pastry
1. What is the maximum number of people who are eating all the three items.
 2. What is the minimum number of people eating all the three items.

21. Rohit lives in a 100 storey building. He has 2 similar glass plates. There is a threshold floor among these 100 floors. If he drops the plate from any floor below the threshold floor, the plate does not break. But if it is dropped from any floor above threshold it will break. In how many tries can he determine the threshold floor?
22. The owner of apple plantation has a donkey. He wants to transport his 3000 apples to the market, which is located after the desert. The distance between his apple plantation and the market is about 1000 kilometres. So he decided to take his donkey to carry the apples. The donkey can carry at the maximum of 1000 apples at a time, and it eats one apple for every kilometre it travels. What is the largest number of apples that can be delivered to the market?
23. Given a fleet of 70 Lorries, each with a full fuel tank and a range of 150 km, determine how far can you deliver a load? You can transfer the load from lorry to lorry, and you can transfer fuel from lorry to lorry. Assume all the load can fit in one lorry.
24. Ricky has two candles and matchsticks. Each candle takes exactly 2 hours to burn from one end to the other. The candles do not burn at a constant rate and are not identical. As a result, two equal lengths of the candle would not necessarily burn in the same amount of time. How would he measure exactly 90 minutes by burning these candles?
25. Determine the number of points on the globe where, by walking 2 km south, then 2 km east and then 2 km north, one can reach the place where one started?
26. A badminton coach has 10 boxes of shuttles (each shuttle weighing exactly 7 g) with one box with defective shuttles (each one of the defective shuttles weighs 8 g). Each box has 10 shuttles. He is given an electronic weighing machine and only one chance at it. How will he find out which box has the defective shuttles?
27. Rajesh is working for Sohit for seven days and Sohit has a silver bar to pay him. He must pay Rajesh for his work at the end of every day. If he can make two breaks in the silver bar, how does he pay Rajesh? (Assume: Equal amount has to be paid daily as the work done on daily basis is same).
28. 3 ants are sitting at 3 corners of a triangle with dimensions $5 \text{ cm} \times 5 \text{ cm} \times 5 \text{ cm}$. Given that each ant picks a random direction and starts to move along the edge of the triangle, find the probability that none of them should collide.
29. 50 students are studying in the classroom. The class teacher of the class got bored one day and offered them a challenge. She will put one student per day, selected at random (a student can be selected more than once), into a special room with a light lamp and a switch which controls the lamp. No other student can see or control the light lamp. The students in the special room can turn on the lamp, turn off the lamp or do nothing. On any day, the students can stop this process and say "Every student has been in the special room at least once". If that happens to be true, all the students will be set free to play. If it is false, then all the students will have to take extra class. The students are given some time to discuss and figure out a solution. How do they make sure they will play and not attend any extra class?
30. It is Satnam's birthday; he has to cut the cake into two equal pieces, but is confused because a rectangular piece has already been cut out of it. He calls you to solve his problem, without knowing about the size and orientation of cake. How can you achieve this by making one straight cut? Given that cake is rectangular.
31. In MKM society there are 100 couples. Everyone in the society has to live by the following rule: The husband is executed if his wife finds about his spouse cheating on her. All the women in the society

only gossip about the husbands of other women. No woman will ever tell another woman if her spouse is cheating on her. So every woman in the society knows about all the cheating men in the society except her own. It is assumed that a husband remains silent about his unfaithfulness. One day, the head of the society announces to the whole society that there is at least 1 cheating husband in the society. What would have happened?

32. Soup, Juice and Shake often eat lunch out. (i) Each orders either Pepsi or cola after lunch. (ii) If Soup orders cola, then Juice orders the drink that Shake orders. (iii) If Juice orders cola, then Soup orders the drink that Shake doesn't order. (iv) If Shake orders Pepsi, then Soup orders the drink that Juice orders. Who do you know always orders the same drink after lunch?
33. What occurs once in every second, once in a minute, never in a day but once in a thousand years?
34. Vivek and Satnam are arguing over a number. Satnam claims that he has found a number whose remainder is 1 when divided by 2. He gets remainders as 2, 3, 4, 5, ..., 9 when he divides by 3, 4, 5, 6, ..., 10. Vivek argues there is no such number and finally they ask their friend Sahil to decide who is right. Determine whom did Sahil agree with and why?
35. Sham thinks of two consecutive numbers between 1 and 10. Salil knows one digit and Rahul knows the second digit. The following exchange is done: Salil: I do not know your digit. Rahul: Neither do I know your digit. Salil: I know now. What are the four solutions of this number puzzle?
36. There are 6 black, 8 green, 10 yellow, 12 indigo and 14 tan coloured balls in an opaque black box. How many minimum balls should you pick up (without looking inside the box) one by one so that you are certain that you have at least 2 balls each of 2 different colours?
37. Bishal started going down a staircase. Having gone down 4 steps he saw Himnit coming up. For one step that he takes Himnit goes up by two steps. He met her on the way going down. When he still had 7 steps to go down, Himnit had gone up. Determine the number of steps in the staircase.
38. Manish has a pack of 52 playing cards. He can select two cards from the pack and is required to pick a three of spade. However, he has the freedom to pick both cards at a time or pick them one by one. How will he pick the cards so as the probability to pick a three of spade is more?
39. Heena was born in London and is a bit crazy about running. She started running at the age of 4 years, and she is determined to run till she grows 100 years in age. As soon as she grew 4, she started running straight in a direction from the place she was born, but she also wants to celebrate her 100th birthday at her hometown. So, she decides that she will run till a particular point and will return back along the same path. But with age, the speed of Heena decreases. In fact, it is directly proportional to the number of years left to reach 100 years of age. At the age of 51, she was running at 98 km/year. Keeping all these constraints in mind, she wants to run as far as she can. Can you help her in finding out the farthest point she can reach?
40. On 1st of January Vijay and Vikram set their watches together. None of them was aware that Vikram's watch was getting faster by 2 min per hour and Vijay's watch was getting slower by 1 min per hour. After some time, they discovered that Vikram's watch was 1 h ahead of Vijay's watch. Can you find out after how long they noticed this?

 Explanatory Answers
Exercise 24.1

1. Iron should be moulded into such a shape that its density becomes less than the density of water and it should displace as much water as possible.

For example: If that Iron is moulded into saucer of maximum possible radius, its volume will increase which will reduce the density of Iron and it will displace more water. Hence, it can easily float on water.

2. E, D, T, C, P, C, \dots . These letters are initials of Ek, Do, Teen, Char, Panch, Che, Saat, Aath, Nau, ...

So next letter will be S, A, N which are initials of Saat, Aath, Nau, ... This can also come in the form of days of week, planets, months, etc. Example: J, F, M, A, M, J, \dots Jan, Feb, Mar, ...

3. As there are 5 boxes having same number of Chocolates and 11 people also get same number of chocolates. So, the total number of chocolates has to be multiple of 55. Let us say it is $55x$.

Now let us say we have:

a – Cadbury Chocolates

b – Nestle Chocolates

c – Mars Chocolates

So we get 1 equation as:

$$a + b + c = 55x \quad (1)$$

$$\text{Then we have } 17a + 2b + 2c = 295 \quad (2)$$

Using equation (1) and (2)

For $x = 1$ Total number of Chocolates will be = 55

$$a + b + c = 55 \quad (a)$$

$$17a + 2b + 2c = 295 \quad (b)$$

By solving above 2 equations we get

$$15a = 185$$

$$a = \frac{37}{3} \Rightarrow a \text{ is not an integer.}$$

For $x = 2$, Total number of Chocolates will be = 110

$$a + b + c = 110 \quad (a)$$

$$17a + 2b + 2c = 295 \quad (b)$$

By solving (a) and (b)

$$15a = 75$$

$a = 5$ $a \Rightarrow$ is an integer.

For $x = 3$, Total number of Chocolates will be = 165

$$a + b + c = 165 \quad (a)$$

$$17a + 2b + 2c = 295 \quad (b)$$

By solving (a) and (b)

$$15a = -35$$

$$a = \frac{-35}{15} \text{ a } \Rightarrow \text{is not an integer and is negative number.}$$

For further values of a will always come out to be negative.

So, our answer is number of Cadbury Chocolates = 5 and number of Nestle Chocolate + Mars Chocolates = 105 (Multiple Possible values)

4. Rohit can win the game under one condition if the last marble is picked by Satish. In order to achieve this motive what he needs to do is in his penultimate turn he should pick marbles in such a way that only four marbles are left. Whatever number of marbles is picked by his opponent he will be the last to pick the remaining marbles leaving out one. So in this case he needs to pick 3 in the start and then pick the complementary which sums up Maximum + Minimum, i.e, 4 here.

5.

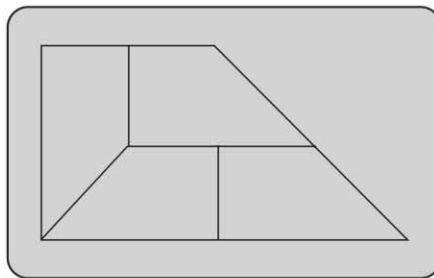


Figure 2

6. Let age of Sahil be S and Vivek be V

$$\text{Given that } S + V = 80$$

We are also given that

Sahil is thrice as old as Vivek (a) was when

Sahil was half old as Vivek (b) will be when

Vivek is twice as old as Sahil (c) was when

Sahil was four times as old as Vivek (d)

We will use a bottom to top approach so first will use (d) then (c), (b) and (a)

	Sahil	Vivek
d	$4v$	v
c	$4v + 7v = 11v$	$\uparrow 7v$
b	$8v/2 = 4v$	$8v$
a	$3 \times 2v = 6v$	$9v - 7v = 2v$ $2v + 2v = 4v$

So finally

$$6v + 4v = 80$$

$$v = 80/10 = 8 \text{ years}$$

$$S = 48 \text{ years}$$

7. Refer to Figure 3

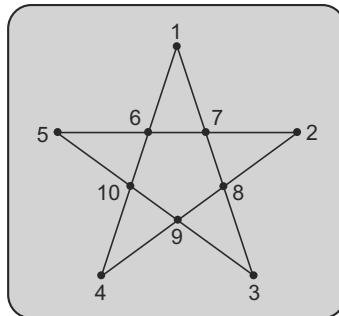


Figure 3

8. Suppose Table touches walls at Points *A* and *B*.

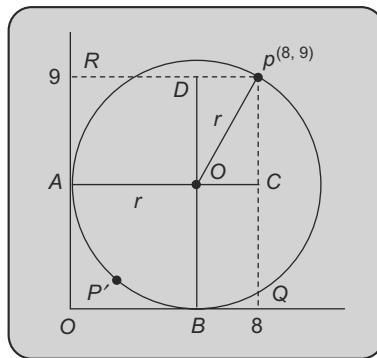


Figure 4

Let *O* be centre of Circle and *r* be the radius

Let *P* be the Point where ink Spot is

$$\text{So, } RP = 8 \quad \text{and} \quad PQ = 9$$

Hence,

$$OC = 8 - r$$

$$OD = 9 - r$$

So in ΔPOC

$$PC = OD = 9 - r$$

By applying Pythagoras theorem

$$r^2 = (8 - r)^2 + (9 - r)^2$$

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$$r^2 - 34r + 145 = 0$$

$$r = 5, 29$$

So radius = 29 is possible if the ink stain would have been P .

9. (a) As the King has 1000 juice cans. These cans should be numbered from 1 to 1000 in binary format. So the maximum 10 bits are required to label bottle number – 1000.

1000 – Has binary equivalent = 11111 01 000 (10 digits)

So Take 10 Prisoners and ask Prisoner 1 to drink from all the bottle whose first bit is 1, Prisoner 2 to drink from all the bottles whose second bit is 1, Prisoner 3 to drink from all the bottles whose Third bit is 1 and so on.

Then make them stand in order of their bit number

10	9	8	7	6	5	4	3	2	1
----	---	---	---	---	---	---	---	---	---

Now suppose the bottle number 624 has poison

So binary code of 624 is

1 0 0 1 1 1 1 0 0 0 1

So Prisoner 10, 7, 6, 5, 1 will die because they all drank from this bottle (624).

- (b) Only one Prisoner is. Sufficient suppose he starts drinking from each bottle at 2.00 pm and

Bottle number	Drink Time	Death Time
1	2:00:00 (pm)	6:00:00 (pm)
2	2:00:05	6:00:05
3	2:00:10	6:00:10
1000	3:23:20	7:23:20

Mark the bottle with the time stamp at which the prisoner drank the juice. Time of death will tell the bottle from which has the Poison in it.

10. To reach the opposite corner the Ant should never along the diagonal of wall having dimension 5 feet \times 4 feet. So Ant will travel $\sqrt{5^2 + 4^2} = \sqrt{41} = 6.403$ feet. Now Ant has reached the Ceiling. To reach the designed corner it will have to move just 3 Feet. So Total distance travelled by Ant is $6.403 + 3 = 9.403$ feet.
11. There will be Total 27 cubes. There will be 3 layers of 9 cubes each. We can number the cubes accordingly.

1 4 7	2 5 8	3 6 9
10 13 16	11 14 17	12 15 18
19 22 25	20 23 26	21 24 27

Figure 5

Cube number 14 is the central cube. Its adjacent cubes are

Layer 1 – 5

Layer 2 – 11, 13, 15, 17

Layer 3 – 23

Suppose the mouse starts eating cube number 1, so it will eat next cubes at layer 1 in the following order 2, 3, 6, 9, 8, 7, 4

Now only Cube number – 5 is left but 5 cannot be eaten. The mouse should advance to layer 2. It will eat in the following order 13, 10, 11, 12, 15, 18, 17, 16. Only Cube number 14 is left which can't be eaten. Mouse should move to layer 3. It will eat in the following order 25, 22, 19, 20, 21, 24, 27. So only Cube number 26 is left on that layer. If it eats 26, next it will have to eat cube number 14. So conclusion is that the mouse can never eat the central cube at last.

12. There are 92 Solutions to this and 12 unique solutions to this. This is a famous 8 queen problem. One of the methods is to find solution by hit and trial. First you try to keep first queen in 1A and other queens subsequently but we are unable to place in other blocks. Next we can try by putting in other different blocks, and so on.
13. 3 Links need to be opened

	1	2	3	4	5	6	7	8	
a			x						a
b						x			b
c		x							c
d								x	d
e	x								e
f							x		f
g				x					g
h						x			h
	1	2	3	4	5	6	7	8	

Figure 6

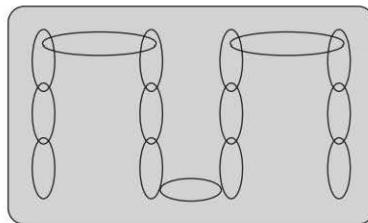


Figure 7

14. There are total 7 People

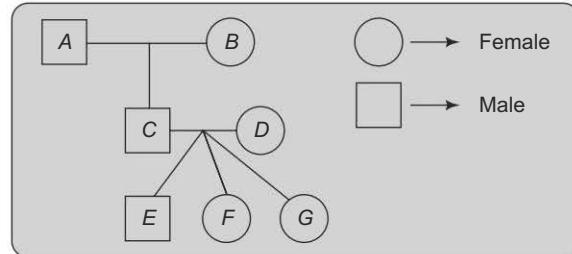


Figure 8

$$15. \quad X + Y = 800$$

$$43 \times x + 19 \times y = 800$$

Table 1

X	X	Y	Y/19 = y	Remarks
43×18	774	26	1.37	Not an Integer
43×17	731	69	3.63	Not an Integer
43×16	688	112	5.89	Not an Integer
43×15	645	155	8.16	Not an Integer
43×14	602	198	10.42	Not an Integer
43×13	559	241	12.68	Not an Integer
43×12	516	284	14.95	Not an Integer
43×11	473	327	17.21	Not an Integer
43×10	430	370	19.47	Not an Integer
43×9	387	413	21.74	Not an Integer
43×8	344	456	24	Integer

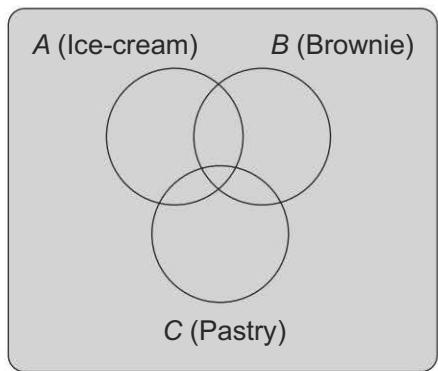
So 2 parts will be 344 and 456

16. 3 numbers will be $-3 \times -1 \times 1 = 3 \rightarrow$ which is a prime number.
17. After first interval, if there are 8 orange hats and 1 white hat, the student with White Hat can tell the answer as he can see 8 orange hats, and there is at least 1 white hat. But nobody answers after this interval, so this is not the case.

After second interval, if there are 7 orange hats and 2 white hats, the student with white hats can tell the answer as they can see 7 orange hats, and 1 white hat. But nobody answers after this interval, so this is not the case.

After third interval, if there are 6 orange hats and 3 white hats, the student with white hats can tell the answer as they can see 6 orange hats, and 2 white hats. Also, this time invigilator said these were the final 10 minutes that means the invigilator is expecting the answer after this. And they gave the answer after this interval, so this is the correct possibility. So there are 3 white hats and 6 orange hats.

18. Suppose there are 3 switches A, B and C. First of all turn on switch A for 10 minutes and then turn it off. Now turn on Switch B and immediately run to Room where tube is Present. If the tube is not glowing but is warm then it is switch A and if the tube is glowing then it is Switch B and If the tube is not glowing and it is not warm then it is Switch C
19. Divide the Coins into 2 groups of 6 and 8. Suppose there are t coins showing tail in a group of 8 coins. Then there will be $6 - t$ coins showing tail in a group of 6 coins. So there will be $6 - (6 - t) = t$ coins showing head in this group. Now flip all the coins in group of 6 so the number of coins with tail will be t . So in both the group there comes out to be t coins showing tail.
20. (a)

**Figure 9**

Let $A \cap B \cap C = x$, to maximize x , $A \cap B$, $A \cap C$, $B \cap C$ should be minimum.

x can have maximum value = 70. $A \cap B$, $A \cap C$, $B \cap C$ can have minimum value = 0.

$A \cap B \cap C + \text{Only } A + \text{Only } B + \text{Only } C + A \cap B + A \cap C + B \cap C = 100$

So we have:

$$x + \text{Only } A + \text{Only } B + \text{Only } C = 100.$$

For $x = 70$

Only $A = 12$, Only $B = 5$, Only $C = 0$

So $70 + 12 + 5 + 0 = 87$ (not equal to 100)

For $x = 69$

Only $A = 13$, Only $B = 6$, Only $C = 1$

So $70 + 13 + 6 + 0 = 89$ (not equal to 100)

|
|
|

For $x = 63$

Only $A = 19$, Only $B = 12$, Only $C = 7$

So $70 + 19 + 12 + 7 = 101$ (1 more than 100)

This extra 1 can be accommodated into $A \cap B$, $A \cap C$, $B \cap C$. So maximum possible value of x is 63.

20. (b)

It can be best explained using the following concept:

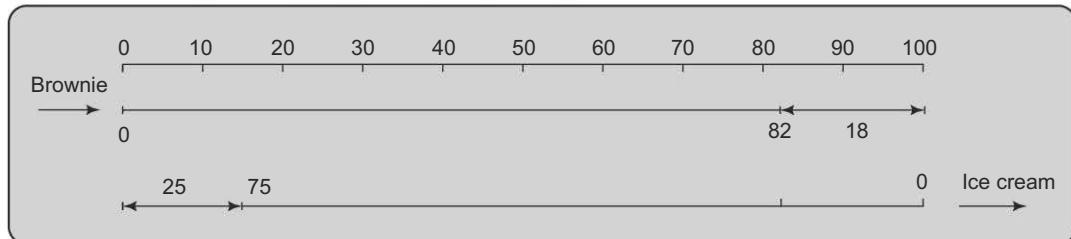


Figure 10

Total void spaces to be filled are $25 + 18 = 43$.

Only 18 people can eat both Icecream and Pastry.

Only 25 people can eat both brownie and Pastry.

So people who can eat Brownie + Pastry + Icecream = $70 - 43 = 27$.

21. Let us start with the easiest solution that can come to our mind. We start dropping plate from 1st floor, if it breaks, this is the threshold floor, else we move to 2nd floor, and so on. In this way, the answer comes out to be a maximum of 100 tries. But wait, we have 2 plates with us. Let us start at the second floor.

If the plate breaks, then we can use the second plate to go back to the first floor and try again. If it does not break, then we can go ahead and try on the 4th floor (in multiples of 2). It will take 50 tries to reach floor 100 and one more plate to try on the 99th floor so the total is 51 tries. If we try at intervals of 3, we get a better solution with a maximum of 35 tries to find threshold floor. You can try it yourself to find it how. If we increase the intervals further, we get minimum number of tries (20 tries) for an interval of 14. But this is not the best solution we can reach at.

Instead of taking equal intervals, we can take interval to be one less than the previous interval. Let the plate is first dropped from floor 14. If it breaks, then we need 13 more tries to find the solution. If it does not break, then we should try floor 27 ($14 + 13$). If it breaks, we need 12 more tries to find the solution. So the initial 2 tries plus the additional 12 tries would still be 14 tries in total. If it doesn't break, we can try 39 ($27 + 12$), and so on. Moving in this way, we drop plate from floor 50 in 4 tries, floor 60 in 5 tries, floor 69 in 6 tries, floor 77 in 7 tries, floor 84 in 8 tries, floor 90 in 9 tries, floor 95 in 10 tries, floor 99 in 11 tries, floor 102 in 12 tries. The maximum number of tries will be for worst case scenario when the threshold floor is 13 or 26 or 38 or 49, and so on.

So, 14 tries is the best solution we can get.

22. The answer is 533 apples. The donkey takes 1000 apples and travels 200 km. At that time, he is left with 800 apples, it drops 600 apples there and then he comes back with 200 apples that it will eat during return. The donkey takes 1000 apples again and repeats the same process again. After second trip, there are 1200 apples at 200 km mark. Then it picks 1000 apples, when it reaches 200 km mark, it would be left with 800 apples, so now he has a total of 2000 apples. Now, he travels 333 km more taking 1000 each time and after 2 turns there would be 1001 apples. He picks up 1000 apples and reaches his destination which is 467 km away now with 533 apples.
23. Let us start it with a smaller input. If there were only 1 lorry, it would have simply gone till 150 miles. Suppose we have 2 Lorries, everything else being same. We can take both Lorries till 75 miles, so both will be left with half fuel, and then we can put all the fuel in 1 lorry and it can further go till 150 km. So, total of 225 km ($150/2 + 150/1$).

If we have 3 lorries, we can take all 3 lorries till $150/3$ km, so each of them will be left with two-third of fuel. In total they have a fuel equal to capacity of 2 lorries (I simply did $3 \times 2/3 = 2$). This fuel can be put in 2 lorries. Now, further analysis is same as case with 2 lorries. So, they can go a further 225 km. So, a total of 275 miles ($150/3 + 150/2 + 150/1$).

Proceeding in this way, 70 lorries will cover a maximum of $150/70 + 150/69 + 150/68 + \dots + 150/2 + 150/1 = 724.94$

24. If he lights the candle from both sides, it will take exactly half the original time, i.e., 60 minutes to burn completely. So, initially – Light candle 1 on both sides and candle 2 on one side.
60 minutes – Candle 1 will be burnt out. Light the other end of candle 2.
90 minutes – Candle 2 will be burnt out.
25. Infinite. How? If we consider the southern hemisphere, there is a ring near the South Pole that has a circumference of 2 km. So what if we were standing at any point 2 km north of this ring? If we walked 2 km south, we would be on the ring. Then 2 km east would bring us back to same point on the ring (since the circumference is 2 km). 2 km north from that point would bring us back to the point where we started from. If we count, there would be an infinite number of points north of this 2 km ring.

Consider a ring that is 1 km in circumference near the South Pole. Walking a mile along this ring would cause us to circle twice, but still bring us to back to the point we started from. As a result, starting from a point that is 2 km north of a 1 km ring would also be valid.

So, there could be infinite such rings, and there will be infinite \times infinite such points. The answer will be infinite points.

26. This puzzle is actually a simple one. Take 1 shuttle from box 1, 2 shuttles from box 2, 3 shuttles from box 3, and so on. Now, weigh all these 55 shuttles together. In an ideal scenario, the total weight that the machine should show is 385 g. But, if box 1 has defective shuttles, it will show 1 g more, if box 2 has defective shuttles; it will show 2 g more, and so on. So, you can figure out the box with defective shuttles
27. Break the bar into 3 pieces of weight ratio 1 : 2 : 4. Referring these bars as 1, 2 and 4, following needs to be done at the end of each day.

At the end of Day 1: Give Bar 1 (Sohit-2 and 4, Rajesh-1)
 At the end of Day 2: Give Bar 2, Take back Bar 1 (Sohit-1 and 4, Rajesh-2).
 At the end of Day 3: Give Bar 1 (Sohit-4, Rajesh-1 and 2)
 At the end of Day 4: Give Bar 4, Take back Bar 1 and Bar 2 (Sohit-1 and 2, Rajesh-4)
 At the end of Day 5: Give Bar 1 (Sohit-2, Rajesh-1 and 4)
 At the end of Day 6: Give Bar 2, Take back Bar 1 (Sohit-1, Rajesh-2 and 4)
 At the end of Day 7: Give Bar 1 (Sohit-Empty, Rajesh-1, 2 and 4).

28. The only way to avoid collision is that all ants move clockwise or all ants move anticlockwise, otherwise a collision is certain. Now, each ant can pick any direction randomly, so a total of $2 \times 2 \times 2 = 8$ cases are possible. This is just like that when you toss 3 coins; there are 8 possible outcomes possible. The probability to not collide will be favourable cases/total cases = $2/8 = 0.25$.
29. They all select one student say, Suraj. Every time any student is selected other than Suraj, they follow these steps. If they have never turned on the light bulb before and the light bulb is off, they turn it on. If not, they don't do anything. Now if Suraj is selected and the light bulb is already on, he adds one to his count and turns off the bulb. If the bulb is off, he does nothing. The day his count reaches 49, he calls the class teacher and tells him "Every student has been in the special room at least once".
 If his count has reached 49, it means 49 persons other than him have been through this room that makes a total of 50.
30. In general, when a straight cut is made at any angle through the centre of a rectangle, the resulting pieces are always of equal area.

So, if you make a cut along the line that joins the centres of the cake and centre of piece that has been already cut, the cake will get divided into two equal parts and so does the missing part. Half the cake minus half the missing part gives you half of the remaining cake. So, you get two equal portions of cake.

31. Say there was only 1 cheating husband in the society. There will be 99 women who know exactly who the cheater is. The 1 remaining woman, who is being cheated on, would have assumed there are no cheaters. But now that the mayor has confirmed that there is at least one cheater, she realizes that her own husband must be cheating on her. So her husband gets executed on the day of the announcement.

Now let us assume there are 2 cheaters in the society. There will be 98 women in the society who know who the 2 cheaters are. The 2 wives, who are being cheated on, would think that there is only 1 cheater in the society. Since neither of these 2 women know that their husbands are cheaters, they both do not

report their husbands in on the day of the announcement. The next day, when the 2 women see that no husband was executed, they realize that there could only be one explanation – both their husbands are cheaters. Thus, on the second day, 2 husbands are executed.

Through induction, it can be proved that when this logic is applied to n cheating husbands, they all die on the n^{th} day after the mayor's announcement.

32. Soup is one who orders the same drink always and that drink is Pepsi. Let us see what will happen if Soup orders cola. In that case, Juice and Shake will order same drink by statement second. So, either both Juice and Shake will have Pepsi (but in that case, statement fourth cannot be true) or both will have cola (but in that case, statement third cannot be true). So, a contradiction always arises if Soup takes cola.

Now, Soup will always have to take Pepsi. So, he is the person who always orders same drink.

33. The letter ' n '.
34. If a number n on being divided by x leaves remainder $x - 1$, then if $n + 1$ is divided by x , the remainder should be zero.

The converse of this property is also true. If a number m on being divided by x leaves remainder 0, then $m - 1$ will give remainder $x - 1$ when divided by x .

The smallest number that gives 0 as remainder when divided by any number from 2–10 will be LCM of 2 to 10, i.e. 2520 (you can find it). So, 2519 will follow the remainder properties mentioned in the problem. Answer is 2519.

35. None of the two friends can have numbers 1 or 10, since they would guess the other one's number with no problems. I will describe solutions at one end of the interval of numbers 1–10 (the same can be done on the other end).

Information that Rahul does not know must be important for Salil. So Salil must expect that rahul has 1 or 3 (if the Salil has 2). And as Rahul does not know, then he has certainly not 1. So the first pair is 2 and 3.

If Salil had 3, then he would expect the other one to have either 2 or 4. But if Rahul had 2 (and Rahul would have known that the first one does not have 1), then he would know the number of Salil. However, neither the Rahul knows the answer, so he has 4. The second pair of numbers is 3 and 4. Solutions at the other end of interval are 9 and 8 or 8 and 7.

36. We can get 2 balls each of two different colours even when we pick up 4 balls but this is not necessary. So we will have to consider the worst case scenario to be certain. Suppose we pick up all 14 tan coloured balls first so this will contain a pair of tan coloured balls. Next in the worst case scenario we may get all different coloured balls (1 black, 1 green, 1 yellow and 1 indigo) but after this the next will certainly make a pair with any of the above colours since there are only 4 colours besides tan. So when we pick 19 balls we are sure to get 2 balls each of 2 different colours.
37. Let total number of steps be n . When Himnit started coming up, Bishal had covered 4 steps already and when she has reached top, Bishal has still 7 steps to go.

In the same time, she has covered n steps and he has covered $n - 11$ steps. If speed of Himnit is twice that of his, $n = 2(n - 11)$

Solving this, we get $n = 22$.

38. It is actually same, you can choose either way.

When you pick both cards at the same time, probability of getting 3 of spade is $2/52$ or $1/26$.

When you pick cards one by one, the probability will be $1/52 + (51/52) \times (1/51) = 2/52 = 1/26$

39. Going by proportionality relation (at age of x years), we can write speed = $k(100 - x)$, where k is a constant. At 51, speed = 98 km/year. Using this, we get $k = 2$.

So, when Nancy is 4 years old, she will run at 192 km/year. At 5, she will run at 190 km/year, and so on. From 4 years to 100 years, she can run $192 + 190 + 188 + 186 + \dots + 2 = 9504$ km. So, she can go till a farthest point of $9504/2 = 4752$ km.

40. After every hour, Vikram's watch would get 3 minutes ahead of Vijay's watch. So, for Vikram's watch to get one hour ahead of Vijay's watch, it should take 20 hours.

Part III

Verbal Ability

-
- Chapter 25: Sentence Correction
 - Chapter 26: Vocabulary
 - Chapter 27: Fill in the Blanks
 - Chapter 28: Reading Comprehension
 - Chapter 29: Para Jumbles
 - Chapter 30: Critical Reasoning
 - Chapter 31: Syllogisms

Chapter 25

Sentence Correction

25.1 Introduction

Sentence correction constitutes the maximum number of questions in any paper of verbal ability. To master this section, one should have a good grasp of the basics of English grammar especially parts of speech which include nouns, pronouns, verbs, tenses, adjectives, articles, etc., as the questions are based upon these concepts.

During the past few years, a pattern has been observed in the types of questions asked in the placement papers. An exhaustive list of these errors is discussed in subsequent sections of this chapter. The students should go through this list as it will equip them to handle the sentence correction questions with ease.

25.2 Usage of Articles

25.2.1 Use of 'An'

1. Before the words beginning with vowel sounds; e.g., an umbrella, an egg, an ostrich, etc.
2. Before the words beginning with a silent 'h'; e.g., an honest man, an honorable death, an hour, etc.
3. With abbreviations that begin with the vowel sound 'em' also have 'an' before them; e.g., an MLA, an MBA, etc. Abbreviations that begin with the letters M, N, etc., have the beginning sound 'em'.

25.2.2 Use of 'A'

1. Before words beginning with consonant sounds; e.g., a boy, a cap.
2. 'A' is also used before vowel letters having consonant sounds; e.g., a university has the beginning sound 'yu' which is a consonant sound. Other examples are a euphemism, a unit, etc.
3. Before 'one' as the beginning sound is 'w' and not 'u', e.g.: a one rupee note, a one-man army.

25.2.3 Use of 'The'

1. When we are referring to a particular thing that has already been spoken about. for example: The sweater with a 'V' neck is missing.

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2. Before proper nouns, i.e., names of mountains, rivers, monuments, etc.
For example: The Himalayas, The Pyramids.
3. Before superlatives
For example: The best boy, the fastest car.
4. Before musical instruments
For example: I can play the flute very well.
5. While referring to a class of things.
For example: The rich condemn the poor.
6. Before the comparative degree when used for comparison.
For example: the more they get, the more they want.
7. Before a proper noun when used as a common noun.
For example: Kalidas is the Shakespeare of India.
8. Before units of weight, measurement, etc.
For example: Oranges are weighed by the dozen.

25.2.4 Omission of Articles

1. When nouns are used in a general sense.
For example: Luck favours the brave, Man is mortal.
2. Before languages
For example: English is a universal language.
3. Before seasons
For example: Winter will be harsh this year.
4. Before names of relations like father, mother, etc.
For example: Mother's love has no substitute.
5. Before the meals of the day
For example: I will have lunch with my friend.
6. Before abstract nouns
For example: Happiness is not a destination, it is a state of life.

25.3 Usage of Nouns

25.3.1 Certain Nouns are Always used in Singular Form

1. Information, furniture, advice, news, rice, classics, ethics, repair, scenery, machinery, stationery, fuel, mischief.

For example: I have no information on this topic.

The machinery is too old to function in order.

- Names of subjects like Physics, Mathematics, Economics, Politics, Athletics.

For example: She is reading politics at the university.

Athletics is an inherent part of her growing up.

- Words like dozen, score, hundred, thousand, etc., when preceded by a numeral.

For example: a dozen mangoes, three thousand rupees.

25.3.2 Some Nouns are Always Used in Plural Form

- Cattle, police, poultry, gentry and artillery.

For example: The Police have nabbed a thief.

The gentry were very sophisticated.

- Things that are in pairs such as scissors, spectacles, trousers, binoculars, stockings, shorts.

For example: Where are my trousers?

These scissors are not sharp.

- Other words that take a plural form are measles, goods, premises, thanks, annals, etc.

For example: The hotel premises have sprawling lawns.

25.3.3 Collective Nouns

The nouns such as jury, team, government, committee, audience, orchestra, etc., are used with a singular verb when they indicate a unit; otherwise a plural verb is used.

For example: The jury is out on the case.

The jury were divided in the case.

25.4 Usage of Pronouns

- Each, every, anyone, anybody must always be followed by the singular pronoun of their person.

For example: Every girl has to bring her own book.

- The pronoun 'one' is followed by 'one's'.

For example: One must respect one's parents.

- 'But' and 'except' are followed by pronouns in the objective case.

For example: Everyone is going to the party except him.

- Pronouns following 'than' and 'as' are decided by writing the clause and completing the sentence.

For example: She is taller than I (am).

He is as bright as she (is).

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5. When two or more nouns are joined by ‘either...or’, ‘neither...nor’ the following rules apply:
 - (a) When both the nouns are singular, the pronoun will also be singular. For example: Neither the thief nor his accomplice is known.
 - (b) When one noun is singular and the other is plural, the pronoun must be plural.
For example: Neither the teacher nor the students have done their work.
6. ‘Who’ is used for a subject and ‘whom’ is used for an object.
For example: Who was there on the phone?
To whom were you talking to?
7. ‘Whose’ is used for living persons and ‘which’ for non-living things.
For example: Whose books are these?
Which bag do you like the most?
8. ‘Each other’ is used for two people and ‘one another’ is used for more than two.
For example: They both loved each other.
All of you must help one another in the project.
9. If pronouns of different persons are to be used together, the serial order is 2nd person, 3rd person, and 1st person.
For example: You, he and I are good friends.
10. A pronoun takes an objective case after ‘Let’.
For example: Let me help you.
11. A pronoun takes an objective case after ‘like’ or ‘unlike’
For example: He, unlike me, is an industrious guy.
12. A pronoun written after a preposition, will always take the objective case.
For example: This remains between you and me.
13. Relative pronoun ‘which’ conveys additional information and ‘that’ explains a certain thing.
For example: I cannot find the file which is red in colour.
I cannot find the file that I have to take for the meeting.
14. In sentences using the following expressions, ‘that’ is preferred to ‘who’ or ‘which’: only, any, it is, all, superlatives.
For example: All the sheets that were given were white.
He is the same man that I was talking about.
He is the only man that can do it.
15. The relative pronoun should be placed as near as possible to the antecedent.
For example: He visited the place where Napoleon died during his holidays. (Incorrect)
During his holidays, he visited the place where Napoleon died. (Correct)

25.5 Subject-Verb Agreement

1. Two subjects joined by ‘and’ will take a plural verb.
For example: Rahul and Sahil are good friends.
Two subjects when joined by ‘and’ but taken to be a single unit, will have a singular verb.
For example: Bread and Butter makes a healthy breakfast.
Two subjects when joined by ‘or’ will take a singular verb.
For example: Either Rahul or Rohit has topped the class.
2. If two subjects are joined together by ‘as well as’, the verb will act according to the first subject.
For example: The Students as well as the teacher are playing.
3. When the sentence begins with:
‘The number of.....’ the verb is singular.
‘A number of.....’ the verb is plural.
For example: The number of houses is limited.
A number of students have passed the exam.
4. ‘Many a....’ is always followed by the singular verb.
For example: Many a man was wounded in the crash.
5. If two subjects are joined with ‘either...or’, ‘neither...nor’, the verb agrees with the nearer subject.
For example: Either Rahul or I am to do this work.
Or Either I or Rahul is to do this work.
Similarly, neither the teacher nor the students were present for the function.

25.6 Usage of Tenses

The change in the form of verbs to denote time is called the tense of the verb

1. Present Indefinite tense is used with actions that are habitual or of a fixed time-table, universal truths and proverbs or sayings.
For example: I go for a walk at 5 o’ clock in the morning.
My school bus comes at 8 o’ clock.
The Earth moves around the Sun.
2. Words like usually, generally, often, whenever, etc., are used in Present Indefinite Tense.
For example: I usually go to play football.
3. We do not write the future or the present tense after such expressions as suppose that, it is high time, as if’ etc.
For example: It is high time that I started preparing for my exams.
4. When the verb in the principal clause is in the past tense, the verbs of the subordinate clauses should be in the Past tense.
For example: I was sure that he was alive.

5. When two actions have happened in the past, then Past Perfect Tense is used in the action that happened earlier and Simple Past is used in the action that happened later.

For example: When I reached the station, the train had already left.

6. ‘For’ and ‘Since’ are used to denote time. ‘For’ is used to denote a period of time while ‘since’ is used to denote a point of time.

Table 1

For	Since
3 hours	3 o' clock
7 days	18th September
10 years	2002

When the expressions ‘for’ and ‘since’ are used in a sentence, we always use the Perfect Tense or Perfect Continuous Tense.

For example: I have been working in this company since April '07.

When we reached the airport, she had been waiting for us for 6 hours.

7. When forming a sentence depicting two simultaneous actions, both the clauses will have the same tense.

For example: While I worked, he slept.

While she was sleeping, I was cooking

8. If in a sentence, two actions are indicated and both have to take place in the future, the principal clause will have Present Indefinite Tense and the subordinate clause will have Future Indefinite.

For example: If I go to Delhi, I shall be back by Monday.

9. When expressing wishes and desires, we use ‘were’

For example: I wish I were a queen.

10. We use Past Indefinite Tense when time, date or day is mentioned.

For example: I was born in 1959.

I had a test last Monday.

11. We should avoid using ‘ing’ with:

a. Verbs of senses – see, hear, taste, and smell

b. Verbs of feelings – wish, want, desire, love, hate, like, dislike

c. Verbs of cognition – think, learn, understand, forget, remember, seem, appear

25.7 Usage of Adjectives

1. While making a comparison, the objects must be the same.

For example: The streets in London are wider than California.

(Incorrect)

The streets in London are wider than the streets in California.

(Correct)

2. Elder is used to compare the persons of the same family and is followed by ‘to’.
Older is used to compare persons or things in general and is followed by ‘than’.
For example: Sarika is the oldest teacher we have.
Sarika is my eldest sister.
3. The adjectives ending in ‘....ior’ e.g. superior, junior, senior, inferior, etc., are followed by ‘to’ and not ‘than’.
For example: He is junior to me.
This cloth is superior to the other one.
4. ‘Less’ is used to denote quantity while ‘Few’ is used to denote a number. E.g.: There are few students in the class today.
There is less water left in the jar.
5. Use of few, a few and the few:
Few is used for such a small number that it is almost negligible.
A few is used for a number which is small but is still a significant number that cannot be ignored.
The few is used for all the items of a small number.
For example: Few inhabitants have survived the deadly fire.
A few of my friends are going abroad.
The few pens I have are all black.
Little, a little and the little is used to denote quantity in the same fashion.
6. ‘Farther’ means more distant while ‘further’ means something more advanced.
For example: Delhi is farther from Jammu than Chandigarh.
I need further research to support the theory.
7. When a comparative is used in the sense of superlative, it is followed by ‘any other’.
For example: He is brighter than any other scientist in the University.
8. ‘Later’ is used to denote time while ‘latter’ means which comes second.
For example: You came later than I.
Out of the two contestants, the latter one has more chances of winning.
9. Likely, sure and certain are followed by ‘to’.
For example: Congress is likely to rule for another term.
10. When we compare the two qualities of the same person, then ‘...er’ is not used.
For example: You are more calm than soft-spoken.
11. When two adjectives with differing degrees of comparison are used, they should be complete in themselves.
For example: This novel is as good, if not better than the previous novel. (Incorrect)
This novel is as good as, if not better than, the previous novel. (Correct).

12. Some adjectives do not follow the rules of comparison and are used in absolute terms – absolute, excellent, unique, universal, whole, impossible, perfect, right, etc.
For example: Of all, this is the perfect solution to the problem.
13. When two comparative degrees are used in a sentence for proportion, ‘the’ is used before both of them.
For example: The greater the demand, the higher the price.
14. Double comparatives or Double superlatives are not used in a single sentence
For example: This car is more better than the other car. (Incorrect)
This car is better than the other car. (Correct)

25.8 Usage of Conjunctions

1. ‘Hardly’ or ‘scarcely’ is followed by ‘when’.
For example: Scarcely had I stepped out, when it started raining.
2. ‘No sooner’ is followed by ‘than’.
For example: No sooner did he reach the class, than the bell rang.
3. ‘Not only’ is followed by ‘but also’.
For example: Not only did I pass my papers, but also stood first in the class.
4. ‘So....as’ is used in negative sentences, whereas ‘as.....as’ is used in affirmative sentences.
For example: He is not so tall as his brother.
He is as tall as his brother.
5. Words such as regards, describe, define, treat, mention, portray and depict are followed by ‘as’.
For example: She regards me as her mother.
He was treated as a slave.
6. ‘If’ is used for a hypothetical situation and ‘whether’ is used for uncertainty.
For example: If I were the Prime Minister, I would wipe out terrorism from our country.
I do not know whether to join that company or not.
7. ‘Though’ is followed by ‘yet’.
For example: Though he is rich, yet he is unhappy.

25.9 Usage of Prepositions

1. Preposition of time
 1. ‘On’ is used with days and dates.
For example: I shall come home on my Birthday.
 - ‘At’ is used with definite point of time.
For example: I will come home at 7 pm.

'In' is used with parts of the day, months, seasons and years.

For example: I will come home in summer.

2. No preposition is used after words like next, alternate, every etc.

For example: I will come to see you every Monday.

2. Preposition of position

'At' is used for an exact point.

'In' is used for larger areas.

For example: I stay at 29, Park Street, Calcutta.

I stay in Calcutta.

3. 'Beside' means by the side of and 'Besides' means in addition to

For example: The lady was standing beside her son.

Besides the written paper, you have to clear the interview also.

4. 'In' is used for things at rest while 'into' denotes an action.

For example: We were swimming in the river.

He jumped into the river.

5. 'At' is used for open spaces while 'in' is used for enclosed areas

For example: I saw him at the traffic lights.

I will meet you in my cabin.



Exercise 25.1

Directions for questions 1 to 35: Out of the following sentences, one part has an error, identify the part that has an error:

- | | |
|--------------------------------------|-------------------------------------|
| 1. 1. We <u>find</u> the officer | 2. lying seriously injured |
| 3. and he died shortly afterward | 4. no error |
| 2. 1. The communist party | 2. <u>is as good if</u> not better |
| 3. than any other | 4. political party |
| 3. 1. One of the biggest | 2. industrial groups |
| 3. in Jharkhand | 4. <u>are declaring a blackout</u> |
| 4. 1. The quality of the plays today | 2. <u>are inferior to</u> |
| 3. the ones produced | 4. in the past |
| 5. 1. Hardly had Irfan | 2. gone through the new book |
| 3. when the professor came | 4. <u>and enquired him</u> |
| 6. 1. You would not have | 2. reached so late for the function |
| 3. if you would have <i>had</i> | 4. travelled by your own vehicle |
| 7. 1. My friend's elder sister | 2. is the principal |
| 3. of a | 4. girl's college |
| 8. 1. Every woman, man | 2. and child |
| 3. in the building on fire | 4. have been saved <i>has</i> |

9. 1. The prime minister with his wife and son
3. after a brief holiday
10. 1. In 1952, Bannister broke the four-minute record
3. and proved he could run more fastly
11. 1. Luna has accepted her errors
3. in the neighbourhood;
12. 1. Due to the lack of strong,
3. the detective couldn't decide who *m*
13. 1. The prime minister along with his
3. this most crucial meeting on
14. 1. The Andes is a South American
3. sacred by the tribes
15. 1. She went on to proclaim
3. of it being dirty, politics
16. 1. The fierce battle has come
3. because the artillery on both sides
17. 1. Anybody who have
3. agree that it was
18. 1. For his convocation ceremony
3. or father are
19. 1. The Professor's pioneering work
3. – his numerous discoveries and theories,
20. 1. After years of building a business empire,
3. a letter of regrets
21. 1. One of the most understated
3. of health and medical are
22. 1. The orchestra were deeply
3. of the audience which gave
23. 1. She started
3. had contacted her
24. 1. All the art that
3. the reign of his grandfather
25. 1. If the fence was
3. green, the entire premise
26. 1. Had you come at
3. you would not have
27. 1. Only between you and I
3. eloped with the youngest son
28. 1. It was only after I countered
3. finally conceded that
29. 1. One must not forget
3. the place where he was born,
30. 1. He conceded that she
3. and hence it was
31. 1. Despite identical testimonials
3. the authorities turned
- C* 2. are returning to the capital
4. in Dalhousie
2. for running a mile
4. than any other human alive
2. and made up with everyone
4. everyone except he.
2. yet confusing, evidence,
4. to frame for the murder charges.
2. cabinet *have* arrived to commence
4. deciding the fate of article 370.
2. range considered a *b*
4. because of their age *b*
2. that contrary to popular opinion
4. are the most challenging career field.
2. to an abrupt and unexpected halt
4. has run out of ammunition.
2. seen the movie would
4. the best performance he had ever given.
2. either his elder sisters
4. expected to attend.
2. in the field of geothermal energy
4. have not received the due credit.
2. all that he left behind were
4. which he collected during his lifetime.
2. achievements in the field
4. the eradication of rickets.
2. overwhelmed by the response
4. them a minute-long ovation.
2. calling all the recruiters which
4. in the past few months.
2. had been created during
4. were ordered to be burnt to ashes.
2. painted white instead of
4. might have looked more graceful.
2. time, as was discussed,
4. missed the carnival.
2. the baker's daughter has
4. of the village priest.
2. every logic of hers that she
4. Ulman is as efficient as me.
2. the source of his origin;
4. and what values were infused.
2. was cleverer than smart
4. risky to hire her.
2. of various witnesses' of sighting an UFO,
4. a blind eye to the whole matter.

32. 1. The family members
3. as soon as the rescuers
33. 1. The house which
3. had grown up in
34. 1. For entertaining the king's guests
3. the minister rewarded him
35. 1. Illuminati binds its members
3. to the organisation;
2. started looking for each other
4. started their operation.
2. all the brothers and sisters
4. was blue.
2. like no one else ever had before,
4. with thousand gold coins.
2. not to disclose their allegiance
4. including their family and closest friends.

Directions for questions 36 to 50: Each of the following questions has two sentences A and B

Mark (a) if you think sentence A has an error

(b) if you think sentence B has an error

(c) if you think both sentences A and B have errors

(d) if neither sentence has an error

36. 1. Pay more attention to your studies lest you should fail again.
2. All the furniture have been sent to the new office located in Udaipur.
37. 1. The greater the demand, higher the price.
2. One of the failings of modern education are that it does not promote original thinking.
38. 1. Either the chief or his aides failed in his duty.
2. This land is ours.
39. 1. The number of peacocks in this township are quite small.
2. A number of petty thieves have been rounded up for interrogation.
40. 1. At last the police has nabbed the culprit in Mangalore.
2. Do you know to play saxophone?
41. 1. The suicide bomber was spotted in a truck laden with explosives before detonating it.
2. He struggled not to break the vow of secrecy that she had forced him to take.
42. 1. Like a defiant child, she turned a deaf ear to all his calls.
2. He stopped seeking any explanation from his son; his daily lifestyle revealed all the answers.
43. 1. Ill-informed, the officer started speaking voraciously about the previous incumbent's tenure.
2. The sun's rays had just begun to appear when a distant cry was heard across the valley.
44. 1. The pilot managed to safely manoeuvre the airplane through the snowstorm despite of zero visibility.
2. Kirti made her vow not to open the door to anyone till the time she does not call her.
45. 1. The impact of her upbringing is obvious in the child's exemplary attitude.
2. He was chagrined when his fiancée blamed him whenever something went wrong.
46. 1. With the slew of robberies across museums in the country, the curator was going through sleepless nights.
2. The audience, along with the artists, were moved to tears by the little girl's story.
47. 1. You need not call him unless you want to.
2. The scientific community is in a tizzy after the latest findings have been revealed.
48. 1. Can Joseph sing as well as her?
2. He denied all his statements made during the discussion about the policy.
49. 1. The boy was sitting besides his mother throughout the show.
2. For years she couldn't meet them even though she lived just round the corner.
50. 1. He used to live at Bhopal at the time when the infamous gas tragedy occurred.
2. Even the most experienced divers dared not enter the depths of that river.

Directions for questions 51 to 60: The following sentences have been divided into 4 parts. One of the parts has an error. Mark that part as your answer.

- | | |
|----------------------------------|---|
| 51. 1. I have been living here | 2. since the past nine years |
| 3. but no one | 4. has visited me ever. |
| 52. 1. There were | 2. lesser players |
| 3. in the academy | 4. than expected. |
| 53. 1. The number of tourists | 2. staying |
| 3. at the hotel | 4. are very small. |
| 54. 1. Egg and toast | 2. are |
| 3. a healthy | 4. breakfast. |
| 55. 1. If you have some | 2. one with all the ability |
| 3. but if one is not dependable, | 4. do you want him as part of your group? |
| 56. 1. The athletes | 2. shall be |
| 3. awarded | 4. turnwise. |
| 57. 1. He has enrolled | 2. for the complete course |
| 3. comprising of | 4. four modules. |
| 58. 1. He is disinterested | 2. in cricket and |
| 3. he never watches | 4. any matches. |
| 59. 1. In the beginning | 2. of the play, |
| 3. there was | 4. a prelude. |
| 60. 1. Between all the | 2. pre was movies |
| 3. 'Citizen Kane' | 4. is the best movie. |

Answer Key

Exercise 25.1

1. 1	2. 2	3. 4	4. 2	5. 4	6. 3
7. 4	8. 4	9. 2	10. 3	11. 4	12. 3
13. 2	14. 4	15. 4	16. 4	17. 1	18. 3
19. 4	20. 2	21. 3	22. 1	23. 2	24. 4
25. 1	26. 1	27. 1	28. 4	29. 2	30. 2
31. 2	32. 2	33. 1	34. 4	35. 1	36. b
37. c	38. a	39. b	40. c	41. a	42. b
43. d	44. c	45. d	46. b	47. a	48. c
49. c	50. a	51. 2	52. 2	53. 4	54. 2
55. 3	56. 4	57. 3	58. 1	59. 1	60. 1

 **Explanatory Answers**
Exercise 25.1

1. The subordinate clause is in the past tense, so the principal clause should also be in the past tense only. So, “We found the officer..” is correct. **Ans 1**
2. The correct way of comparison is ‘as good as’. **Ans 2**
3. When the sentence begins with ‘one of.....’ the subject is singular; thus the verb should also be singular ‘..is declaring..’. **Ans 4**
4. The subject is singular (quality), so the verb should also be singular (is). **Ans 2**
5. The correct expression is ‘enquired about’. **Ans 4**
6. In sentences showing unfulfilled condition, main clause is in the past tense and the subordinate clause is in the past perfect tense. So, “..if you had travelled ..” is the correct answer. **Ans 3**
7. The college is for girls. There is no possessive noun needed. **Ans 4**
8. Sentences that begin with ‘every’ will always have a singular verb (has been saved). **Ans 4**
9. The subject in this sentence is Prime Minister which is singular. So, ‘..is returning..’ **Ans 2**
10. The correct word for comparison is ‘faster..’. **Ans 3**
11. Luna is the subject here and “he” is the object; hence it should be “..except him”. **Ans 4**
12. Here “who” is in the place of an object, the one to be framed. Hence it will be “whom”. **Ans 3**
13. Here the Prime Minister is the subject, while his cabinet is the object. Cabinet being a collective noun bears no effect on the verb since it is not the subject. So the verb will be singular – “..cabinet has..” **Ans 2**
14. Although its name makes it appear plural, the Andes is a collective name for a single mountain range and hence will be treated as singular. So it has to be “..its age.” **Ans 4**
15. Politics collectively refers to one field and hence will be treated as a singular here. So, “..is the most..” is the correct usage. **Ans 4**
16. Artillery is one of the exceptions to the rule of treating collective nouns as singular. So it will be “..have run out of..”. **Ans 4**
17. The sentence is starting with “anybody” and so the verb will be singular – ‘has’. **Ans 1**
18. The second subject is singular, “father”, so the verb also has to be singular “is”. **Ans 3**
19. The subject of the sentence is the “professor’s work” which is a singular noun and so the verb has to be “..has not received..”. **Ans 4**
20. Although enlisting many regrets, the letter is only one. Hence it should be “..left behind was..”. **Ans 2**
21. The subject here is singular “..one of the most understated..” and so it will be “..is the eradication of..”. **Ans 3**
22. Orchestra is a collective noun and hence has to be treated as singular – “..orchestra was..”. **Ans 1**

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23. Recruiters are people, and not non-living things. “Who” will be used instead of “which”. **Ans 2**
24. Art is a collective noun and hence the verb will be singular “was ordered”. **Ans 4**
25. The speaker is talking about a hypothetical situation (if) which can’t be true now – so “was” has to be replaced with “were”. **Ans 1**
26. The correct preposition will be “on time” or “in time”. **Ans 1**
27. “Between you and me” is a phrase which implies that it has to be kept secret and not to be shared with anyone – which is being used here. **Ans 1**
28. A comparison is being made using “as”. It will be I instead of me. **Ans 4**
29. “One” is a gender-neutral word. By using “he” later in the sentence, a gender is being ascribed to it, which is incorrect. The right way is “..the source of one’s origin..”. **Ans 2**
30. Both the qualities are of the same person, hence we’ll write it as: “more clever than smart”. **Ans 2**
31. The sound of ‘UFO’ isn’t that of a vowel but of the letter U i.e. “yu”. So ‘a’ will be used. **Ans 2**
32. When the people involved are more than two, we use “one another”, and not “each other”. **Ans 2**
33. “which” is used to convey additional information. Here the part which follows is part of the main idea, hence “that” is to be used. **Ans 1**
34. The correct usage is “..a thousand gold coins..”. **Ans 4**
35. There has to be ‘the’ in front of Illuminati. **Ans 1**
36. **Sentence A:** no error. **Ans b**

Sentence B: Furniture is a singular noun. So ‘...has been...’.

37. **Sentence A:** ‘the’ is used before the comparative degree when written in the sense of comparison. ‘the higher the price’. **Ans c**

Sentence B: Sentence begins with ‘one of....’, the subject is singular, so the verb will also be singular (....is that)

38. **Sentence A:** Match the pronoun with its corresponding noun, with ‘aides’, it will be ‘failed in their duty’ **Ans a**

Sentence B: No error.

39. **Sentence A:** Sentences that begin with ‘the number’ have a singular verb. **Ans a**

Sentence B: No error

40. **Sentence A:** Police is a plural noun, so ‘have nabbed....’ **Ans c**

Sentence B: ‘know how to play’

41. **Sentence A:** The sentence structure is incorrect because it fails to highlight what it is referring to in “..detonating it.” That “it” could be the truck or the explosives. The correct way will be – The suicide bomber was spotted in a truck, laden with explosives, before detonating it. **Ans a**

Sentence B: no error.

42. **Sentence A:** no error. **Ans b**

Sentence B: “..his daily lifestyle..” fails to reveal whose lifestyle is it referring to – the father’s or the son’s. The correct framing of the sentence is: “.. ; the son’s daily lifestyle revealed all the answers.”

43. **Sentence A:** no error. Ans d
Sentence B: no error.
44. **Sentence A:** The correct usage is “despite” or “inspite of”. Ans c
Sentence B: Since both the individuals involved are females, the clause “..till the time she doesn’t call her” fails to highlight who will call whom. Correct usage will be: “till the time Kirti doesn’t call her.” Or “till the time she is not called by Kirti.”
45. **Sentence A:** no error. Ans d
Sentence B: no error.
46. **Sentence A:** no error. Ans b
Sentence B: The subject is the audience which is a collective noun and hence the verb should be singular, i.e. “..was moved to tears..”
47. **Sentence A:** A very common, incorrect usage. The sentence should be “You don’t need to call him if you don’t want to”. Ans a
Sentence B: no error
48. **Sentence A:** it should be “..as well as she.” Ans c
Sentence B: The word discuss means “to talk about”; since the word about is already included in the meaning, we never use it as “..discuss about..”.
49. **Sentence A:** Beside means “by the side of” while Besides is “in addition to”. Hence the correct expression is “..was sitting beside..”. Ans c
Sentence B: The correct prepositional usage is “just around the corner”.
50. **Sentence A:** the correct preposition is “in Bhopal”. Ans a
Sentence B: no error.
51. ‘for’ is used to denote a period of time, i.e. for 8 years, 8 months, 8 days, 8 hours, etc. ‘since’ is used to denote a point of time i.e. since, 2007, October, Monday, 12 o’clock. So, here the correct expression will be ‘..... for the past 8 years.....’. Ans 2
52. ‘few’ is used with a countable noun. ‘less’ is used with an uncountable noun. So, ‘...fewer players...’ is correct. Ans 2
53. The subject in this sentence is ‘The number....’, which is singular, so the verb also has to be singular, ‘.... is very small’. Ans 4
54. Here, ‘egg and toast’ is together treated as a singular subject. Thus a singular verb ‘is’ should be used. Ans 2
55. The error of parallelism – ‘... all the ability but no dependability...’. Ans 3
56. ‘..wise’ is used with criteria like age, gender, class, etc. For ‘turn’, the correct expression is ‘turn by turn’. Ans 4
57. The correct expression is ‘consist of’ or ‘comprise’; ‘of’ is redundant. Ans 3
58. ‘Uninterested’ means ‘not interested’. ‘Disinterested’ means ‘unbiased’. Here, the boy is uninterested and not disinterested. Ans 1

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59. ‘At the beginning’ and ‘at the end’ are two expressions that are used to denote a point of time while ‘in the beginning’ and ‘in the end’ are used to denote a longer period of time e.g. (a) In the beginning, he was shy but later on he gained confidence. (b) The spider tried hard to climb the wall but fell each time, in the end he reached the top. (i.e. finally, he reached the top) **Ans 1**
60. Between is used for two objects and Among is used for more than two objects. Thus, ‘Among all the’ is correct. **Ans 1**

Chapter 26

Vocabulary

26.1 Introduction

As engineering students have a technical background, they pay little attention towards learning new words. And so, facing questions on a vocabulary test can give them nightmares. But memorizing these new words is not impossible if a proper technique is followed; the most common being with the help of ‘roots’. Many words in English language have their roots in other languages. Learning words through these roots is learning with the help of the etymology of words. English language has derived most of its words from the Greek or Latin language. The advantage here is that by learning one root, one can memorize many other words derived from that root, e.g., ‘mal’ means something that is bad or ill, etc. So, all the words that begin with this root will have a negative connotation, like:

malfuction	not functioning properly
malnutrition	improper nutrition
malcontent	bad content, rebellious
malice	ill will, bad feelings for others
malicious	to be full of malice
malingering	to shirk work or responsibility
malediction	curse
malevolent	wishing evil or harm upon others

So, we end up learning many words just through the aid of one root. This proves advantageous in tackling ‘odd one out’ questions as well. A list of most of these roots is provided in this section. Memorising all of them will automatically equip the student to face most of the vocabulary questions and arrive at the correct option.

26.2 List of Roots

Phil	love
Philosophy	love of knowledge
Philanthropist	social worker, one who loves mankind

Bibliophile	one who loves books (Biblio + Phil)
Philatelist	one who loves collecting stamps
Philanderer	flirt

Mis	hate (opposite of phil)
Misanthropist	one who hates humankind
Misogynist	one who hates women
Misdeed	wrong doing
Mislead	to lead for the wrong thing
Misjudge	to judge incorrectly

Bene	good
Beneficiary	one who receives the benefit
Benefactor	one who gives the benefit
Benediction	blessing (Bene + Dicto)
Benevolent	kind-hearted, good natured, generous
Benign	gentle, mild, harmless

Malus	bad, evil (opp. of bene)
Malnutrition	improper nutrition
Malfunction	not functioning properly
Malice	ill will, bad feeling
Malignant	harmful, spreading illness
Malediction	curse (malus + dicto)
Malevolent	spiteful, wishing harm to others
Malefactor	wrongdoer
Malicious	intended upon harming others
Malign	harmful, unpleasant
Malinger	to shirk
Malcontent	discontented and rebellious
Malaise	illness

Paidos	Child
Paediatrician	a doctor who treats ill children
Pedagogue	one who leads a child – a teacher (paidos + agog (to lead))
Pedagogy	methodology

Demos

- Democracy
Demagogue
Demographics

People

- rule of people
a leader (demo + agog)
features related to the population

Psycho

- Psychologist
Psychiatrist
Psychotherapist
Psychosomatic
Psychotic
Psychopath

mind

- one who has done advanced study in psychology
a doctor who can cure mental disease
a doctor who treats people using psychotherapy
mental disease that affects the physical state also
one with severe mental illness
one who has chronic mental disorder especially accompanied by abnormal or violent social behaviour

Gregos

- Gregarious
Egregious
Congregate
Segregate
Aggregate

Herd

- one who always likes to be in the company of others
outstanding in a bad way, shocking or outrageous
to come together
to separate
to add

Ambi

- Ambidextrous
Ambivalent
Ambiguous

Both

- skilled with both hands
having mixed feelings about someone or something
doubtful or unclear

Loc/Loq

- Eloquent
Grandiloquent

Soliloquy
Monologue
Circumlocution
Elocution
Loquacious
Somniloquist

Speech

- Impressive speech, very good language
flowery language, speaking by using very difficult words mainly to impress

speaking to oneself
one person speaking at length
to speak in a roundabout manner
public speaking
who speaks a lot
who speaks whilst asleep

Scriptus	To write
Describe	to explain by way of writing
Inscribe	to write inside
Prescribe	to write beforehand
Proscribe	to prohibit
Ascribe	to attribute
Scribble	to write nonsensically
Manuscript	written by hand
Typecript	typed material
Scriptures	written material (religious)

Cide	To kill
Genocide	mass killing of humans
Homicide	killing of a human
Fratricide	killing one's own brother
Suicide	killing oneself
Matricide	killing one's own mother
Patricide	killing one's own father
Uxoricide	killing one's own wife
Regicide	killing one's own king

Chronos	Time
Chronic	continuing for a long time
Anachronism	something that is out of place in the current context
Chronology	science of time, order and accurate dating of events
Synchronise	to time together

Pathos	Disease or feeling
Pathology	study of diseases
Pathologist	doctor who examines tissues through biopsy
Sympathetic	understanding another's feelings
Pathetic	disgusting
Telepathy	feeling from a distance

Eq	Equal
Equinox	when day and night are of equal length
Equanimity	evenness of temper
Equilibrium	balance
Equilibrist	tight rope walker
Equivocal	unclear
Plac	Calm
Placate	appease
Placid	calm
Implacable	someone or something that cannot be calmed
Placebo	a medicine/tonic that imitates the action of real medication
Bellum	War-like
Belligerent	war like, aggressive behaviour
Rebellious	one who does not conform to authority
Belligerent	easily angered
Magnus	Great
Magnify	to see an enlarged view
Magnitude	the great size or scale of an event or happening etc.
Magnanimous	large-hearted, generous
Magnum opus	the greatest or most important work produced by a writer, artist, or musician, etc.
Viv	Life
Vivid	life-like, very real
Vivacious	full of life, lively
Revive	bring back to life
Pan	All
Pantheism	one who believes in all religions (pan + theo)
Panacea	universal medicine that can cure all diseases
Pandemic	occurrence of disease that affects many people worldwide
Pandemonium	very noisy, chaotic

Monos

Monopoly	to be the only provider, seller in an industry
Monologue	single person speaking
Monogamy	marriage to one person
Monarch	rule of one person
Monocle	spectacle with one lens

Polus

Polygamy	a custom which allows many marriages
Polyglot	one who speaks and understands many languages
Polymath	a person who is very learned in several fields

26.3 Prefixes and Suffixes

Fore

Forecast	to tell the weather beforehand
Foretell	to tell the future beforehand
Forethought	thinking of something beforehand

Un

Undo	reverse the action
Untie	to open

Con

Concurrent	happening at the same time
Congenital	present from birth
Conclave	meeting
Congruent	same
Concomitant	happening at the same time
Convergence	rays coming together

Di

Divergence	to spread out
Divert, Diversion	change direction
Dissect	cut apart

Alone/singular

to be the only provider, seller in an industry

single person speaking

marriage to one person

rule of one person

spectacle with one lens

Many

a custom which allows many marriages

one who speaks and understands many languages

a person who is very learned in several fields

Before

to tell the weather beforehand

to tell the future beforehand

thinking of something beforehand

Reverse

reverse the action

to open

Together

happening at the same time

present from birth

meeting

same

happening at the same time

rays coming together

Twice, apart

to spread out

change direction

cut apart

Nov	New
Novelty	newness or originality
Novice	beginner
Trans	Cross
Transnational	across the countries
Transborder	across the borders
Vince	Conquer
Convince	persuade a person
Invincible	one who cannot be conquered
Cred	Believe
Credence	something regarded as true
Credit	recognition
Credulous	gullible, naive
Incredible	that cannot be believed
Creditable	praiseworthy
Circum	Around
Circumlocution	roundabout way of speaking
Circumference	length around a circle
Circumvent	to avoid
Retro	Backward
Retrospect	looking or thinking back in time
Retrograde	going back, getting worse
cracy, archy	to rule
Anarchy	no rule at all, chaos
Monarchy	rule of one king
Aristocracy	rule of the royal family
Plutocracy	rule of the wealthy
Autocracy	self-rule, imposed rule

-ious	to be full of
Ferocious	full of ferocity
Sagacious	full of wisdom
Voracious	one who reads or eats a lot / full of voracity
Pugnacious	one who is very aggressive
Vivacious	full of life

Counter	contrary
Counter argument	disagreement
Counter productive	harmful, undermining

De	remove
Detoxify	remove the poisonous substance
Dethrone	remove from throne
Deregulate	remove the imposed controls
Derelict	careless, negligent

26.4 Word Groups

After memorizing the words through roots, the next step is to identify the finer differences in the usage of these words. Many of these words might seem similar but they are not the same and these form some of the trickiest questions in this section. To answer these, the student should be aware of the concept of ‘word groups’. In a group, we shall list down the similar words in a context and then explain the meaning and usage of each and every word in the group. Seeing them all together with their usage makes it easier to remember these words.

26.4.1 Praise

Word	Meaning	Sentence
Commend	Praise formally	The author was commended for such an informative book.
Accolade	Award of merit	The Filmfare award is the biggest accolade of Bollywood
Eulogy	Speech or piece of writing which contains high praise for someone	Her latest film has brought eulogies from the critics.
Laudatory	Expressing praise (usually in the form of speech or writing)	His laudable efforts were recognized in the Principal’s laudatory speech.
Extol	Praise enthusiastically	The king was extolled by his courtiers on his arrival.
Lionize	Treat as a celebrity	After the recent success in the Olympics, Saina Nahwal has been lionized by the media.
Adulate	To praise or admire excessively/ obsequiously	The youth congress members adulate Rahul Gandhi.
Plaudit	A round of applause	3 Idiots opened to the plaudits of the critics.
Acclaim	Applaud or praise publicly	She was acclaimed for her arduous work in social service
Hail	Greet enthusiastically	The crowd hailed Mike Tyson as he stepped inside the ring

26.4.2 Hate to Spend

Word	Meaning	Sentence
Stingy	Unwilling to spend money	Uncle Scrooge was a stingy man.
Parsimonious	Miser	The minister was praised for his parsimonious lifestyle.
Frugal	Economical	The family has been living frugally since their breadwinner son passed away.
Niggard	Stingy person	The Municipal Corporation has been providing a niggardly supply of clean drinking water.

26.4.3 Spend a Lot

Word	Meaning	Sentence
Extravagant	Spending excessively	Her extravagant lifestyle is a burden on her husband's finances.
Spendthrift	One who spends too much	Her mother's spendthrift ways have caused trouble to the whole family.
Prodigal	One who spends money recklessly	His prodigal habits have become too difficult to control.
Squander	Spend wastefully	In this age, we must not squander away our natural resources.

26.4.4 Unpredictable/Unusual

Word	Meaning	Sentence
Capricious	Unpredictable	After the accident, he has been experiencing capricious mood swings.
Mercurial	extreme changes in temperament	He is unpredictable because of his mercurial nature.
Fitful	Irregularly stopping and starting	The border areas are subjected to fitful bombing raids.
Whimsical	Determined by chance or impulse.	Rahul is notorious for his whimsical personality.
Eccentric	Unusually strange	It would be easy to dismiss him as a lovable, eccentric old hippie.

26.4.5 Argumentative

Word	Meaning	Sentence
Adversary	Someone you are competing with, or arguing or fighting against.	His political adversaries were creating trouble for his team.
Belligerent	War-like (can be used for aggressive actions or behaviour)	Everyone was surprised to see her bellicose behaviour.
Belligerent	Hostile and aggressive	The captain was accused of belligerence.
Pugnacious	Ready to start a fight	The boss was in a pugnacious mood so everyone stayed out of his way.

Irascible	Irritable/ Short-tempered	His wife has an irascible temper.
Surly	Bad-tempered	I was surprised to see him becoming surly towards me.
Churlish	Bad-tempered or Rude	It would seem churlish to argue on such a petty issue.
Peevish	Querulous	He always wore a peevish expression on his face.
Fractious	Irritable (someone who gets angry about small things)	The professor was visibly fractious.
Cantankerous	Quarrelsome	Nobody likes to sit with the cantankerous old woman.
Contentious	Argumentative	The discussion on the most contentious issues has been avoided till now
Gruff	Rough-mannered/harsh voice	She was despised for carrying a gruff exterior.
Ireful	Full of anger	Her ireful exterior concealed one of the kindest hearts.

26.4.6 Criticise/scold

Word	Meaning	Sentence
Chastise	To punish/ to criticize severely	Amit was chastised for his rude remarks.
Censure	To criticise harshly	The Finance Minister was censured by the Prime Minister in the cabinet meeting
Admonish	To scold earnestly	The students were admonished for their behaviour.
Reprimand	Criticize angrily	The guard was severely reprimanded for coming drunk
Reproach	Express disapproval for a fault	He felt embarrassed on hearing the words of reproach.
Revile	Criticize abusively	The argument became so heated that the ministers began to revile each other.
Castigate	Rebuke or punish severely	Health inspectors castigated the kitchen staff for poor cleanliness
Excoriate	Censure severely	The journalist in his editorial excoriated the administration for inaction.
Chide	Scold	The woman chided her child for being late.
Rebuke	Criticize angrily	The student was rebuked by her teacher for cheating

26.4.7 Lively

Word	Meaning	Sentence
Brisk	Lively/quick	The CEO was brisk and demanded work to be done quickly.
Ebullient	Lively and full of enthusiasm	The children were ebullient during their trip to the amusement park.
Exhilaration	Great joy and excitement	It was exhilarating for him to escape the jungle and find a village.

Exuberant	High-spirited	Out of all the participants in the screening test, the exuberant young girl was selected.
Scintillating	Lively and interesting (usually used for performance or conversations)	Everyone was captivated by the scintillating performance of the dancers.
Vivacious	Lively and exciting	She is beautiful and vivacious.

26.4.8 Secret/Hidden

Word	Meaning	Sentence
Covert	Not openly practised, or hiding place	The soldier was suspended for divulging the details of covert military operation to the enemy.
Furtive	Secretive	A man was standing down the street casting furtive glances at us.
Surreptitious	Done by stealth; kept secret	ISI agents were caught during their surreptitious intelligence operations in Agra.
Clandestine	Secret	A tryst can be defined as a clandestine meeting between lovers.
Skulk	Move stealthily, lurk, or keep oneself hidden	I think I saw someone skulking in the bushes.
Abscond	Depart furtively esp. unlawfully to avoid arrest	The murderer absconded along with the accomplice.
Incognito	With identity concealed	Scorpios like to travel incognito.
Arcane	Mysterious, secret	Technology is always arcane to those who don't understand it.
Enigma	A puzzle/mystery	Chinese monasteries remain an enigma to the outside world.

26.4.9 Arrogance

Word	Meaning	Sentence
Haughty	Too proud.	He was disliked by everyone for his haughty behaviour
Vain	Excessively proud	Do not come off sounding too boastful and Vainglorious
Disdainful	To think oneself superior to Others	The editor disdainfully rejected everyone's suggestions.
Condescending	Behaving in a way that shows superiority over others	I hate your condescending attitude towards me.
Egotistical	Having an exaggerated opinion of oneself	George and Jane have an intensely egotistical nature in common.
Conceited	Being too proud of one's abilities	Everyone disapproved of him for being conceited.

26.4.10 Food and drink

Word	Meaning	Sentence
Epicurean	Dealing with the pleasure of enjoying fine food and drink	Delicious epicurean delights are prepared from scratch by culinary arts students and expert chefs.
Gourmand	One who enjoys eating and drinking in large quantity.	Gourmands are never concerned with the quality food.
Gourmet	A connoisseur of food or one who enjoys good food and wine	The food in this place is made for gourmands rather than gourmets.
Glutton	One having an insatiable appetite	He is called a glutton because he cannot control his appetite.
Palatable	Pleasant to taste	The garnishing made the food look more palatable.

26.4.11 Friendly

Word	Meaning	Sentence
Affable	Friendly and pleasant	Mr. Sahni is an extremely affable man.
Winsome	Attractive and charming	The model gave the judges her most winsome smile.
Genial	Kind and sociable	The genial old man was loved and respected by all his people.
Amiable	Friendly and pleasant	He was a charming and amiable man.
Amicable	Showing a friendly spirit	The discussion ended amicably.
Comely	Attractive or pleasant to look at	The studio was full of comely blondes ready to be photographed.
Cherubic	Sweet and innocent to look at	I couldn't take my eyes off her cherubic face.
Alluring	Attractive	Discount sales in retail stores allure the shoppers.

26.4.12 One Who Talks a Lot

Word	Meaning	Sentence
Garrulous	Talkative	Outgoing, ebullient and garrulous, she was loved by loved by all her colleagues
Loquacious		
Verbose	Wordy, tedious or lengthy	Everyone in the hall was bored after hearing his verbose speech.
Voluble	Talking easily and fluently	He became voluble in his admiration of the portrait
Glib	Smooth, easy or unconstrained	A glib talker, he can easily impress anyone with his conversation.



Exercise 26.1

Synonyms

Directions for questions 1 to 10: Out of the given four options, select the word or phrase that is most nearly same in meaning to the capitalized word:

1. **EQUIVOCATE**
 1. Disloyalty
 2. Amalgamate
 3. Mislead
 4. Idolatry
2. **RUDIMENTARY**
 1. Feeble
 2. Inchoate
 3. Baroque
 4. Malleable
3. **MUNDANE**
 1. Famous
 2. Intricate
 3. Commonplace
 4. Theatrical
4. **HAPLESS**
 1. Voracious
 2. Fortuitous
 3. Serendipitous
 4. Unlucky
5. **CITADEL**
 1. Metropolitan
 2. Head priest
 3. Fort
 4. A mythological creature
6. **NOSH**
 1. To drink
 2. To dance
 3. To snack
 4. To bang
7. **CHORTLE**
 1. Whimper
 2. Chuckle
 3. Grimace
 4. Laugh
8. **MAWKISH**
 1. Foolish
 2. Researched
 3. Odd
 4. Sentimental
9. **ENSCONCE**
 1. Settle
 2. Warm
 3. Wrap
 4. Anger
10. **CONTRIVED**
 1. Trap
 2. Love
 3. Fake
 4. Plan

Antonyms

Directions for questions 1 to 10: Out of the given four options, select the word that is most nearly opposite in meaning to the capitalized word:

1. **MITIGATE**
 1. Mollify
 2. Exacerbate
 3. Allay
 4. Masticate
2. **EFFERVESCIENCE**
 1. Glittery
 2. Langour
 3. Felicity
 4. Cheerfulness
3. **JOCUND**
 1. Dexterous
 2. Obscure
 3. Variegated
 4. Morose
4. **IRRELEVANT**
 1. Sprightly
 2. Rescind
 3. Germane
 4. Ardent
5. **NEBULOUS**
 1. Murky
 2. Limpid
 3. Definitive
 4. Pungent

- | | | | | |
|-----------------------|---------------|-------------|-------------------|---------------|
| 6. INDUBITABLE | 1. Unending | 2. Doubtful | 3. Unquestionable | 4. Invincible |
| 7. HYPERBOLE | 1. Cosmic | 2. Killjoy | 3. Understatement | 4. Overkill |
| 8. AFFRONT | 1. Counter | 2. Enrage | 3. Flatter | 4. Hate |
| 9. BESOTTED | 1. Worshipped | 2. Obsessed | 3. Arranged | 4. Unaffected |
| 10. MOOT | 1. Proven | 2. Silent | 3. Clever | 4. Darken |

■ **Analogy**

Directions for questions 1 to 10: Out of the given four options, select the word pair that is most similar in relationship to the capitalised pair:

- | | | |
|---------------------------------|-----------------------------|---------------------------|
| 1. TEETOTALER: ALCOHOL | 1. Dipsomaniac: Alcohol | 2. Celibate: Marriage |
| | 3. Enthusiastic: Ebullience | 4. Glutton: Food |
| 2. HAUGHTY: SUPERCILIOUS | 1. Austere: Lavish | 2. Mandrill: Pigeon |
| | 3. Recluse: Hermit | 4. Instigate: Allay |
| 3. ENCOMIUM: ADMIRATION | 1. Eulogy: Censure | 2. Requiem: Sorrow |
| | 3. Plaudit: Failure | 4. Lament: Joy |
| 4. HELP: OBSEQUIOUS | 1. Facetious: Somber | 2. Flout: Obey |
| | 3. Praise: Fawn | 4. Hackneyed: Banal |
| 5. HAMMER: CARPENTER | 1. Shaves: Architect | 2. Anchor: Engineer |
| | 3. Rake: Gardener | 4. Boots: Jailor |
| 6. COGENT: PERSUASIVE | 1. Ugly: Winsome | 2. Acquiesce: Disagree |
| | 3. Germane: Relevant | 4. Dejected: Jubilant |
| 7. SPLINTER: WOOD | 1. Shard: Pottery | 2. Dew: Drop |
| | 3. Incumbent: Office | 4. King: Royal |
| 8. COURTESY: VENERATION | 1. Delight: Beam | 2. Respect: Apathy |
| | 3. Apology: Haughtiness | 4. Astute: Flinch |
| 9. INCIPIENT: INCHOATE | 1. Fervent: Fervour | 2. Impending: Catastrophe |
| | 3. Latter: Initial | 4. Hedonism: Austerity |

10. SATIATE: HUNGER

- | | |
|----------------------|----------------------|
| 1. Instigate: Incite | 2. Plethora: Surplus |
| 3. Pain: Anodyne | 4. Slake: Thirst |

■ Odd One Out

Directions for questions 1 to 10: Out of the given four words, select the word or phrase that does not belong to the group.

- | | | | |
|-----------------|---------------|----------------|----------------|
| 1. 1. Precursor | 2. Vanguard | 3. Filibuster | 4. Harbinger |
| 5. Usher | | | |
| 2. 1. Vex | 2. Chafe | 3. Harass | 4. Peeve |
| 5. Germane | | | |
| 3. 1. Exonerate | 2. Austere | 3. Exculpate | 4. Acquit |
| 5. Vindicate | | | |
| 4. 1. Subtle | 2. Ephemeral | 3. Evanescence | 4. Fleeting |
| 5. Transient | | | |
| 5. 1. Neophyte | 2. Novitiate | 3. Tyro | 4. Greenhorn |
| 5. Preen | | | |
| 6. 1. Gobble | 2. Gorge | 3. Devour | 4. Grub |
| 5. Quark | | | |
| 7. 1. Astute | 2. Ascetic | 3. Acute | 4. Adroit |
| 5. Adept | | | |
| 8. 1. Beguile | 2. Scorn | 3. Entice | 4. Hoodwink |
| 5. Dupe | | | |
| 9. 1. Imperfect | 2. Invincible | 3. Impregnable | 4. Indomitable |
| 5. Impassable | | | |
| 10. 1. Mollify | 2. Placate | 3. Reconcile | 4. Incite |
| 5. Assuage | | | |

■ Contextual Usage

Directions for questions 1 to 15: For each of the words given, choose the word/phrase from the alternatives that is most appropriate substitute in the given context.

- Augurs:** UAE seems to have changed its attitude to terrorists and that augurs well for India.
1. Portends 2. Predicts 3. Records 4. Works
- Deleterious:** Any decline in the revenues of the union government and the associated fall in disbursements to the states will have deleterious effects on regional imbalances in the country.
1. Beneficial 2. Negligible 3. Fluctuating 4. Harmful
- Beleaguered:** If the Indian batsmen are beleaguered in South Africa, units making bats in South Kashmir also face a grave future.
1. Defeated 2. Proficient 3. Ridiculed 4. Disenchanted
- Salutary:** Demystification of public finance and policy is a salutary goal in democracy.
1. Important 2. Trivial 3. Beneficial 4. Just
- Laconic:** His laconic answer failed to reveal his emotions.
1. Terse 2. Inventive 3. Witty 4. Succinct
- Abeyance:** The project was kept in abeyance due to lack of funds.
1. Dormancy 2. Deprivation 3. Deference 4. Detestation

7. **Eschew:** To garner worldwide support, the Non-Alignment Movement leaders should display their inclination to eschew the controversial standards it accuses the West of adopting.
 1. Renounce 2. Relinquish 3. Disavow 4. Amplify
8. **Circumspect:** One needs to be very circumspect when dealing with organizations of ill repute.
 1. Robust 2. Wary 3. Discreet 4. Chary
9. **Wizened:** His wizened face deceived his age.
 1. Creased 2. Withered 3. Lined 4. Cultivated
10. **Berate:** The poor worker was severely berated for his carelessness at work.
 1. Ostracized 2. Scolded 3. Warned 4. Incarcerate
11. **Munificent:** She will always be remembered amongst the peasants for the munificent acts which marked her reign.
 1. Magnanimous 2. Cruel 3. Hasty 4. Sacred
12. **Lampoon:** Healthy parenting is being careful not to lampoon the children in public.
 1. Accompany 2. Beneficent 3. Ridicule 4. Adorn
13. **Variegated:** Her restless spirit can be understood seeing the variegated apparel she wears.
 1. Expensive 2. Assorted 3. Flimsy 4. Garbled
14. **Cavort:** Ever since she received her letter of admission, she has been cavorting in the neighbourhood.
 1. Caper 2. Show Off 3. Shout 4. Sulk
15. **Petulant:** She was always the least popular child at family reunions because of her petulance.
 1. Misbehaviour 2. Affableness 3. Haughtiness 4. Crankiness

Answer Key

Synonyms

- | | | | | | |
|------|------|------|-------|------|------|
| 1. 3 | 2. 2 | 3. 3 | 4. 4 | 5. 3 | 6. 3 |
| 7. 4 | 8. 4 | 9. 1 | 10. 3 | | |

Antonyms

- | | | | | | |
|------|------|------|-------|------|------|
| 1. 2 | 2. 2 | 3. 4 | 4. 3 | 5. 3 | 6. 2 |
| 7. 3 | 8. 3 | 9. 4 | 10. 1 | | |

Analogies

- | | | | | | |
|------|------|------|-------|------|------|
| 1. 2 | 2. 3 | 3. 2 | 4. 4 | 5. 3 | 6. 3 |
| 7. 1 | 8. 1 | 9. 1 | 10. 4 | | |

Odd One Out

- | | | | | | |
|------|------|------|-------|------|------|
| 1. 3 | 2. 5 | 3. 2 | 4. 1 | 5. 5 | 6. 5 |
| 7. 2 | 8. 2 | 9. 1 | 10. 4 | | |

Contextual Usage

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. 1 | 2. 4 | 3. 1 | 4. 1 | 5. 1 | 6. 1 |
| 7. 2 | 8. 2 | 9. 2 | 10. 2 | 11. 1 | 12. 3 |
| 13. 2 | 14. 1 | 15. 4 | | | |

 **Explanatory Answers**
Synonyms

1. Equivocate means to lie or hide the truth by not answering directly

Disloyalty: lack of loyalty; unfaithfulness

Amalgamate: to mix up

Mislead: to misguide someone

Idolatry: worshipping the idols

The synonym for equivocate is mislead.

Ans 3

2. Rudimentary is undeveloped

Feeble: weak

Inchoate: not complete

Baroque: a European art style of the 17th and 18th centuries

Malleable: that can be moulded

The synonym for rudimentary is inchoate.

Ans 2

3. Mundane is common, routine or uninteresting

Famous: well-known

Intricate: very complicated or detailed

Commonplace: where everyone visits

Theatrical: related to theatre

The synonym for mundane is commonplace.

Ans 3

4. Hapless means unfortunate, unlucky

Voracious: very eager, having a large appetite for food or anything

Fortuitous: happening by chance, and not intentionally

Serendipitous: accidental, happening by chance

The synonym for hapless is unlucky.

Ans 4

5. Citadel means a fort, defence tower

The synonym for citadel is fort.

Ans 3

6. Nosh means a light snack or meal.

Ans 3

7. Chortle means a gleeful laugh.

Whimper: series of low, feeble sounds to express pain, mostly

Chuckle: a quiet, suppressed laugh

Grimace: a face expression

Ans 4

8. Mawkish refers to something sentimental in an exaggerated way.

Ans 4

9. Ensconce is to settle in a cosy, comfortable place.

More than the warmth of the place, the word refers to the act of establishing in that place.

Ans 1

10. When something is made up deliberately, we call it Contrived.

Fake means something not natural.

Ans 4

Antonyms

1. Mitigate means to lessen

Mollify: to lessen or reduce the intensity

Exacerbate: to make worse

Allay: to lessen the fear

Masticate: to chew

The antonym for mitigate is exacerbate.

Ans 2

2. Effervescence means bubbling, showing enthusiasm etc.

Langour: Lack of energy, physical weakness

Felicity: state of happiness, celebration

The opposite for effervescence is languor.

Ans 2

3. Jocund means cheerful and gay

Dexterous: skilful

Obscure: hidden, not clear

Variegated: having a lot of variety

Morose: sullenly ill-humoured

The opposite for Jocund will, naturally, be Morose.

Ans 4

4. Irrelevant means not related or relevant

Sprightly: lively

Rescind: to annul, cancel

Germane: relevant, pertinent

Ardent: fervent, passionate

The antonym for irrelevant is germane.

Ans 3

5. Nebulous means hazy, not very clear

Murky: unclear, muddy

Limpid: lacking energy

Definitive: clearly defined

Pungent: sharp, caustic, bitter

The antonym for nebulous is definitive.

Ans 3

6. Indubitable is something which cannot be doubted or questioned.

Ans 2

7. Hyperbole means an exaggerated claim or statement.

Killjoy: someone who is a spoilsport

Overkill: means excessive action

Ans 3

8. Affront means something which causes outrage. Counter, enrage, and hate all are negative in connotation. Flattery takes on the intent to impress someone.

Ans 3

9. Besotted is to be drunk or infatuated with something.

Unaffected is the only word which can explain something contradictory.

Ans 4

10. Moot is something which can be disputed or is uncertain.

Ans 1

Analogies

1. One who is a teetotaler doesn't take alcohol.

One who is celibate does not marry.

■ Other Words

Dipsomaniac: one who drinks a lot

Ebullience: oozing energy

Glutton: one who eats a lot.

Ans 2

2. Haughty and supercilious are synonyms. They both mean to be arrogant and snooty.

Similarly, a recluse or a hermit is someone who stays away from the rest of the world.

■ Other Words

Austere: strictly bare minimum, nothing extra

Lavish: abundance

Mandrill: an animal

Instigate: to provoke someone.

Allay: to calm down.

Ans 3

3. Encomium and admiration are synonyms

Requiem and sorrow are also synonyms.

■ Other Words

Plaudit: an expression of praise

Lament: to grieve.

Censure: to criticize severely.

Ans 2

4. Obsequious is someone who is too eager to help. Similarly, hackneyed and banal mean the same, i.e. something that is dull, boring, routine.

■ Other Words

Facetious: inappropriately funny, hilarious, **jocular**

Flout: not to follow

Fawn: young one of a deer

Somber: dark, dimly lit.

Ans 4

5. Hammer is a tool used by a carpenter

And rake is a tool used by a gardener.

Ans 3

6. A cogent argument is one that is so strong that it is persuasive.

Again, Germane is an argument that is relevant.

■ Other Words

Acquiesce: to accept someone's request

Dejected: to be in low spirit or mood

Jubilant: to be happy.

Winsome: charming.

Ans 3

7. Splinters of wood are small pieces or shavings of wood.

Similarly, shards are small pieces of pottery.

■ Other Words

Incumbent: holding the office/position currently

Regal: Royal.

Ans 1

8. Veneration is a higher degree of courtesy as courtesy means to be respectful and veneration is to worship. And Beam is to be very happy while delight is to be pleasantly happy.

■ Other Words

Apathy: indifference

Flinch: to hesitate

Haughtiness: proud, snobbish

Astute: clever, shrewd

Ans 1

9. Something that is in the incipient stage is in the initial stage and is inchoate, i.e. ill formed. Similarly, someone who is fervent has fervour.

■ Other Words:

Fervent: passionate

Fervour: enthusiastic

Impending: about to happen

Catastrophe: big calamity

Hedonism: fanaticism, strong belief in something/idea.

Austerity: living a life devoid of luxuries.

Ans 1

10. To be satiated is to be satisfied, i.e. not hungry

Similarly, slake is not to be thirsty

■ **Other words:**

Instigate/Incite: to arouse, provoke

Plethora: abundance

Anodyne: something that reduces pain.

Ans 4

Odd One Out

1. Precursor, vanguard, harbinger and usher, all refer to the beginning of something while filibuster is an exceptionally long speech. **Ans 3**
2. Vex, chafe, harass and peeve are all negative words that point to irritating or bothering someone. Germane is relevant. **Ans 5**
3. Exonerate, exculpate, acquit, and vindicate all mean to free from blame while austere is very strict and unsparring. **Ans 2**
4. Ephemeral, evanescent, fleeting and transient refer to a thing that is short lived and temporary, while subtle is something that is underlying, not very obvious. **Ans 1**
5. Neophyte, Novitiate, Tyro and Greenhorn refer to people who are beginners and learners. Preen is to tidy oneself and dress up smartly. **Ans 5**
6. Gobble, gorge, devour, and grub all refer to a way or act of eating food. Quark is certainly a misfit as it is a term which refers to a sub-atomic particle. **Ans 5**
7. Astute, acute, adroit, and adept are all terms to describe intelligence or perceptiveness. While ascetic refers to severe discipline and abstention. **Ans 2**
8. Beguile, entice, hoodwink, and dupe are words which mean deception or trickery. Scorn means to treat with dislike. **Ans 2**
9. Invincible, impregnable, indomitable, and impassable mean something or someone who is too powerful. Imperfect (not without perfection) is the clear odd one out. **Ans 1**
10. Mollify, placate, reconcile, and assuage means to soothe or relieve. While incite means to provoke. **Ans 4**

Contextual Usage

1. The meaning of the word ‘augur’ is to signify or indicate in advance; same as ‘portend’. Predict means to foretell or prophesize about the future. As here one event is indicating the happening of the second event and no one is predicting the future. **Ans 1**

2. Deleterious is ‘harmful’. Ans 4
3. Beleaguered, in this sentence would mean defeated because according to the sentence if the Indians lose in South Africa, the craze for cricket will become less in India and will affect the bat manufacturing industry here. Proficient means to be extremely skilled at something; had they been proficient, why would their sales dip. Ridiculed is to make fun of; so if the players are made fun of, it will have no effect on the sales of bats in the country. Disenchanted is to be free from any attachments, illusions, etc. Ans 1
4. Salutary means beneficial. Reading this sentence, salutary will mean important, as a goal is important and not beneficial. Ans 1
5. Laconic is someone who speaks less. In this sentence, the person does not reveal his emotions as he speaks less or he is terse. ‘Inventive’ would mean original or creative. ‘Succinct’ is used for shortened versions of written material e.g. novels, books, etc. ‘Witty’ is clever or funny; which again tells us about the emotions. Ans 1.
6. Abeyance is a temporary state of suspension. Dormancy also means suspension or slowing down of activity. Deference is offering respect and detestation is to dislike. Ans 1.
7. Eschew is to avoid or keep away from. Renounce is to give up or disown. Disavow is to disclaim the knowledge of or connection with something. Relinquish is to surrender or let go. Though the words are very similar but the apt substitute for ‘eschew’ will be ‘relinquish’ as relinquish also has this usage. Ans 2.
8. As one is dealing with organizations of ill repute, one needs to be cautious. Wary is being watchful; being on one’s guard. Robust is strong and healthy. Chary is careful or cautious. Discreet is showing prudence or circumspection. Ans 2
9. Wizened is withered or shrivelled. Ans 2
10. To berate is to scold. Ostracize is to banish someone from the society. Incarcerate implies confining, like in a prison. Ans 2
11. Munificent refers to great generosity. Magnanimous is someone who’s generous or large-hearted. Ans 1
12. To lampoon is to publicly criticize someone using ridicule or sarcasm. Adorn means to decorate and berate means to criticize severely. Ans 3
13. Variegated comes from variety. Flimsy means something very thin and easily damaged. Garbled is something in a confused and distorted manner. Ans 2
14. Cavort is to jump or dance around excitedly. Caper means skipping or dancing in a lively way. Ans 1
15. Someone is petulant when they behave in a childishly bad-tempered way. Affableness is friendliness. Haughtiness is superior arrogance. Crankiness is bad temper or irritability. Ans 4

Chapter 27

Fill in the Blanks

27.1 Introduction

For testing the vocabulary of students, fill in the blanks are asked in almost all the placement papers. The format is that a sentence is given with one or two blanks and the students have to select the best word out of the given options which fits in those blanks. The following points should be kept in mind while attempting these questions:

1. A good knowledge of vocabulary is beneficial for the students. Often, the correct word, with its three antonyms is given in the four options which make the task of selecting the correct answer much easier.
2. The correct answer should be the one that fits the sentence grammatically and also conveys the true meaning of the sentence. You can consider the following sentence:

In the radio industry, mostly a broadcasting time in the evening a larger and more audience and thus, it is the time that is more lucrative to the advertisers of high end products.

- | | |
|---------------------------|----------------------------|
| (a) Demands, attractive | (b) Denotes, agreeable |
| (c) Indicates, prosperous | (d) Encourages, widespread |

In this example, almost all the options will fit in the blanks grammatically but we have to carefully look at the sentence to find a clue to the correct choice of the answer. Here, the first blank can have any of the four given words as they are more or less similar in meaning but the options for the second blank are very different and thus, critical to find the answer. If we examine the sentence closely, it says ‘one that is appealing to advertisers of high end products’. Here is the clue; the sellers of expensive or high end products shall be looking for a prosperous audience and not attractive or agreeable or widespread. Thus, the correct answer is (c) because it conveys the sense of the sentence. This way by finding a clue from the given sentence we can reach our answer.

3. An often repeated format in the fill in the blanks questions is when a sentence is given with a word of contradiction like yet, but, although, even though, etc. Generally, when these words are used, the sentence shows some contradiction. Here, one has to be very careful as the two blanks of the sentence will be opposites.

For example: Anupama was frustrated, although she was adept at making lies sound -----, when telling the truth she -----the power to make herself believed.

- | | | | |
|-----------------------|----------------------|-------------------|--------------------|
| (a) Plausible, lacked | (b) Convincing, held | (c) Honest, found | (d) True, acquired |
|-----------------------|----------------------|-------------------|--------------------|

Here, in the sentence given above, a contradiction is depicted by ‘although’ and it should be conveyed that Anupama is good at telling lies but not the truth. So, the words should be opposites and the correct answer is (a) as this is the only option in which both the words are opposites. Thus, ‘lies sound plausible, when telling the truth she lacked the power’.

4. Always read the sentences after filling your answer choice to be sure that you have selected the correct answer.

Exercise 27.1

Directions for questions 1 to 25: Out of the given options, fill in the blanks with the most suitable word:

1. The giraffe a few shreds of the branch but was mainly not hungry.
 1. Chewed
 2. Nipped
 3. Gnawed
 4. Nibbled
 2. Popular songs often the history of a culture as there subjects are recurrently the events that have predisposed and steered the society.
 1. Confuse
 2. Renounce
 3. Recall
 4. Recount
 3. A recent survey has revealed that while 78 percent of college students are eligible for at least one form of financial aid, only 43 percent of these students are such aid.
 1. Complaining about
 2. Recipients of
 3. Dissatisfied with
 4. Paying for
 4. A business concerned about its competence ought to pay attention to the actions of its employees because the errors of each of its staff often the effectiveness of the organisation to which they belong.
 1. Remake
 2. Provoke
 3. Celebrate
 4. Undermine
 5. Though many people enjoy observing rituals and traditions not their ritualistic culture, they participating in them.
 1. Sanctioned by, encourage
 2. Endemic to, eschew
 3. Upheld in, condone
 4. Accustomed to, avoid
 6. Modernity seems to be chiefly mistaken notions, perhaps because of breaking free from the fetters of convention, the result is that we are very likely to be unexamined hypotheses and unprepared action.
 1. Immune to, accepting of
 2. Contrary to, reliant on
 3. Fraught with, vulnerable to
 4. Disposed of, suspicious of
 7. Although bound to fairly implement the law, a judge is free to use his discretion to the anachronistic.....of some penalties, at the same time.
 1. Enforce, judiciousness
 2. Impose, legality
 3. Exacerbate, severity
 4. Mitigate, barbarity
 8. Though their early annoyance had considerably, they continued to the sloppy worker who had broken the machine.
 1. Blazed, assail
 2. Diminished, appease
 3. Abated, berate
 4. Intensified, torment
 9. The treatment of waste water was being through the contaminants, but possibly it would be more sensible to counterbalance the pollution in the water by adding certain chemical compounds that cause the detrimental waste particles to become inert.
 1. Attempted, tracing
 2. Undertaken, removing
 3. Initiated, avoiding
 4. Simplified, identifying

10. In the 16th century, blatant flouting of a generally accepted system of principles was regarded as, even as a sign of lunacy.
 1. Irrational 2. Frivolous 3. Wilful 4. Impermissible
11. I've reminded him times to send me the list of all those employees who were missing from the function on Republic Day.
 1. Sumptuous 2. Voluminous 3. Umpteen 4. Opulent
12. He his anger on the workers at the construction site.
 1. Wreaked 2. Wooed 3. Wobbled 4. Winked
13. I have heard many inspiring anecdotes of cavaliers during my childhood.
 1. Valiant 2. Cowardly 3. Cowed 4. Defiant
14. He is too for the authorities to catch him without any action.
 1. Native 2. Gullible 3. Artless 4. Wily
15. It was a rather performance; however we had expected it to be quite vibrant and enjoyable.
 1. Lively 2. Vivacious 3. Vapid 4. Dreamy
16. He was feared by his followers more like not only because of his obsession with strict discipline but also because of his adherence to unnecessary details.
 1. A martinet, rigid 2. An authority, sporadic
 3. A tyrant, reluctant 4. A fraud, conscientious
17. Under the guidelines with respect to ethics, which have been recently embraced by the National Committee of Healthcare, human genes will be allowed to be manipulated only to cure diseases for which treatments are inadequate.
 1. Similar 2. Uncommon 3. Alternative 4. Most
18. Although administering untamed chimpanzees with food makes them comparatively less and easier to monitor for the purpose of study, it is also known to their regular social patterns.
 1. Interesting, reinforce 2. Manageable, disrupt
 3. Shy, upset 4. Accessible, retard
19. In spite of the of most of their colleagues, some academicians have begun to underline "pop culture" as crucial for the hopes, myths, and fears of the modern, contemporary society.
 1. Antipathy, entangling 2. Discernment, evaluating
 3. Scepticism, deciphering 4. Enthusiasm, symbolizing
20. Dependence on overseas sources of heavy metals, although remains for the country's foreign policy.
 1. Deepening, a challenge 2. Diminishing, a problem
 3. Excessive, a dilemma 4. Debilitating, an embarrassment
21. It goes without saying that Sushant is a remarkable.....: he excels at narrating anecdotes and stories that enthral his audience till eternity.
 1. Dilettante 2. Prevaricator 3. Raconteur 4. Nescient
22. What daunt most travellers are the curves of the mountainous roads that lead to the summit.
 1. Shady, steadily 2. Gentle, steadily
 3. Jagged, steadily 4. Serpentine, steeply

23. She welcomed the summary of the crisis; he had wasted no words yet delineated his involvement most.....
1. Cogent, compellingly 2. Verbose, direfully
3. Succinct, eloquently 4. Terse, insufficiently
24. The backdrop of the stage set up for the performance renders it difficult to find banners and decorations that can match it.
1. Fatuous 2. Variegated 3. Translucent 4. Byzantine
25. Women from the Victorian era were so by constraints, obligations, and that prevented them from attaining economic independence.
1. Surrounded, routines 2. Fettered, dogmas
3. Ensnared, time 4. Emancipated, possibilities

Directions for questions 26 to 30: A paragraph is given below with some words missing. Each blank has four options. Select the option that fits the blank in the most appropriate way:

A blog is a web page made up of succinct, regularly updated entries, called posts, which are arranged (26) like a journal. The purpose of blogs (27) greatly from links to news, photos, even fiction. Blog posts are (28) to instant messages on the web. Many blogs fall into the (29) "What's on my mind" category of communication; others are more collaborative endeavours based on a (30) topic or area of mutual interest.

26. 1. Symmetrically 2. Chronologically 3. Interestingly 4. Passionately
27. 1. Depend 2. Shift 3. Vary 4. Change
28. 1. Familiar 2. Similar 3. Unique 4. Superior
29. 1. Personal 2. Ephemeral 3. Temporal 4. Local
30. 1. Vague 2. Specific 3. Controversial 4. Contemporary



Answer Key

Exercise 27.1

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. 4 | 2. 4 | 3. 2 | 4. 4 | 5. 2 | 6. 3 |
| 7. 4 | 8. 3 | 9. 2 | 10. 1 | 11. 3 | 12. 1 |
| 13. 1 | 14. 4 | 15. 3 | 16. 1 | 17. 3 | 18. 3 |
| 19. 3 | 20. 2 | 21. 3 | 22. 4 | 23. 1 | 24. 2 |
| 25. 2 | 26. 2 | 27. 3 | 28. 2 | 29. 1 | 30. 4 |



Explanatory Answers

Exercise 27.1

1. 'Nibbled' is the correct option. It means taking small bites and as the question clearly mentions that the giraffe was not hungry, this is the most apt answer.

Gnawed – To bite or chew Nipped – To squeeze or pinch.

Ans 4

2. The correct answer is ‘recount’ as the sentence talks about retelling historical events. **Ans 4**
3. The question explains that more students require financial aid than are receiving it. So, the most accurate answer is ‘43% of these students are recipients of financial aid.’ **Ans 2**
4. The question is trying to state that any business which wants to run smoothly should keep a watch on the operations of its employees otherwise the errors made by the employees can diminish the effectiveness of the organisation. The most suitable word to fill in the blank is ‘undermine’ which means diminish in this context. **Ans 4**
5. The presence of the word ‘though’ indicates some contradiction to the expressed point of view. Of all the options, only the answer choice 2], if selected, will represent this contradiction; the people may enjoy observing rituals which are new to them but they don’t participate in them.

Endemic – Localised

Condone – Overlook, forgive.

Ans 2

6. Here, option 3 fits the blanks very well; modernity is full of mistaken notions mainly because it exposes us to things that are new and unexamined. **Ans 3**
7. As the sentence mentions anachronistic (here, obsolete) ____ of some penalties, the correct word here will be barbarity. And ‘barbarity’ has to be mitigated in today’s time and not exacerbated i.e. made worse. **Ans 4**
8. Seeing ‘although’, we know there is a contradiction; so, by looking for opposites we know that the correct option is [3]. It says that though the anger had come down but still they continued to scold the worker.

Blazed:- Bright flame or fire

Abate : Reduce in force or intensity.

Torment:– To torture.

Ans 3

9. As the latter part of the sentence talks about keeping the contaminants but making them inactive, the first part must be different in the sense that the treatment of waste water is being done by getting rid of contaminants. Thus, the most accurate option is ‘undertaken.....removing’. **Ans 2**

10. Here, we have to find a word that is a milder version of madness; the correct word would be irrational. Frivolous:– not important. **Ans 1**

11. While talking about a thing being repeated a number of times; the correct word is umpteen.

Sumptuous – very tasty

Voluminous – having a large volume

Umpteen – many

Opulent – rich and wealthy.

Ans 3

12. The sentence wants to convey that he unleashed his anger onto the office staff. The correct word that fits the blank is ‘wreaked’. Rest all have different meanings:

Wooed – to charm, attract

Wobbled – walk unsteadily

Winked – to sign with one eye closed.

Ans 1

13. Cavaliers are horsemen who fight battles. So, they have to be brave, i.e. valiant.
Coward – shy, fainthearted
Defiant – not taking orders or authority
Cowed – to get frightened from. Ans 1
14. If the police is finding it difficult to catch him, he is wily i.e. clever.
Native – original settlers of a place
Gullible – easy to fool, one who believes others readily
Artless – simple, not clever. Ans 4
15. Since the word ‘however’ has been used; the concert has to be the opposite of what they expected. As it was expected to be bright and entertaining, the opposite will be vapid i.e. dull and boring.
Vivacious : lively. Ans 3
16. Someone who is a strict disciplinarian is a ‘martinet’ and so he will be rigid in his adherence to formal details.
tyrant – one who exercises his powers unjustly
sporadic – happening irregularly, occurring in scattered instances
conscientious – careful and meticulous by one’s inner sense of what is right. Ans 1
17. As ethics are in question, the genes are to be manipulated only if absolutely necessary and rest all the treatments have failed; so the correct answer is ‘alternative’. Ans 3
18. ‘Although’ depicts the contradiction, which is aptly furthered by option 3, i.e. the monkeys become less shy but the food upsets their normal routine also. Ans 3
19. Many great thinkers of any time scoff at ‘pop culture’; the usage of ‘scepticism,’ regarding it is apt. The sentence goes on to state that understanding ‘pop culture’ holds the key to demystifying many contemporary mysteries and legends. Ans 3
20. The sentence explains that even though reliance on foreign sources for heavy metals is reducing, it continues to pose a problem for the country. Thus, the most accurate option is ‘diminishing..... a problem’. Ans 2
21. Dilettante is someone with an amateur interest in an art, without a real commitment. While Prevaricator is someone who speaks in a misleading way and Nescient is an ignorant person. Raconteur refers to the person who tells anecdotes in a skilful way, which is what the sentence is expressing. Ans 3
22. Our cue is the “mountainous road” – so it certainly can’t be gentle, or even jagged, which means something with sharp points protruding out. Serpentine means something in a winding line. This is the most appropriate option. Ans 4
23. Since he had “wasted no words” – verbose can’t be our answer. The second blank has to contain a positive comment and so it can’t be option 2 or 4. Between eloquently and compellingly, the latter makes a stronger case as it is more impactful on the audience. Ans 1
24. We want something which would make it difficult to match colours of the other decorations with it. Byzantine is something complicated, while fatuous is silly. Translucent means semi-transparent, and variegated means various colours in irregular patches or streaks. Clearly, our answer will be ‘variegated’. Ans 2

25. Constraints and obligations will only restrict women in some way. Hence our answer has to be either option 2 or 3. If we look at the second blank, our answer becomes clear: time doesn't fit in with the set of obligations and constraints, while dogmas, which are strictly observed principles, adds to the meaning. So, 2nd option conveys the meaning of the sentence in the best manner. **Ans 2**
26. All entries in a blog follow a timeline, i.e. they were arranged chronologically... **Ans 2**
27. Blogs are written for a wide range of reasons. So the reasons behind a blog vary... **Ans 3**
28. Blog posts share common threads with instant messages. So, the most accurate response for the blank is that the two are similar. **Ans 2**
29. Many blogs are personal to the writer's heart as they may contain instances from the life of the blogger. **Ans 1**
30. Other than personal blogs, another variety may be one where various bloggers blog together about topics of current or contemporary importance. **Ans 4**

Chapter 28

Reading Comprehension

28.1 Introduction

Reading comprehensions are unseen passages that test the student's ability to understand the content of the given text; and subsequently, answer the questions based on that text. Recently, almost all the companies have included at least one passage in their test. Though it is a very time consuming affair to read the passage and understand it, but one must not overlook the fact that if understood well, it will lead to 5 correct answers in a single go.

The questions asked in the RCs can be broadly divided into two types:

1. Direct questions
2. Indirect questions

28.1.1 Direct Questions

Direct questions are those that are picked up directly from the facts given in the passage. These can be answered even if one has not read or understood the entire passage. These questions are a must to attempt as one can be sure that these answers are correct. Even if the student does not have sufficient time left to attempt the RC, he/she can find the answers to these questions by having a cursory glance at the passage.

28.1.2 Indirect Questions

Indirect questions are the questions that are based upon the understanding of the passage. If there is negative marking in the paper, then one should be very careful before attempting these questions. A few of these questions are:-

- (a) What is the central idea of the author in the passage?
- (b) Suggest a suitable title for the passage.
- (c) The passage seems to be culled from _____
- (d) What would be the logical continuation to the given passage?
- (e) What is the tone of the author?
- (f) What is the writing style of the passage?

Now, let's look into all these in detail.

- (a) One should be very careful while attempting these questions as all the answer choices will be similar. The trick lies in selecting the best and rejecting the rest. This is not as difficult as it may seem. While answering a question on the central idea of the passage; first, one should be clear about the structure of the passage. Usually, the central idea is given in the first or the second paragraph itself but it is very important to read the entire passage before answering this question. One should try and peep into the author's mind and then select the answer choice that the author seems to be most strongly propagating. One has to very carefully segregate the main idea from the peripheral information given in the passage.
- (b) Consider a question in which we are asked to suggest a title. Now, a common mistake that students make is that they pick up a title that depicts the most prominent or important part of the passage. They overlook the fact that a title is the forerunner to the passage and it should be inclusive of the entire content.
- (c) Many a time, a question is asked on, 'where is the passage taken from?' Here, one has to carefully judge the content of the passage. If it is very technical for example, a passage on genetically modified food, it might be from a science journal or magazine. But, if it looks like a report of some incident or event, it could be taken from a newspaper. Or if the passage is given in an instructional tone, it can be from a school text book also. Thus, in this type one has to apply one's common sense to fit this passage in a structure. Last but not the least, since one has to select from the given options, one can reach the correct answer by rejection.
- (d) Similarly, while deciding the logical continuation to the passage, we should focus more on the last line of the last paragraph of the passage rather than the main theme of the passage. This way one will be able to handle these questions in a better way.
- (e) & (f) It is very important to understand the difference between the writing style of the passage and the tone of the author. Writing style is the manner in which the passage is written while tone refers to the mood in which the author has written it. Various types of writing styles could be the following:
 - (i) Informative: If information is given about a certain topic.
 - (ii) Analytical: If the issue at hand is discussed with its advantages and disadvantages.
 - (iii) Argumentative: If the issue is debated and the arguments which are for and against are put forth.
 - (iv) Novelistic: If the passage goes on like a story in a novel.
 - (v) Narrative: If the passage is written by the author by referring himself as 'I'.

28.1.3 Various Tones of the Author Could be the Following

- (i) Optimistic: If the author is very positive about the issue at hand.
- (ii) Sarcastic: If the author does not approve of the things mentioned and uses sarcasm to show his displeasure.
- (iii) Vitiolic / Bitter: If the author is full of hatred for that particular issue.
- (iv) Impassioned: If the author really empathises and feels for the cause/issue.
- (v) Disillusioned: If the author is displeased with the issue and has lost hope in it.
- (vi) Didactic: When the author is in a preaching or teaching mode.

28.1.4 Tips to Solve a Reading Comprehension

1. Always scan the questions first. It helps to know whether the questions are direct or indirect and what kind of information do you need to focus on when you read the passage.
2. Only after scanning the questions, start reading the passage. Look for the key sentences in each paragraph. Generally, it is the beginning or the ending line of the paragraph. This helps us define the structure of the passage, i.e. whether the author is:
 - (i) Just giving information about the topic.
 - (ii) Analysing an issue by giving its advantages and disadvantages.
 - (iii) Proposing a theory and giving the competing theories with it.
 - (iv) Suggesting something and then supporting it with various examples, etc.

If we have the structure defined, it becomes much easier to answer the indirect questions. Keep marking the places from where a question has been asked. It will save your time later.

3. Start looking for the answers. Questions are generally asked in a sequence. So, start by answering the first question.
4. In case you do not remember the answer, go back to the passage, read again and keep marking the answers. This is not a good practice but if you do not know the answer, you are left with no choice.



Exercise 28.1

Directions for passages 1 to 5: Read the passages below and answer the questions that follow:

■ Passage 1

While other nations continue their battle of the garbage by trying to discern ways to correct their faulty civic systems to deal with the huge mounds of trash, Mayberry finds itself dealing with a problem most others would love to have – where to get more garbage from? This coastal nation has been importing garbage from neighbouring countries to fuel its waste-to-energy programme which, through incineration, supplies power to millions of households in this 23 million-strong nation.

This story first broke out around 3 months back in a new, disruptive magazine called *The Taboo* and since then has gone viral across various media; particularly getting strong limelight from the green crusaders. And the figures which Mayberry boasts are almost legendary; the country ends up accumulating only about 1.8% of its total garbage in the landfills.

The natural query which follows is that how did Mayberry get it right? Let's make that "so right". Let's start from the start. Mayberry started early, right back in the mid-1990s, through apt policy changes, involving all the stakeholders, active engagement via awareness programmes, and securing a buy-in from the industry. This approach of integration, rather than the traditional segregation, enabled the government to systemise it to the extent of introducing landfill taxes and have more than 95% of the household waste to be reused, recycled, or recovered.

The law now holds the companies responsible to amass the entire waste that ensues from their production processes, either themselves or through contracting it out to public or private agencies. The *Vinfi Daily* reports about the incentivisation of waste reduction, especially from products and their packaging. The Mayberry administration takes it a step further by providing easy access to recycling centres and raising public awareness through regular campaigns. The report goes on to state that in 2009, dumping of organic waste was illegalised; the same is biologically treated to produce biogas, compost, and fertilisers.

All these proactive steps have led to a combined impact of slicing the amount of household waste from 27,50,000 tonnes in 1996 to 720,000 tonnes in 2012; a phenomenal reduction. Not just this, almost 3.1 mil-

lion tonnes of material and 10.8 TWH (terawatt hour) of energy were recovered from just household waste in 2012. We're talking about a jump of 165% and 82% respectively.

1. Following are the reasons that have led to efficient waste management for Mayberry except:
 1. Reducing the consumption of commodities to avoid wastage
 2. Strong economic incentives for companies to produce less waste
 3. Bans on landfills and imposition of taxes
 4. Easy access to recycling stations
2. According to the passage, the author is:
 1. Criticising Mayberry for their excessive emphasis on recycling and importing trash from Norway
 2. Uncertain about the future of recycling stations and landfills in Mayberry
 3. Applauding the efforts of Mayberry for efficient waste management
 4. None of these
3. The above passage seems to be taken from:

1. A Mayberrian newspaper	2. A textbook of class X student in India
3. A journal of waste management	4. An editorial in a <i>Vinfi Daily</i>
4. What is the tone of the author in passage?

1. Clinical	2. Vitriolic	3. Factual	4. Appreciative
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■ Passage 2

LB Nimbl. That's the name of the blog that has taken the sports fraternity by storm. Birthed and run by Kyle Denzing, Ethan Sunn and Wendy Chen, Nimbl has raised the conversation over how hobbyist journalists can be better than the professionals. In the summer of 2012, Kyle stayed with a group of bikers, which included Cleo Tyler, a legend in the cycling world in his own right. After his sojourn with the group, Denzing went on to publish an interview with Dr. Joshua Mustic, a physiologist who was instrumental in formulating the FPE dope test, which cited irrefutable evidence that Tyler's samples were botted with FPE. FPE is a hormone which boosts the oxygen supply to the muscles and hence leads to intensified endurance. The interview clearly decreed the famous cyclist as a cheat.

In ways more than one, Cleo Tyler was a shining star in the list of sports champions globally. Pro cyclist, seven time winner of Tour De Laom, cancer survivor, and the founder of the most celebrated cancer foundations of the decade – Tyler had made it and made it well.

But, as it is commonly known now, it was all a facade. After Dr. Mustic's interview, the Anti-doping agency went on what Tyler termed as a 'witch hunt' and released a report that divulged that not only did he indulge in performance enhancing himself, but created a climate of coercion for the rest of the team members too. The cult of Tyler exercised its muscles on the reporters for quite a while. But, although most of the mainstream media stood by his side and painted the story of a heroic survivor, there were factions which didn't quite take the story fed to them. It sounded too good to be true. That is why Denzing's story was the spark which led to the fire and the fall from grace of one of the most popular names of the decade.

5. According to the passage who is the whistleblower in the dope case of Cleo Tyler?

1. Kyle Denzing	2. Ethan Sunn	3. Dr. Joshua Mustic	4. Wendy Chen
-----------------	---------------	----------------------	---------------
6. No one ever reported the malpractices of Cleo Tyler because:
 1. The reporters were threatened by Tyler if they wrote against him
 2. No one could find out about the malpractices
 3. The journalists were in his awe and never doubted the heroic survivor
 4. None of these

7. By the line, “hobbyists were better journalists than the professionals”, the author means:
1. We should love our job just like we love our hobbies
 2. The demands of a profession are different from the demands of a hobby
 3. One is more sincere and fearless while doing one’s hobby than one is to one’s profession
 4. None of these

■ Passage 3

A couple of months back, journalist Ern Burrup penned a buoyant article titled ‘The Elephant that became a Tiger’. It was a dig at *The Non Conformist* which had alluded to the country of Fargo as “the Caged Elephant” in a report brought out in 1991. It was the same year when a daring and visionary Kozma Zak, then finance minister, championed the dismantling of the infamous License Raj and equipped the economy on a new era. Today, after more than two decades, one ponders about the Tiger’s condition.

Two quarters back, a double digit growth seemed well within reach. Fargo’s pulsating private sector, encouraging demographic trends, aptitude for innovation, and emerging landscape for corporate giants guaranteed to shift the country into the fast lane. And Fargo had its share of shining moments. In the last decade, its economy averaged an 8% growth to become the world’s 12th largest economy. The socio-economic progress was especially high in momentum, lifting millions out of poverty.

Today, the double digit dream seems to be slipping away. Last October, Lemony Gravis, Planning Commission deputy chairman, alerted that sustaining 8% growth itself would require “extensive efforts”. In late December, the International Monetary Fund (IMF) unveiled its World Economic Outlook in which it predicts Fargo dropping short of the intended 8% figure.

The inflection, to a degree, owes itself to the downturn in the world economy, of course, but it is also due to Fargo’s lethargy in adapting to the challenges and adjustments brought after years of vigorous development.

As Gravis himself encapsulated, growth was never a “God-given right”; and certainly not a double digit one. Since 1982, The Global Competitiveness Report has appraised the determinants of productivity. The list includes governance, education, macroeconomic management, infrastructure, market efficiency and size, technological adoption, business sophistication, and innovation. In its 2013–2014 edition, published in July, Fargo ranks 69th, dropping 10 places from 2010.

So, what explains this turn of fortune? Not to say that fortune could be taken as a cover. As per the World Economic Forum’s Executive Opinion Survey 2013, logistics and infrastructure remain the most intractable factor for doing any business in Fargo. As an economic rule of thumb, the rate of growth of infrastructure should grow at least at the same rate as the economy is. Fargo seems to lambast this rule aside. According to the minister of road transportation, traffic boomed by 9.8% annually between 2003 and 2013, in contrast to 2.6% expansion of the road network.

The report goes on to highlight other deficiencies that hold back Fargo from realising its full potential – dismal educational standards, a stubborn gender gap, inordinate red tape, unchecked corruption, inadequate public finances, and pricey yet fruitless subsidies.

8. According to the passage, the relative position of Fargo amongst other countries is —

1. Improving	2. Falling
3. Stable	4. Can’t be determined
9. By declaring, ‘Growth has never been a “God-given right”’, Lemony Gravis means:
 1. Every country has to pass through the ups and downs as per the global trends.
 2. One cannot claim what is not one’s right.
 3. It is a competitive world and all its members must know the strength and weakness of their neighbours.
 4. Growth will only happen if a country works towards it by increasing its productivity and improving the governance, education, etc.

10. Following are the reasons for the slow growth of Fargo except:

1. Lack of infrastructure
2. Slowdown in global economy
3. Widening skill gap in the white – collar job market.
4. Slow adaption to challenges and changes in recent times.

11. The writer of the article is _____

- | | |
|-----------------------------------|------------------|
| 1. An economist | 2. A journalist |
| 3. A politician from ruling party | 4. None of these |

■ Passage 4

Those gigantic waves wreak dreadful damage when they crash on the shores of such distant lands. In a picture of impeccable sunny skies and a seemingly placid sea, a tall wall of water can sprout up above twenty or thirty feet high on beaches and waterfronts, devastating buildings and sweeping away unsuspecting residents in its path.

One would wonder how these waves form; so sudden and so huge. The answer lies in sub-marine earthquakes. Whenever such a quake occurs it is liable to set up an incredible level of shock, upsetting the calm waters of the deep ocean. The waves of this activity travel to the surface and create a huge swell in the ocean many kilometres across. It rolls outward, and the water dips in the centre as another swell emerges. Thus, a series of concentric swells are formed; akin to those ripples made when a pebble is dropped in a still water body. The difference is in the magnitude. The pebble conjures rings which are only about an inch across and less than a quarter of an inch high. While the ocean swells are sometimes nearly a kilometre wide and rise up to several multiples of ten feet in height.

You'd be able to relate to these waves better once you know what the Japanese call them – Tsunami. The Pacific inhabitants have lived in the shadow of its fear for centuries now; not just the Asian ones, but their South American counterparts too. An underwater earthquake in the Japanese waters could cause a massive swell to break out and crash on the shores of the Southern Chile. The waves travel at high velocities; as high as hundreds of miles an hour, gathering more momentum as they travel this distance. One would shudder to imagine the colossal damage they must inflict when these monstrous waves reach a shore.

Curiously, barely any attention was paid for dealing with Tsunamis until after World War II, despite the havoc wreaked on all coastal regions. What changed things was this particularly tragic calamity in 1947 when one such earthquake sent Tsunamis roaring on to the quiet shores of Hawaii. Not just that, such was the intensity that they barraged inland, causing hundreds of deaths and wiping out acres of property worth millions and millions of dollars.

What followed was what led to the formation of a game-changing program in 1948, called the Seismic Sea Wave Warning System. Under the aegis of the government, the US Coast and Geodetic Society initiated this program which sought to foresee these catastrophic waves which was done by combining the earthquake monitoring systems with the global seismological data which helped locate the earthquake as soon as it would occur. With this collective information, the program was able to detail the severity of the quake and put up a tracking chart centring on the epicentre and then revealing the speed at which the concentric belts would travel. All of this facilitated the prediction of not just when the Tsunami would hit the shore, but also which parts they would strike.

12. The author expresses surprise over which aspect of the waves?

1. They are formed in concentric patterns.
2. They often strike during clear weather.
3. They are produced by deep swells.
4. They arise under conditions of cold temperature.

13. The waves discussed in the passage often strike:
1. Along the Aleutian Islands.
 2. In areas outside the pacific region.
 3. At great distances from their place of origin.
 4. At the same time at the occurrence of earthquakes.
14. The US coast and the Geodetic Survey set up a program to:
1. Prevent submarine earthquakes.
 2. Locate and determine the severity of earthquakes.
 3. 1 and 2.
 4. Predetermine the occurrence of such waves.
15. Nothing was done about the waves till:
- | | |
|--|--|
| 1. Tsunami occurred | 2. Large areas in Chile were devastated. |
| 3. After the outbreak of World War II. | 4. Deaths occurred. |
16. Given the present wave tracking systems, the scientists can forecast all of the following, except:
- | | |
|---------------------------------------|------------------------------|
| 1. The travelling rate of the waves . | 2. When the wave will strike |
| 3. The height of the wave. | 4. Where a wave will strike. |

■ Passage 5

Majority of the great inventions that the world has seen, were first met with disdain and scepticism, and sometimes outright rejection. The arrival of the world's first airplane was no omission. The idea of a flying machine was greeted with as much buzz and anticipation, as with jeers and sneers. Some found it downright repulsive. Those people labelled Orville and Wilber Wright, the inventors of the airplane, impulsive clowns. All of this, however, did not deter the Wright brothers, who, induced by their burning desire to fly, continued their aeronautical experiments.

Both brothers had always had an ardent interest in the field. In their younger days, they reaped money by making and selling kites and toys. Later, they moved on to designing a newspaper-folding machine, building a printing press, and operating a bicycle-repair shop. When they came across the death of Otto Lilienthal in 1896, their interest morphed into a preoccupation.

An avant garde in hand gliding, Lilienthal controlled his gliders by manoeuvring his body in the required direction. This set up was repellent to the Wrights and so, they began examining more competent methods to regulate the mid-air balance. Throughout 1900 and 1901, the brothers evaluated plentiful gliders and came up with new control techniques. The biggest hurdle was the lack of adequate lift power which almost drove them to abandon their endeavour.

Not the ones to give up so easily, the Wright brothers declared that the existing published tables of air pressure on curved surfaces had to be wrong. And so they set upon to come up with the correct figures by labouring with model wings in a wind tunnel. And sure enough, the efforts paid off and the old tables were annulled and replaced with the first reliable numbers. This also ensured that the Wright brothers were able to design a machine that would fly.

Costing less than a thousand dollars, in 1903, the Wrights put together their first airplane. Not just that, they even fit in their own source of propulsion in the form of a lightweight gasoline engine. On December 17th 1903, when they first ignited the engine, the vehicle throbbed ferociously before finally it took flight. It managed to stay aloft for twelve seconds and flew around one hundred twenty feet.

By the time 1905 came upon the world, the Wrights had tuned the machine to impeccable fineness which saw it not just flying but also turn and circle mid-air, as well as remain airborne for close to half an hour in one go. Many before them had flown in hot-air balloons or in hand gliders, but the brothers were the first to

fabricate a full-size flying machine fuelled by its own power. And it is due to this indispensable contribution in the history of engineering feats, the Wright brothers have justly been called the Fathers of Aviation.

17. Public opinion held that the Wright brothers had _____.
 1. Acted without thought 2. Been negatively predisposed
 3. Been too wary 4. Were not smart enough.
18. By reading the passage, it can be made out that the Wrights were _____.
 1. Appreciative of the work done by Lilienthal
 2. Disillusioned with the technology used by Lilienthal.
 3. Lionized Lilienthal for the work done by him in the field
 4. Indifferent towards Lilienthal
19. Which of the following statements are true?
 A. Wright Brothers are called the Fathers of Aviation.
 B. The Wright Brothers mistakenly questioned the existing tables of air pressure on curved surfaces.
 C. The first heavier-than-air flying machine cost less than one thousand dollars.
 D. The Wright Brothers designed and built their own lightweight gasoline engine.
 1. All of the above 2. ABD but not C 3. ACD but not B 4. ABC but not D
20. The above passage seemed to be taken from:
 1. A business newspaper 2. A text book on science and technology
 3. A history text book 4. A journal on science and technology.

Answer Key

Exercise 28.1

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. 1 | 2. 3 | 3. 4 | 4. 4 | 5. 1 | 6. 3 |
| 7. 3 | 8. 2 | 9. 4 | 10. 3 | 11. 1 | 12. 2 |
| 13. 2 | 14. 4 | 15. 3 | 16. 3 | 17. 1 | 18. 1 |
| 19. 3 | 20. 4 | | | | |

Explanatory Answers

Exercise 28.1

Passage 1

1. All the measures are mentioned in Para 4 ‘There is a fertilizer’ except the 1st option. Ans 1
2. Reading the last paragraph of the passage, one can easily say that the author is praising Mayberry for its efforts in waste management. Ans 3
3. This article cannot be from a Mayberrian newspaper and neither is it too technical to be from a journal. It does not explain the things like a textbook; thus it is from an editorial in a Vinfi daily. Ans 4
4. Clinical is related to disease; vitriolic is bitter, factual is one which has lots of facts and no opinion. The tone for this passage is appreciative since the author is speaking highly of Mayberry. Ans 4

Passage 2

5. Since Kyle Denzing stayed with the group of bikers, he must have only found about the dope test; so he is the whistleblower in this case. Ans 1
6. It is mentioned in Para 2, line 3, ‘For a reporters’. Ans 3
7. The professional journalists did not reveal the truth just because they were in awe of Tyler while Kyle Denzing who had been biking as his hobby did that. So, we can easily conclude option 3. Ans 3

Passage 3

8. Refer paragraph 4, last 2 lines. Fargo’s position is falling. Ans 2
9. The implication of this statement is very clearly shown in the 4th option, i.e. we will have to strive to achieve growth and not take it for granted. Ans 4
10. All the reasons are mentioned in the 5th and 6th paragraph except 3rd option. Ans 3
11. This article criticizes growth in Fargo, so it cannot be written by a politician of the ruling party. It has facts in it related to economics; this must be written by an economist. Ans 1

Passage 4

12. Though all the facts mentioned are true but the surprising thing is that the waves suddenly emerge on a clear day from underneath a calm ocean. Ans 2
13. Refer paragraph 3, 2nd line, Ans 2
14. Refer paragraph 5, 3rd line. Ans 4
15. Refer paragraph 4, 1st line. Ans 3
16. Referring to the last paragraph of the passage, everything else can be determined except the height of the wave. Ans 3

Passage 5

17. Para 1, 4th line mentions the Wright brothers as ‘impulsive clowns’, i.e. acting without thinking. Ans 1
18. The Wright brothers were appreciative of Lilienthal’s work and that is why they took it forward. Ans 1
19. All the facts given in sentences A, C and D can be verified except B (they proved the air pressure tabled was incorrect). Ans 3
20. The passage contains many technical details, so, it should have been taken from a journal. Ans 4

Chapter 29

Para Jumbles

29.1 Introduction

Para jumbles are a test of reasoning rather than the language skills. In these questions, 4 or 5 sentences are jumbled up and the directions are given to make a coherent paragraph out of them. Though easy, these types of questions can be very time-consuming. The greatest mistake is when one tries to read the Para jumbles according to the sequence given in each answer option. If one tries to completely solve each answer option, it is even more confusing. Following are the steps that one should follow while solving the Para jumbles:

Step 1: Do not look at the answer options first and waste time. Read the sentences first. The main reason is that if one reads the answer options first, one's tendency will be to read the sentences in the sequences suggested and the person ends up wasting a lot of time. According to the fabled Murphy's Law, the last option most often turns out to be the correct answer.

Step 2: When reading the sentences, try and find two sentences that are definitely connected to each other, i.e. one has to precede or follow the other. The student will always find at least two such sentences and that will narrow down the search.

Step 3: Look for the sequence of the two sentences isolated by the previous step in the answer choices and eliminate the ones that do not have that sequence. For example: If you feel that sentence A has to follow sentence C, look for the sequence CA in the answer choices. This will enable you to eliminate at least two options (even all the other three, if the student is lucky, but of course, the student seldom is!).

Step 4: Read the remaining options and choose a more suitable answer.

Directions for examples 1 and 2: *Given below is a paragraph, the first and sixth lines of which are marked 1 and 6, respectively. The four lines in between are jumbled. From the suggestions given below in the questions, choose that sequence which would make the passage most logical.*

Example 1: A time comes when every author regards his critics more comical than formidable, and goes his way unheeding.

- A. Keats, perhaps, is the most haunting example of an elegant spirit hounded to his end by vicious criticism.
- B. But then again, there are the more sensitive souls, who buckle under this chastisement.

- C. After enduring much silent torment, these people abandoned the profession of the pen once and for all.
 D. Though some biographers claim, the attack of Gifford and Terry unquestionably expedited his death.
 6. That early demise surely cost the world at least a few more beautiful poems.

1. BCAD 2. BDCA 3. BACD 4. BDAC

Solution: After looking at sentence 6, we realize that, to maintain continuity, sentence 6 should be preceded by D. Therefore, the answer has to be either (1) or (3). Reading the sequences, even cursorily it makes clear that the answer is option 1.

Ans 1

- Example 2:** A. Subsequently, sometimes they have to put up with the brunt of a failure.
 B. They, therefore, overlook marketing dilemmas.
 C. But the markets are uncertain and it is tremendously tricky to foresee developments on the marketing front.
 D. Many flourishing firms are under the impression of doubt that their products will forever be in demand.

1. DBCA 2. CBDA 3. DBAC 4. ADCB

Solution: The paragraph will surely begin with sentence D as it is the introductory sentence. Now, we have to select between options 1 and 3. After reading both the sequences, we can see that the answer is 1. **Ans 1**



Exercise 29.1

Directions for questions 1 to 8: In the questions given below, each passage consists of six sentences. The first and the sixth sentences are given at the beginning and at the end, respectively. The middle four sentences in each of the paragraphs have been removed and jumbled up. These are labelled as A, B, C and D. Find out the proper order of the four sentences out of the given options:

1. 1: At the centre of one side of the quadrangle, the Chief of the committee, the most important person in the room, sits.

- A: A committee is not merely a motley collection of individuals.
 B: On him, rides much of the potential of the success or failure of this group.
 C: While this is in progress, we have an option to experience the 'feel' of a committee.
 D: With the opening of the meeting, he briskly runs through a plethora of formalities.
 6: When its members assemble, it begins to have an amorphous life of its own.

1. CDBA 2. ABCD 3. DBAC 4. BDCA

2. 1: A certain force exists among every single body present in our universe.

- A: Usually it is very faint but when either of the bodies is a planet, like the earth, the force becomes substantial.
 B: It has been probed by many scientists including Newton and Galileo.
 C: The mass of our planet attracts everything on or near its surface.
 D: This gravitational force is proportionate to the mass of the bodies involved.
 6: The greater the mass of the object, the stronger is the earth's force of attraction on it. We may call this the force of attraction of gravity.

1. ACBD 2. ACDB 3. BDCA 4. BDAC

3. 1: Kolkata, unlike other cities, retained its trams.
 A: As a consequence, there was a horrendous congestion.
 B: It was slated to be the first ever in South Asia.
 C: They ran down to the middle of the road.
 D: To ease the traffic on the roads, they decided to establish an underground railway line.
 6: Work began in 1972, when the foundation stone was laid.
- 1. ACDB 2. ADBC 3. DBCA 4. CADB**
4. 1: Conversations, contrary to some opinions, is a true art.
 A: It is like other arts based upon congenial circumstances and suitable surroundings.
 B: But it depends more upon the personality of the one you are talking to.
 C: People are apt to believe that because of the interests in their minds, they make a conversation beautiful.
 D: If he gives you a patient ear and enjoys your conversation, you are a good talker.
 6: Otherwise, it is a show of boredom for both.
- 1. ABDC 2. ABCD 3. DCAB 4. CDAB**
5. 1: Greatness is a great power which produces great effects.
 A: What is central is, he must display it to the world in a way that cannot be denied.
 B: It isn't adequate that a man possesses great power himself.
 C: He must place a certain idea in the public conscious.
 D: I keep no other idea of greatness than this twofold definition.
 6: "Great outcomes arise from the great innate energy."
- 1. ACDB 2. BACD 3. BADC 4. DABC**
6. 1: An over-sensitive individual feels unduly despondent by assuming that other people are talking bad about him.
 A: He also feels that they are judging his actions unfavourably.
 B: But even if it is true that the people are actually doing so.
 C: He should think that others are not always discussing him.
 D: He should ignore the general censure.
 6: Because it causes no damage to him.
- 1. CBAD 2. CABD 3. ACBD 4. DCAB**
7. 1. This is a coffee-table book with a difference.
 A. But the novelty of Shivalika Dey's work resides in the fact that she has penned a lively and personalized book, wonderfully complemented by photos.
 B. And there are so many such books out in the market, which, at times, feels like an overdose.
 C. There is a unifying element in her choice of images, which replicate her own views about India.
 D. Usually these types of books contain a great number of vivid pictures by some famous photographers, accompanied by a small text, insipid and lifeless.
 6. And Shivalika Dey, obviously loves her motherland, although she does not claim infallibility.
- 1. DCBA 2. DBAC 3. ABCD 4. CDBA**
8. 1. However, necessary scientific skill can be, it is by no means adequate.
 A. If you aspire to annihilate the human race.
 B. Though it does not enable us to settle on what ends we shall pursue.
 C. Science enables us to know means to any chosen ends.
 D. A dictatorship of men of science would very soon become horrible.

6. Science is there to help you do so.

1. *DACB*

2. *DCAB*

3. *DCBA*

4. *CDBA*

Directions for questions 9 to 20: In the following questions 4 – 5 sentences are given in a jumbled up manner. Arrange these sentences to form a coherent paragraph:

9. A. This has come to be especially pernicious, especially in the case of youngsters where cyber-bullying has even led to suicides.
 B. Privacy, undeniably, is a chief concern here.

- C. Is it really a good idea to wipe out whatever little privacy we do have left with a lens that documents our lives to this degree?
 D. There are many cases of people's lives being turned upside down because of certain personal information, textual or visual, finding its way to the web.

1. *DABC*

2. *DBAC*

3. *BADC*

4. *BDAC*

10. A. When acquaintance with him blossoms into intimacy, we are inclined to become very intensely awake to his failings and imperfections.
 B. In the beginning, we may feel greatly attracted to someone because of certain qualities that we find in him.

- C. But, on close acquaintance, we begin to perceive his faults and shortcomings.
 D. Nobody is without flaws and loopholes.

1. *DBCA*

2. *ADBC*

3. *BCAD*

4. *CADB*

11. A. Complications crop up when users disregard family and work obligations because they find *Facebook* a more interesting and enjoyable medium to spend time on.
 B. They have crossed the line from social networking to social dysfunction.

- C. Youth today have substituted human interaction with cyber interaction.
 D. Social Networking has now become an addiction, a compulsion; a compulsion to dissociate from what is out there.

1. *DCBA*

2. *DACB*

3. *CBDA*

4. *CDBA*

12. A. The area under the production of pulses remained largely stagnant during the past few decades.
 B. But the output of pulse production is dismal, to say the least.

- C. They are not only an affordable source of proteins for the masses, but also maintain the nitrogen fertility of the soil.
 D. The importance of pulses in the human diet hardly needs any introduction.

1. *DCBA*

2. *ABDC*

3. *ACDB*

4. *DCAB*

13. A. The ambition centres on education and science.

- B. Science for me, and for the vast majority of scientists, is not about the secrets of nature or even about truths.

- C. I believe that these two words have been abused to an extent that their original meanings have been lost in a fog of too much respect and mystery.

- D. Science is simply a method to postulate a minimum set of assumptions that can explain the existence of many phenomena's of nature.

1. *ABCD*

2. *DCBA*

3. *BDCA*

4. *ACBD*

14. A. Struggles incubate success and so, it is necessary that humans should inevitably exert themselves.

- B. If there were no adversities, there would be no success.

- C. In this exertion, we find the root source of human advancement.

- D. If there was nothing to struggle for, there would have been nothing to achieve.
 E. This is what is called happiness.
- 1. ABCED 2. BDACE 3. BEDCA 4. BCADE**
15. A. Businesses often believe that since they have so much market muscle and are in such a dominant position, maintenance will suffice.
 B. ASG has also suffered from lower priced clones when the mystique of computers was revealed and there was no longer a need for reassurance from the solidity of the Big Brown.
 C. ASG fell behind on the concept of “connectivity” and faced a blow in consumer preference.
 D. In recent years, however, even the mighty ASG found that market domination was not enough if you don’t keep up with the times.
- 1. ADCB 2. CABD 3. CDBA 4. DCBA**
16. A. Of course, they have not made the blunders that some others have made, but neither did they grow.
 B. The CEO had done an outstanding job in welding a group of assorted and successful companies into a single, profitable company.
 C. It is not surprising that company had been sitting on a cash hoard of about \$24 billion per year without any attempt to use it for growth or development.
 D. The chief executive of General Pistons in Punama once shared with me that he felt very pleased when there were no trouble in any of his numerous divisions.
- 1. BADC 2. ADBC 3. CBDA 4. DBCA**
17. A. Mako Bengin, a poet and translator, accepts this regretful fact without appreciation.
 B. But ingratitude and impossibility do not deter him.
 C. He acknowledges too – in fact, he reverts to the point regularly – the best translators of poetry always flounder beyond a point.
 D. Bengin feels ardently about his work and this is apparent from his writings.
 E. In terms of the fissure between worth and accolades, translators fall somewhere near nurses and street cleaners.
- 1. ADEBC 2. EACBD 3. EACDB 4. DCEAB**
18. A. Then the water too, which the girl had offered him in leaf cups, rested untouched.
 B. Birds pecked at them as they rested, rotting, at his feet.
 C. She gathered wild blossoms and laid them humble before him.
 D. The girl pondered in sorrow, “Is there nothing left for me to do?”
- 1. ADCB 2. DCBA 3. BADC 4. CBAD**
19. A. It was a blessing for us that Dr. Fiza had set up practice in our town.
 B. It was a pleasant surprise when I discovered that my bicycle was fit for riding.
 C. My wife was about to deliver her first child and Dr. Fiza was the only qualified doctor available.
 D. Before her, we had to go all the way to Babina to get a doctor in case of an emergency.
- 1. ACDB 2. CADB 3. DBAC 4. BDCA**
20. A. In my opinion, police personnel should never stoop down to gain appreciation/acceptance.
 B. The rot has to stem from someone and that someone is no chimera but the police top brass.
 C. The state police, as an institutional setup, are the creation and the upholder of the law of the land.
 D. In the long run, they will repent trading their grand strengths, their exceptionality for a fleeting recognition and gratification.
 E. Officers are the torch-bearers who have to be exemplary in their conduct by resisting political demands and become role models for the entire force.
- 1. ADCEB 2. ACDEB 3. CDEAB 4. CEDAB**

 **Answer Key**
Exercise 29.1

- | | | | | | |
|--------------|--------------|--------------|--------------|--------------|--------------|
| 1. 4 | 2. 4 | 3. 4 | 4. 1 | 5. 2 | 6. 3 |
| 7. 2 | 8. 3 | 9. 4 | 10. 1 | 11. 1 | 12. 4 |
| 13. 4 | 14. 2 | 15. 1 | 16. 4 | 17. 2 | 18. 2 |
| 19. 2 | 20. 1 | | | | |

 **Explanatory Answers**
Exercise 29.1

- ‘..... as the most important person’. The sentence introduces the chairman and *B* further elaborates on the same. Thus, it should begin with *B*. **Ans 4**
- The ‘it’ in sentence *B* refers to the force of gravitation introduced in sentence 1. Thus, *B* will follow 1. Looking at the options that start with *B*, *D* will definitely follow *B*. After *DB*, sentence *A* takes the discussion further and talks about the gravitational pull of planet earth. Thus, the sequence should be *BDAC*. **Ans 4**
- This paragraph mentions two things: the tram and the railway line. The congestion in traffic was due to the trams and the solution was the railway line. Sentence *A* and *C* talk about the tram; so they will come after 1 and *B* and *D* talk about the railway line; so they will come with 6. Narrowing down on options 1 and 4; when we see closely, the answer should be *CADB*. **Ans 4**
- Sentence *A* takes the idea of conversation being an art further, so it should follow 1. Later, *B* and *D* both mention a person getting involved in a conversation, depicting a sequence *BD* which is definite. Hence, *ABDC* is the correct option. **Ans 1**
- Reading the sentences, one can make out that sentences *B* and *A* should come together followed by *C* as *B* mentions about what is not enough and *A* explains what else is required, while *C* culminates it further. **Ans 2**
- ‘They’, in sentence *A*, is referred to the other people mentioned in sentence 1 and these people are talked about in sentence *C*. So, the *AC* link is in option 3. **Ans 3**
- Clearly there is a link between *A* and *C* as *A* ends up mentioning the photos and *C* further talks about those pictures. Thus, we narrow down to option 2 which has this link. **Ans 2**
- Sentence *C* talks about the means to achieve something and sentence *B* talks about the ends. With *CB* link, we are left with option 1 and 3. Out of the two, one can easily reach at option 3 as the final answer. **Ans 3**
- Sentence *B* is an introductory line that gives us an idea about what the rest of the paragraph entails. So, the beginning will be with *B*. Reading further, there is a clear link between *D* and *A* as *D* talks about many cases in which the lives have been turned upside down and *A* mentions teenagers committing suicides. **Ans 4**

10. *D* is the introductory line, which will be followed by *B* as it introduces the topic. After *B*, *C* and *A* are also linked as *C* talks about acquaintance and *A* takes it further to intimacy. So, the correct sequence is *DBCA*. **Ans 1**
11. Sentence *D* proclaims the topic – social networking. And then sentence *C* introduces the other main player – the youngsters. And they are later referred to in the rest of the sentences. So, the sequence will start with *D* and then *C* will follow. Sentence *B* refers to the youngsters as “they”. So, *C* will follow *B*. Thus, the correct answer is *DCBA*. **Ans 1**
12. Just by a cursory glance, one can find out that *D* is the introductory line and is connected to *C* also. Later *BA* is also linked. Thus, correct sequence is *DCBA*. So, we are left with one answer choice i.e. 4. **Ans 4**
13. Sentence *A* talks about science and education while *C* further mentions ‘...these two words...’ Thus, we identify the *A C* link which is given in option 4. **Ans 4**
14. Reading the sentences, sentence *A* and *C* are linked and should follow each other. Also, sentence *E* should come at the end as it mentions what is happiness. **Ans 2**
15. Sentence *B*, *C* and *D* are talking about *ASG* while *A* mentions the businesses in general. So, *A* should be the introductory line. The paragraph cannot begin with sentence *C* or *D*; ruling out options 2, 3 and 4. **Ans 1**
16. The chief executive and the company General Pistons, both are introduced in sentence *D* which makes it the introductory sentence. And *D* is very well connected to *B* and then to *C*. Making the correct sequence to be *DBCA*. **Ans 4**
17. *E* compares the translators with the nurses and street cleaners and sentence *A* mentions Mako Bengin accepting the sorry fact. Also, *C* is linked with *A* resulting in the sequence *EAC*. After *C*, it has to be sentence *B* in the sequence as *B* is further linked to *D*. *B* talks about the ‘never say die’ spirit of Mako Bengin and *D* takes it further. Hence, the correct sequence is *EACBD*. **Ans 2**
18. The trick to the answer lies in selecting the correct starting sentence. *A* cannot be the starting sentence as it says, ‘...water, too,...’. *C* cannot be the starting sentence as it starts with ‘she’ while ‘The girl’ is introduced in *A* or *D*. Out of options (2) and (3), the former makes better sense. **Ans 2**
19. Reading the four sentences, there is a *DB* link as *D* talks about going all the way to get a doctor and *B* about the cycle. Also, there is a clear *CA* link. Looking at the options, the correct answer choice is *CADB*. **Ans 2**
20. *A* seems to be the introductory line to the paragraph and it is connected to *D*. So, we get the *AD* link which is there in *ADCEB*. **Ans 1**

Chapter 30

Critical Reasoning

30.1 Introduction

In these questions, a short passage is followed by a question. These questions call for the student's skill to evaluate and analyse arguments in a given situation. Before we go further, it is important to understand the terminology related to critical reasoning.

- **Argument or statement:** An *argument* is a group of statements that has to be evaluated or analysed. In short, whatever information is given to us is an argument.
- **Assumption:** An *assumption* is something based on which the argument/statement is made. It is usually not mentioned in the statement.
- **Conclusion:** A *conclusion* is the essence of the argument. It is many times written either at the beginning or at the end of the argument.
- **Inference:** *Inferences* or implicit statements are those that are not directly mentioned in the statement/argument but can be made out or understood by reading the argument.

Now, let us see the various types of questions that are asked in critical reasoning and the methodology for approaching them.

Example 1: (Assumption) Projector Heads' most current film is based on a best-seller and stars Tom Heartthrob. Hence, the film is expected to fare better than average at the box office. Identify the assumption in the aforementioned statements.

Solution: In the above statement, we should first identify the conclusion. Here, the conclusion is that the film will do well at the box office. Now, let us identify the assumptions on which this conclusion is based. Given fact states that Tom Heartthrob stars in the film and it is based on a best-selling novel. Thus, the conclusion is based on two assumptions which are as follows:

1. Best-selling novel will ensure a good movie
2. Presence of Tom Heartthrob will lead to the film's success.

It is only when we assume this can we derive the conclusion. Thus, one has to first identify the conclusion and then scrutinise the facts given and look for gaps. These gaps are called the assumptions.

Example 2: (Conclusion) The results of a growing number of studies proclaim that even a modest deficiency of vitamins can be detrimental to your health; though proofs of the benefits of multivitamins are still far from certain. Clearly, multivitamins are no substitute for a lifestyle of exercise and a well-balanced diet. But being healthy is not easy all the time. So, the few rupees you spend on them is probably a smart medical investment.

Which of the following can be concluded from the above passage?

1. It is best to stick to a balanced diet that contains all the vitamins and stay away from any medication.
2. As long as you understand that any potential benefit is modest and subject to further refinement, taking a daily vitamin makes a lot of sense.
3. A multivitamin a day builds up the immune system of the body.
4. There is enough evidence that multivitamins do not cause any harm.

Solution: Here, again let us first try and find out the conclusion given in the argument. It is given at the end, ‘the few rupees you spend on them is probably a good investment’. Since the author uses the word ‘probably’, it becomes clear that he/she is not completely supporting the use of vitamins. Now, let us consider all the answer choices one by one.

1. This option outrightly rejects taking vitamins while the author speaks somewhat in its favour. So we reject it.
2. Here there is an explanation given to the use of vitamins, it is said that these might be beneficial but not the ultimate. This supports ‘Probably’ in the conclusion. This is the correct answer.
3. The argument nowhere talks about the immune system of the body.
4. No mention of studies related to multivitamins causing harm has been made.

Thus, we can find a conclusion to the given argument by carefully studying the given facts and sticking closely to them. *A conclusion should be such that deviates the least from the arguments and puts forth the main point in a concise manner.*

Example 3: (Weakening the Argument) The wholesale price of raw cotton has dipped significantly in the last year; unlike that of raw wood. Therefore, although the retail price of cotton clothing at apparel stores has not fallen, it will inevitably wane. Which of the following, if true, most seriously weakens the argument above?

1. The cost of processing raw cotton has increased during last year.
2. The operating costs of the average retail clothing store have remained constant during the last year.
3. Changes in retail prices always lag behind changes in wholesale prices.
4. The cost of harvesting raw cotton has increased in the last year.

Solution: Whenever this type of question is asked in which we have to weaken the given argument; very simply put, we have to contradict the author’s viewpoint. Reading the argument, the author is comparing the raw material cost of woollen and cotton clothing. Subsequently, he observes a downward trend in the prices of wholesale cotton and thus, says that it will lead to low price of the end product i.e., cotton clothing in retail stores.

In such questions, a very common mistake that students make is that they do not identify which statement is to be contradicted. Here, we have to oppose author’s viewpoint and not the facts of the case. So, one has to contradict the fall in price of clothing rather than the fall in price of

wholesale cotton (this is a fact given and not a conclusion). Now let us look at the options individually:

1. This talks about increased cost of processing raw cottons. Thus, the reduction in prices of raw material is adjusted with the increase in price of processing. So, the end product remains at the same cost. This weakens the author's viewpoint that the prices of cotton clothing will fall.
2. Since the operating costs of store remain the same, it does not affect the cost of clothing.
3. This supports the author's viewpoint rather than weakening it.
4. Cost of harvesting cotton is immaterial for the manufacturer as he is still getting it cheaper than the last year.

In this manner, one has to find the author's main argument and then look for options that go against that argument in such questions.

Example 4: (Finding a Flaw) With the advent of computers in schools, the need for homework time has been reduced to half, as the machines take care of the basic calculations that students earlier used to spend a lot of time doing themselves. With more computers in the classroom, students will be enabled more and process what they learn more quickly, and thus moving on to the more complex subjects quicker than they would have without the use of PCs.

Which of the following, if true, would be a flaw in the reasoning given in the paragraph above?

1. Students need to do the work themselves in order to understand the fundamentals before proceeding to the next level of work.
2. Students have enough time to do their homework and should agree to do a set number of hours of homework every night.
3. If they wanted computers, students would have already purchased their own.
4. Students never do calculations by hand any more but always use calculators.
5. Computers are exorbitantly expensive and will force budget restrictions that could hurt the schools in other areas.

Solution: Firstly, one needs to understand that 'finding a flaw in the reasoning' is different from 'weakening the argument' question. Here, we have to not only go against the author but also find the fault with his reasoning. So a proper justification is needed to refute the author. Once again, the first step is to identify the conclusion, i.e. the point that the author is making. In this paragraph, he is trying to say that if the students use computers, it is better as the computers will process the information more rapidly and the students can in turn, move on to the next topics faster. But here, the author has failed to note that though the computers can help in doing the work but ultimately it is the students who have to understand the topic, process it and then retain it. Thus, the answer choice for this is (1). Rest all talk about things that are out of content, e.g. the price of computers or time or calculators, etc.

The answer choice will be the one which has the strongest argument.

These are some sample questions with answers showing the basic type of questions, asked in critical reasoning. But there are many questions that are asked from the content of the passage itself. These have to be handled individually and there is no set methodology to them.

Example 5: (Inference, Implicit) The phenomenon of child labour tends to be complicated. Children are compelled to work because they belong to poor families who cannot survive without the benefit of extra income that accrues to the family through these young hands. Any effort to abolish it through legal remedies would, under the aforementioned circumstances, not be realistic. The only option is to forbid child labour in hazardous industries and, also, to regulate and ameliorate the working conditions across the board. Numerous developing countries, including India, are adopting this approach.

What can be inferred about the policy being followed on child labour in India?

- a. Giving economic benefits to the families of child labourer.
- b. Reducing/Controlling child labour in unhealthy areas of work.
- c. Marinating and improving working conditions for children.

1. Only (a) and (b) 2. Only (b) 3. (a), (b) and (c) 4. Only (b) and (c)

Solution: While looking for implicit or implied arguments, one should be very careful with the words given in the statement. One should look for implied things, i.e., things that are not clearly stated but at the same time, be cautious not to deviate from the given facts.

In the above statement, an approach taken by developing countries like India on child labour is given. Options (b) and (c) are stated in the second last line but nothing has been told about option (a). Though it is written that the children of poor families work as labourers and stopping them would mean loss of income to such families, but there is no mention of the economic benefits given to them. Since we cannot add any information from our own side, our answer will be only (b) and (c).

Ans 4



Exercise 30.1

Directions for questions 1 to 20: Read the following statements and answer the questions that follow:

1. In a recent national survey of job-seeking applicants, roughly two-fifth admitted to being slightly dishonest. However what we cannot deny is that the survey might have underestimated this claimed proportion of dishonest job applicants, because _____.

Which statement below will complete the passage most aptly?

1. Some dishonest people taking the survey might have claimed on the survey to be honest
 2. Some generally honest people taking the survey might have claimed on the survey to be dishonest
 3. Some people who claimed on the survey to be slightly dishonest may turn out to be very dishonest
 4. Some people who asserted their dishonesty may have been answering honestly
2. When it comes to purchasing power, the rural households, surprisingly, outdo the urban or suburban ones which are at the same income level. Possibly because the urban and suburban households use part of their income for food and shelter, which in turn, can be used by rural households for other needs.

The lines above are best supported by which of the following inferences:

1. The average rural household includes more people than does the average urban or suburban household.
 2. Rural households incur lower housing and food costs than do either urban or suburban households.
 3. Suburban families usually hold greater purchasing power than do either urban or rural ones.
 4. The median income of suburban and urban household is normally higher than that of a rural one.
3. Which of the following best completes the passage given?

Higher the worry investors have of losing their money, the greater will be the demand they will make for a high potential return on their investment; after all great risks must be offset by the chance of great rewards. This principle is the driving force in determining interest rates, and is illustrated by the fact that -----

1. Successful investors are distinguished by an ability to make very risky investments without worrying about their money
2. Lenders receive higher interest rates on unsecured loans than on loans backed by collateral

3. In times of high inflation, the interest paid to depositors by banks can actually be below the rate of inflation
4. At any one time, a commercial bank will have single rate of interest that it will expect all of its individual borrowers to pay
4. Most archaeologists have so far believed that people first reached America less than 20,000 years ago by crossing a piece of land bridging into North America. But recent discoveries of human remains and shelters in South America dating more than 32,000 years ago have led researchers to speculate that perhaps, people arrived in South America first, after voyaging across the Pacific, and then spread northward. Which of the following, if it were discovered, would be evidence against the speculation above?
 1. A rock shelter near Pittsburgh, Pennsylvania, contains evidence of use by human beings 19,000 years ago.
 2. North American sites of human habitation predate any sites found in South America.
 3. The site in South America that was occupied 32,000 years ago was continuously occupied until 6,000 years ago.
 4. The last Ice Age, between 11,500 and 20,000 years ago, considerably lowered worldwide sea levels.
5. The soaring levels of fertilizer and pesticides, used when farmers attempt to produce high yields of the same crop year after year, pollute water bodies and hence, the supplies. Experts, thereby, urge farmers to diversify their crop and to rotate their plantings annually. To be eligible for the governmental price-support benefits, farmers must have produced that same crop for past many years.

Which of the following would be a suitable conclusion to the above argument?

1. The rules for governmental support of farm prices work against efforts to reduce water pollution.
2. The only solution to the problem of water pollution from fertilizers and pesticides is to take farm-land out of production.
3. Farmers can continue to make a profit by rotating diverse crops, thus reducing costs for chemicals, not by planting the same crop each year.
4. New farming techniques will be developed to make it possible for farmers to reduce the application of fertilizers and pesticides.
6. At the time when the world had enforced limitations on nuclear-arms testing, people were more likely to save their money. But when globally governments stepped up the nuclear-arms testing, people tended to spend more of their money. The perceived threat of a potential nuclear calamity, therefore, decreases the willingness of people to postpone spending in order to save more money.

Which of the following is an assumption to the above argument?

1. The threat of nuclear calamity has increased over the years.
2. Most people approved the development of nuclear arms.
3. People's assessment of the threat of nuclear calamity depends on the amount of nuclear arms testing being done.
4. The people who amassed the most money when nuclear-arms testing was limited were the ones who supported such limitations.
7. The ice had already formed on the front windshield as the moisture condensed during the night. The ice gave way quickly once the car was warmed up the next morning, because the defrosting vent, which targets its air on the front windshield only, was turned on at full force.

Which of the following statements undermines the explanation given above?

1. The side windows had no ice condensation then.
2. Even though no attempt was made to defrost the back window, the ice there melted at the same rate as did the ice on the front windshield.
3. The speed at which ice on a window melts increases as the temperature of the air on the window increases.
4. The warm air from the defrosting vent for the front windshield cooled rapidly as it dissipates in the air.
8. Monopoly is the state where a particular person or group has an exclusive control over an activity. There are no competitors and the player operates in a single market. Vanilla vinegar is an example of one such industry.

Which one of the following conclusions can be inferred from the above?

1. Vanilla vinegar cannot be a monopoly.
2. Oligopoly is the situation where there are many competitors in a certain industry.
3. Vanilla vinegar faces a lot of competition in the domestic market.
4. Vanilla is operating in a monopolistic market.
9. The well-known Greek philosophers Aristotle and Plato have brought a theory under the light of criticism. The word ‘theory’, in criticism, according to these two astute men of Greece, means considering all the meanings and interpretations. Currently the structural criticism of a poem or an essay rests on this “theory” propounded by them. As a result, most of the critics of today _____:

Which of the following will aptly complete the passage?

1. Follow the theory of Plato and Aristotle.
2. Follow the western “Theory”.
3. Follow the destructive criticism of Plato.
4. Follow the constructive criticism of Aristotle.
10. Read the passage below and state which of the assumptions that follow does the argument depend on?

Dr. Mendes, the headmaster of Vaidya Centre of Education, has taught many untrained teachers in his college. Five of them also went on to win the state awards for the “Best Teacher”.

This shows us that although people commonly believe that teachers are born and not made, this case of Dr. Mendes shows that the skills required to become a high-quality teacher can be picked up for good.

1. Dr. Mendes does not train well.
2. None of the teachers, who joined Dr. Mendes’ Centre of Education, were successful before undergoing training by him.
3. We should have more training colleges for teacher.
4. Untrained teachers should not be appointed in educational institutions.
11. Quite a few people have questioned the judge’s objectivity in cases related to sexual discrimination against women. But the records reveal that in sixty five percent of such cases the judge has judged in favour of the woman. This illustrates that the charges levelled against the judge hold no ground.

The argument above is flawed in that it ignores the possibility that

1. A large number of the judge’s cases were over allegations of sex discrimination against women.
2. Many judges find it difficult to be objective in cases of sex discrimination against women
3. The judges find it difficult to be objective in cases of sex discrimination
4. The evidence shows that the women should have won in more than sixty percent of the judge’s cases involving sex discrimination against women

12. A group of children with varied ages was read stories in which people caused harm to others; some did so intentionally and some, accidentally. When enquired about appropriate punishments for those who had caused harm, the younger ones, unlike their seniors, proclaimed punishments that did not vary in accordance with whether the harm was done intentionally or otherwise. We can see, thus, that younger children do not consider the person's intentions relevant to the punishment.

Which of the following would most seriously weaken the conclusion above?

1. While interpreting these stories, the audience had to draw on a relatively mature sense of human psychology in order ascertain the intent behind the act of harm.
 2. In all stories, the severity of the harm inflicted was vividly stated.
 3. Younger children are as likely to produce harm unintentionally as the older ones.
 4. The manner of assigning punishment of the older children was quite similar to that of adults.
13. The cost of production for radios in Country M is seven percent less than that in Country N. Even once the transportation fees and traffic charges are added, it is still cheaper for a company to import radios from Country M to Country N than to produce radios in Country M.

The aforementioned statements best support which of the following assertions?

1. Labour costs in Country M are ten percent of those in Country N.
 2. Importing radios from Country M will eliminate ten percent of the jobs in Country N.
 3. The tariff on a radio imported by Country M is less than ten percent of the manufacturing cost of the radio in Country N.
 4. The fee for transporting a radio from Country M to Country N is more than ten percent of cost of manufacturing the radio in Country M.
14. Complete given sentence:

Although the intricacies of even the most common types of dreams have and will always vary from person to person, the broader stencilling and themes are _____

1. of a baffling assortment.
 2. too complex to comprehend.
 3. too simplistic to require any explanations.
 4. exceptionally consistent.
15. It is clear as a bell that Einstein could not have possibly formulated the theory of relativity. After all, it is a well-known fact that Einstein did not receive a passing grade in maths class as a child.

Which of the following options weakens the above argument?

1. One needs a passing grade in maths to formulate a theory.
 2. It was a well known fact that Einstein was a Genius.
 3. Failing a class does not necessarily mean that a person could not make a new theory.
 4. Historians say that some other physicist had given the theory of relativity.
16. Some men are undoubtedly intelligent; but of the intermediate men, we could say—'Intelligent?' Yes, I think, so. Or no, I would not be inclined to call them intelligent.

Which of the following most clearly represents the intention of the writer of the above?

1. To call men intelligent who are not strikingly so must be so to use the concept with undue precision.
2. Every empirical concept contains a measure of vagueness.

3. Calling someone intelligent or not depends on one's whim.
4. There isn't any need to be as indecisive as the writer.
17. A significantly cohesive work group is a prerequisite to ensure high team performance. Sociologists note that the association between the two resides in the support that individual team members give to one another and the consequent acceptance of the group's goals and activities. Each of the following either provides support for or cannot weaken this assumption about the relationship between the cohesiveness and success except
1. A group of Japanese researchers found that successful work teams were heralded by dominant leaders.
 2. University researchers found that there was a significant correlation between team productivity and the extent to which the team members understood and complied with the group's objectives.
 3. American researchers found that successful team members tended to rate their fellow members more favourably
 4. Industrial psychologists have found that work groups which tend to participate in afterwork social activities were more productive.
18. Many commercial offices are located in a building having two to eight floors. In case the building has more than three floors, it is equipped with a lift. If the above statements are true, then which of the following must also be true?
1. Second floors do not have any lifts.
 2. Seven floors have lifts.
 3. The lift is available only from fourth floor onward
 4. All floors are reachable by lifts
19. Spokesman for a Chemical Company to the residents of a nearby town: A thorough battery of tests has been conducted and no evidence has been discovered which may betray that the fumes leaking from our waste disposal site are harmful to the human life in any way. We see no reason to be alarmed, much less to begin evacuating people from their homes.
- Which of the following would be the least relevant question to the Chemical Company spokesman, from the head of the residents' committee?
1. What steps are being taken by the company to handle the situation?
 2. Are there any further tests being conducted?
 3. What will be the cost to the company, if it has to stop the leaks?
 4. Can these fumes have an adverse effect on plants or animals?
20. It is common knowledge now that the burning of oil, coal, and other combustible energy sources produces carbon dioxide – a natural constituent of the atmosphere. At the same time, elevated levels of carbon dioxide are held responsible for half the amount of greenhouse effect. Enough carbon dioxide has been sent into the atmosphere already to trigger a marked temperature jump. Industrial production activity must be slowed, or the production processes must be changed.

Which of the following would tend to weaken the strength of the above conclusion?

1. Carbon dioxide is injurious to health
2. Most of the carbon dioxide is emitted by automobiles.
3. Industry is slowly moving over to synthetic liquid fuel extracted from coal.
4. A switch to other energy sources would be too costly.

 **Answer Key**
Exercise 30.1

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. 1 | 2. 2 | 3. 2 | 4. 2 | 5. 1 | 6. 3 |
| 7. 2 | 8. 4 | 9. 1 | 10. 2 | 11. 4 | 12. 1 |
| 13. 3 | 14. 4 | 15. 3 | 16. 3 | 17. 1 | 18. 2 |
| 19. 3 | 20. 2 | | | | |

 **Explanatory Answers**
Exercise 30.1

1. The reason for the underestimation in the survey is what is asked.

This can happen if people, who are dishonest, claim to be honest as given in option 1.

Option 2 runs contrary to this logic.

The degree of honesty, discussed in option 3 is not relevant to the question.

Option 4 is a clever way of saying that you cannot say that you are lying and be speaking the truth. Although, logically correct but irrelevant to the questions asked. **Ans 1**

2. The statement says that the purchasing power of rural households is more than urban households mainly because their expense of food and shelter is less than that of urban households at the same income levels (.....some of the income urban and suburban households use for food and shelter can be used by rural households for other needs). This idea is mentioned in option 2. **Ans 2**

3. Since an unsecured loan is more risky from the lender's point of view than a loan backed by collateral, the fact that lenders receive higher interest rates for unsecured loans is an illustration of the principle outlined in the passage.

Thus choice 2 is the best answer.

None of the other choices gives a clear instance in which increased risk is contrary to the principle of the rate of return.

In choice 4, contrary to the principle, the rate of return remains constant despite possible variations in risk. **Ans 2**

4. The reasoning behind the researchers' speculation that people first arrived in South America is that there is no evidence of North American sites that predate the human shelters discovered in South America.

If it were discovered that, as 2 states, some North American sites predate those in South America, the reasoning behind the speculation would no longer hold.

Thus, 2 is the best answer.

The facts related in 1 involve time periods occurring after those discussed in the passage, and so create no conflict with the speculation.

Although 3 and 4 describe discoveries of the South American site; neither the relative climates mentioned in 4 nor the duration of occupation mentioned in 3 provides evidence against the speculation. **Ans 2**

5. Farmers benefit from governmental price supports only when they produce the same crops from years to year.

Farmers who wish to receive the benefit of these price supports will be unlikely to reduce water pollution because they will not follow the expert's advice regarding diversification and rotation.

Thus, 1 is the best answer. It concludes the statement by showing the contradiction.

The other statements mention neither farmer's costs and revenues nor developments in farming techniques and thus support no conclusion about prospects for profits or future farming techniques. **Ans 1**

6. On the basis of an observed correlation between arms testing and people's tendency to save money, the argument concludes that there is a causal connection between a perception of threat and the tendency not to save.

That connection cannot be made unless 3, linking the perception of threat to the amount of testing being done, is assumed to be true.

Therefore, 3 is the best answer.

The conclusion does not depend on their having been an increase in the perceived threat over time or on how many people supported the development of nuclear arms.

Hence neither 1 nor 2 is assumed. Furthermore, the argument does not deal with those who supported arms limitations or with the availability of consumer goods. Thus, 4 is not assumed. Hence, **Ans 3**

7. The speed with which the ice on the windshield melted is attributed to the air blowing in full force on the defrost mode onto the front windshield.

The explanation is undermined if as 2 states, no attempt was made to defrost the back window and the ice on the back window melted as quickly as did ice on the windshield. Therefore, 2 is the best answer.

In the absence of other information, the lack of ice formation on the side windows that is mentioned in 1 is irrelevant to the validity of the explanation.

Choice 3 might support the explanation, since the air from the defrosting vent was blowing at full force. Option 4 doesn't give a reason to doubt that air from the vent caused the melting of ice, and thus neither jeopardizes the explanation's validity. **Ans 2**

8. Very clearly, the inference that can be drawn from the given information is 4, i.e. Vanilla vinegar is in the monopolistic market. **Ans 4**

9. The paragraph will be ideally completed with phrase 1, i.e. they follow the 'theory' of Plato and Aristotle. **Ans 1**

10. The argument talks about the unmatched skill of Dr. Mendes in making good teachers. The assumption behind this argument is stated in option 2, i.e. none of the teachers who came to him were successful earlier; so the skills imparted by Dr. Mendes were critical in getting them success. None of the other options give any details related to this argument. **Ans 2**

11. The flaw in the argument is that it assumes erroneously that the majority of decisions favourable to women in sex discrimination cases demonstrate the absence of discriminatory behaviour against women on the part of the judge who made those decisions. Choice 4 exposes this flaw by pointing out that

the judge may well have failed to decide in favour of women in cases where evidence shows that the women should have won.

Therefore, 4 is the best answer.

Choices 2 and 3 introduce considerations with no relevance to the reasoning of the argument.

Because the passage concerns a particular judge, 2 is not appropriate as it concerns cases of a particular type, 3 and 1 also have no bearing, because the origin of the cases is not an issue in the argument.

Ans 4

12. Choice 1, the best answer, indicates that younger children might be unable to tell whether the harm in the stories was produced intentionally.

Thus even if younger children do regard people's intentions as relevant they might be unable to apply this criterion here.

Therefore 1 undermines the conclusion. Choices 2 supports the conclusion by suggesting that another factor-severity of harm either possibly or actually motivated variation in the punishment assigned by younger children. Neither choice 3 nor choice 4 affects the conclusion's concerns about what children recognize about other's behaviours, not children's own behaviour.

Ans 1

13. If the tariff on importing radios from Country M to Country N were as high as ten percent or more of the cost of produce radios in N, then, contrary to what the passage says, the cost of importing radios from M to N would be equal to or more than the cost of producing radios in N.

Choice 1 gives possible partial explanation for cost difference, but neither is supported by the passage because the cost advantage in M might be attributable to other factors.

Choice 2 and 4 are both consistent with the conclusion in the passage, but the passage provides no evidence to support them.

Ans 3

14. The contrast in the argument (depicted by 'although') will be shown by option 4 remarkably consistent; 'As the details vary from person to person but the themes are predictable and consistent.' No other option is suitable.

Ans 4

15. Option 3 weakens the argument by saying that there is no prerequisite to formulating a theory. Option 1 and 4 strengthen the argument. Option 2 weakens it but does not give a concrete reasoning for the same.

Ans 3

16. From the statement, we can easily make out that the author is confused about what to call the people who are intermediate men and so he is being whimsical. This makes option 3 the suitable answer. Rest none of the options fit. Option 1 talks about men who are 'not strikingly intelligent' and 'not intelligent'. Option 2 has no relevance to the given data. Option 4 is a suggestion to the writer while we have to comment on the intention of the writer. Thus,

Ans 3

17. All the options except 1 point at the positive correlation between a group cohesiveness and success. Option 1 talks about successful Japanese work teams headed by dominant leaders; whether the teams were cohesive or not is not mentioned.

Ans 1.

18. From the given statement, it is very clear that any building that has seven floors will have a lift. But in the rest of the three statements, we are not sure how many floors does that particular building have.

Ans 2

19. Given the situation where the Chemical plant is leaking and emanating fumes that are harmful to human, plant or animal life, the most irrelevant question is 3 How much will it cost you to prevent the leaks? Rest all the questions are very suitable as the resident's committee will have queries on steps taken to correct the leaks or further steps are being taken or not etc. Even the question about the safety of plant or animal life is also relevant. But the cost when human life is in danger is immaterial. **Ans 3**
20. The conclusion states that carbon dioxide levels have increased due to the industrial processes. Option 2 weakens it the best by stating that 'the most carbon dioxide is emitted by automobiles'. **Ans 2**

Chapter 31

Syllogisms

31.1 Introduction

Syllogism is an approach of thinking in which we reason from the two given propositions or statements, called *premises*, to a third one called the *conclusion*. A premise is a statement that acts as the basis of the arguments. Let us understand with the help of an example.

Example 1: 1. Birch is a tree.

2. Trees are green.

Therefore Birch is green.

The first two statements are premises and the third is the conclusion drawn from the premises. Whether the conclusion is valid or not can be verified with the help of Venn diagrams. The diagrammatic representation is shown in Figure 1.

B = Birch

T = Tree

G = Green

As seen from the diagram, ‘if all trees are Green and Birch is a tree’, Birch is included in the set of Greens and must be Green as well.

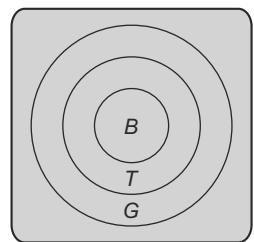


Figure 1

Example 2: 1. Some professors are serious.

2. Serious people always wear spectacles.

Hence, some professors can wear spectacles.

The Venn representation is given in Figure 2.

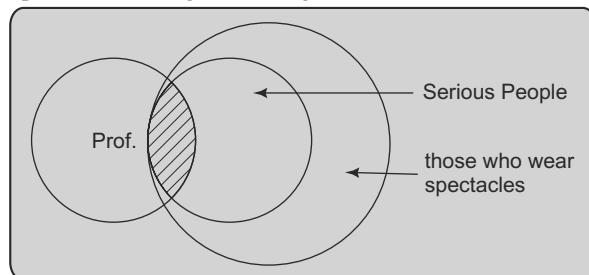


Figure 2

The shaded area represents the professors who wear spectacles.

Example 3: 1. No honey bees buzz.

2. Humming birds always buzz.

Therefore, we can say no humming birds are honey bees.

The Venn diagram for this would be as shown in Figure 3:

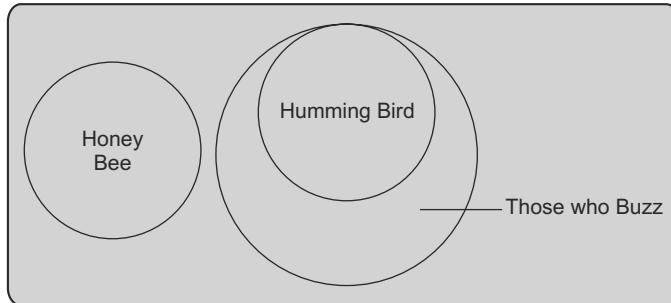


Figure 3

Here, since Honey Bees fall outside of things that buzz, they cannot be Humming Birds.

Example 4: 1. Only boys play football.

2. Lily plays football.

Therefore, Lily is a boy.

Note—We need to make a distinction between ‘only’ and ‘all’. ‘Only’ does not mean ‘all’. For example, when we say only children get toothache we do not mean all children get toothache but that if there is someone who gets toothache it must be a child.

Here, since only boys play football, it would mean that all those who play football are boys, therefore Lily who plays football must also be a boy.

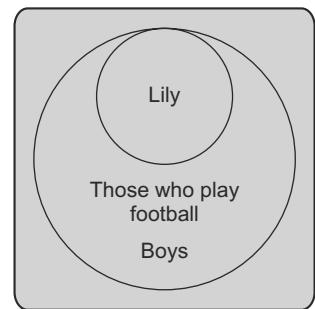


Figure 4

Example 5: 1. All dogs bark.

2. Tommy usually barks.

However, we cannot straightaway conclude Tommy to be a dog. We can only conclude that Tommy may or may not be a dog.

On examination, we see that Tommy is another element in the set of barking things and may not be a dog. The diagrammatic representation is shown in Figure 5.

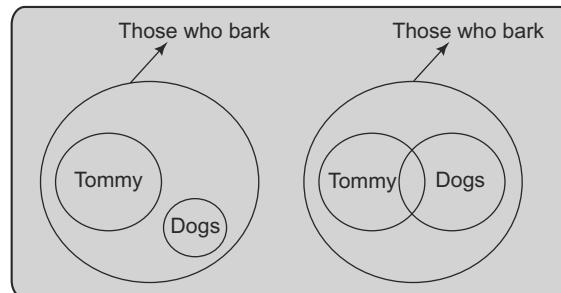


Figure 5

31.2 Types of Syllogisms

Various types of Syllogisms are as follows:

- A. Six statements.
- B. Rows of sentences with three segments in each row.
- C. Conditional syllogisms.

30.2.1 Six Statements

In this type of question, six statements are given and these are followed by four options. The student has to mark the option where the third statement can be concluded from the first two premises or statements. With this type of question we move into the realm of hard-core reasoning.

Example 1:

- | | | | |
|----------------------------|------------------------------------|--------|--------|
| a. All ministers lie | b. All workers tell only the truth | | |
| c. Kho-Kho is not a worker | d. Kho-Kho lies | | |
| e. Kho-Kho is a worker | f. Some workers lie | | |
| 1. adc | 2. bdc | 3. bfe | 4. fde |

Now let us examine each of the options one by one and see which the incorrect sets are, and why they are so.

Option 1: adc

This is an answer you may mark. However, the logic is flawed. Just because ‘all ministers lie’ and Kho-Kho lies does not mean that Kho-Kho is not a worker – workers could lie too. If the sentence had been “no workers lie” then this could have been the correct answer. A Venn diagram for adc would make it clearer.

There is a possibility that Kho-Kho may be a Minister. This is shown in the second Figure

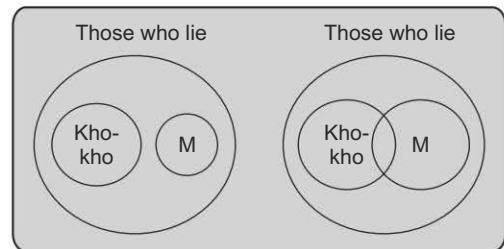


Figure 6

Option 2: bdc

If workers tell only the truth then workers is a set inside a bigger set of those who, speak the truth, therefore if Kho-Kho lies, Kho-Kho cannot be a worker. Thus, [2] is the answer and same can be represented as shown in Figure 7.

Although we have got the answer and ideally need not check the other options, let us do so to check why they are incorrect.

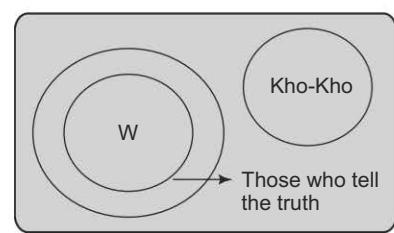


Figure 7

Option 3: bfe

‘All workers tell only the truth’ and ‘some workers lie’ are contradictory statements and thus nothing can be deduced from contradictory statements.

Option 4: fde

If some workers lie and Kho-Kho lies we cannot find out whether Kho-Kho is a worker or not. Kho-Kho may be a minister, or anything for that matter. The diagram for option [4] would be as given in Figure 8:

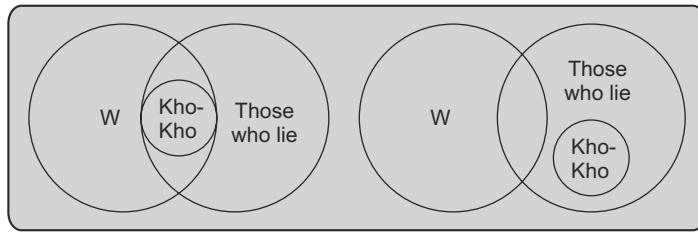


Figure 8

31.2.2 Rows of Sentences with 3 Segments in Each Row

Here, one question has three sets and each set has three sentences. The last sentence should be a logical continuation of the previous two. After evaluating each option, we will know which set or sets are valid syllogisms.

Example 2 A. Some phones are pens. Some pens are erasers. Some erasers are phones.

- B. No flower is mango. No mango is cherry. No flower is cherry.
- C. All dogs are bulls. Some bulls are oxen. Some dogs are oxen.
- D. Some cats are rats. All rats are dogs. Some cats are dogs.

1. A and C

2. D only

3. C and D

4. A, C and D

Let us evaluate all these sets one by one.

Set A. This set can have two possibilities:

Case 1:

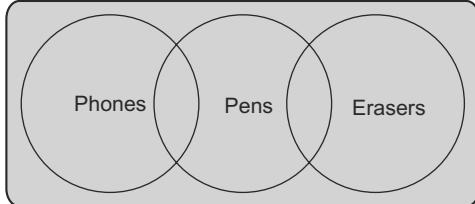


Figure 9

Case 2:

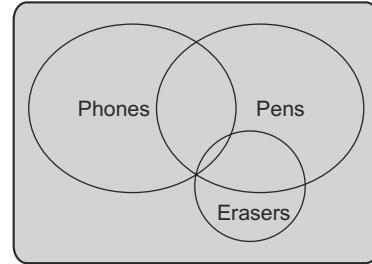


Figure 10

Since we cannot be sure of the conclusion drawn, A is not a true syllogism.

Set B. Again, there are two cases possible.

Case 1:

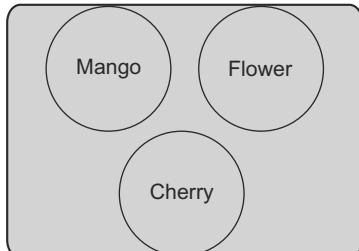


Figure 11

Case 2:

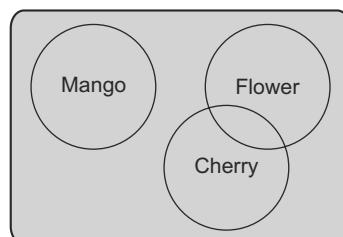
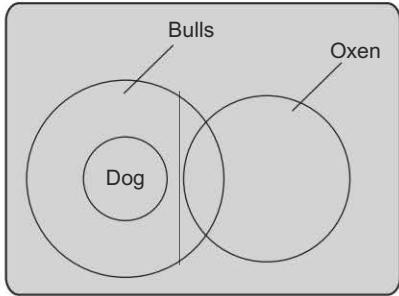
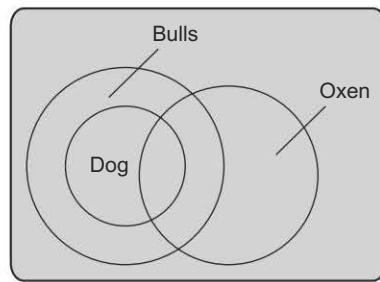


Figure 12

Thus, we are not sure of the relationship between flower and cherry. So, set B is also not a valid syllogism. Set C. This set holds the same logic as set A and we can never be sure about the relationship between dogs and oxen. Again, two cases are possible.

Case 1:**Figure 13****Case 2:****Figure 14**

Set D. The following diagram (Figure 15) represents the statement given:

Here, we get the correct answer. Thus, the correct answer for the question is 2, as only set D is a valid syllogism.

31.2.3 Conditional Syllogisms

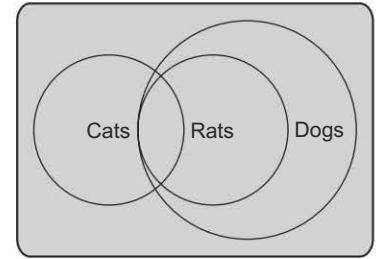
These are commonly known as Cause and Effect relationship questions,

- I. Here in a statement, a cause and its effect is given. For example:
When it gets dark, it will rain.

Here, the **Cause** is darkness and the **Effect** is raining

Now, we can conclude the following things from this statement:

1. When it is dark
If it is dark, we can definitely say that it is going to rain as this is what is stated. Thus, we can conclude:
Cause is Present \Rightarrow Effect is Present
2. It is raining
Now if it is raining, one cannot say it must be dark as it could be raining for any other reason also.
Darkness leads to rain but it is not the only thing that leads to raining. Thus,
Effect is Present \Rightarrow Cause may or may not be Present
3. It is not raining
If it is not raining, we can safely conclude that it must not be dark because in case it was dark, it would have rained in the first place. The very fact that it is not raining means it must not be dark.
Effect is Absent \Rightarrow Cause is absent
4. It is not dark
If it is not dark, again, one cannot say that it is raining or not since it could be raining for any other reason. Thus,
Cause is Absent \Rightarrow Effect may or may not be Absent

**Figure 15**

After all this explanation, we can derive that our conclusion can only come if:

Cause is Present \Rightarrow Effect is Present

Effect is Absent \Rightarrow Cause is Absent

- II. The second type of statement is the “if and only if” statement e.g.

If and only if she is happy, she will dance

Here, the Cause is happiness and the Effect is dancing.

In these kinds of questions, our previous rules are reversed as in this case, there is one and only one cause that is leading to the effect. Only if she is happy, will she dance; otherwise she will never dance. Thus, here the conclusion will be possible if:

Cause is Absent \Rightarrow Effect is Absent

Effect is Present \Rightarrow Cause is Present

- III. Either... or ... Case

We can form two cases in an either... or situation e.g.

Either I play or I sleep.

Case 1 : I play

Case 2 : I sleep

Now, if case 1 happens, Case 2 will not happen and vice versa

So, If I play, I will not sleep.

And, If I sleep, I will not play.



Exercise 31.1

Directions for questions 1 to 10: For each set of statements (A to F) given, there follow four sets of combinations of three. Choose the set in which the statements are logically related.

- | | | |
|---|----------------------------------|--|
| 1. A. All channels offer entertainment.
B. All things that offer entertainment are clever.
C. Some channels do not offer entertainment.
D. Some things that offer entertainment are not clever.
E. All channels are clever.
F. No clever thing offers entertainment. | 1. BAE 2. BAF | 3. CDE 4. ABD |
| 2. A. All radios are CDs.
C. Some radios are electronics products.
E. All electronics products are CDs. | 1. EFA 2. ACD | B. All electronics products are radios.
D. No electronics product is C.D.
F. No radio is an electronics product. |
| 3. A. Some musicians are singers.
C. All singers are creative.
E. No musician is creative. | 1. AEF 2. DEF | 3. ABD 4. ABE |
| 4. A. All phones are good.
C. All good things come at a price. | 1. ABF 2. ABC | B. All musicians are creative.
D. Some creative persons are not musicians.
F. Some singers are not creative. |

- E. All phones come at a price.
 F. Some things that come at a price are not phones.
1. DFA 2. BDE
 5. A. All lazy people are healthy.
 C. All rich people are healthy.
 E. No healthy people are lazy.
 1. BCD 2. ABC
6. A. A few swimmers are gymnasts.
 C. All gymnasts are geologists.
 E. Some geologists are swimmers.
 1. ACE 2. ADF
7. A. Few lenses are good.
 C. Some cameras are good.
 E. Some cameras are not lenses.
 1. ACE 2. AEF
8. A. Some schools charge hefty fees.
 C. No school charges hefty fees.
 E. No tutorial is a school.
 1. BFA 2. BEC
9. A. Some rich people are not status conscious.
 B. Some rich people who are traditional in values are also status conscious.
 C. All rich people who are status conscious are also traditional in values.
 D. All rich people are status conscious.
 E. Some rich people are traditional in values.
 F. Some rich people are status conscious.
 1. EDC 2. DEC
10. A. All wrestlers are fortunate.
 C. Some fortunate people are wrestlers.
 E. Some fortunate people are successful.
 1. ABD 2. EFC
3. BCE 4. CAE
 B. Some rich people are not lazy.
 D. Some healthy people are not lazy.
 F. Some lazy people are not healthy.
 3. ECA 4. FBC
 B. All swimmers are gymnasts.
 D. Some gymnasts are swimmers.
 F. Some swimmers are geologists.
 3. AFC 4. None of these
 B. All cameras are good.
 D. Some good things are lenses.
 F. No camera is good.
 3. CDE 4. None of these
 B. All tutorials charge hefty fees.
 D. All schools charge hefty fees.
 F. All tutorials are also schools.
 3. BAD 4. BFC
3. FEA 4. EDB
 B. All wrestlers are powerful.
 D. Some powerful people are fortunate.
 F. All wrestlers are successful.
 3. BDE 4. FBD

Directions for questions 11 to 15: In each of the following statements, a conditional syllogism is given followed by two conclusions. You have to decide which of the given conclusions is/are definitely drawn from the given statements.

Select answer as:

1. If only I follows
 3. If neither I nor II follows
 11. **Statement:** If it rains, J does not go out.
 J has gone out.
2. If only II follows
 4. If both I and II follow

Conclusions:

- I. It is not raining.
 II. J has some urgent business to transact.
 12. **Statement:** If there is shortage in the production of pumpkins, the price of pumpkins will go up.
 Price of pumpkins has gone up.

Conclusions:

- I. There is shortage in production of pumpkins.
- II. Pumpkins were exported.

13. **Statement:** If all players play according to their potential, we will win the match.
We have won the match.

Conclusions:

- I. All team players must have played to their full potential
- II. Few players have not played to their full potential

14. **Statement:** Only if I work hard, I will pass this examination.
I passed the examination.

Conclusions:

- I. I must have worked hard.
- II. Working hard is the only way to pass the examination.

15. **Statement:** Either I will be a singer or I will be a writer.

Conclusions:

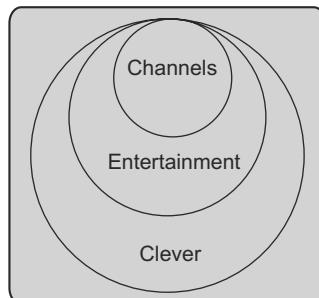
- I. I am a singer and a writer.
- II. I am a writer and not a singer.

 **Answer Key**
Exercise 31.1

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. 1 | 2. 4 | 3. 1 | 4. 4 | 5. 1 | 6. 1 |
| 7. 4 | 8. 1 | 9. 4 | 10. 1 | 11. 1 | 12. 3 |
| 13. 3 | 14. 1 | 15. 2 | | | |

 **Explanatory Answers**
Exercise 31.1

1.

**Figure 16**

Here, all channels are clever.

Ans 1

2. 1.

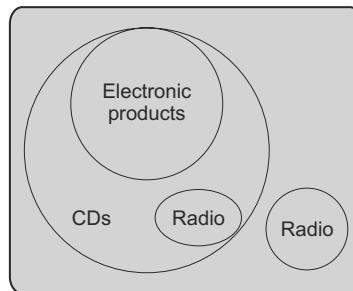


Figure 17

As radio is not an electronic product, it can be a CD or it can fall out of this, we cannot conclude for sure that radio is a CD.

2.2.

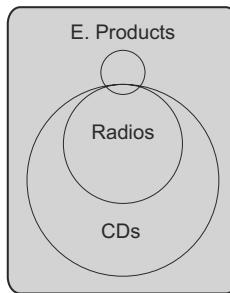


Figure 18

So, some electronic products (which are radios) are CDs also. Conclusion is incorrect.

2.3.

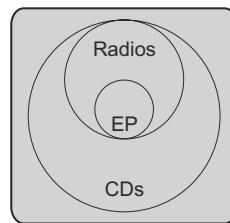


Figure 19

Again, we cannot conclude that no electronic product is a CD.

2.4.

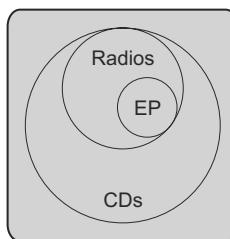


Figure 20

Clearly, all electronic products are CDs.

Ans 4

3. 1

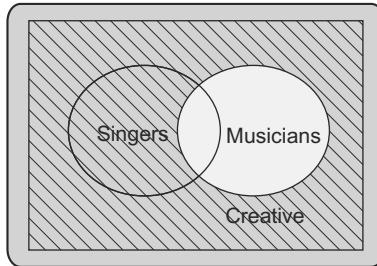


Figure 21

As musicians are not creative, the creative set can come anywhere but in the musicians set so; some singers who are musicians will never be creative. So, this is the correct option.

2. Here, there are only two variables, creative and musicians. So, no conclusion can be drawn.

3. and 4]

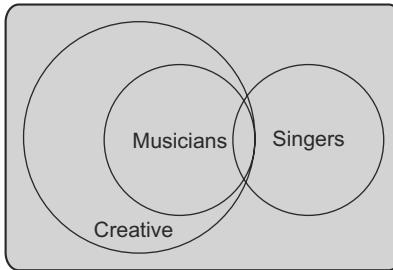


Figure 22

Now, creative can be bigger set encompassing singers also, we cannot be sure about the relationship between singers and creative.

Ans 1

4. 1. There are only two variables — phones and price; nothing can be concluded.
2. Statement E is in direct contradiction to statement D. So, conclusion cannot be drawn.
- 3.

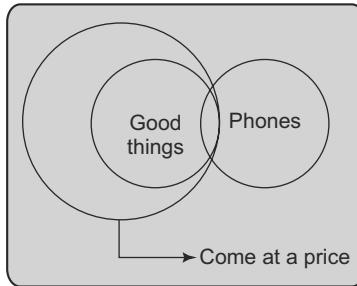
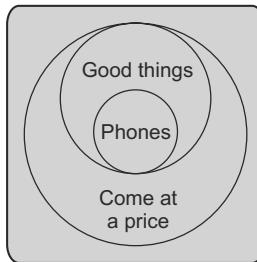


Figure 23

Again, we cannot define the relationship between phones and price. All phones can also come at a price or some phones can come at a price. So, conclusion cannot be drawn.

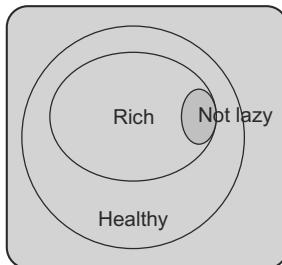
4.

**Figure 24**

Clearly, all phones come at price.

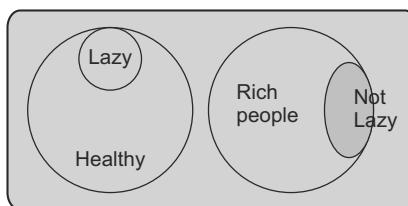
Ans 4

5. 1.

**Figure 25**

So, some not lazy people who are rich also are healthy. So, this is the correct option.

2.

**Figure 26**

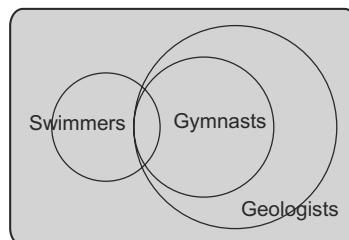
Here we are not sure whether the set 'Rich' will come in the set of 'Healthy' or not. Thus, no conclusion is possible.

3. Statement E and A are contradictory statements. No conclusion can be drawn.

4. This option does not make a clear picture. No conclusion can thus, be drawn.

Ans 1

6. 1.

**Figure 27**

1. Clearly, some people who are geologists are gymnasts and swimmers also. So, this is the correct option.

2. Both, A and D, statements talk about swimmers and gymnasts only. No third variable is being used. No conclusion can be drawn.

3.

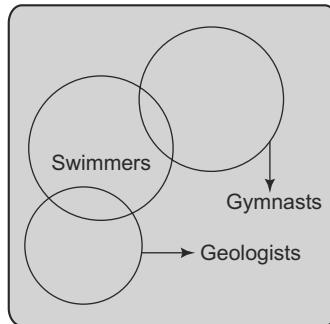


Figure 28

Relationship between geologists and gymnasts is not defined.

Ans 1

7.

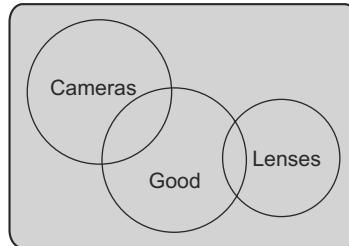


Figure 29

1. Here, the relationship between cameras and lenses cannot be defined. Cameras could be a bigger set also, encompassing lenses as well; so, no conclusion can be drawn.

2. Relationship between cameras and good cannot be established.

3. Conclusion cannot be drawn.

4. None of options is correct.

Ans 4

8. 1.

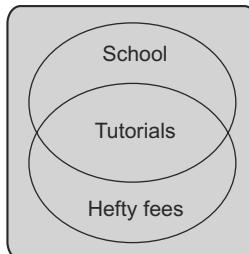
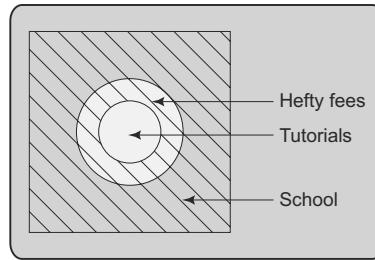


Figure 30

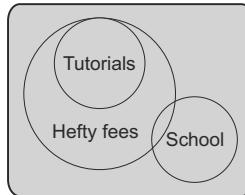
Clearly, some schools that are tutorials charge hefty fees. So, this is the correct option.

2.

**Figure 31**

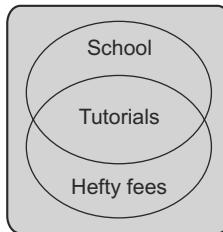
School could fall anywhere in this set except the tutorial one. So, we cannot say that no school charges hefty fee.

3.

**Figure 32**

Clearly statements A and D are contradictory.

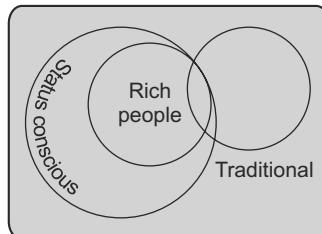
4.

**Figure 33**

Naturally, we cannot conclude no school charges hefty fees.

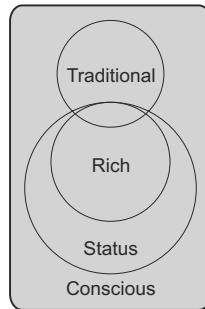
Ans 1

9. 1.

**Figure 34**

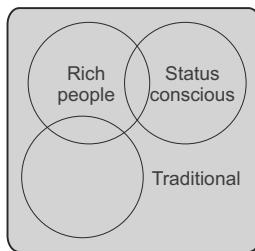
Statement E says some rich people are traditional in values. C statement says, "All rich people...." These are contradictory statements.

2.

**Figure 35**

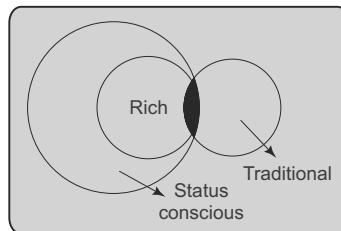
Since statement E says some rich people are traditional. So, we cannot conclude statements C.

3.

**Figure 36**

Again, no conclusion can be drawn.

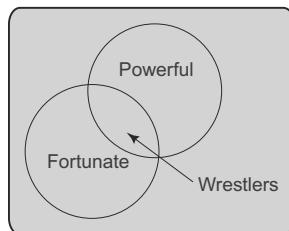
4.

**Figure 37**

Clearly, some rich people who are status conscious are traditional in values.

Ans 4

10. 1.

**Figure 38**

So, some powerful people are fortunate. So, this is the correct option.

2.

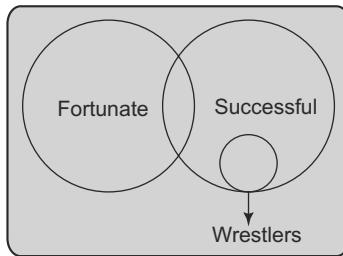


Figure 39

Some fortunate people could be or could not be wrestlers.

3.

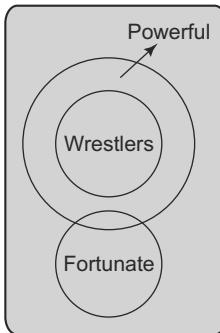


Figure 40

The conclusion talks about successful which was not a variable initially.

4. Here, there are four variables involved – powerful, fortunate, successful and wrestlers. And thus no conclusion is possible. **Ans 1**

11. Effect Absent → Cause Absent

J has gone out thus, it is not raining. Conclusion 1 follows. **Ans 1**

12. No conclusion is drawn from a statement that has Effect present. No conclusion follows. **Ans 3**

13. No conclusion is drawn from a statement that has Effect present. No conclusion follows. **Ans 3**

14. In an ‘only if case’:

Effect present → Cause present

I passed the examination I must have worked hard

Conclusion I follows. **Ans 1**

15. In an ‘either.... or’ case, only one of the two cases is possible. So, if I am a singer, I am not a writer.

Conclusion II follows. **Ans 2**

Part IV

Group Discussions and Personal Interviews

-
- Chapter 32: Group Discussions
 - Chapter 33: Personal Interviews

Chapter 32

Group Discussions

32.1 Introduction

A Group Discussion (GD) is a forum where participants sit together to discuss a topic, with the common objective of finding a solution to an issue or simply analyzing it to come up with various viewpoints.

In general, arriving at a conclusion, unless specified to the contrary, is not the ultimate idea. Rather, discussing the issue at hand in a detailed, non-controversial and systematic manner is the end.

The companies need to judge a large number of candidates on the basis of not only one, but various parameters, which turns out to be quite tedious and time consuming. A GD offers a viable solution to this predicament and is generally used for any kind of competitive shortlisting these days, especially during a campus placement selection procedure.

32.2 Need for GD

GDs have become an integral part in the selection processes for jobs as well as various entrance exams. The fundamental reason is that it assesses a candidate in a group situation, which he/she will be very commonly found in during their employment in any kind of organization. Another motivation is that one can judge a large number of candidates, in a very short span of time, and on a wide range of parameters; thus easing the process for the recruiters. Some of the criteria that the selectors/moderators are typically able to assess are as follows:

- **Knowledge Base:** This is directly related to how aware and up-to-date you are. You need to read regularly and renew your knowledge bank about various domains and trends. A person with a strong knowledge base conveys a thirst for learning and a mind that can grasp different and complex concepts.
- **Ideas:** It is much easier to consume page after page of subject-wise knowledge, but to be able to absorb, process and synthesize all that one knows into ideas which reek of freshness, uniqueness and depth of thought, is a mark of a person who stands apart from the crowd.
- **Team Work:** In most of the companies, we need to work in a team. Hence the companies assess how you behave, contribute and participate in a group and whether you can create a balance between the group's objectives and your own and how do you deal with different types of people in varied situations.
- **Body Language:** Body language refers to the non-verbal communication. It supports the verbal communication and empowers it. It may also contradict what your words are conveying and creating an uneasy impression on your listener. This is the reason why your body language should be in sync with what you are speaking.

- **Communication Skills:** Good Communication involves both verbal and the non-verbal forms and implies conveying your thoughts in a way that the listener understands them just the way the speaker intends to. The discussion usually takes place in English language as it is considered the official language for all businesses. A certain comfort with the language and its articulation is required for the speaker to perform well in his/her job.
- **Confidence:** If the speaker is not confident about what he/she is saying, then nobody will believe it. Even a strong point will fail to have the intended impact. A confident person takes charge and leads the organization from the front.
- **Listening:** Many people are able speakers, but not everyone can be as good a listener. It can provide a person an edge over the others. It helps an individual to understand his/her client, supervisor and stakeholders, better than others and hence, deliver better too. Listening lies at the core of one's interpersonal skills.
- **Logical Articulation:** A right thing, but at the wrong time and in a wrong way, becomes wrong. Monitor the manner in which one desires to put his/her point forward. A sound, logical articulation is an indicator of the thought process being the same.
- **Time Management:** Keeping a track of time is essential. At the workplace, there is always a deadline attached to any work assigned to an individual. A person is required to complete his task within proposed timeframe and with minimal errors.
- **Leadership Skills:** Be it any organization, government or private, small or big, the need for leaders is never fulfilled completely. These leaders are the ones who step up and take their colleagues along to greater heights in a way which leads to the fulfillment for the company as well as its people.
- **Creativity:** Abstract GD tests an individual's creativity and out of the box thinking. It also allows an individual to stand apart from the others and shows not just his/her originality, but also the courage to stand behind it as well with conviction.

32.3 Flow of Group Discussions

Most of these discussions follow a more or less predictable administration.

- The number varies vastly depending on the total number of candidates and may lie anywhere in the range of 8 to 15.
- The seating arrangement will either be circular, semi-circular, U-shaped, or in some cases, designed around a regular rectangular table.
- The duration of a discussion typically falls in the bracket of 15–20 minutes. But at times, may extend up to 30–35 minutes.

The sequence of stages has been described in Figure 1.

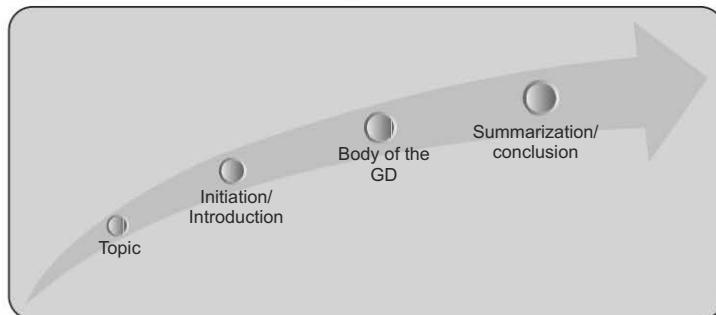


Figure 1

32.3.1 Topic

Once all the participants settle down in the discussion room, they are given the topic for the discussion followed by a few minutes to think upon the same. This is considered to be the preparation time and allows every participant to create a basic structure for the viewpoint which he/she wishes to express. First, every participant needs to make up his/her mind about the stand on the topic, i.e., whether he/she wants to support it or go against it and how an individual wants to go about the topic. Then an individual needs to quickly jot down the points to support and enhance his/her chosen stance. Here, if the speaker recalls any relevant data, then it should also be noted. Remember, a few but good points are anytime better than a run-of-the-mill laundry list.

32.3.2 Introduction

As the name suggests, this is the beginning of the discussion. If the topic is clear and holds no room for explanation, then begin by giving a brief introduction to the topic followed by your take over it. If the topic is not self-explanatory or is ambiguous, then it is very important for the initiator to first ask the group to discuss its meaning and how the group wants to take it further.

32.3.3 Body of GD

This is where one gets into the heart and heat of the matter—the actual discussion starts. Put forward your views confidently and to the point. No set pattern can be prescribed and the speaker needs to sense the situation to act accordingly. There are different roles which can be portrayed and these have been described later in this chapter. To be able to leave a prominent mark, an individual needs to keep updating his knowledge base. Content is indispensable and without it nothing can salvage a speaker. Once the participants are in, there are a few techniques, described later in this chapter, which will help them to think better.

32.3.4 Conclusion

It is important to understand the difference between summarization and conclusion. They are often thought to be synonyms. Summarization involves highlighting the key points of the entire discussion, whereas in conclusion you need to give a solution or a final decision, after considering all the points raised by the participants. Mostly, a GD is not concluded, but summarized.

A conclusion represents the final stage where the whole or majority of the group moves in favour or against the topic. On the other hand in case of summarization, one participant or sometimes each of them simply sums up the whole discussion in brief.

32.4 Types of Group Discussions

- A. Topic Based
 - Knowledge Based
 - Abstract topics
- B. Case Studies
- C. Role Plays

32.4.1 Topic Based

As the name suggests, this type of GD revolves around a specific topic given to the group for discussion. It can further be divided into following two categories:

- **Knowledge Based:** The most typical kind of discussion, this is chosen to assess your knowledge base and analytical capability. You need to have a basic level of knowledge pertaining to the topic so that you can contribute uniquely to the group. Examples of such topics are as follows:
 - i. The size of the nation's budget reflects the nation's fear.
 - ii. Should India accept the UN Security Council seat without the veto power?
 - iii. The social sector has become a lucrative business. But is it supposed to be that?
- **Abstract Topics:** Abstract topics test your imagination and common sense. There is no clear, pre-defined interpretation of the topic and participants need to think out of the box. Over the course of the discussion, the same topic might turn out to mean something entirely different than what you began with. These topics include the following:
 - i. A teardrop on my guitar
 - ii. Green is better than red
 - iii. A to Z

32.4.2 Case Studies

Sometimes the participants of the discussion can be given a case study of any company or a fictional situation based on real life and they will be given a short description about the issue and the factors involved with one or more problems related to it. The participants need to identify the stakeholders, their constraints, governing factors and feasible alternatives. It is an open-ended discussion where nobody is right or wrong. What is being evaluated here is your ability to think at both, the macro and micro levels, your thought process and problem solving abilities. Examples include the following:

- i. The Satyam Scam
- ii. The rise of Facebook
- iii. Hero and Honda parting ways

32.4.3 Role Plays

This will normally involve putting the participants in a work-related situation to see how they would deal with it. Each member of the group may be allocated a role and briefed beforehand on their role and the background to the topic under discussion. One has to get under the skin of her/his role and behave accordingly. Remember, the speakers have to behave like the person whose *role* they are put into, not how *they* as a person would normally behave.

- i. Make a case for your department to receive an increased allocation of funds.
- ii. Argue the case for 'your' candidate to be the one who gets promoted.
- iii. Demand for rise in wages from the workers and union.

32.5 Points of Preparation

This is not a one day job, but a continuous process wherein an individual needs to pay attention and keep enhancing all of the above-mentioned skills. It is quite a holistic attempt and working at a single aspect will not yield the desired outcome.

Nevertheless, there are a few things that one should keep in mind and these have been discussed in the upcoming sections.

32.5.1 While Preparing for the GD

- One needs to work on the structuring of his/her thoughts. One structured line has more effect than ten ambiguous lines.
- One needs to make reading his/her hobby. The more a person reads, the richer will be his/her knowledge bank. This will also enrich their vocabulary and would improve fluency in English. Find what works for an individual—newspapers, books, magazines, etc. For example, if lengthy reading is not one's thing, then he/she can pick up a book of short stories.
- Another way to improve one's spoken language is to expose oneself to English more. Some of the ways to do it is to listen to daily news in English, read aloud whenever one is studying his or her textbooks, etc.
- Sit in front of a mirror and observe own self while speaking on a topic – facial expressions, body language, voice, etc.
- If an individual has willing friends/family members, get into a discussion with one and have the other make notes of the proceedings, and not participate at all. See how an individual responds to changes during the talk, and how the same get manifested by us. Many times, we are blind to our non-verbal behaviour, since we cannot see ourselves.
- Practice and learn to pace one's articulation – a speaker should not be so slow that the listener loses interest, or so fast that no one can gather what you need to express.
- **On the day of the GD:**
 - Dress in comfortable, business formals.
 - Although it might be provided by the recruiter, keep the paper and pen handy.
 - Wear a watch so as to keep an eye on the time during the discussion.
 - Maintain a relaxed and confident posture from the start so that your mind also imitates it and avoids a case of butterflies in the stomach.
- **During the GD:**
 - An individual needs to pace his or her voice and its level in a way which is audible and easy to understand.
 - Every discussion has its ebbs and lows. In case one is having a soft voice or is not able to make him or herself heard in the noise, keep a look for these low activity points and make the entry then.
 - While making a point, refrain from delving into too much detail on anything. This will attract midway interruption from other participants and the spoken point might not meet its mark.
 - In case the group is digressing from the topic or time allotted, politely point it out. But do not do it too frequently.
 - Since the group discussion is carried out in English, comfort and fluency in this language is necessary. Try to remove the “ummm”, connecting Hindi words and long pauses.
 - Keep your attention away from the moderator. A speaker's discussion is with the group and not with her/him; their role is that of an observer. This will also prevent a speaker from becoming conscious

and risking distraction. He/she may choose to interrupt the GD if the group is getting too noisy or straying away from the topic at hand.

- One must keep an eye on his or her body language at all times; even when one is not speaking.

Following are some key postures for a good body language:

- Never point finger towards anybody.
- Do not lean back. Sit straight and slightly inclined forward. This shows that a person wishes to be in this discussion. Remember not to slouch at any point.
- Use hand gestures illustrating what you are saying, but do not overdo it. Keep it subtle and not too far from your body.
- While quoting some other participant point him out with open hand (not with one finger).
- Do not fidget or tap your fingers on the table or armchair.
- The body posture needs to be kept open and not something which conveys a closed person. Avoid negative postures, like crossing arms.

32.6 How to Crack the GD

Observing and monitoring yourself on the following parameters translates into an effective participation in a GD. The following are the main scoring points in an effective GD:

- **Initiate:** Try to be amongst the first people to make a point in the discussion; provided you have valid points to present. But do not over-attempt or speak for the sake of speaking as it may backfire. It is considered to be the moment of complete attention, from the group as well as the moderator, and can make or break one's selection prospects.
- **Understand:** To have a watch on which direction the group is moving in. Especially in cases where you do not know much about the topic, keep your focus on what the others are saying, so you can draw content from theirs.
- **Assert:** This involves combining politeness with firmness. Aggression is a big no-no and reflects badly on one's attitude and interpersonal skills.
- **Structure:** Structure your arguments logically to justify what you are saying. Unrelated and random arguments only leave a bad impression, disrupt the flow of the group and attract negativity.
- **Involve:** Participate actively, by listening as well as by talking, throughout the GD. Know the pulse of the group. Doing so will reflect in the quality of one's contribution. Allow the others to speak frequently and let them complete what they are saying.
- **Articulate:** Work continuously toward articulating one's ideas into meaningful sentences to make the best impact. Clarity in speech reflects clarity of thinking. In case fluency is not your forte, practise forming sentences in your mind before you utter them.
- **Emphasize:** Do not let your words do all the talking. Use non-verbal communication to emphasize points and reinforce what your voice and words are conveying. It leaves a deeper impact on all those who are watching you.
- **Listen:** Be attentive and listen closely so that you can track where the discussion is moving and know what points have already been stated. Thus, your content remains original.

- **Summarize:** This is a combination of your memory and ability to focus on what is important and needs reiteration. It also conveys a capability for leadership. Typically, either a particular participant is requested to summarize or a person takes charge and presents the final opinion on behalf of the group. Alternatively, each one of the participants can individually be asked to present their final opinion apropos the discussion which had preceded it. This is especially done in cases where the discussion had turned too noisy and the noise drowned out everyone's voices. Some of the key points to be kept in mind during the summarization are as follows:
 - Do not express only your viewpoint or emphasize it more than the others, simply because you own it. The GD is over and now you are representing the group.
 - Do not misuse this chance to earn some extra points by introducing a new viewpoint or discussion point. That is a digression from the role you have chosen.
 - A summary should not be one sided or biased. It should contain relevant points from both the sides and cover the entire discussion in a concise, whole manner.
 - Do not speak out everything pell-mell. Take a moment before you begin and articulate your content sequentially and logically.
 - In case somebody else summarizes and you think that he/she did not summarize well or excluded some key points, then humbly interject and add those points. In case two or more than two persons have already contributed, hold back and let the discussion draw to a close.

32.6.1 How to Generate Thoughts

More often than not, once you get the topic for the GD, you will be given a time span of 2 to 4 minutes to gather your thoughts and prepare for a fruitful discussion. During this time, one should write down the various points or the facts and any data that he or she can present. Following are some quick, easy-to-use techniques to generate systematic, holistic ideas:

i. SPELT: Social, Political, Economic, Legal, Technology

Examine the given topic from each of these aspects and present it accordingly. Think about how these areas will be affected or how these areas play a role in the given topic. This will help you bring out viewpoints which others might overlook and will also convey a holistic mindset of yours.

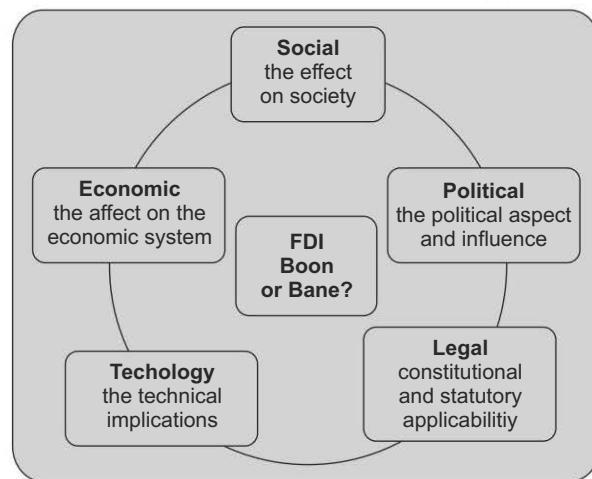


Figure 2

ii. KWA: Key Word Analysis

When you cannot think of things to say, analyze the words in the topic to identify the key idea contained within them and then build up from there.

For example:

Wildlife: The diminishing wild and the diminishing life. Start analyzing the words in this topic.

Wildlife: The diminishing wild and the diminishing life

Wildlife: It refers to the life of forest or the living things in the forest like the different species of animals, ecosystems, trees, plants, etc.

Figure 3

Diminishing Wild: The forest is diminishing. We are cutting down the trees and various species of plants are on the verge of being extinct. Also, the wild animals are now being kept in the zoo. Due to this they are losing their basic animal instincts.

Diminishing Life: The animal population is reducing with the decreasing forest area at a fast pace. We have already lost a few species and many are on the verge of extinction. The loss in forest area is also negatively affecting our lives. The ratio of oxygen and carbon dioxide is steadily moving towards unhealthy levels. The weather is becoming extreme and is adversely affecting different aspects of our lives.

iii. VAP: Viewpoint of Affected Parties

Think about the people who will be affected by this. Understand how the given topic influences and directs these parties' existence and actions and speak from their point of view.

For example: Opening up massive FDI in agriculture. The affected parties will be the farmers, agro-based industries, the commerce ministry, RBI, Rural development ministry, etc.

For example: Live-in Relationship – See Figure 4.

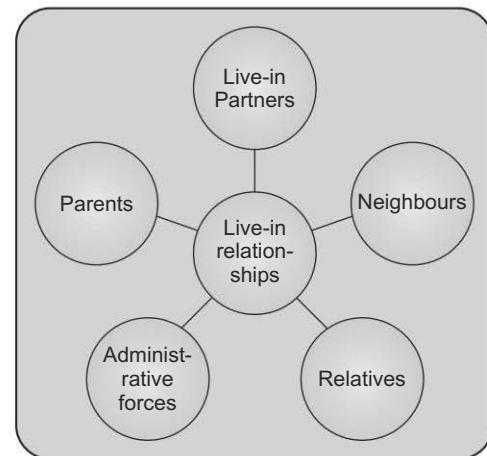


Figure 4

32.7 Roles in a Group Discussion

To an extent, a GD is like a staged drama, isn't it? There is a start, middle, climax and then it comes to an end. People with various attitudes and emotions are involved, and just like a drama each one adopts a role during the discussion. But unlike a drama, most do not and should not stick to one chosen role and switch during the discussion as and how the situation demands. Then there are some situations that need to be avoided and are a big no-no.

32.7.1 Roles to Portray

- **Initiator:** Initiating a topic shows you are a leader and a confident one. You always get marks for initiating a topic; unless the point made lacks quality and depth.
- **Mr Brains:** He is the person who brings in a lot of matter and comes up with wide interpretations of the topic. He keeps fuelling up the discussion with new ideas and new dimensions.

- **Watchman:** His role is to maintain order in the group. He directs the group process and controls the entry and exit of participants. He is crucial for meeting time commitments made to the panel, especially, in ensuring consensus in group discussions.
- **Butcher:** He does a great service to the group by enhancing the quality of content by not allowing the group to get carried with tangential ideas or letting anybody run away by saying anything. He is most welcome in a group, which has one or two aggressive elements in it. (*A Piece of caution here is not to cut down on every point and not let the discussion flow in any direction.*)

32.7.2 Roles to Avoid

- **Clown:** He keeps cracking jokes, especially the silly ones.

Solution: Do not try to create unnecessary humour. While an attempt to lighten things is always appreciated, but overdoing it can ruin whatever chances you might have.

- **Non-Participant:** He is the Mr India of the group. Nobody even notices that he is there. He is lost in a world of his own.

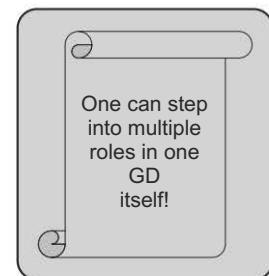
Solution: Do not sit there ideally; you are a participant, not an audience.

- **Dominator:** He acts as if he owns the group. He shouts at people, makes fun of them and is in constant need of spotlight.

Solution: Do not try to overpower anybody or put down anybody or be the only one who's speaking. Control your aggression and be calm so that the others too may have a chance to speak.

- **Show off:** He thinks of himself as a superstar, shows off as if he is "know it all".

Solution: Do not act as if you are the only one in the room who has knowledge and everyone else is a fool. It is a sign of great disrespect to the group participants and conveys unwanted arrogance.



32.8 Myth Busters and Do's and Don'ts

There are several commonly held misconceptions about GD. Some of them have been discussed in Table 1.

Table 1

Myth	Reality
<ul style="list-style-type: none"> • The more I speak, the more marks I'll get 	<ul style="list-style-type: none"> • By doing this, you will come across as desperate and brash and it will only slash off some points from you.
<ul style="list-style-type: none"> • You should always speak in favour of the motion 	<ul style="list-style-type: none"> • If everybody speaks in favour then how will the discussion move forward? If you think few people are going against the topic and you can present good points and support your points with relevant data then speak against the topic. But do not choose a side just because fewer people are choosing it.

Contd...

Myth	Reality
• Aggression conveys confidence	• Aggression is never appreciated. Replace it with assertiveness and let your calmness impress everyone.
• You must try to make the others agree to their point	• The idea is to examine the topic from various angles; there is no one right final answer nor is one person expected to get it right.
• You should speak loudly in order to be heard	• Speak in a moderate volume and tone, with appropriate modulations. Speaking in a very loud voice will only irritate others and show you as a crass person.
• The first one to speak always makes it	• Initiating a GD surely gives you a positive point. But it won't last if your point is not strong, or you stay silent through rest of the GD.
• Prepare on few topics given in various GD Books, and you are all set	• You need to keep updating yourself regularly on the various scales of current affairs. The judging panel never refers to books for topic. The topics in these books are only for reference and practice.

32.8.1 Do's

- Be yourself. If you will try to imitate someone else or try to be something which you are normally not, the hollowness of that will be apparent and only leave a bad taste in the mouth of your assessors.
- Let others speak. Encourage the non-participants to step up and voice what they think about the topic at hand. This is always seen as a sign of inclusive leadership and also earns you respect from fellow participants.
- Remember, it is just a discussion. It is not a seminar, and certainly not a debate or worst, an argument. It involves a free-flowing exchange of ideas among the participants to broaden their perspectives and of the group at large.
- Maintain good body posture. Keep your back straight and shoulders open. Relax your lower back slightly or you might look too uptight. Keep your hands in your lap or on the table.
- Always address the entire group while articulating your views. Avoid one-to-one conversations or singling out someone for ignoring or paying too much attention. Spread your energy across the group.
- Put up your best behaviour replete with politeness, positivism and confidence. Do the right things and let not the group's or particular participant's attitude slip down in your conduct.
- Try to use gestures while voicing your point. They add expression to your persona and convey the confidence of a good orator. Keep the gestures controlled and subtle; wild hand waving or pointed, in-your-face ones will chop off your points drastically.
- If the moderator has asked anybody to summarize the GD then do not add anymore points. This means the GD has come to the end.

32.8.2 Don'ts

- Do not shout or raise your voice which sounds too loud for the environment.
- Do not criticize on the basis of religion/race/caste/etc.

- Do not get personal with anyone.
- Never ever try to bluff.
- Do not stretch a point for too long – it can make a good point go bad.
- Do not cut anybody in-between. Wait for their sentence to complete and then speak.
- Do not tap your fingers on the table, or shake your leg, or any other unnecessary movements which convey impatience or disinterest.
- Do not employ double-meaning statements or jokes.
- Do not put down anyone. In case you don't agree with someone's point, either ignore or counter it politely by asking them to see it from another angle.

32.9 FAQs on Group Discussions

- Can I use any other language, apart from English, during a GD?
—No. Unless it is specified to the contrary, please speak in English only.
- What should I wear for GD? Do I need to be formally dressed for a GD?
—GD is a part of selection procedure where you are judged on various parameters, including your appearance. It creates the first impression and is formed even before you speak your first word. So yes, dress formally and smartly. It will add confidence to your demeanor as well. (*Please refer to "Personal Interviews: Interview Attire" for further details.*)
- I have some good points and I want to put it forward, but some participants start shouting/speaking in loud voices. What should I do?
—Try to calm down the group and tell them that shouting won't help anybody. Once they are settled then put your point across.
—In case that doesn't happen, either wait for the noise to ebb and make your entry there, or simply refuse to be a part of the mindless cacophony and risk rejection with the entire group participants.
- I have no Idea about the topic given. The GD is over for me, isn't it?
—Relax! There is always a way out. Boost up your listening and start processing what the others are saying. More often than not, the first 2–3 speakers will give you enough information to chew upon and build your own points from it.
- I did not start the GD, nor could I end. Is there any chance I can still hope for a positive result?
—Yes. As much as starting/ending the GD lends you special attention, even that is not a guarantee of getting you through. If you have put in some strong points during the discussion and have made a meaningful contribution, you have a great chance.
- My neighbours are so tall or are seated in such a way, that my view is getting blocked. Or worse, I think it is preventing the moderator from seeing me clearly. What do I do?
—First, try to push your chair forward or adjust its position in such a way that your visibility remains unaffected. If that does not help, politely ask the participants in question to move their chairs in a way that does not obstruct your view.
- What if one or more participants are not letting me speak or trying to get into an argument with me because of difference of opinion?

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—Never get personal with anyone. You are not here to prove a point to anybody. In case somebody tries doing it with you, politely ask them to refrain from it and remind them that everyone has the right to speak what they believe in. Do not make pointed statements.

- At any point if I feel that the group is becoming too unruly, can I seek the moderator's intervention?
—Once the discussion has begun, the group is expected to conduct itself and not resort to anybody's help for management, including the moderator. The moderator might choose to intervene if he/she deems fit, but they cannot be called upon by the participants directly. It is the group's responsibility to maintain its decorum.
- Can we also be asked to give a written summary?

—In some GDs, the moderator will ask each one of you to quickly write down a summary of the discussion held. Again, remember it is a summary and not your sole opinion on the topic. Stick to the points which were made and in case you feel that the group missed out an important point, mention it. Do not overwrite and contain yourself to 10 to 15 lines only.

32.10 Topics for Group Discussions

32.10.1 Social Topics

- The education system needs some radical reforms
- The decay of our culture
- Influence of online social networks on our youth/Social networking on internet is a boon
- Individual freedom versus societal civilities
- Violence and bloodshed should not be screened on TV and the big screen
- Women are not competent for defense services
- Smoking needs to be banned completely
- Marriage is a social ploy
- English should be made the official language
- The older generation is less practical than the younger one
- Joint family – a blessing in disguise
- Parents can never understand children
- Capital punishment can never be a solution; even for the most heinous crimes
- The Indian youth is becoming greedier by the day
- Who is to be blamed for eve-teasing – the boys or the girls
- Gen X is a powerful guide for the current generation
- Education fails to teach us teamwork
- We shine abroad but need the “*danda*” to perform in our own country
- When will we get rid of the “*chalta hai*” attitude
- Traffic is a growing trouble
- The political class is the new royalty

- We need an attitudinal reconstruction toward women
- Beyond middle class is there still a struggle for “*roti, kapda and makaan*”

32.10.2 Economics and Business

- Rocketing oil prices – what can the government do?
- MNCs and globalization – devils in disguise
- Indians favour quantity over quality
- Is consumer really the king in India?
- Profit is the only business of business
- Advertising is all glam with barely any truth
- Media: print versus electronic
- A good idea needs a good salesman
- Gold: sound investment or a bubble about to burst?
- The threat of the Chinese market to India
- Business and ethics cannot walk hand-in-hand
- Real Estate can only move upward now
- India–really the NextGen superpower

32.10.3 Politics

- How does our political system degenerate the society?
- Criteria of education qualification for politicians
- Good leaders is the need of the hour
- Only a dictator can save India
- Tainted ministers should be barred from contesting elections
- Celebrities migrating to politics
- Corruption is the main outcome of democracy in India/democracy is a luxury in India
- Corrupt but efficient politicians or honest but inefficient politicians?
- Corruption or overpopulation – what should India tackle first?
- The involvement of money in elections
- A corruption-free India is impossible
- Loss of faith in government is an alarm bell for the country

32.10.4 General

- What is the societal utility of sting operations?
- Brain drain needs to be reversed
- Flexible timings versus fixed timings

- Can a paperless education/workplace be a reality?
- Animals testing for new drugs and medical procedures – why or why not?
- Advertisements aim to fool and should be banned
- Do peace and non-violence belong to the 21st century?
- Life skills should be made a compulsory part of education
- Winning is not an important thing; it is the only thing
- The test of success is not an ability to eliminate the problem before it exists, but to meet and resolve it whenever it arises
- A man with words and no deeds is like a garden full of weeds
- A closed mouth catches no flies
- Physically unfit policemen should be suspended
- Better to be born rich or lucky?
- Patience is a bitter plant which bears sweet fruits
- Mobile phones today – no escape
- Cursing the weather is bad farming
- Facebook is only meant to be a time pass
- Wisdom bears no relation with age
- Criticism is always better
- Beauty contests do little to emancipate women
- A life beyond 50 is a happier life
- Hypocrisy is a prerequisite to survive in today's world
- The five senses cannot be enjoyed without the sixth one – money
- Money is sweeter than honey
- The ends cannot justify the means
- The way to heaven leads through hell
- To be human is to be born selfish
- Efficiency and corruption are two sides of the same coin
- Ifs and buts cannot lead us to our goals
- Wisdom does not check age
- Internet is a world of copycats
- Money alone can't make you rich
- Hungry people in a grain-rich India
- When will we move beyond an Indo-Pak cricket match?
- Old people need more empathy
- Hope is good if backed with hard work
- How civilized a society are we?
- Juvenile criminals should be treated at par with the adult ones

32.10.5 Abstracts

- A ship is safe at the harbour; but that is not what it is meant for
- Beauty and brains go together
- Rules are meant to be broken
- There is no right way of doing a wrong thing
- Is God male or female?
- Men are from Mars; women are from Venus.
- A person should not be too honest; straight trees are cut first
- All work and no play makes jack a dull boy
- The wheel just keeps turning round and round
- If I were the prime minister of India...
- This morning when I woke up...
- Up the down staircase
- Black is black and white is white
- I think, therefore I am
- Time is money
- Black is beauty
- It's a man's world
- The colour of the cat doesn't count; as long as it catches mice
- Honesty is the best policy
- The last few lines
- Keep running
- Dreams do come true
- Orange
- The letter 'A'
- Music is the soul of life
- Footprints
- Yesterday is history. Tomorrow, a mystery. Today is a gift.
- We're being watched
- Life after death – the afterlife
- And the clock struck 13
- Roses are red, violets are blue
- You only live twice
- There goes Time
- When the clock strikes again
- The eggs must be broken to get an omelette

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- Gone with the wind
- A fool can ask more questions in an hour than a wise man can answer in seven years
- A teardrop on my guitar

32.10.6 Education

- Examination – has it killed education?
- Do we really need education to be successful?
- E-learning: a substitute for classroom learning?
- Is reservation in higher education only alternative for social equality?
- How effective are Indian B-schools?
- B-schools should aim at creating entrepreneurs.
- Increasing number of engineering colleges is a boon to society.
- Education system in India – should we change the present system of education?
- Indian universities *vs* foreign universities
- A room without books is like a body without soul
- Educated Indians lack national commitment?
- Education industry is a business these days?
- Computers result in unemployment?
- Offbeat career *vs* conventional career
- Practical knowledge *vs* theoretical knowledge
- The present education system perpetuates inequality
- Reading beyond textbook is important
- Competition right from childhood – is it good or bad?

32.10.7 Sports

- If winning is not everything why do they keep the scores?
- Cricket in India has lost its sheen
- Cricketers are overpaid?
- The money invested in cricket is harming the development of other sports
- Should India change its national game?
- Sports is more than just cricket

32.11 Sample Group Discussions

32.11.1 Sample GD 1

Moderator: Please come in and take your seats.

Enter the classroom and take your respective seats.

Moderator: "Okay. You know the general rules for any GD. The time limit is fifteen minutes. Once I give you a topic, you will have two minutes to think over it. After that you should start the GD. The discussion time is ten minutes, after that a summary of the topic is expected from you.

And the topic for your group is "Social Networking Sites – Impact on Youth". Your time starts now.

(Here the moderator has explained you all the rules and the various time fragments. He wants to see the leadership quality in you. He has left the time management up to you and wants to see whether you can take initiative or not, whether you can handle a team to have a healthy discussion or not. It is very likely that he won't speak for the rest of the GD, nor will he remind you about the time.)

Write down the various points that you can think of on your paper. Write down as many facts and data as you can think of, about the topic.

(Once the thinking time is over, bring it to the group's notice and initiate the topic. You should introduce the topic first, and if the meaning of the topic is not clear to you then allow someone else to introduce it, while you try to analyze what the topic is and how should you go about it.)

Neha: Since the thinking time is over, we should start with the discussion. Shall we?

Popularly social networking is known as the use of dedicated websites to communicate and share with other members of the website by posting thoughts, photographs, videos, etc.

It helps individuals in making new friends and also finding old friends who might not have been in touch for years and without this platform it would be impossible to get in touch with them again. In simple words, it helps in reviving old relations and helps in making new relations.

Some of the widely used Social Networking sites are Facebook, Twitter, Google plus, Orkut, etc.

Satnam: But, talking about disadvantages, the biggest disadvantage of these sites is that there is a possibility that someone may extract your personal and professional information and use it to harm you and therefore you should be fully aware of such things and never disclose any sensitive information like bank account details, credit card details, and so on.

Karan: There is a security check. If you browse on "https" link then the chances of hacking diminishes.

Isha: The problem with social networking sites is that you waste a lot of time on them, the time which can otherwise be used in some useful activity.

Pankaj: Very rightly said. The humongous amount of time that our youth wastes on these virtual social networking sites, makes them aloof of the things that are actually happening in the society. They hesitate in talking to anybody in person and are rather happy leading a fake virtual life where they pretend to be someone else.

Vivek: Well it is up to you how you want to spend your time. One cannot blame these sites for one's lack of judgment. If you do not want to waste your time then limit your online activity to fewer hours. But, please do not blame these useful sites for it.

Aditi: Ok, we do not need to be aggressive here. I believe, what Pankaj wanted to convey was that we cannot ignore the fact that we are choosing the virtual life over reality. This escape mentality is wrong. But Vivek is right in his argument as well that it depends on an individual as to how he/she wants to spend their time. I think we need to improve our sense of righteousness and belonging. We as individuals need to understand that though the virtual life seems easy and wonderful, it is a dangerous trend and is wrong.

Isha: Yes, this race of proving oneself to be popular amongst peers based on the number of likes and comments one photo or status/tweets gets is making our young generation insecure and is jeopardizing their confidence. They spend more time online establishing themselves as "cool" and "happening" and are completely ignorant of people sitting with them. Walk in any restaurant or public place, you will see a group of people sitting together but rather than talking amongst themselves they are busy "connecting" with their online friends. This trend is lethal.

Neha: Yet at the same time, these social networking sites, if used correctly, can be real gemstones. Take for instance *Linkedin*. This is a professional networking site. You can have healthy, profession-based discussions, share job openings, latest trends in the market and many more such things.

Aditi: Absolutely. These websites prove to be a good platform for professional social networking, but again, since the extreme of anything is bad, the over-use of these will also lead to wastage of time and you will be left with little or no time for your real world friends and family.

Moderator: Ok. The discussion is over. Please summarize it.

Isha: Well to sum it up, we discussed various aspects of social networking sites and their impact on our young generation. It surely is a tool through which we connect with each other. The communication becomes fast. We can stay in touch with a large number of people and it also gives us exposure. We are constantly updated about various current events, but we cannot neglect the fact that youngsters are getting addicted to it and are wasting a lot of time in the virtual world and are getting distanced from the real world. They are developing negative traits and insecurities. Also, the social media is being misused by some unwanted elements in ways which lead to others' defamation, especially girls.

(Please note that here isha puts forward all the key points of discussion, both positive and negative.)

Moderator: That was a good discussion. You all can go now. Thank you.

Participants: Thank you, Sir.

32.11.2 Sample GD 2

Moderator: Please come in and take your seats.

Enter the classroom and take your respective seats.

Moderator: "Okay. I am sure you would be aware with the basic rules for any GD. The time limit is Twenty minutes. Once I give you a topic, you will have Three minutes to think over it. The discussion time is ten minutes, after that a summary of the topic is expected from you.

And the topic for your group is "War is sometimes the only way to preserve peace". Your time starts now.

(Please use the thinking time wisely. Since this is a topic where lots of data and references come into play, please note down as many as you can think of. We generally think that we will remember whatever points we thought of and that there is no time writing it down, but when the discussion starts you are swayed away in the discussion and all those points and data don't strike you then. Also, some of us make the mistake of writing down lines or paragraphs. Please remember that you have little time to think and lots of data to enlist. So don't waste it in writing a whole paragraph. Instead write main/reference points.)

Monika: Well friends, I think before we begin with the discussion, at first let us discuss the actual meaning of the topic, since the topic is a little ambiguous. What it means, according to me, is that if two countries are facing problems or a country has forcibly acquired a neighbouring country's land and is spreading unrest and terrorism in that country then the country at target is left with no other option than to declare a war against the country at default. Is that right?

Navtesh: I agree with your point Monika. According to me also, the meaning of this topic is the same. Though there is a different aspect as well. If there is some internal insurgency and internal terrorism in a particular country then the government of that country can declare a war against such terrorists.

Akshat: I disagree with you here, my friend. A war is always on a very big level. It is huge. For example, the war between India and Pakistan at Kargil or the World War I or World War II. What you are talking about, is a battle between the government and the local discrepancy forces. Even the rebellion that the unhappy citizens declare against their government cannot be termed as a war. It is a revolt.

And in my opinion, war at any given point of time cannot be good. It brings unrest, inflation and above all the death of thousands of soldiers which in turn devastates the respective families. This can never be good.

Prateek: Well I agree with you Akshat that war between two countries can never be good. But we cannot limit war as a gun battle between two countries. Yes, war is always on a large scale, but we can have a war against unemployment where the whole world, continent or a particular country can unite to fight against this problem and such a war will always be good.

Monika: Yes, the war against these social discrepancies is always good, but the war between two countries is not always bad. Every coin has two sides. Yes, a war brings certain unwanted consequences with it but what we are talking here is not about each and every war, but certain war situations which are inevitable are for the betterment of citizens. For example, the war between the United States of America and Iraq, the Iraqis were unhappy with Saddam Husain. He was leading an autocratic government. He was using public money for his own luxury and comfort, killing people whenever he wished. There was a constant state of fear amongst the citizens. After the American Forces attacked the Saddam Husain Government and demolished it, the Iraqi citizens are at peace and are on the path of development.

Moderator: Thanks to all of you for such a healthy discussion. Good Luck !!!

32.11.3 Sample GD 3

Moderator: Please come in and take your seats.

Enter the classroom and be seated.

Moderator: "Hello everyone! The process is standard and simple – once the topic is announced, you'll be given two minutes to collect your thoughts on the matter, followed by a 10 minutes discussion to dig up different aspects of the same. In the end, any one of you is expected to summarize the same. So, your topic is 'The Mystery of a GD.' Please start."

(The moderator here has made certain things pretty clear – the duration, topic, flow. Note that a healthy, holistic discussion is expected and raising a different viewpoint will be more valued than proving your point right. So in those two minutes, jot down as varied a list of points as possible. Don't repeat and focus on expanding the topic into various domains. The moderator has also indicated that a summary may be asked for, from anyone. It is not a surety. So, stay alert and keep a tab of what the other participants are saying.)

Misha: Aah! This has got to be a very interesting discussion indeed – a GD on GD! As a starting point, I suggest we discuss and understand the need to have a GD in the first place. We can then go on to elaborate on how a GD can be cracked. What say?

Ken: That sounds good. As odd as the topic may seem, I believe the very same aspect shall prove to be the reason for this being a very fun discussion.

Chetan: Quite right! I think a GD is a very powerful tool – one can assess many people, on many parameters, in a short time. It is efficient on time, resources, and energy. What more could a selector ask for?

Misha: Could not agree any more. A GD allows the selectors to assess the candidates in a real-time situation, very similar to what occurs at workplaces. We all will be dealing and working with the people all the time and communication will be of prime importance. Additionally, it also helps reveal one's leadership qualities as well as the ability to work in a team. Not to forget.

Hina: I'd like to point out here that...

Samarth: I would not say the same. I think a GD and workplace dynamics are not comparable; in a GD, one is in a setup for a brief period of time and so everyone puts their best foot forward, trying to win the moderator's attention. While an office is real-life and try as much as you can, you cannot pretend to be someone that you are not.

Tumpa: Exactly. Once we're in the thick of things, we forget to pretend and our true nature is revealed. And so the same happens in a GD, too. Once the discussion picks up pace, the gloves come off and the moderator can clearly discern the candidates. So, a GD is as good as any office situation. You were saying something, my friend? (looks toward Hina.)

Hina: (smiles) Yes, thank you. My view is that one's expression is a reflection of one's thought. If there's clarity of mind, the same is visible when one articulates theirs.

Vishnu: That's too off the topic. We're here to discuss GDs, not people's mental states!

Hina: But isn't that a...

Chetan: I'd agree with her, sir (looks at Vishnu). A GD allows a moderator to peek inside a candidate's internal disposition which is always a reliable predictor of future performance. Why else do you think companies conduct these psychometric tests and all? Obviously there's some..

Manaswita: Unless the candidate is a very good actor and is merely putting up a show, People are ready to fake to any limit in order to be more agreeable and enable a possible consensus for a discussion.

Sample Score Sheets



Group Discussion – Sample Review Sheet (Group)

Group no. _____

Topic: _____

Time: _____

Evaluation Chart

Name	Score out of 10			
	Subject Knowledge	Communication Skills	Participation	Remarks
P1				
P2				
P3				
P4				
P5				
P6				
P7				
P8				
P9				
P10				
Group Performance				

Date: _____

Panel Member: _____



Name:

Group Discussion – Sample Review Sheet (Individual)
 (To be completed immediately after GD Session by the Moderator)

Fact	Weightage %	Student Rating (1–4)	Observations
Subject Knowledge	35		
Voice (Tone and Pitch)	5		
Body Language (Posture & Eye Contact)	10		
Leadership Skills	10		
Initiative	5		
Confidence	5		
Fluency	5		
Listening	5		
Group Behaviour	15		
Analysis	5		
Others (specify)			

Meaning of rating scores – (1) Bad (2) Average (3) Good (4) Excellent

Observed Strengths

Observed Weaknesses

Panel 1: _____
 Panel 2: _____
 Panel 3: _____

REMARKS:	_____

Ken: I doubt if a consensus is the goal. I think it is more crucial to bring up different ideas and thoughts, be tolerable of those which are different from you, and listen and speak in equal measure. An agreement is not always a healthy sign, it can be deceptive and...

Manaswita: Oh you're talking too idealistically.

Ken: I think I'm asserting a realistic and preferred way of behaving in a GD. What's ideal...

Misha: Guys! We hardly have a minute left. Let us not waste time in settling scores. I think cracking a GD requires a lot of self-confidence, knowledge and a logical mind. No personality is the best and everyone has his/her own quirks. A workplace is like the real world only where different...

Moderator: "Your time is up. Instead of one person, I'd like each one of you to give your personal view on the topic in not more than five sentences. Please leave the sheets behind once the time is up. You have a minute for this. Thank you."

32.12 Viewpoints on a Few Group Discussion Topics

32.12.1 Management – Science or Art?

Management is both an art as well as science. Let's explore how:

- **Art**

1. How a person responds and interacts with a state of things is art, a personal, intuitive thing.
2. Only the managers who have thought out of the box, an art itself, have registered exceptional success.
3. Getting others to do the work which you want is an art and isn't everyone's cup of tea.

- **Science**

1. All firms across the world follow a set of theories of management which is in accordance with science. Companies globally follow a set of predefined theories, whose base is scientific and relies on standardization for success.
2. Certain actions predictably lead to predefined results and that forms the basis of systems.
3. With a close-knit involvement of the human factor, management does not really hit the mark in terms of an exact science. This dynamic element renders the case of management rather dicey.

32.12.2 Social Networking Sites – Impact on Youth

Social networking is the crown head of the internet. For most people today, the internet is synonymous with, if not, social networking itself. However social networking is a double-edged sword that has both benefits and limitations, as discussed in the upcoming sections.

- **Advantages**

- i. It helps us not just to meet new people but also to find old friends who might have been out of touch for years and probably without this platform it would have been impossible to reunite. In simple words it revives old relations and forms new ones.
- ii. It breaks the monotony of life as these sites offer numerous applications and activities to cater to a plethora of tastes, which does not allow you to be bored for a second.

- iii. It presents a vast space to expand your business because there are millions of people who are on these sites and this medium offers a cheap, easy and flexible avenue of promotion and endorsing.
- iv. A person does not feel left out even if he/she is far away from family and friends. One does not have to miss another birthday, anniversary or any occasion.

- **Disadvantages**

- i. The biggest disadvantage is the possibility of someone extracting your personal and/or professional information and using it for fraudulent purposes, or worse, to malign your reputation. Therefore, one needs to be alert and fully aware of what they share and not disclose any sensitive information like bank account details, credit card details, and so on.
- ii. Children at young age should never be allowed to use these sites because at such a young age they are not in a position to decide whether it is right or wrong to be friends with strangers and also exposing them to social networks will erode their innocence. Everything should be done at right time and social networking is not the thing to do for young kids – their place is outdoors, discovering the world.
- iii. One should not get addicted to it, because it can have severe repercussions like losing your productivity at work, loneliness, etc. Excess of anything is bad and social networking is no exception to it.

- **War is Sometimes the Only Way to Preserve Peace**

Few famous quotes to begin with:

"Sometimes we try to justify this unsavory business on the cynical ground that by rationing out the means of violence we can somehow control the world's violence. The fact is that we cannot have it both ways. Can we be both the world's leading champion of peace and the world's leading supplier of the weapons of war?"

- Jimmy Carter, in a 1976 campaign speech

"I sit on a man's back choking him and making him carry me, and yet assure myself and others that I am sorry for him and wish to lighten his load by all means possible except by getting off his back."

- Leo Tolstoy

For such a topic, the analysis can be done into the following two broad ways:

- i. **SWOT:** Strengths (positives) and weaknesses (negatives) of an activity like war, opportunities and threats for the stakeholders involved in such activities.
Positives and weaknesses of war are very common ones ranging from death toll, economic loss, loss of healthy domestic administration to means to curb the unsolicited acts of unsocial groups, selfish demands of countries, etc.

Coming to opportunities for stakeholders, the biggest is the gain from war between some other countries like the United States whose one of the major exports is war weapons to other countries. Then they also come up with advantages in the form of helping out nations in rebuilding. Similarly, there are examples where developed countries' stakeholder gain and those of under-developed or developing ones lose out.

- ii. **PESTLE**

- **Political:** The UN was founded after the Second World War with the US spearheading its formation. The UN was set up with the commitment to preserve world peace via international cooperation and collective security.

And yes, the UN's entire budget is just a tiny fraction of the world's total military expenditure, a measly 1.8%.

- **Economic:** There is a huge fissure between what the countries are prepared to earmark for military systems and anything which will bolster their power status, and what they would be willing to devote for socio-economic alleviation and poverty elimination.

Price wars among competitors especially telecom, FMCG, real estate, air carriers, etc., is a point that can also be taken up.

- **Social:** Bloodshed all over, distrust and hatred among all in society due to domestic wars and across countries due to wars among the countries. Effect on GDP of the winner as well as that of one who loses is fatal.

War against poverty – peace is required for poverty stricken – no use of ammunition required here – sound policies and honest implementation of the same is required to get peace in such a war.

War with oneself – very necessary to win and achieve goals in life – one cannot be content with what one has – one needs to fight in this competitive world, a war that cannot be called off.

- **Technological:** Cyber wars, wars planned in minds and fought on social media especially among competitors from FMCG, pharmaceutical and other sectors.
- Legal: Legal obligations in today's world owing to different pacts signed at international level, interference of UN.
- **Environmental:** Nuclear and chemical wars, hurting the environment, making the sustainability tougher day by day, exploiting as well as ruining of natural resources. You can even give the example of Hiroshima and Nagasaki incident in Japan.

- i. **MISCELLANEOUS POINTS:** Lot of examples to quote in this discussion: World War 2, Afghanistan, India-Pakistan, Japanese attack on the US naval base, Iraq, Taliban, Internal terrorism in Kashmir, Sri Lanka and LTTE.

32.12.3 Should Cloning be Banned?

- **Against**
 - i. Cloning is believed to have developed as a potentially strong solution for the problem of infertility. Women who are infertile can now have babies of their own with the help of this technique which involves implanting the cloned embryos into the mother's womb. This gives a new ray of hope to infertile couples who long to have their own baby.
 - ii. Cloning can eradicate all the worries regarding the child's health. Scientists can alter their genes to ensure a healthy child.
 - iii. It can also cater for organs for transplantation.
 - iv. Administer treatments for variety of diseases.
- **For**
 - i. If we clone with the intention of organ transplant, then what happens to the clone once the organ has been donated, rather taken out of it?
 - ii. Human beings are not vegetables that can be grown with the sole purpose of "consuming" and then disposed of once that purpose is solved. With the already bursting population, can the "cloned species" be accommodated with respect of housing, infrastructure, food, water, future healthcare (which it will need a lot!)?

- iii. Cloning will also start creating discrimination – “pure bred” vs “clones”. Well that can be tackled. But it is a risk many may not be willing to take.
- iv. Man is far too young to try to play God!

32.12.4 Who is needed: A Leader or a Manager?

To begin with, let us know that none of them is an island on its own. Some people believe a manager is the same as a leader because they perform the same tasks. However, there is a remarkable difference in how they achieve results. These approaches taken by managers and leaders have now taken such importance and gravitas in management research works that they are differentiated and treated separately.

Differences

- i. The thinking process is different. Leader thinks from his heart and for a greater good whereas a manager is more methodical in approach.
- ii. The leader has a vision to decide goals. The manager has a plan to achieve the goals.
- iii. The leader motivates people to do work by his actions, words and by example. The manager might have to push people to do what he says, might have to enforce rules for the same on his subordinates.
- iv. While a leader produces change owing to his visionary power, a manager administers it through the skill sets acquired through experience in due course of time.
- v. The leader thinks out of the box, loves to take risks. The manager is risk averse and often wishes to achieve the goals safely.
- vi. A manager works on people to achieve results, a leader works with people to achieve results.
- vii. When a manager focuses to bring out the best results, a leader tries hard to bring out the best in his people.
- viii. A manager develops the workers’ skills and a leader brings out their confidence.

Similarities

- i. Both should have good interpersonal skills whether it is verbal communication, presentation skills or written communication.
- ii. Both depend on their subordinates as both serve as a link between top management and subordinates.
- iii. Both manager and leader negotiate in order to carry out their duties.
- iv. Disagreements do occur in a manager’s and leader’s teams and both do settle disagreements and conflicts amicably.

In the end, we can summarise:

Organisations like to have effective managers, but the employees like working with leaders. When a manager leaves a team, it barely changes; but when a leader leaves, the team can never be the same again. No two leaders are the same.

Not to forget, a leader will tell his workers that if they do not do the work right, he will be fired. While a manager knows the details about the products being produced by his line, a leader knows the details about his team. He knows their names, their birthdays and family members. While a manager talks every time about the importance of the workers development to the organisation, a leader talks every time about the importance of workers to the organization’s development.

Chapter 33

Personal Interviews

33.1 Introduction

An interview is a meeting between an applicant for employment and a company representative to determine if the candidate is qualified for a job, internship or a volunteer opportunity. Even if the vacancy is for the position of a volunteer or an unpaid intern, most organizations will take at least one round of interview to assess and choose the best candidate(s) for the opportunity.

The interview is an avenue to check for a suitable match among the candidates, i.e., an individual's talents, skills and the needs of the potential employer. The goal of an individual in an interview is not merely to convince the employer about his or her suitability for the job but also to utilize this meeting to evaluate whether this is the right position for him or her. During the interview, a question for which the interviewer is seeking a decisive answer is "Why should we hire you?" or "if we recruit you, will you be an asset to the company?" All your responses must revolve around these questions. Always remember that interviewing is a two-way street, it is of vital importance to both the interviewer and the interviewee. The *right man for the right job* is the need of the hour for every organization.

Interviews can be conducted in-person, over the phone or via video or Skype. This depends on the factors like the company, position they are hiring for and the pool of candidates who have applied for the job.

33.2 Types of Interviews

An individual or a candidate is likely to experience a variety of interview styles and formats. In some cases, the candidate is handed over the offer letter just after the completion of one round of interview; which can be long or short. In other cases, the process may be longer and involve more than one interview with multiple stakeholders including the Human Resources (HR) representative, different levels of management and potential colleagues.

33.2.1 Screening Interview

This type of interview is usually exercised by larger organizations that have a large applicant pool and hence they need to trim the numbers. The screening interview becomes the first stage of the process and is used to ensure that the candidate meets the minimum eligibility requirement. It is often conducted by a computerized system or by an HR representative, through a telephonic conversation. The agenda is to go through a standardized list of checks to determine if there is anything which might disqualify the candidate from the further processes of the position.

33.2.2 Telephonic Interview

This is a cost-effective way of screening candidates with a view to narrow down the number of final applicants for the one-to-one interviews, which are resource-heavy. These can be comparatively challenging as one cannot rely on non-verbal communication to make a mark. So, you need to lay emphasis on your voice clarity and tonal expression in order to convey yourself in the best possible way. You are expected to prepare for this interview like any other interview and in case when you are called and you are not prepared, then you can always politely request for a rescheduling to a mutually convenient time. This will give you space to refresh yourself mentally and be better prepared.

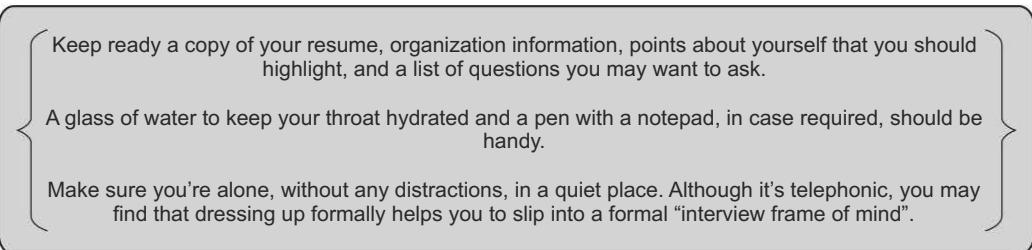


Figure 1

33.2.3 Video Conferencing

Video conferencing is typically used to conduct interviews by the help of video technology, e.g., Skype. This is typically used when the interviewer is in a separate city and helps in saving costs. All these interview strategies that you'd adopt if you were meeting in-person should be applied here too and can make or break your interview – body language, dressing and, of course, the verbal communication.

33.2.4 One-on-One Interview

The most common and also the most related-to-interview format is the one-on-one (also called face-to-face). It is customarily conducted by the hiring manager – the one to whom will the applicant be reporting to, if hired—and is usually the last step in case of a multistage process. Since the interviewer is not an HR person, he/she may or may not be as competent and so the interview becomes more subjective than usual – depending on the interviewer's personality and experience, the interview may follow a clear agenda, or it relies on the candidate to lead with his or her responses to open-ended questions.

33.2.5 Panel Interview

This type of interview is taken by a panel of two or more interviewers and is preferred in order to minimize the factor of individual bias. This format is quite common for graduate, professional colleges and lateral job interviews. One or all interviewers may question the candidate.

33.2.6 Group Interview

A group Interview is conducted to know the leadership style and group behavior of the candidates. It can be conducted in either of the two ways – questions aimed at each candidate separately and sequentially or the same question thrown to all the candidates simultaneously, where anyone can answer the question. The

candidates may also be asked to indulge in group task and solve a problem together. This, again, is done to evaluate skills like team work, presence of mind etc.

33.2.7 General Group Interview/Information Session

This one is more like an open-house session which is planned to save time and makes sure that the applicants have got a good hold on the basics of the job and organization. Large doses of information are disseminated simultaneously, encouraging curious, well-intended questions to be usually followed by the personal interviews.

33.2.8 Sequential/Serial Interview

A serial interview, as the name implies, involves two or more interviewers, separately or in a sequence. Either the candidates remain seated and the interviewers switch places one after the other or the candidates move from one room to another. At the end, the interviewers gather to consolidate their evaluations and reach a unanimous decision on the hiring. The challenge of this format is the occurrence of the ‘first impression’ situation more than once. You need to be much more alert and keep your energy running in order to leave a lasting impact on each interviewer. Always remember to maintain consistency in your responses and demeanor; else it could lead to a question on your credibility.

33.3 Interview Attire

Your appearance speaks for you when you are not speaking and could play a crucial role in sealing the deal, i.e., not to imply that you may get hired simply because you are well dressed, but vice versa does hold true – a wrong outfit has ruined the chances of many job seekers. Your selection of clothes should reflect the kind and level of the job you aspire for. Candidates will do well if they research the employer’s standards and norms on dressing and use those inputs to present themselves in a way that they are representing the employer already.

33.3.1 Neatness Counts

Be sure to check for these little things which a rushed mind tends to miss until the last moment – store or dry cleaning tags, missing buttons, tiny rips in your clothing, dirty or uncut nails, unpolished shoes or worn heels, sagging socks, fly away hair—regardless of gender. Make sure that your clothes are neatly ironed and apply a lint brush, if necessary. People tend to associate the neatness of your appearance with the neatness of your manner of work. The corporate world deems **conservative clothing** in sober colours as its unofficial uniform. Avoid wearing or showing anything that might be regarded unprofessional, such as an unconventional body piercing, a tattoo or exotic jewellery. Dress comfortably, but appropriately. Once you’ve got these mentioned things in order, relax and concentrate on the interview.

33.3.2 Men

- i. Men should wear a well-tailored **suit** in traditional colours such as navy blue, charcoal gray or black, in solid or subtle stripe patterns (e.g. pinstripe).
- ii. Regular *formal shirts* should be worn, preferably in solids (no stripes or checks, except fine pinstripes). The shirt needs to be long-sleeved and button-down in sober/conservative colours. Also, light shirt with

dark pants or dark shirt with light pants is the code. Prefer dark trousers as light trousers visibly crease faster and may lend a shabby look by the time you appear for the interview.

- iii. A watch and/or one ring – not a flashy or big-stoned one – are acceptable. Apart from this, no jewellery, unless worn for religious or personal reasons, is acceptable.
The material of the clothes you wear should be translucent or even semi-transparent. A vest under the shirt can never go wrong; it absorbs the sweat and keeps the shirt looking fresh for longer; especially during summer and humid months. Do not wear strong cologne or a lot of it.
- iv. The tie should preferably be solid or with pinstripe or a very petite print; just bear in mind that it should be conservative. A solid colour shirt can have a printed or striped tie; and a pinstriped shirt should have a solid tie.
- v. **Shoes** need to be formal, polished (leather) and in good condition. No sneakers, canvas shoes, etc. **Socks** need to be a dark solid or with a small pattern. As a rule, men match the colour of their belts to their shoes and color of their socks to their trousers. With black or navy blue trousers, a black belt, black shoes and black or navy blue socks look best.
- vi. Men should have their beard or other facial hair clean shaven or neatly trimmed; like French beard, is acceptable. A full beard or stubble is unacceptable. Also, some industries and/or organizations may frown upon any kind of facial hair and long hair.



Men look sharp when they get a haircut 2–3 days before.

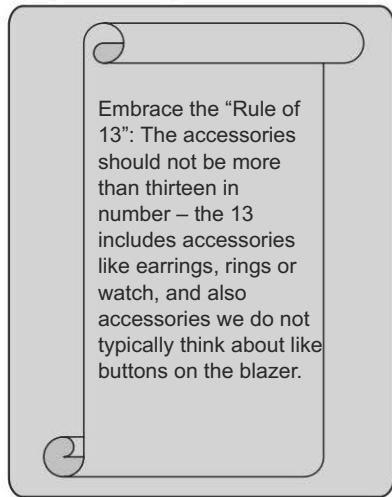
33.3.3 Women

- i. Western formal wear like shirt or blouse with formal trousers is the most acceptable way of dressing up for an interview. A skirt should be knee-length or longer; not shorter. Neutral shades like charcoal grey, navy blue, black, etc., should be chosen. Indian formals (like salwar kameez, sarees, etc.) appear fine but should be in sober colours with minimal work upon it.
Avoid a low neckline and keep it conservative is the golden rule. Avoid sleeveless or excessively frilly top.
- ii. Shoes should be dark in colour (like black, brown, navy, etc.), closed-toe, with a low, medium or flat heel.
Your hair should be clean and well groomed. It is preferable to tie your hair for an interview. Keep your hair away from your eyes so you may focus on the ‘eye contact’ during the interview. You should wear natural looking makeup that will flatter and compliment and not overpower your outfit or distract your interviewer.
- iii. Nails should be clean and manicured. Women do not have to wear nail polish; however, if polish is worn, make sure that it is a natural, conservative colour and is not chipping off.

33.3.4 Accessories

Do not wear strong perfume, or a lot of it.

Wear only a conservative amount and minimalist type of jewellery. A pair of studs is your best bet.



Embrace the “Rule of 13”: The accessories should not be more than thirteen in number – the 13 includes accessories like earrings, rings or watch, and also accessories we do not typically think about like buttons on the blazer.

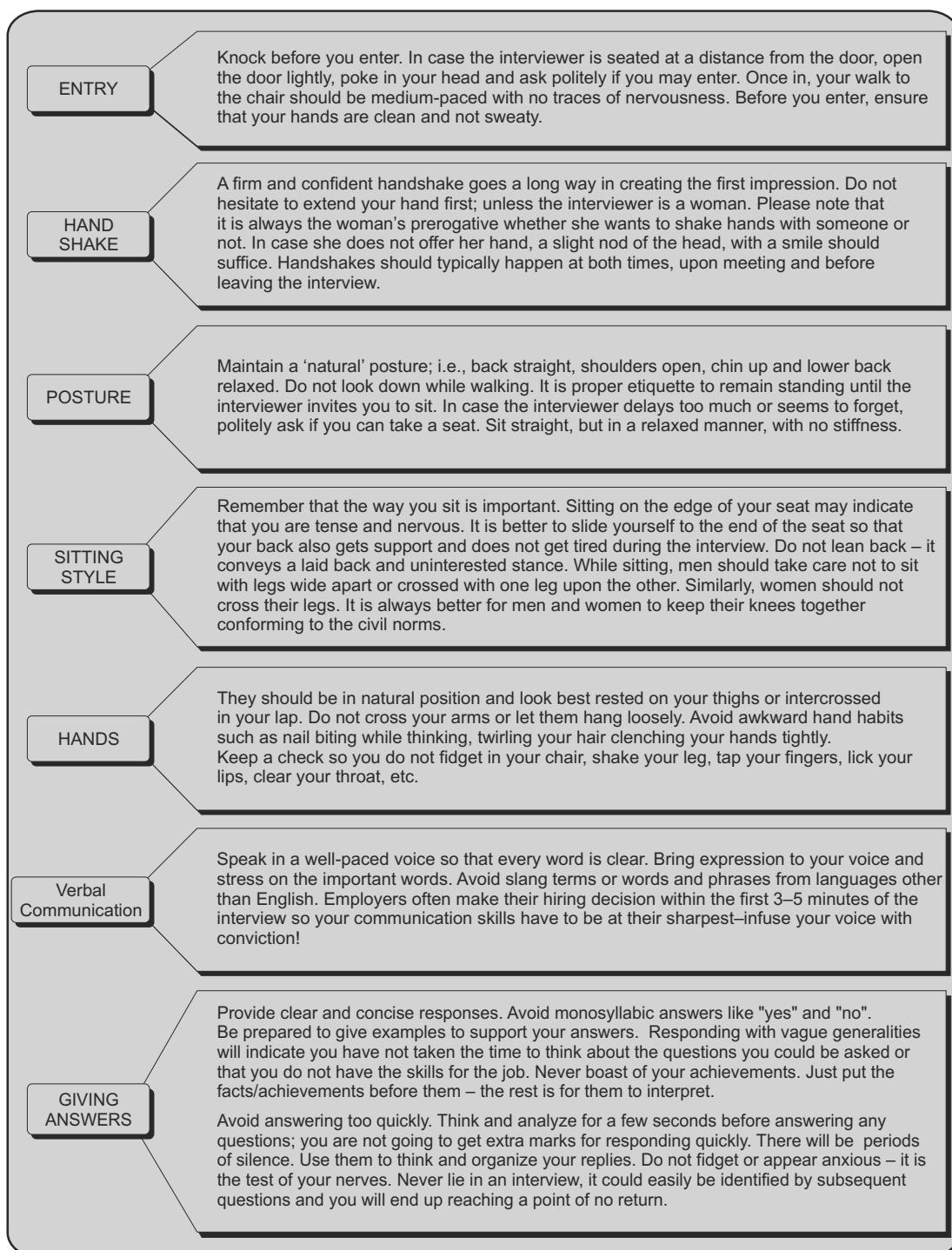


Figure 2

Handbags should be well-kept, moderate in size and neat in appearance. When you sit, keep your handbag next to your chair or on the floor or sling it from the handle towards the floor. Avoid keeping it behind you or on your lap and certainly not on the table.

33.4 Body Language

An appropriate body language is one of the essential elements required to crack any interview. Figure 4 presents the key elements to be kept in mind with respect to the body language.

33.5 Managing Successful Interviews

If there is one thing which is as important as the interview is the preparation for it. The key to successful interviewing is to know three things – you, the position/role and the organization. Let us have a look at how to go about this crucial preparation.

33.5.1 Research in-depth

It is essential to *research the position* using written description, talking to people working in the field, utilizing *LinkedIn* by searching for people with similar profiles and going through their skill sets and expertise areas, talking to experts in the area, checking business journals, papers, etc. Scourge the job opening adverts and description to look for tip-offs on what the organization is looking for and if and how can you live up to those needs.

Thoroughly *research the organization* with the same endeavour. Such awareness during the interview exhibits an earnest and mature interest in the opportunity. Most frequently asked question is “What do you know about our organization?” Silence or lack of response here would indicate a sign of lethargy and/or indifference. Do your homework and you will be able to ask better questions and also focus on your strong points better. Questions to keep in mind while researching include the following:

- ✓ What are the organization's products and/or services? What industries/populations does the organization serve?
- ✓ How large is the organization? Is it a part of a larger organization? What are some of its acquisitions?
- ✓ Where is its headquarters? What are the other divisions and where are they located?
- ✓ What is the outlook for this organization or this industry in general?
- ✓ What is the salary range for this type of position?
- ✓ Who are its competitors? A brief comparative analysis is a good thing to do.
- ✓ Work culture of the organization?
- ✓ Has it been in the media lately? If yes, why?
- ✓ A broad organization structure – name of the CEO or MD.

33.5.2 Know Yourself Well

Most candidates are clear on what benefits the organization can bring to her/him, but the reverse is not as true! Understand and demonstrate the value of what you can bring to the table. Even though this might just be your first ‘real job’ and you would like to treat it more like a learning opportunity than anything else, no company

will allow you to treat it like an educational institution. You will have to exhibit your skills, the value you have gathered from your previous involvements in prior assignments, education, co-curricular, volunteer, etc.

- To begin with, assess your skills, interests and values.
- What skills has your previous experience added to you?
- What kind of work engages you?
- What have you learned in the classroom which can be applied in a work situation?
- Where have you been successful in all the activities you undertook?
- What kind of people do you prefer working with?
- What type of work environment do you enjoy?
- What concerns or issues matter most to you at work?
- Are there any evident divergences between what you like to do, what you do well, your previous experience, what matters to you, and the expectations you have?

Apply these thought points to the career field you plan to foray into. Deal with these before the interview, not after it.

33.5.3 What to Carry for the Interview

Part of being prepared for an interview is taking the complete, correct documents and other ‘props’ with you. Items which you should consider include the following:

- ✓ A professional-style leather folder. This will give you some space to put your necessary documents (resume, certificates, reference sheet, any completed application materials, etc.), business cards and other things required to be brought by you or which the organization provides on the interview day.
- ✓ A nice notepad coupled with a good pen, inside the folder. The notepad inside will allow you to write down questions before the interview to ask the interviewer, write down answers to questions you ask and jot down the observations made during the day and pointers to information you have collected about the organization.
- ✓ If required and possible, carry your portfolio of practical/creative work that demonstrates your sustained and developing interest and motivation for the concerned field of study/work or performance pieces (audio, video, live performance).
- ✓ You might also consider a small purse/pouch for bare essentials, some mints and loose change for the parking garage or public transport, as the case may be.

Avoid carrying a backpack or a bulky tote as this does not lend to a professional, organized impression which you need. Minute details like these make an impressive difference.

33.5.4 Arrival

In the case of off-campus recruitment, it is required to find out about the venue beforehand, directions to get to the place and the estimated time to reach.

Try and arrive at least 15 minutes prior to the interview, so that you can relax and feel comfortable with the surroundings.

From the moment you drive into the parking lot or enter the reception or interview area, remember that you are being observed and your impression making is underway.

Treat every individual you encounter with respect and professionalism—you never know who will be in the interview room with you or who will be consulted regarding hiring decisions.

Freshen up in the washroom to ensure that you look your best. Relax as you wait and try to visualize a successful interview, while breathing rhythmically to keep your nerves calm. Go over the notes you have made and collect your thoughts in an organized manner.

33.5.5 First Impression

First impressions do matter. It includes everything, right from your attire to how you walk up to the interview table and of course, the first couple of minutes of the interview. Also, refer to the sections 2.3 and 2.4 describing appropriate attire and body language, respectively, to manage your first impression.

Adjust any online profile like *Facebook®*, *Twitter®*, *LinkedIn®*, blogs, etc. It should sport a professional look or simply be restricted from public access. In case an individual holds a *LinkedIn* profile then s/he must update it. A lot of students/trainees maintain a profile from time of college and use the platform to voice opinions in related groups. *LinkedIn* is an excellent platform to gain company knowledge and be up-to-date with what is happening in the industry.

33.5.6 Be Thorough with Your Resume

Your work on the resume does not end after you have finished working on it. You should know your resume inside and out and be prepared to talk in depth about your experiences and provide concrete examples of your skills to substantiate the claims you've made in the document. Do not forget many questions asked in the interview refer to or arise from the information in your resume. It also acts as a support for cross-verifying your answers during the interview.

33.5.7 Rapport Building

The way we behave: The people with warm, confident, enthusiastic and committed attitude often make a positive impact on the other person in front or the interviewer.

Utilize the interview to interact: Ideally, this refers to a strategic conversation. Visualize it as an exciting opportunity to learn more and sharpen conversational skills. Be responsive and make the conversation dynamic, initiate dialogue within your zone of comfort (areas in which you have command).

The way by which a skilled interviewer gets the candidates to start talking, you too can elicit information on the organization's requirements and philosophy and then tailor your responses accordingly. Be alert, listen and watch attentively in order to use to your advantage the information that he/she voluntarily shares. Ensure that you keep reinforcing your interest in the organization and enthusiasm for the work profile being offered. Do not make it repetitive, clichéd, or too blatant – subtlety is the key!

33.5.8 Prepare Good Questions to Ask the Interviewer

Like most of the interviewers, while nearing the end of the interview, do not sit mute or say no and let this chance pass at the time you are being invited to ask questions. Asking the right, pertinent questions displays a preparedness and keenness which is appreciated in any interview.

Apart from the list of questions you keep in your head to ask during or at the end of the interview, if you stay alert during the conversation, some more questions can sprout in your head from whatever information the

interviewer is sharing. Such impromptu questions add more credibility and also reflect your attentive listening and quick presence of mind. The following will help you generate ideas to prepare your own list of questions:

■ Questions about the job

- ✓ What projects and assignments will I be involved in during my initial weeks?
- ✓ What are the main factors which determine the quality of my work's output?
- ✓ What are the challenges I can expect during my work?
- ✓ Whom will I be most closely working with?
- ✓ Who will be my team members?
- ✓ Could you give me a brief outline of a normal day routine for a person in this position?

■ Questions about career growth and performance

- ✓ What would my growth plan look like?
- ✓ What sets apart your organization's employees from the others?
- ✓ May I know the performance evaluation process in detail?
- ✓ What kind of training programs will I be engaged in? How frequently?
- ✓ Could I have a few illustrations of the career paths of the previous incumbents?

■ Questions about the hiring process

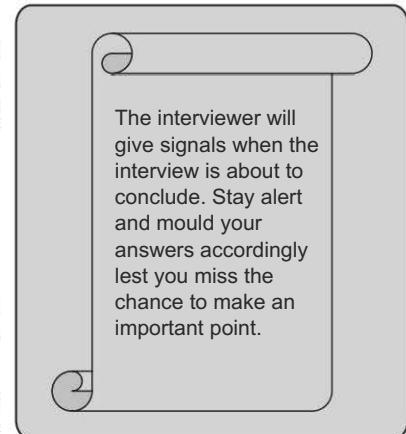
- ✓ When can I expect to hear back from you?
- ✓ How soon can I join work?
- ✓ What will be the next stage in the recruitment process?
- ✓ How would your company define an ideal candidate for this position?

■ Some areas of questioning to avoid in the first interview, include the following

- ✓ Do not end up asking a question whose answer is clearly available in the written material or the website provided by the employer. It shows poorly on your part.
- ✓ Direct questions related to compensation and/or benefits.
- ✓ Very complex or technical questions. More often, the interviewer is from the Human Resources (HR) department and is not equipped to handle queries from this domain. So ignore these questions to avoid embarrassing them or creating an awkward moment, or worse, leading them to think of you in a not so positive light.

33.5.9 Leaving the Interview Room

Once the interview concludes, start with expressing your thanks to the interviewer/s for their time, consideration, etc. Do not let your energy drop and prevent you from listening closely to the closing lines as it discloses the planned follow-up or simply the next stage in the hiring process. In case that is not revealed, feel free to ask. Before leaving the



The interviewer will give signals when the interview is about to conclude. Stay alert and mould your answers accordingly lest you miss the chance to make an important point.

room, reaffirm your interest and keenness in the organization/profile and exit unhurriedly and with grace; collect your belongings, if any, maintain a confident gait and gently close the door after you leave.

Hope for the best, be prepared for the worst.

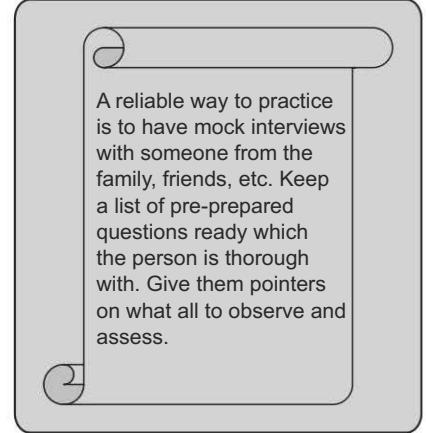
33.6 Feedback

Rejection is a popular word, but not an appropriate one with respect to the recruitment domain.

Nevertheless, be ready for it. The feeling of rejection or non-selection and its fear keeps bothering us. Another reaction to rejection is anger. This can be momentary or long lasting; but only ends up hurting us. Let not rejection or the feeling of being rejected get to you. Always consider it as a lesson which will serve you better next time. Rejection teaches us more than an easy success. Remember, “Even when you fall flat on your face, you are still ahead of where you were.”

There are a number of reasons why applicants are rejected by an employer; some of which have no relationship to your skills or talent. Following are some of them:

- Inability to express self clearly and/or poor communication skills (voice, articulation, diction, grammar, mannerism, gesticulation)
- Uncertainty about future goals and/or career plans or unrealistic goals
- Poor personal appearance
- Lack of enthusiasm or interest in the job or organization (failure to ask questions)
- Excessive interest in salary, benefits and vacation
- Lack of courtesy, maturity or tact
- Lack of knowledge about the organization
- Lack of confidence or over-confidence
- Evasiveness
- Supercilious attitude
- Stern and inflexible attitude/behaviour
- Lack of eye contact
- Ineffective greeting
- Arriving late
- Being rude, abrupt and overbearing
- Neglecting to acknowledge and thank the interviewer for their time
- Indecisiveness
- Being unprepared
- Too aggressive
- Too many excuses
- Reluctance to relocate, if the job demands
- Poor references



A reliable way to practice is to have mock interviews with someone from the family, friends, etc. Keep a list of pre-prepared questions ready which the person is thorough with. Give them pointers on what all to observe and assess.

33.7 Types of Interview Questions

The very word *interview* tends to trigger off a stressful response in majority of people. The good news is, we need not do that. If we know ourselves well and keep our cool, an interview is no different than a conversation with a prefixed purpose. An interviewer generally employs a wide variety of questions in order to examine a candidate from various aspects and then determine her/his suitability for the position. The use of behavioural and/or situational questions and tests is becoming increasingly common – a more holistic approach is underway. Hence, in order to be completely prepared, we must acquaint ourselves with the plethora of questions and practice answering the same beforehand. Preparation builds confidence and confidence promises a better performance. Let us not forget that interviewers are also human beings and once in a while you may encounter one who says/does something which may raise your blood pressure. In such situations, instead of immediately responding as our urge may be, it is wise to pause, take a breath, and think calmly before you answer.

33.7.1 Probable/Traditional Questions

One of the most commonly utilized techniques to handle the traditional interview questions is the PAWS method. PAWS stands for *Profile, Academic, Work, and Skills*. You may include all or as many of these four, irrespective of order, to maximize your suitable responses for the position. Also bear in mind that for any response, limit your answer to no more than ninety seconds.

Following are some examples on what each of the four entails:



Figure 3

- **Profile:** This involves developing points on how you became interested in the position, what is it about the work which excites you, what value you can bring, the talent and skills you possess through any previous experiences – volunteer work, co-curricular, hobbies, memberships, projects, etc. What makes you, YOU.
- **Academic:** Mention your educational background (degrees/diplomas/certifications) and any other training and professional development activities/courses that you undertook, which are related to the opening, directly or indirectly.
- **Work:** Highlight all the paid or unpaid experience related to the job. In cases where it is not directly related, it is your onus to highlight how the skills which you picked up from it can help you perform better on the position you've applied for.
- **Skills:** Apart from the indisputably relevant skills that you do have for the profile, be clear on the pertinent, transferable skills so that you can express it appropriately.

33.7.2 Frequently Asked Questions During Interviews

Q. Tell me something about yourself.

The traps behind this question are lack of preparation and the tendency of candidates to launch into a long description. Always keep it simple and crisp. Because we are non-native speakers of English, so the more we talk the more mistakes we may make. Nervousness makes people talk more than normal and the interviewer knows this too. Keep calm and be crisp.

Alternative, related questions:

- If your references were asked about you, what do you think they would say about you?
- What kind of a person are you to work with?

The meaning behind the question:

Whether through the disguise of others or directly through your own internal lens, the intent is to see how you perceive and regard yourself – both as how you think others see you and how you see yourself.

It is the classic opener and gives the interviewer time to size you up and to make you feel comfortable at the same time. While answering this, you can refer to the following:

- ✓ Family background
- ✓ Places you grew up in
- ✓ Schooling and further educational background.
- ✓ Skills
- ✓ Specialization (take the opportunity to link up your specialization background with the job in view)
- ✓ Strengths relevant to the job
- ✓ Any significant projects/assignments/extracurricular activities where you excelled and the responsibilities involved
- ✓ One or two major achievements
- ✓ Hobbies/interests
- ✓ If you have had any internship in any organization. An internship is usually the first job exposure of any candidate; hence interviewers are often keen to learn how you performed. Mention the nature of work or project you did and what are your achievements. You should mention how the experience gained could be of great help to you in performing the tasks of the job for which you are being interviewed.
- ✓ Keep a few well-chosen qualities and adjectives up your sleeve to respond to this; e.g., dedicated, independent, ambitious, loyal, motivated, determined, understanding, dynamic, credible, diligent, courteous, steadfast, adaptable, able, self-assured, courteous, steadfast, etc.

Your reply should not exceed a time limit of 2 minutes in all. Remember, whatever information you volunteer, ensure that you can take care of further questioning in those areas. Many a time, the remaining set of questions will stem from this one answer you give.

Q. What are your greatest strengths?

It is important to sound confidently natural without bragging. Stay humble and adopt a clinical stance while expressing these.

It is important to focus on those attributes which will qualify you for the job. Create an honest list of what you think are your strengths or weaknesses and then select those which you can back up with examples from academic/personal life. You do not want your credibility to take a nose dive if you cannot justify the strength you state for the interviewer, it is just a claim, you will have to make it believable. Here is an exercise worth doing before any interview. Make a list of your skills, dividing them into three categories:

- **Knowledge-based Skills:** Amassed through education and other experiences (e.g., languages, courses, degrees, training, computer skills and technical ability).
- **Transferable Skills:** The moveable skills that you developed from your experiences and can be applied to effective use as it is or in a modified manner (e.g., people skills, communication skills, analytical problem solving, time management skills).

- **Personal Traits:** The qualities which are unique to you and set you apart as a person (e.g., flexible, dependable, friendly, innovative, expressive, punctual, a team player, etc.)

Once you're done compiling this list, pick out three to five from each category to match the requirements of the job and possible expectations of the recruiter.

Example 1: "My strength is the ability to consider the bigger picture and consequently break it down into smaller, more manageable tasks. I assess the goal I have to achieve, say before this quarter ends, and then work out what I need to do and/or complete on a daily, weekly and monthly basis. This not only makes me efficient at my work, but also rewards me with a regular sense of achievement."

Furnishing such examples allows the interviewer, in yet another way, to visualize you in the role.

"One of the greatest skills that I've picked up during my education is sound analytical skills. Coupled with an integrated sense of planning, it allows me to manage my work systematically and at the same time be dynamic enough to deal with unexpected and unplanned situations. I try not to let my organizational skills clash with my flexibility."

Q. What are your weaknesses?

If you are completely honest on this one, you may be digging your job interview's grave.

Do not say that you do not have one; then it is a given thing that you're blatantly lying. Do not try to convince them that you do not have one; it will reek of arrogance and/or ignorance. In case they are led to believe that you are dishonest and lack integrity, probably no worse thing can happen to your chances of converting the interview into disaster.

Do not proclaim things like, "I sometimes feel that I'm too committed to my work and end up compromising on my time with family." Or something like, "I think my work excellence tends to attract a lot of envy from those around me. Please, let us just keep our feet on the ground and our head out of the clouds."

When you are asked such a question there are several ways you can answer it as given in the following:

- i. **Non-essential skills:** Scrutinize the key strengths and skills essential for the position you have applied for. Next, run through an honest list of your weaknesses and choose one which is not essential for performing that job well. And select minor weaknesses.
- ii. **Skills you have improved:** Another safe option is to find a weakness which you still have but have considerably improved upon, consciously. Refer to your initial level of functioning and then elaborate on the steps you have taken to ameliorate the same. Finally wrap it up with stating your current, improved level.

Be sure not to mention anything that you improved upon that is related to the job for which you are being interviewed. You do not want your qualifications for the job to be questioned.

The meaning behind the questions:

These are more popular questions in interviews, because they want to stress you out and the interviewers are interested in hearing four possible things which are given as following:

- **Facing challenges:** How you respond to stress and deal with pressure and how much you are able to keep your composure. Also, how you deal with the less-pleasant aspects of you as a person.

- Honesty: No one is perfect. But not all of us are comfortable acknowledging our imperfections, let alone dealing with them. How transparent are you in your self-assessment and how comfortably do you convey it to others.
- Self-improvement: How proactively you recognize and deal with your weaknesses and the extent to which you're ready to improve upon them.
- Risk factor: Sometimes, your weak point may be such which may hinder your performance at work or not render you a very good fit within the organization.

Example 2: "I have had trouble with procrastinating; but now I have learned to write down a list of things that I need to do and keep a calendar to keep track of deadlines. This not only helps me to finish things on time, but has also helped me to be more organized."

"I used to get nervous when speaking in front of group of people. I have overcome this anxiety with lots of practice/rehearsals/hard work and I'm much more confident today."

Q. Why should we hire you?

This is another common interview question which can take you down the wrong road, unless you've done some thinking ahead of time. This question is purely for the final chance to go all out in selling your talent for the job. Think of yourself as the product. Why should the customer buy? How are you going to create value?

The Wrong Track:

- George answers by saying, "Because I need and want a job." That's nice, but the bottom line here is, "What can you do for us?"
- Meera says, "I'm a hard worker and really want to work for this company." The majority of people think of themselves as hard workers, what's special about you? And why this company?

The Right Track:

- ✓ Vinay's answer to this question is, "Because I'm a good fit for the position." Getting warmer, but more details, please. Talk about your skills related to the position.
- ✓ Sharon answers, "I have what it takes to solve problems and do the job." – Very well. Expand on this, and you've got it!

Develop a Sales Statement

The more meticulous yet succinct an answer you provide, the better it is. It is a chance to summarize your high points, your real value and then relate it to the organizational needs.

You can start by talking about your strengths and proceed to explain the requirements of the job and the company. Finally, round up by convincingly matching them to show the interviewer that you are the best for them.

The bottom line of this question is,
"What can you do for this
company?"

Product Inventory Exercise

The starting point is the job posting or the job description, if available with you. What kind of needs is the employer implying upon for a suitable candidate for that job? What will make your case stronger as a contender for that opening? Make a list of those requirements.

Next, pitch yourself against those requirements and see your suitability for the same. The first check has to be the top two to three requirements of that job. Nevertheless, do not fall into the trap of undermining your unique personal traits; a recruiter hires a human, not a machine.

The Sales Pitch: You are the Solution

For this you need to amalgamate the requirements of the position and what offering do you have to match those, into a summary statement which becomes your sales pitch. Like any such pitch, it has to be crisp yet complete. Stress on your strong and/or unique points, and sign it off with your *USP* (*Unique Selling Point*).

Q. Would you call yourself a team player?

The obvious answer to this question is a doubtless, yes. But you have to support your statement with evidence. Examples from day-to-day college activities, sports/co-curricular activities or any projects you've worked on are ideal to answer such questions. This question can reveal your ability in following ways:

- To recognize and understand the viewpoints of others
- To appreciate the contribution you are expected to make, etc.
- To communicate effectively with others

Alternative, related questions:

- What do you prefer more – working on your own or with a group of people?
- Describe in your own words what you think teamwork is?
- Can you tell us about a time when you were a part of the team?
- What do you think are the ingredients for a perfect team?
- Another way is by presenting a situation, with different factors involved and asking you how you would choose to deal with it and justify your reasoning for your actions. It tests your presence of mind, analytical skills and at what level your perspective operates.

Example 3: Try to think of some incidents when you kept your cool and resolved a crisis that your team encountered. Suppose students in your college had once become dissatisfied with a difficult project given and had started clamouring for an easier project. At that juncture you had taken the initiative and convinced them about how knowledge of such a project would increase their confidence and prompt them to crack harder problems in future. Giving more details on how you carried your team through this journey and got their full commitment can be very revealing.

"I certainly enjoy working with others; I'm outgoing, enjoy the feeling of team spirit and understand the needs of others. I'm good at helping the team to see the bigger picture – helping them to focus on what really matters rather than getting bogged down in irrelevant details."

"I believe I have strong communication skills and while I do not yet have experience in a leadership role, I do have a talent for coordinating between different team members and resolving any disputes which may arise."

Q. What are your hobbies/interests?

First of all understand that a hobby is usually an activity in which you take a deep and abiding interest.

It is something that you are really passionate about doing. Try to include those hobbies that require some skill, creativity and discipline.

Hobbies are not something that everybody is expected to indulge in and does on a daily basis – like chatting, sleeping, roaming around, spending time on social networking sites, etc.

Example 4: If you mention reading as your hobby, do not freeze when asked about the last book you have read. Prepare in advance the names of the books you will mention, know the author's name, the theme and what the book is about.

If you are interested in sports in general or in any particular sport, be ready to tackle questions related to the various sports the nation participates in, the tournaments held, important sports figures (national/international) country's records and achievements, personal participation, etc.

Hobbies could cover gardening, movies, photography, music, travelling, painting, poetry, singing, dancing, cooking, fishing, theatre, etc. Be ready for in-depth questions related to these and in case you have not indulged yourself much in that hobby yet, refrain from mentioning it.

Q. Where do you see yourself 5 years from now?

The interviewer uses this question to know your long-term professional plans and whether hiring you will suit them or not, to figure out whether you plan ahead and set goals, and if those are in sync with the company's goals.

To prepare this answer, draw a well-researched career path which would naturally flow from your current position into the coming 3–5 years at least. Think about factors like what is the average tenure of a person in this role, what positions and responsibilities lie at the next levels, etc. Some companies map out these career pathways on their website, too. Additionally, you can seek inputs from friends and family, professionals you know in that field, alumni, *LinkedIn* profiles, etc.

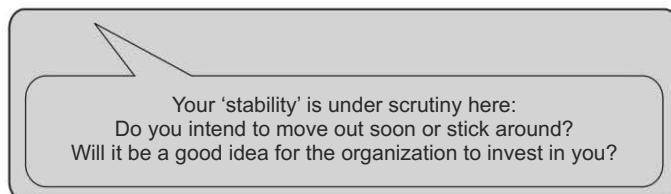
Example 5: It is often advantageous to emphasize your keenness in thoroughly mastering the initial position before moving on. The interviewer will probably want someone who will be happy and competent in that role for at least a year or two. Also, how working with this particular company will fit into your professional development.

If you're jittery or feel that you do not have material for a relevant answer, adopt a quasi-pat answer like "I would want to see myself progressing towards my career goal, pick up new skills and take on bigger responsibilities." **Or something like**, "I will leverage the available opportunities and contribute amply."

Then there is always the best policy called honesty. Being a fresher, you can always state, "I've no particular plans in mind except that I am clear that I want to put in a sincere, consistent effort and learn to the maximum. At the same time, I am open to internal opportunities and switch roles, if required, to advance myself. With my vigour and dynamism, I am confident of learning quickly and adapting comfortably to be able to contribute to the organisation's goals."

Q. How do you handle stress/pressure?

A typical response to this sounds like, "I handle stress fairly well. I am the kind of person who mitigates it; rather than folding under it. I flourish when challenged and I am comfortable working in a goal-based environment with ambitious deadlines."



But if your answer is left at that, you will sound canned and lack credibility. You need to elaborate and substantiate it with a real life example. Try to incorporate the points given as following:

- Pressure and stress are inherent to today's lifestyle
- You are aware of the effect these have on you
- How you handle that effect

Avoid conveying the idea that the cause of the stress was related to you, directly or indirectly. Pick out a reason which was external and beyond your control or purview.

Example 6: "With so many demands in our limited time, stress is sure to follow. But for most people this can be overcome by doing two specific things – which I follow too. First, I create a prioritized to-do list where I track every task along with progress notes detailing what has been completed for each task and what remains. This makes me more organized. Second, if time required to complete the tasks is too less, I talk to the concerned person immediately. Review the things to be achieved and set mutually realistic expectations."

"Under stress, I do pretty well. The appropriate way to deal with stress is to plan and allocate one's time in a focused manner and that's what I do. I respond to situations, rather than to stress." Follow up with an example.

Q. What techniques do you use to get things done?

The intent behind this question is to assess your working style, i.e., how do you plan and organize your work, handle contingencies, etc.

Do not feel weighed down with the expectation of revealing high-sounding fundas or present some complex management technique. Give a simple, brief outline of how you manage your work and your approach toward various types of tasks.

Example 7: "Meticulous planning is crucial for my completion of any task. I break the process into three basic stages: planning, organizing and action. Compiling a simple *To-Do list* makes things simpler and smoother for me. Apart from the master list, I break it down into smaller, task-specific lists. Depending on the nature of the work, I regularly review the lists to track my progress. Another simple method I employ is the prioritization into what is or not important and/or urgent. Combining these two makes sure I stay on top of things and prevent any major disasters."

Q. Why do you want to work for this organization?

Let us make things easier by reading this more like "What do you know about the company?" Now does a good answer seem feasible, isn't it? It is a way of ascertaining if, and how much, of groundwork you've done before coming for an interview. While the intent is to highlight the positive points, it should not come across as flagrant flattery. Express points which you can ably back up with supplementary information and relate to your own interests, as well. You can also mention how you came across the information and through what source.

 Strictly avoid saying anything negative or bringing up any bad press, etc., that the organization may have had.

Q. Can you outline your ideal employer to me?

By understanding your perception of a perfect employer, the interviewer can do a fair expectation matching and appraise how close their organization comes to it and so how much likely are you to fit in smoothly with the set up. It is a clever trap most candidates easily walk into; unless you are agile.. In case of over expectation, the natural rebound question is going to be about how if the company does not fit into your definition of the ideal employer, then why should they even hire you in the first place?

Example 8: “An ideal employer for me would be a growing company with established credentials in its sector, and offers a rich scope for advancing my skills and position within the hierarchy.”

Q. Would it be a problem if we asked you to work overtime/evenings/weekends?

It is an entirely personal call on how you feel about long hours at work; above and beyond the stipulated, official timings. The factors to be evaluated will be entirely subjective and no two cases are completely comparable. But as a general scenario, and unfortunately, indicating your disinclination or incapability for the same may well go against you. At the same time, you should not let yourself be made to agree on unreasonable working conditions which you won’t be able to keep up with, unless you are sure of living up to such promises.

Whatever your stance, try to communicate your opinion in as reasonable and positive a manner as possible. Even if you aren’t keen on overtime, you might be prepared to offer a compromise as in the example given ahead.



Alternative, related questions:

- Would you mind working over the weekend once in a while if the need arises?
- Do you prefer a regular set of working hours?
- As you can see, this role demands some extra work. How do you feel about it?

The meaning behind the question:

Typically, this question is asked mostly when working long hours are not actually a norm for the job. They intend to assess your flexibility and how much are you willing to accommodate for out-of-turn situations and also your level of commitment to the work you undertake.

Example 9: “I like to think of myself as reasonably flexible and if the call of the hour for the business’ success is for extended hours, including weekends, then, keeping my other commitments in mind, I will certainly not be unwilling to do so. Also, I’d hope that a scenario such as you mentioned, is more an exception than a rule. I’m sure you’d agree that everyone has a life beyond work and a balance between the both has to be struck. And though, my work and profession, both are essential to me, I would like to keep my work life within the normal limits.”

Q. Within how much time do you anticipate it will be before you start making a contribution to the organization?

Be pragmatic. Start off by expressing your intent of putting in your hundred percent from day one. Go on to talk about anywhere between at least four to six months before you can be expected to start making a meaningful contribution.

Q. I can hire someone from within the company. Give us a reason to hire an external such as you?

This is yet another chance of highlighting your fit for that position. Mostly the recruiter will not actually have someone internally, but is directing this question merely to hear you on what your value proposition is for that job. Focus the spotlight on your unique selling points as well as bring out the relative pros of external hires over internal ones, like fresh perspectives, new systems, etc.

Q. What are your salary expectations?

To be able to answer this question, research needs to be done beforehand. You will need to garner the figures for the average salaries for the same position in other organizations – an industry benchmark, so to say. Based on these figures, quote a range, not an exact package, which you would expect from the employer. Do not make the mistake of quoting too low – you might come across as desperate or someone with a low self-worth. Also, do not make the mistake of quoting too high and ruin your chances.

33.7.3 Miscellaneous Questions

- What motivates you?
- Can you tell me about the time when you have failed to achieve a goal?
- What do you think you will be looking for in this job?
- Why do you feel you will be successful in this profile?
- What other types of work are you looking for apart from this role?
- Why did you apply to our organization/for this job?
- What do you think are benefits/downsides of joining our company?
- What is the singlemost important factor you seek in an employer?
- What qualities do you think a person needs to work effectively in our company/department?
- What were your favourite subjects? The ones you enjoyed the least? Why?
- What did you learn or gain from your part-time/summer/co-op/internship experiences?
- What are your plans for further studies?
- Do you have any questions for us?

33.7.4 Problem-Solving Questions

These questions are designed to gain a better insight of how you handle precarious work situations. While answering such questions, keep in mind to establish your capacity to process information quickly, have a logical thought process, and come up with creative, out of the box solutions as the need be.

The following five-step course of action is suitable for handling a majority of problem-solving questions:

- Pay attention and be very clear on what exactly is the final output being asked for.
- Ask clarifying questions from the interviewer to better your understanding of the situation.
- Start by explaining first how you'd ensure a reliable data gathering on which rests the reliability of your final solution.
- Elaborate on how you will use that data to generate a sizeable number of alternatives.
- And finally, encapsulating the aforementioned factors, present your concluding solution.

The key to answering problem-solving questions is not to worry about getting the 'right' answer but, rather, to demonstrate your logical thought process in solving the problem.

Q. What do you do when you disagree with your line manager?

There is no fixed answer to this one. The response will be subjective, depending on the circumstances and the degree of how crucial is the matter at hand. Is it a minor issue essentially relates to a matter of perspective and the consequences of which won't make much of a difference or is it more acute and could involve bypassing the direct supervisor and report the matter with the next in line? Avoid referring to the latter and build your response around the first scenario so that you have the scope of featuring your emotional intelligence, interpersonal skills, and the ability to be self-aware.

Alternative, related questions:

- If you disagree with a decision taken by your line manager, how would you respond to the situation?
- Would you choose to make your disagreement known if a superior is involved?

The meaning behind the question:

The question might seem to you a way of seeing how subordinate or submissive you are; but that is not so. It's a way of ascertaining your emotional maturity and adeptness at interpersonal interaction when things are a bit sticky. How you would choose to express your disagreement in a way which does not upset anyone or anything and yet, conveys your point across.

Example 10:

"It goes without saying that there will be times when my manager and I won't see eye to eye on a decision or simply a situation; we're humans after all. The key to any such situation is communication; transparency, equanimity and objectivity. Allow ourselves to see the same setting from the other side. Even if at the end of it, we aren't able to reach a common point, we can always choose to disagree. I have to respect her prerogative to make a call, whether I agree with it or not. One is always capable of not agreeing with something completely, yet put their weight behind it for a larger cause."

Q. You have two ropes, each of which takes an hour to burn. Is there a way to burn these both in exactly 45 minutes?

"We know that it takes an hour for each rope, with two ends each, to burn. If we light the rope simultaneously from both ends, it will take half the time to burn the entire rope then, i.e., 30 minutes.

Thus if we burn 1 rope simultaneously on both ends and light the other rope on one end only (30 minutes), we have our solution ready.

After 30 minutes, one rope is burnt and the other rope has 30 minutes of burning time left. And so, if we now light the other end of that rope, the total burning time left would be half, i.e., or 15 minutes, and in total, 45 minutes."

- Q. How many times a day do a clock's hands overlap?
- Q. If you had to extract coffee from coffee beans – how would you do it?
- Q. How much would you charge to wash all the windows in your city?

33.7.5 Skill-Testing Questions

Many a time employers seek your competence on certain practical skills and how tech-savvy you are in things required to perform the job well. Such skill-testing questions are often hands-on and most frequently resorted in technical, scientific and industrial/manufacturing fields.

When it comes to skill-testing questions, one thing is clear – answer only if you know it! If not, don't pretend to know it. Instead, direct the answer to your interest in learning. If possible, mention something else that can possibly compensate for your inadequacy in the asked-for skill (e.g., “ Well, I'm not very familiar with that software. But I am well adept at...”).

33.7.6 Situational/Hypothetical Questions

Such questions are raised to establish a realistic assessment of how you would handle real-life situations at work. In order to successfully handle a situational question, take your time and give it a calm thought before you present your answer. Be honest and answer definitively in detail. There is no black or white answer here; they are only looking to form an idea of how you will respond to circumstances which are regular for someone who will work in that position. Your answer will be a pointer toward how you can be expected to behave in similar real-life situations.

Q. In my opinion, your interviewing skills are terrible. What do you have to say to that?

What is being assessed here is your capacity to deal with criticism; and the worst thing you can do here is let your first, unfiltered reaction come out. Most crucially, watch your body language in this moment! Take a pause and gather yourself before you start responding to this on the lines of learning from the experience, asking for feedback, and try to perform better in the next one.

Q. You are working at the front desk when out of nowhere a fax arrives, multiple phone lines start ringing, a big client walks in and a delivery guy turns up with a package that requires your signature. Please list the actions which you will take at this moment onwards.

In such an example, you should be able to recognize that the interviewer is trying to assess your prioritization skills, to fire-fight, and pull off crisis-management. Not panicking is step one!

Example 11:

“In this entire melee, the first thing I'll attend to is the phone calls, while simultaneously greeting the client and the courier with a professional smile. I'll answer the calls, which will either be forwarded to the concerned person, or on hold, thus allowing me to interact with the client, followed by the courier, which anyway just requires a signature. The reason for choosing the calls over the people present there is that the people there can see that I've suddenly been caught in too many things; which the people over the telephone will not be able to know. After successfully prioritizing the calls and the visitors, I'll finally switch my attention to the incoming fax.”

33.7.7 Behaviour-Based Questions

These are devised to draw out information about your past behaviours. Interviewers design their questions around the skills and traits they deem essential for advancing in that position or company. The questions habitually begin with phrases such as:

- Recall an instance when...
- Tell me about a time...

- Give me an example of...
- Describe a situation in which...

Some aspirants find the format of such questions a bit tricky to deal with and so face trouble responding. Nevertheless, if your groundwork is in place, you will have your professional, academic, and life experiences ready to be shared at appropriate points. You can recall specific courses of action that you undertook and how it helped resolve the matter or deal better with the circumstances.

Typical behaviour-based interview subjects include the following:

- Working under pressure
- Handling a delicate situation with a colleague
- Applying balanced judgment and logic in problem-solving
- Thinking out of the box
- Meeting deadlines
- Persuading people to do things your way
- A report/proposal that was commended
- Foreseeing potential problems and developing proactive measures
- Making a vital decision with limited information at your disposal
- Adapting to difficult/new circumstances
- Tolerance for a different viewpoint
- Dealing with an agitated/ difficult client
- Delegating a project efficiently
- Explaining something complex to someone who is not familiar with it
- Prioritizing the factors of a complicated project

Strategies

There are two favoured strategies that are regularly employed to create an articulate and pertinent answer to such behaviour-based interview questions – STARS and W5. Regardless of the technique you choose, do not forget to not cross the threshold of ninety seconds.

1. STARS

STARS stands for:

S – Name a **Situation** you were in

T – **A Task** you had to accomplish

A – Describe the **Actions** you took

R – Enlist the **Results** of those actions

S – **Summarize**

The actions that you took, in particular, are pivotal because they reveal your thought process and allow the interviewer to visualize how you might respond to similar situations at the work place. Ensure to state a definite result of the entire build up.

2. W5 Model

The W5 model, as you might have guessed by its name, refers to the proverbial team of: what, who, why, when, where, and how. Using these as pointers for detailing the situation, within approximately seventy seconds you should mention the relevant knowledge, ability and skill. Keep the spotlight on the successful outcome which corresponds to your story. Choose your words purposely with the aim of helping your employer visualize you in that experience and then relate it to their organizational setup (e.g.: "It was the last hour before the final system upload was to be done, when the servers went down.."). Wherever possible, fit in positive feedback from colleagues, managers, professors, teammates, etc., to emphasize your involvement and effort. The remaining twenty seconds should be spent in recapitulating the entire experience and outline the value and skills that are portable in your work with the organization.

Sample Questions

- Detail a situation in which you couldn't speak or finish a task owing to the lack of enough information for a sound decision.
- Talk about a time when you had to be relatively quick in forming a decision.
- Tell us about a time in which you had to use your verbal communication skills in order to make your point.
- Give me an example of how you managed to motivate your teammates and colleagues.
- Describe a situation in which it was necessary to be vigilant and attentive to your surroundings.
- Tell us about a goal that you'd set for yourself and were successful in achieving.
- Give me an example of how you managed to successfully communicate with an individual who personally didn't like you much.
- Describe the most creative/unique work-related project you have undertaken.
- Describe a time in which it was indispensable for you to alter your actions/behaviour in order to respond to someone else's needs.
- Tell us about a time when you had to meticulously analyze a person or situation in order to be effective in your choice of action.
- Give us an illustration of a problem you have faced and how you went about solving it.
- Tell us about how you have worked collaboratively in a group and how successful it was.

33.8 Commonly Asked Questions (in Recent Years)

1. Introduce yourself.
2. What according to you are the qualities required for this job role?
3. Why should we hire you?
4. Your resume highlights various skills and qualities of yours. Support them with real life examples.
5. Describe your dream job.
6. What do you know about our company
7. What are your hobbies?
8. Define success.
9. What is your favourite subject?
10. Why are you switching from trade A to B?
11. Why do you want to join our Company?

12. Describe your working style.
13. What are your Expectations from the Job?
14. Who has inspired you in your life and why?
15. Where do you see yourself 5 years from now?
16. Have you worked with someone you didn't like? If so, how did you handle it?
17. Tell me about a time when you misjudged a person.
18. State any three of your weaknesses?
19. If after sometime you start disliking the job? What would you do?
20. How do you deal with Criticism?
21. Let's say we don't hire you; then what will be your reaction?
22. Let's say you are very passionate about your work but the other people working around you are very restless and casual, then in that case what will you do to motivate them?
23. Suppose you find yourself in a deserted island, what 3 things you will require to survive?
24. If due to overload of work, you have to spend 10 – 12 hrs in the Company, then will you be comfortable with it?
25. How do you feel about working late nights and on weekends?
26. What do you think is the difference between campus life and corporate life? How will you bear with it?
27. Which vertical (technical, managerial) of our firm would you prefer to join?
28. Which business leader you admire?
29. Tell me one thing that you would like to change about yourself and about our company?
30. Are you a hard worker or smart worker? Give example.
31. Give an example of a situation where you faced a challenge and came out victorious.
32. Why should we prefer a fresher like you over other experienced candidates?
33. Are you an introvert or an extrovert?
34. Are you good at working in a team?
35. Would you rather work for money or job satisfaction?
36. Would you like to ask us any questions?

33.9 Resume Writing

A Resume is your first face to the organisation and thus, contributes greatly to your chances of clinching that dream job. That is beyond discussion. You must take the task of making your Resume very seriously. Following are the key points to be kept in mind while making a Resume:

33.9.1 Difference Between Resume and CV

A quintessential resume is an overall, succinct introduction of your entire experiences and skills, so far in life, as they relate to a particular career or job profile that you aspire for. Your resume need not be one static document but should be customised while applying for a particular job so as to highlight the skills and experiences most relevant to the work. It should typically not be more than a page in length.

In contrast, a Curriculum Vitae or CV, as is commonly referred to, is fairly a much more detailed overview of your experience, especially made by the candidates who aren't freshers and are lateral hires. This is a lengthier document that specifies the work responsibilities held in the previous jobs in addition to achievements in other life areas, as well.

33.9.2 The Strategy of Making a Resume

A Resume is the first impression that the employer makes about you. It is like a marketing statement that you make. The following things are a must while making a resume:

- A resume should be made as per the employer's perspective rather than our perspective. It should mention the things that are relevant to the employer rather than those that are important to you. It is advisable to modify your resume according to the different jobs you are applying for.
- A resume should be crisp and clear with all true facts. Never even think of bluffing in your resume. You are under a scanner and if caught, no company will hire you.
- Presentation is very important: Will you ever go for the interview in shabby clothes? Your answer will be a definite 'NO'. Similarly, never send your resume on a crumpled/creased sheet of paper. The quality of paper and print should be very high. Remember the employer is making a judgement about you with every single cue.
- Do not write the word "RESUME" on the top of the Resume.
- The name should be in the biggest font size. Generally, the font size followed is 16, 14 and 12. Write your name in 16 font size, the headings in 14 font size and the content under the subheadings should be in 12. The font style should be formal, suggested fonts are: Arial, Times New Roman and Calibri.
- Include all your contact information in the resume – name, address with zip code, contact numbers, email, etc. It is very important to check the contact numbers, email ids each time before sending the resume as the entire exercise will be a failure if the employer is not able to contact you. Make a professional looking email_id.
- Prioritize the content of your resume, the most important and relevant information is to be shared first and needs to be highlighted.
- **Career objective:** Candidates do not give much importance to the career objective. But even this is a very important part of the resume. It should not be general but specific to the industry that you are applying for and it should look original rather than copied from the internet. You should understand it in spirit. Your answer should reflect the Career Objective you have listed.

33.9.3 Main Headings of the Resume (in the Following Sequence)

- Name and contact information with Date of Birth
- Career Objective
- Educational Qualification (from latest to previous)
- Academic Experience – Projects done, summer training, industrial visits, workshops attended
- Technical skills (Industry related) and functional skills (soft skills)
- Achievements (in chronological order or the order of imp.)
- Extra Curricular activities
- Personal Profile: Languages known and hobbies
- References: Give only if you are in good books of the people
- References details: Name, designation, company/College name and contact details.

33.9.4 Cover Letter

A cover letter is a letter explaining the content of your resume and conveying any additional information or message which cannot be contained in a resume. The importance of a cover letter cannot be overemphasised when applying for a job off campus. A cover letter typically provides detailed information on how you are qualified for the job you are applying for. Effective cover letters explain the reasons for your interest in the specific organization and the job being offered. Following are the key points to be kept in mind while framing a cover letter:

- The letter has to be addressed to a specific person in the organisation. If you don't know anyone's name, then address it to the HR Manager of the company with its official address.
- Salutation: Dear Sir/Ma'am, if you don't know the gender.
- Subject: A sample Subject line can be 'Application for position advertised in *The Tribune* on 2 March, 2013'
- The body of the letter is divided in three paragraphs:
 1st Para: It is the introductory paragraph in which you state why are you writing this cover letter and for what position
 2nd Para: How your qualification and skills match the job advertised.
 3rd Para: Conclude by thanking the employer for considering you for the position. It should leave a lasting impression.
- Then close it by writing: Yours sincerely or truly with your full name and contact number written under it.

33.9.5 Sending the Resume by Email

While sending the Resume via email, the cover letter becomes the body of the email.

- Make sure that the Resume is in the specified format e.g., MS Word, PDF, etc. If nothing is mentioned then, it should be in a PDF format.
- Save the Resume file in your name only while sending.
- The email from which the Resume is being sent should have a professional email id with a professional photograph. Please make one if you don't have it. (Avoid using words like cool, charming, ironmaster, etc.)
- The 'Subject' should be self explanatory and refer to that specific job opening.
- End the email with your full contact information once again.
- Send a test email to yourself before forwarding it to the Employer.
- Double check your email for grammar, Spell-check, capitalisation. They are just as important as in paper correspondence.

Sample Resume

First Name Last Name

Address:

Contact No:

Email: Official Email ID

CAREER OBJECTIVE

Seeking an internship in XYZ Company where I can enhance my learning. To contribute to the productivity of the organization by harnessing my analytical, designing, coding skills as well as my strong interpersonal and management skills.

ACADEMIC QUALIFICATIONS

Examination	Specialization	Percentage	College/School	Bord/University	Year
B.Tech (Hns.)	*****	*****	College Name, Place	*****	*****
12th Board	*****	*****	School Name, Place	*****	*****
10th Board	*****	*****	School Name, Place	*****	*****

WORK EXPERIENCE

• **Position | Company Name,** **Start Month, Year – End Month, Year**

- ✓ Analysed the product and suggested to modify the URL pattern which raised the Alexa Rank from 40000 to 29000
- ✓ Effectively increased the number of users on the site by 10%

• **Company Name,** **Start Month, Year – End Month, Year**

- ✓ Increased the number of members by 50% in the club
- ✓ Successfully managed events like Jalsa Youth Festival, Kids Olympics, Christmas Celebration with success in participation turnout and managing capabilities.
- ✓ Expanded the club in Northern region by publicizing the club activities.

• **Position | Company Name,** **Start Month, Year – End Month, year**

- ✓ Organized entrepreneurial activities like Entrepreneurship Awareness Camp, E-Summit, Nurture Talent workshop, E-Week in college
- ✓ Tie-Ups with the companies and effectively increased the profit by 10%
- ✓ Recommended as E-Leader by National Entrepreneurial Network and Awarded Letter of Appreciation from Director/Principal
- ✓ Won Debut Championship E-Week for Entrepreneurial week

Academic Projects Undertaken

- Position | Company Name, Year Start Month, Year–End Month

Language for Implementation: C & C++ (Using Graphics)

Operating System: Windows XP

Designed a centralized automated software replacing the existing manual payroll system. The new system categorized processes, provided for restricted access in a user-friendly manner making it easy to generate reports on employee payroll information. Usage of bulky registers was eliminated from the system.

- Position | Company Name, Place Start Month, Year – End Month, Year

Language For Implementation: Core Java

Operating System: Windows 7, Windows XP

The project dealt with detection of faults in the functioning of the Online Counseling system and reduction of paper work by designing an automated software. The software accessed by students of find out cut off for the concerned college.

- Position | Company Name, Place Start Month, Year – End Month, Year

Language For Implementation: Core Java

Operating System: Windows 7, Windows XP

The objective of the project was to revamp an obsolete system. Converted records of customer accounts into an improved platform using Java. The platform established a better network between customers and employees and stored the details of the users in the database using Graphical Interface.

IT SKILLS

Languages	C/C++, Java Applets, Java Web Server, Java Core, HTML, SQL
Software Packages	Photoshop CS5, MS-Office (MS-Word/Excel/PowerPoint)
Operating Systems	Windows98, WindowsXP, Windows2000, Windows8

ACHIEVEMENTS & ACCOLADES

- Scholarship in 4th semester of Engineering
- 2nd position in State level Ball Badminton Championship
- Merit position in **Maths Olympiad** in 1999, 2000 and 2002
- Merit position in **Intra-School Bournvita Quiz** Contest in 2000, 2001 and 2002

EXTRA-CURRICULAR ACTIVITIES

- Attended workshop on **Ethical Hacking and Information Security**
- Participated in **National Chess Championship** in 2004 and 2006
- Participated in **Children Science Congress** during 78th annual session in 2008
- Attended workshop on Cloud Computing **Microsoft Dream Spark Yatra** at ABC University

REFERENCES

- Name, **Position**, Company Name, Phone No.
- Name, **Position**, Company Name, Phone No.

Part V

Practice Papers

Practice Paper 1

Practice Paper 2

Practice Paper 3

Practice Paper 4

Practice Paper 5

Practice Paper 6

Practice Paper 7

Practice Paper 8

Practice Paper 9

Practice Paper 10

Practice Paper 11

Practice Paper 12

Practice Paper 13

Practice Paper 14

Practice Paper 15

Practice Paper 16

Practice Paper 17

Practice Paper 18

Practice Paper 1

(Based on Recent Question Papers of Accenture*)

Total no. of questions: 75

No. of sections: 3

Total duration: 95 min

- There is no negative marking.
- There is sectional cut off.

Section 1: Verbal Ability (25 questions in 25 minutes)

Directions for questions 1 to 4: Read each sentence to find out whether there is any grammatical or idiomatic error in it. The error, if any, will be in one part of the sentence. The number of that part is the answer. If there is 'No error', the answer is (5). (Ignore errors of punctuation, if any.)

1. Imagine, if Israel and Palestine have been together
 - the extremists would have spread
 - the poison
 - all across these lands.
 - No error
2. Life during school days
 - was innocent and carefree
 - No error
3. The marriage between any two adults practising any religion,
 - belief, or creed is solemnized under the Unique Marriage Act
 - provided that at the time of the ceremony the man
 - is at least 21 years old and the female 18.
 - No error
4. The Chicago Post embodies what is ailing
 - the newsprint industry across the
 - developed countries, but especially
 - in the European countries.
 - No error
5. The following sentence has some part of it underlined. From the given options, choose the correct alternative that replaces the underlined part in an appropriate manner.

The resolution passed by the Democratic Working Committee for raising the legal age for drinking to 27 did not have the anonymous supporters of several political parties.

1. anonymous supporters of
2. anonymously supporters of

* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of *Accenture*, a leading multinational IT firm.

- 3. unanimous support by
- 4. unanimous support of
- 5. No correction required

Directions for questions 6 to 10: Read the following passage and answer the questions that follow:

The foremost drawback of natural science is that it isn't human. Before the problems and subject matters like physics, chemistry, and biology, our world is human and we have to live with human beings, including ourselves. When we find ourselves inside a laboratory, there's little which is human there; except ourselves and the fellow workers. Science tells us that ours is a world of elements, cells, and atoms (or whatever smaller than the latest analysis has revealed). Unrealized by many, there are perils in such a living, including obvious ones. For starters, it is too unlike the world of humans to be labelled a sound preparation for it; the core element of that reality is the human presence: a model society is a commune of such presences—self-developing, self-controlling, self-respecting and doing unto others all these. But natural science is least concerned with this presence and its interaction, albeit in this sense and in this relation. Hence, we always face the risk that when we venture into this world and then return to the human one, the transition might not get complete wherein one may tend to ignore the differences between both, and end up treating even humans as mere elements.

Some people turn to communism as communism willingly offers to take decisions for them and relieve them of this agonizing task of applying themselves; though materialistic experts and scientists are attracted to communism for a different reason. It, too, employs radical mechanisms, controlling and manipulating—all in the name of a greater, overriding good, which few people seem to understand. It is this manoeuvring that ensures the victories of science; thereafter, it seems but natural to adopt an analogous approach to the political and social situations, and so attain more effective and swift outcomes than what the alternative wearisome methods of persuasion cause.

- 6. The chief limitation of natural science is that it is _____
 - 1. immoral
 - 2. spiritual
 - 3. human
 - 4. not human
- 7. In a laboratory, we are in a world of _____
 - 1. the cells
 - 2. the skeletons
 - 3. cells, elements and atoms
 - 4. none of the above is correct
- 8. Why do people turn to communism?
 - 1. It offers them a positive faith.
 - 2. It takes their decisions for them.
 - 3. It relieves them of the painful task of thinking.
 - 4. All of the above.
- 9. The control and manipulation of atoms and cells make _____
 - 1. the triumph of science possible
 - 2. the triumph of science impossible
 - 3. the solution of all problems
 - 4. none of the above is correct
- 10. Political and social problems can also be solved with _____
 - 1. the technique of control and manipulation
 - 2. tenderness
 - 3. rudeness
 - 4. all of the above

Directions for questions 11 to 14: Read the following passage and answer the following questions.

How would you define enthusiasm? It is that mystifying something that converts an average Joe into an exceptional individual. It makes the old young, and without it, the young, old. It is like a hidden fountain of boundless energy. It is that striking force which makes us rise from mediocrity to excellence. It illuminates a dull face until the eyes dance and sparkle, and the persona shines with joy. It is an intangible inner magnet that attracts uplifting and happy people to our lives, who go on to become our affectionate friends. It is the joyful emotional spring that bubbles with positive energy, drawing people to come to us and sip from the

bliss that rises out of our heart. It is the jubilant song of an exuberant person who sings an inspiring message to the world:

"I can! We will! It's all possible!"

11. What is enthusiasm?
 1. Enthusiasm makes a person old.
 2. Enthusiasm wastes energy.
 3. Enthusiasm adds sparkle to your eyes and improves your personality.
 4. Cannot be seen with the naked eyes.
12. Choose the correct pair of words where the two are antonyms:

1. Outstanding*Brilliant	2. Mediocre*Average
3. Buoyant*Optimistic	4. Possible*Insurmountable
13. What do you think would be a suitable title?

1. Enthusiasm—a key to achievement	2. Enthusiasm—a hidden force
3. Enthusiasm—the fountain of youth	4. Enthusiasm—a magnetism
14. Enthusiasm leads an individual to convey the impression
 1. that he/she is sparkling with positive energy
 2. that he/she is at peace with life
 3. that he/she is inspired enough to move mountains
 4. that with enthusiasm nothing is impossible

Directions for questions 15 to 18: From the given options, choose the word that is opposite to the highlighted words:

15. Abrogate

1. Enact	2. Enrich	3. Sanitize	4. Garnish
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16. Sedate

1. Agitated	2. Lie	3. Mobile	4. Inebriated
-------------	--------	-----------	---------------
17. Hapless

1. Stern	2. Crucial	3. Lucky	4. Liberated
----------	------------	----------	--------------
18. Profane

1. Fuel	2. Pious	3. Materialistic	4. Spurious
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Directions for questions 19 to 21: From the given options, choose the word which is nearly the same in meaning to the highlighted words:

19. Assiduous

1. Assertive	2. Remitting	3. Avarice	4. Persistent
--------------	--------------	------------	---------------
20. Dexterity

1. Disillusion	2. Dimmer	3. Vantage	4. Skill
----------------	-----------	------------	----------
21. Luminous

1. Resplendent	2. Darkened	3. Preposterous	4. Invoking
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Directions for questions 22 to 25: Fill in the blanks with a suitable option from the given choices:

22. Past civilizations mostly thought of comets as.....of death and doom.

1. harbingers	2. precursors	3. ushers	4. portentous
---------------	---------------	-----------	---------------

23. They could only barely see each other dimly in thelight.
 1. obscure 2. dazzling 3. flickering 4. skeletal
24. It was a mismatched combat between a old giant and a feisty start-up.
 1. lethargic 2. decrepit 3. precocious 4. cultured
25. Though popular as a teetotaller amongst his colleagues, he had noabout drinking in private.
 1. compunction 2. perdition 3. injunctions 4. convictions

Section 2: Quantitative Ability (25 questions in 25 minutes)

26. 110 people in a colony own cars. 50 own a Maruti car and some own Honda cars, 20 own both Maruti and Honda. How many of them own only Honda cars?
 1. 50 2. 40 3. 60 4. 70
27. In a party, 130 people had continental food, 90 had Indian food, and 40 had both continental and Indian food. How many delegates had only one type of food?
 1. 170 2. 220 3. 130 4. 140
28. There are two pipes in a tank. Pipe *A* is for filling the tank and Pipe *B* is for emptying the tank. If *A* can fill the tank in 5 hours and *B* can empty the tank in 10 hours, how many hours it will take to completely fill the tank when *A* and *B* are open and the tank is one quarter filled already?
 1. 10 hours 2. 7.5 hours 3. 5.5 hours 4. 3.33 hours
29. At what time between 2 and 2.30 p.m. are the hands of a clock together?
 1. 2/11 hours past 2 p.m. 2. 4/18 hours past 2 p.m.
 3. 1/8 hours past 2 p.m. 4. 2 : 10 p.m.
30. If *x* is 40% greater than *y* and *y* is 50% lesser than 300, find *x*.
 1. 210 2. 250 3. 200 4. 220
31. In an exam, Varun secured 54% marks. In the same exam, Vicky secured 646 marks, which was 76% of the total. What were the marks scored by Varun?
 1. 496 2. 459 3. 468 4. 480
32. If $\log 3 = 0.4771$ and $\log 4 = 0.6020$, find the value of $\log_{16}243$.
 1. 1.87 2. 1.98 3. 2.622 4. Data Insufficient
33. If $\log_{10}6 = 0.778$, find $\log_{10}1296$.
 1. 3.4 2. 3.5 3. 2.6 4. 3.1
34. 4 men or 6 women can do a piece of work in 15 days. On which day will 2 men and 5 women complete the work together?
 1. 15th day 2. 10th day 3. 12th day 4. 11th day
35. What number must be added to 6081 so that the sum is divisible by 13?
 1. 6 2. 5 3. 4 4. 3
36. Find the unit digit in the expression $\{(8484)^{1794} \times (7895)^{325} \times (4871)^{677}\}$.
 1. 0 2. 1 3. 2 4. 3
37. For any natural number *x*, $x^3 + x^2 + 2$ is always _____.
 1. even 2. odd 3. either odd or even 4. can't be determined

38. In a 1600 m race, A 's chances of winning of are 0.4, B 's chances of winning of are 0.33, and C 's chances of winning of are 0.25. Find the probability that none of them wins the race if dead heat is not possible.
1. 0.12 2. 0.17 3. 0.08 4. 0.02
39. If $1024^{x-2} = (64)^x$, find the value of x .
1. 8 2. -5 3. 5 4. 4
40. The ratio of incomes of Shahrukh and Gauri is 7 : 9 and the ratio of their expenditures is 3 : 4. What is the ratio of their savings?
1. 7 : 4 2. 7 : 3 3. 4 : 5 4. Cannot be determined
41. A thief steals a scooter from a house at 9.00 a.m. and drives it at a speed of 60 km/h. The owner discovers the theft at 10.00 a.m. and sets off in another scooter at 80 km/h in the same direction where the thief went. At what time will the owner catch the thief?
1. 11:30 a.m. 2. 11:00 a.m. 3. 12:20 p.m. 4. 1.00 p.m.
42. Suresh writes natural numbers from 99 to 667. If number of 0's he used is X and number of 4's he used is Y , find the value of $Y - X$.
1. 100 2. 200 3. 300 4. 110
43. When 4517 and 5721 are divided by a three-digit number, the same remainder is left. The smallest such three-digit number is _____.
1. 301 2. 202 3. 404 4. 515
44. From a pack of 52 cards, one random card is drawn. Find the probability that the card is either red or a queen.
1. 15/26 2. 7/13 3. 8/13 4. 17/26
45. Pipe A can fill a tank in 4 hours, Pipe B in 12 hours and Pipe C in 20 hours. If all the pipes are opened, in how many hours will the tank be filled?
1. 3.0 2. 2.5 3. 2.6 4. 3.5
46. An alloy contains iron, carbon, and sulphur in the ratio 3 : 4 : 5. What is the approximate percentage of carbon in the alloy?
1. 20% 2. 30% 3. 33% 4. 36%
47. Ram spends $1/3^{\text{rd}}$ of his free time reading and $1/5^{\text{th}}$ of the remaining time playing video games. If he spends 2 hours on video games, what is his total reading time?
1. 5 hours 2. 6.66 hours 3. 5.33 hours 4. 10 hours
48. The price of petrol rises from Rs 60.00 per litre to Rs 75.00 per litre. By what percent should a consumer reduce the travelling so that he/she may not have to increase expenses on petrol?
1. 20% 2. 25% 3. 30% 4. None of these
49. If $\log_{10} 2 = 0.3010$ then the number of digits in 2^{33} is _____.
1. 11 2. 10 3. 12 4. 20
50. The average age of men in the factory is 4 times the number of women in the factory. If the ratio of men and the women in a factory of 35 is 6 : 1, what is the total of the ages of the men in the factory?
1. 590 years 2. 520 years 3. 600 years 4. 496 years

Section 3: Logical Reasoning (25 questions in 35 minutes)

Directions for questions 51 to 55: Follow the directions given below to answer the questions that follow. Your answer for each question below would be

- if ALL THREE items given in the question are exactly ALIKE
- if only the FIRST and SECOND items are exactly ALIKE
- if only the FIRST and THIRD items are exactly ALIKE
- if only the SECOND and THIRD items are exactly ALIKE

51. VTUIUVTIUTIUVVVI, VTUIUVTIUTIUVVVI , VTUIUVTIUTIUVVVI
52. 068484-84613112, 068484-84613112 , 068484-84613112
53. MNMNMNNNNMNM, MNMNMNNNNMMNM, MNMNMNNNNMNM
54. 886998.11723, 886998.17723, 886998.11723
55. 696969696.6669696, 69696969.66669696, 696969696.6669696
56. If % stands for /, @ stands for –, + stands for * and – stands for +, then $4+5@2 - 3\%2 = ?$
 1. 19.5
 2. 19.8
 3. 12.7
 4. 15.3
57. If % stands for /, @ stands for –, + stands for * and – stands for +, then $33\%3 - 2+5@7\%1 = ?$
 1. 14
 2. 15.3
 3. 15
 4. 14.3
58. If % stands for /, @ stands for -, + stands for * and – stands for +, then which of the following is TRUE?

1. $21\%3+2 - 10@3 = 21$	2. $23 @ 8 + 4 + 25 - 8 = 5.6$
3. $5 \% 4 @ 12 + 36 - 8 = 5.8$	4. $6 - 34 @ 4 + 33 \% 8 = 50$

Directions for questions 59 to 61: Six persons are sitting on a circular table; some of them are facing the centre and some, the opposite direction. A and E are both facing outwards. D is in the centre of A and C but D is to the right of A. F and B are between A and E who are sitting opposite each other. Both F and B are facing the centre. D is second to the left of B.

59. Who is sitting opposite F?

1. B	2. E
3. D	4. C
60. Who is sitting between F and E?

1. A	2. Nobody
3. C	4. D
61. In which direction is C facing?

1. Towards centre	2. Outwards
3. Towards F	4. Cannot be determined

Directions for questions 62 to 65: For the post of an assistant manager of a manufacturing firm, Radiant Inc., situated in New Delhi, the following are the criteria the candidate must satisfy:

- The candidate should have a degree in Manufacturing.
- The candidate should have at least 2 years of experience at a mechanical firm.
- The candidate should be more than 28 years of age as on Jan 1, 2015.
- The candidate should have international exposure during job or during training.
- If a candidate does not have a degree in manufacturing but has more than 3 years of international exposure then the Managing Director, will interview him.

- If a candidate does not have international exposure, then the Production Manager will interview him.
 - If a candidate does not satisfy the age criteria, then he will be interviewed by the HR Manager.
 - If a candidate satisfies all the 4 conditions, he is recruited.
62. Vaibhav was selected for the position of Junior Engineer in Honda, Japan, after he passed out from IIT Delhi. After working for 4 years in Honda, he left. He is 27 years of age as on February 2015. He will be
1. interviewed only by the Production Manager
 2. interviewed only by the MD
 3. rejected
 4. none of these
63. Vishal has been working as an engineer in Maruti Udyog Ltd. for 3 years now. He is a Mechanical Engineer from BITS Pilani. His date of birth is 13/11/1985. He has worked in the manufacturing industry at a junior level. He will be
1. given a written test
 2. interviewed by the Production Manager
 3. data insufficient
 4. not considered
64. Suraj has 3 years of working experience in Yakut Inc. and has also worked in Heinstein Inc., both international manufacturing firms, as an engineer. He has a manufacturing degree from a top engineering college. He turned 28 in February 2014. He is a diploma holder from PU Chandigarh. If he applies for the post, he will
1. be interviewed by the Production Manager
 2. not be considered
 3. be interviewed by the MD
 4. recruited
65. Salman has over 3 years of experience in Production, as an Engineer. He completed his Engineering from Mumbai and worked in Germany for Volkswagen for 3 years before joining his current job. He will be
1. recruited
 2. rejected
 3. interviewed by the Production Manager
 4. data insufficient

Directions for questions 66 to 69: A cuboid has 5 m length, 6 m breadth, and 7 m height.

- Two faces of $7 \text{ cm} \times 5 \text{ cm}$ are coloured grey.
 - Two faces of $5 \text{ cm} \times 6 \text{ cm}$ are coloured magenta.
 - Two faces of $7 \text{ cm} \times 6 \text{ cm}$ are coloured yellow.
 - Now the cuboid is divided into small cubes of 1 cm side each.
66. How many small cubes will have three faces coloured?
- | | | | |
|------|------|------|-------|
| 1. 8 | 2. 6 | 3. 4 | 4. 16 |
|------|------|------|-------|
67. How many small cubes will have only one face coloured?
- | | | | |
|--------|--------|-------|-------|
| 1. 100 | 2. 108 | 3. 76 | 4. 94 |
|--------|--------|-------|-------|
68. How many small cubes will have no faces coloured?
- | | | | |
|-------|-------|-------|-------|
| 1. 60 | 2. 64 | 3. 56 | 4. 40 |
|-------|-------|-------|-------|
69. How many small cubes will have two faces coloured grey and magenta?
- | | | | |
|-------|-------|-------|-------|
| 1. 20 | 2. 36 | 3. 32 | 4. 44 |
|-------|-------|-------|-------|
70. Earlier facing south-east, a man turns 45 degrees clockwise, then walks 10 km to his right and then runs 10 km towards north. In which direction is he now from where he started?
- | | | | |
|---------------|---------|---------------|----------|
| 1. North-west | 2. West | 3. North-east | 4. South |
|---------------|---------|---------------|----------|

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71. Vijay said to a woman, "The sister of your mother's husband is my aunt." How is the woman related to Vijay?
1. Daughter 2. Granddaughter 3. Mother 4. Sister
72. A man is facing east. He turns 90 degrees in the anti-clockwise direction and then another 45 degrees towards his right and then 180 degrees in clockwise direction. Which direction is he facing now?
1. South-West 2. North-West 3. West 4. South
73. In a row of 47, if Rajiv is standing at the 21st position counting from the last, what is his position from the front?
1. 25 2. 26 3. 27 4. 22
74. In a row, Manoj is 10th from the right and Ravi is 12th from the left. If they interchange their positions, Ravi becomes 8th from left. The total number of people in the row are
1. 15 2. 16 3. 17 4. 18
75. On which day was India's 45th Independence Day if 15 August 1947 was Friday?
1. Saturday 2. Monday 3. Tuesday 4. Wednesday

 **Answer Key****Section 1: Verbal**

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. 1 | 2. 4 | 3. 1 | 4. 3 | 5. 4 | 6. 4 |
| 7. 3 | 8. 4 | 9. 1 | 10. 1 | 11. 3 | 12. 4 |
| 13. 1 | 14. 1 | 15. 1 | 16. 1 | 17. 3 | 18. 2 |
| 19. 4 | 20. 4 | 21. 1 | 22. 1 | 23. 3 | 24. 2 |
| 25. 1 | | | | | |

Section 2: Quantitative

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 26. 3 | 27. 4 | 28. 2 | 29. 1 | 30. 1 | 31. 2 |
| 32. 2 | 33. 4 | 34. 3 | 35. 4 | 36. 1 | 37. 1 |
| 38. 4 | 39. 3 | 40. 4 | 41. 4 | 42. 1 | 43. 1 |
| 44. 2 | 45. 3 | 46. 3 | 47. 1 | 48. 1 | 49. 2 |
| 50. 3 | | | | | |

Section 3: Logical Reasoning

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 51. 1 | 52. 1 | 53. 3 | 54. 3 | 55. 3 | 56. 1 |
| 57. 1 | 58. 1 | 59. 3 | 60. 2 | 61. 4 | 62. 4 |
| 63. 2 | 64. 4 | 65. 4 | 66. 1 | 67. 4 | 68. 1 |
| 69. 1 | 70. 1 | 71. 4 | 72. 1 | 73. 3 | 74. 3 |
| 75. 1 | | | | | |

Practice Paper 2

(Based on Recent Question Papers of Aricent*)

Total no. of questions: 110

Total duration: 110 min.

No. of sections: 4

- There is no negative marking.
- There is sectional cut off.

Section 1: Verbal Ability (25 questions in 25 minutes)

Directions for questions 1 to 5: Out of the given alternatives, select the word which is nearest to the meaning of the highlighted word:

1. GARNER			
1. preserve	2. decorate	3. distribute	4. collect
2. NIGGARD			
1. miser	2. shrewd	3. divine	4. loyal
3. ADEPT			
1. requirement	2. bright	3. proficient	4. amateur
4. BRASH			
1. burnt	2. refined	3. aggressive	4. modest
5. EQUIVOCAL			
1. feasible	2. quarrelsome	3. ambiguous	4. reasonable

Directions for questions 6 to 9: Each question has 4 sentences labelled A to D. These sentences have been jumbled up. Arrange the sentences to form a meaningful paragraph:

6. A. The mallards travel 8,000 km or more to Southern Africa and return in spring.
B. If one happens to live in Northern Europe, one will share one's garden with all varieties of animals, birds, and insects.
C. Some of the avian friends will fly away once the weather turns colder.
D. Some of those will stay with you, but you will not have them around all through the winter.
1. BDCA 2. DCBA 3. BCAD 4. ABCD

* This practice paper is based on information available in public domain and also on memory. It represents the recent question paper of Aricent, a leading multinational IT firm.

7. A. It consists of a rounded mass suspended with a fine string.
 B. A seismograph is an instrument used to measure earthquake waves or seismic waves.
 C. Whenever an earthquake occurs, the fixed base also shakes, making the suspended ball swing with respect to the fixed base.
 D. This ball further has a small pen attached to it, the tip of which touches a sheet of paper placed on a fixed base.
1. BADC 2. BCAD 3. CBAD 4. BCAD
8. A. He leapt towards it, jumped in, slunk into the darkest corner, and fell asleep.
 B. Gnuu did not pause to think or feel.
 C. Gnuu's friends were by then well on their way to the town.
 D. What he finally spotted was a safe, dim cranny, just the right size for a sparrow.
1. DABC 2. CDBA 3. CBAD 4. DBAC
9. A. They might drive themselves by a car, a motorcycle or a scooter, or they can catch a bus or train.
 B. During these hours, there should be adequate transport to move them all.
 C. Every morning, almost every major city in the world witnesses millions of commuters move from their suburban homes to the commercial heart of the city.
 D. And the same way, they turn back to their homes every evening.
1. CDAB 2. CADB 3. ABCD 4. CDBA

Directions for questions 10 to 16: Read the passages below and answer the questions that follow:

Passage 1

A lot of what goes by the name of entertainment is simply a camouflaged attempt to demolish consciousness. If you begin by thinking, what is man? How can he best express himself? What are his needs? One will realize that simply possessing the power to evade work and live life till its end in an electric light and to the rhythm of a timed music, is not a reason for doing so. Man needs warmth, community, leisure, ease and security: as also solitude, creativity and a deep sense of wonder. If man recognizes this, he could employ the outputs of industrialism and science holistically, applying the same test every time: does this make me more human or less? He will then gather that the peak of happiness does not rest in resting, whiling time, relaxing, playing poker, drinking and making love simultaneously.

10. The author entails that the answering of the questions in the sentence two can reveal that human beings
1. can be less human when they chase pleasure
 2. need to consider their purpose of life
 3. are being estranged by science from their true nature
 4. can have needs beyond just the physical comforts
11. The author is expected to agree with the statement that relaxing is...
1. sometimes an effort to avoid thinking
 2. that which gives true pleasure
 3. an illustration of man's want for society
 4. that man must learn to shun
12. Which of these will be a logical continuation to the above paragraph?
1. A paragraph on 'where does true happiness lie'.
 2. A quote by a famous anthropologist on 'the meaning of man's existence'.
 3. An anecdote from the author's life
 4. A moral story

Passage 2

Google's mother was the Chief of Police. Everyone thought her to be the smartest police chief in the country. Chief Magenta was smart and agile. She didn't sit around and brood. When she came up against a case she

could not crack, she acted without delay. She cleared her desk, put on her coat, and went home to dinner. Google would have the case solved for her even before dinner got over.

Google never spoke of the help she gave her mother. She didn't want to stand out from the other kids. But even then she couldn't shake off her nickname. It was like her shadow. Only her parents and teachers referred to her by her real name—Georgia. Everyone else called her Google. Google is the name of the world's most popular search engine—anything you wish to know, Google has a solution; A to Z. So was Google's head. She read more books than anyone else in Jugsville, and she never slipped on a fact. Her friends said she was like a library and computer rolled into one, and much more user-friendly.

13. Google never spoke of the help she gave to her mother because _____
 1. She didn't want to take away her mother's credit.
 2. She didn't want her friends to think she was different from them.
 3. She was modest.
 4. She was proud.

14. The nickname was suitable to Georgia because _____
 1. she would share her knowledge with her friends whenever they asked her to
 2. she would remember the facts from any book
 3. she was good in solving mysteries
 4. she read a lot of books

15. Everyone thought that Georgia's mother was the smartest police chief in the country because
 1. she had a daughter called Google
 2. her daughter solved all the difficult cases for her
 3. she was very quick in solving cases
 4. she never disclosed that her daughter solved all the cases for her

16. Google was so bright because

1. she had a sharp mind	2. she read a lot of books
3. she never forgot a fact	4. all of the above

Directions for questions 17 to 21: Fill in the blanks with an appropriate option from the given choices:

17. With the aid of persistence and sincerity, one can keep the _____ of integrity burning even during dark and trying times.

1. flame	2. fire	3. bulb	4. light
----------	---------	---------	----------

18. As the highway was closed, he took a _____.

1. deviation	2. dive	3. diversion	4. digression
--------------	---------	--------------	---------------

19. Swadha was _____ with a grave crime.

1. convicted	2. accused	3. condemned	4. charged
--------------	------------	--------------	------------

20. The lovers had been meeting each other on the sly, but their _____ affair was soon revealed to everyone.

1. clandestine	2. candid	3. unknown	4. overt
----------------	-----------	------------	----------

21. The greater your thoughts and actions are allied and _____, the happier you become.

1. invincible	2. divergent	3. integrated	4. unravelled
---------------	--------------	---------------	---------------

Directions for questions 22 to 25: The following sentence has been divided into various parts, tick mark the part that contains an error:

- | | | |
|-----|------------------------------|--|
| 22. | 1. She is the fastest | 2. of the two |
| | 3. girls, that is the reason | 4. she has been selected as the captain. |
| 23. | 1. I was anxious being | 2. the first time in a few years |
| | 3. at least that I had | 4. travelled to a foreign land. |
| 24. | 1. The Chairman along | 2. with his colleagues |
| | 3. are in | 4. the restaurant. |
| 25. | 1. If the sports head | 2. allows us to lead |
| | 3. the band, Darshan, and me | 4. will have our proudest moment ever. |

Section 2: Quantitative Aptitude (25 questions in 35 minutes)

26. How much time will a train that is 200 metres in length travelling at 72 km/h take to cross a platform that is 100 metres long?
 1. 12 seconds 2. 20 seconds 3. 15 seconds 4. 10 seconds
27. Rahul is carrying a watch in which at 3 o'clock, the hour hand is pointing towards south. After 45 minutes in which direction will the minute hand be pointing?
 1. South-East 2. North 3. East 4. North-west
28. If 10% petrol in a container is replaced by kerosene and again 10% of the mixture is replaced by kerosene and again 10% of the mixture is replaced by kerosene, what is the percentage of petrol in that mixture?
 1. 76.6% 2. 64.8% 3. 72.9% 4. 70%
29. After 20 years, Bhuvan's age will be twice the age of Ajay's current age. The current age of Bhuvan is same as Ajay's age 20 years later. What is the current age of Bhuvan?
 1. 60 2. 50 3. 40 4. 30
30. $a\%$ of b is $b\%$ of ?
 1. a/b 2. $2b$
 3. a 4. depends on a and b
31. If the price of electricity increases by 15%, by what percentage should a family reduce the consumption of electricity so that the electricity bill remains same?
 1. 15% 2. 13.04% 3. 12.76% 4. 9%
32. A boy spends 1/3rd of his pocket money on food, 1/5th for petrol and 1/6th on study material. If he is left with Rs 300 in the end, what is his pocket money?
 1. Rs 500 2. Rs 1500 3. Rs 1000 4. Rs 900
33. Find the greatest number that will divide 1000, 1667, and 2258 leaving remainders 48, 35, and 14 respectively.
 1. 66 2. 67 3. 68 4. 69
34. Gurbinder created a puzzle and gave it to Meena. He inverted all 6's so that they became 9's, and asked her by how much will the sum of all numbers between 0 and 101 both excluding, change?
 1. 300 2. 330 3. 333 4. none of these

35. If all the red cards and aces are removed from a pack of cards, the sum of the values of the remaining cards is (assume a value of 11 for jack, 12 for queen, and 13 for king):
 1. 182 2. 180 3. 175 4. 166
36. One mountaineer climbs a steep hill at the rate of 5 m/min and falls down 2 m in the next minute, and continues in this manner till he reaches the top. If height of the hill is 200 m, how much time will it take to reach the top (in minutes)?
 1. 68 2. 131 3. 130 4. 67
37. Find the approximate value of the missing term. $22\% \text{ of } 526 - ? + 6.8\% \text{ of } 755 = 162.06$
 1. 2 2. 3 3. 4 4. none of these
38. A train overtakes two cars moving at 30 km/h and 60 km/h respectively in the same direction and completely passes them in 20 seconds and 30 seconds respectively. Find the speed of the train.
 1. 15 km/h 2. 120 km/h 3. 90 km/h 4. 60 km/h
39. The sum of a number and its square is 552. What is the number?
 1. 17 2. 21 3. 23 4. 26
40. In a business, X and Y invested amounts in the ratio 5 : 7 and total profit they had was Rs 35,000, how much profit did Y receive?
 1. Rs 22889 2. Rs 22368 3. Rs 21456.50 4. Rs 20416
41. The cost of milk to a milkman is Rs 30 per litre, he adds water to it and then sells it at Rs 50 per litre. What is the ratio of milk to water if his profit is 66.6%?
 1. 4 : 3 2. 3 : 2 3. 13 : 7 4. None of these
42. A certain quantity of diesel is found to be mixed to the extent of 15%. What proportion of the adulterated diesel should be replaced with pure diesel to take the purity level to 98%?
 1. 86.7% 2. 32% 3. 66.67% 4. Cannot be determined
43. Two trains starting at the same time from A and B , 300 km apart, and going in opposite directions cross each other at a distance of 130 km from one of the stations. What is the ratio of the speeds of the two trains?
 1. 30 : 13 2. 17 : 13 3. 13 : 17 4. Cannot be determined
44. A cone of 30 cm radius is mounted on the planar side of a hemisphere such that both fit exactly. Find the volume of the body formed if height of the cone is 10 cm (in cubic cm).
 1. 33,000 2. 44,000 3. 55,000 4. 66,000
45. By selling some rice at the cost price, a shopkeeper still gained 20/17%. How much less rice does he measure per kg?
 1. 250 g 2. 150 g 3. 200 g 4. None of these
46. If an article is sold at 20% loss on cost price, then what percent of selling price is the loss?
 1. 30% 2. 20% 3. 15.3% 4. 25%
47. Arjun purchased a house for Rs 320000 and a plot for Rs 200000, respectively, if he sold the house for Rs 380000 and the plot for Rs 190000, find the resultant percentage of gain or loss.
 1. 9.61% profit 2. 3.33% loss 3. 11.2% profit 4. 6.66% loss

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48. A man walks a certain distance every day. If he moved at 2 kmph, he would have taken 60 minutes more. If he had moved at 4 kmph, he would have taken 2 hours less. The distance is (in km)
1. 20 2. 14 3. 12 4. 18
49. Excluding stoppages, the speed of a train is 60 kmph and including stoppages, it is 50 kmph. How many stops does the train make in one hour assuming each stop is of one minute?
1. 5 2. 10 3. 15 4. 20
50. $\log_{10}((2A + B)/2A) = \log_6 1296 - \log_7 16807$. The value of B = ?
1. 0 2. -1 3. $1 - A$ 4. Cannot be determined

Section 3: Technical Ability (35 questions in 25 minutes)

51. Which sorting algorithm has average case complexity of $n \log n$ whereas worst case complexity as n^2 ?
1. Selection Sort 2. Merge Sort 3. Quick Sort 4. Insertion sort
52. Suppose that there are N distinct elements in a binary heap (with the maximum at the root). Which positions could possibly be occupied by the fourth largest element?
1. 1 2. 4 through 7 3. 2 or 3 4. 2 through 5
53. Which function is used to free the memory?
1. free() 2. clear() 3. destroy() 4. alloc()
54. What is true about the following C functions?
1. Need not return any value.
2. Should always return an integer.
3. Should always return a float.
4. Should always return more than one value.
55. What is output of the following code?

```
void main()
{
    int i, j, k;
    for(i=0; i<3; i++)
        k=sum(i, i);
    printf("\n%d", k);
    getch();
}
sum(s, t)
{
    static int m;
    m+=s+t;
    return m;
}
```

1. 5 2. 4 3. 7 4. 6

56. What is the output of the following code?

```
void main()
{
    int i, j, k, n=5;
    clrscr();
    for(i=5; i>0; i--)
```

```

{
j=1<i;
k=n&j;
k==0?printf("0"):printf("1");
}
getch();
}

```

- 1.** 00011 **2.** 11110 **3.** 11001 **4.** 11100

57. What is the output of the program?

```

void main()
{
int i, j, k;
i = 2;
j = 4;
k = i++ > j & 2;
printf ("%d\n", k);
if (++k && ++ i <- j || i++)
{
j=++k;
}
printf(" %d %d %d", i,-j-,k);
getch();
}

```

- 1.** 4,-3,2 **2.** 5,-3,2 **3.** 4,-2,2 **4.** 5,-2,2

58. What is the final value of x when the code for (int x = 0; x < 10; x++) { } is run?

- 1.** 10 **2.** 9 **3.** 8 **4.** 11

59. What is the data type of FILE?

- 1.** integer **2.** union **3.** pointer **4.** structure

60. What is the output of the program?

```

void main()
{
struct a
{
int i;
char *st1;
};
typedef struct a ST;
ST *str1;
str1=(ST*)malloc(100);
str1->i=200;
strcpy(str1->st1,"Welcome to Aricent");
printf(" %d%s\n",str1->i,str1->st1);
getch();
}

```

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1. core dump 2. Will not compile 3. 200, Welcome to Aricent 4. None of these
61. What is the output of the program?

```
#include<stdio.h>
#include<conio.h>
void main()
{
int i, j=20;
clrscr();
for(i=1; i<3; i++)
{
printf("%d, ", i);
continue;
printf("%d", j);
break;
}
getch();
}
```

1. 1, 20 2. 1, 2 3. 1, 20, 2, 20 4. 1, 2, 20, 20
62. A sparse matrix has _____.
1. many zero entries 2. many non-zero entries
3. higher dimension 4. none of these
63. What type of sorting does a card player do when he arranges the cards, picking one card at a time?
1. Bubble sort 2. Selection sort 3. Merge sort 4. Insertion sort
64. Linked Lists are useful for which problem?
1. Insertion sort 2. Binary search
3. Radix sort 4. Polynomial manipulation
65. Which of the following algorithms solves the all-pair shortest path problem?
1. Dijkstra's algorithm 2. Floyd-Warshall algorithm
3. Prim's algorithm 4. None of these
66. Complexity of the binary search algorithm is _____.
1. $\log_2 n$ 2. $n \log_2 n$ 3. n 4. $n/2$
67. What is the postfix equivalent of the prefix $* + ab - cd$?
1. $ab + cd - *$ 2. $abcd + - *$ 3. $ab + cd * -$ 4. $ab + - cd *$
68. What is the output of $10.5 \% 3$?
1. 1.5 2. 1 3. 0 4. Error
69. What will be the output of the following program?

```
Void main(){
    static char a[]="Aricent";
    char *b="Aricent";
    printf("\n a=%d, b=%d", sizeof(a), sizeof(b));
}
```

1. a = 8, b = 8 2. a = 8, b = 2 3. a = 2, b = 8 4. a = 7, b = 0

70. An identifier in C
1. names things such as variables and functions
 2. is made up of letters, numerals, and the underscore
 3. can contain both uppercase and lowercase letters
 4. all of these
71. A constructor that accepts _____ parameters is known as a default constructor.
1. 1
 2. 2
 3. no
 4. 3
72. Which of the following type of class allows only one object to be created?
1. Virtual class
 2. Singleton class
 3. Abstract class
 4. Friend class
73. Which of the following cannot be a friend?
1. Function
 2. Class
 3. Object
 4. Operator Function
74. ‘cout’ in C++ is a/an _____.
1. operator
 2. function
 3. object
 4. macro
75. How many types of polymorphism are supported by C++?
1. 1
 2. 2
 3. 3
 4. 4
76. Which of the following is an abstract datatype?
1. int
 2. double
 3. string
 4. class
77. Which of the following approach is adapted by C++?
1. Top-down
 2. Bottom-up
 3. Right-left
 4. Left-right
78. What happens if we try to compile the following code snippet?
- ```
class car{ }
class hondacity: protected car{ }
```
1. Code will not compile because body of class car is not defined.
  2. Code will not compile because body of class hondacity is not defined.
  3. Code will not compile because body of body class is not defined.
  4. It will compile successfully
79. Which data structure is best for reversing a string?
1. Linked List
  2. Stack
  3. Queue
  4. Array
80. What is the number of possible binary trees that can be formed by 5 nodes?
1. 42
  2. 120
  3. 80
  4. 102
81. What does JRE stands for?
1. Java Realtime Environment
  2. Java Runtime Environment
  3. Java Research Environment
  4. None of these
82. What is the command in java to compile test.java file?
1. java test
  2. javac test
  3. java test.java
  4. javac test.java
83. Which attribute of array is used to find the length of an array?
1. length
  2. size
  3. sizeof
  4. lengthof
84. Default value of int in java is \_\_\_\_\_.
1. -1
  2. 0
  3. Null
  4. None of these

85. What is the output of the following code?

```
Void main() {
 int i=0;
 printf("%d", i++);
 printf("%d", i);
 printf("%d", ++i);
}
```

1. 1 1 1      2. 1 1 2      3. 0 1 2      4. 0 0 1

#### **Section–4: Logical Reasoning (25 questions in 25 minutes)**

**Directions for questions 86 to 90:** 250 families live in a colony. 240 families read at least one of two magazines, India Today or Times Now, and 40 families read both the magazines.

86. How many families do not read any of the magazines?  
 1. 20      2. 30      3. 10      4. 12
87. How many families read exactly one magazine?  
 1. 210      2. 200      3. 240      4. 235
88. If 85 families read Times Now, find the ratio of the number of families reading Times Now to that reading India Today.  
 1. 17 : 33      2. 17 : 46      3. 17 : 39      4. 8 : 13
89. How many families do not read Times Now? (Use the information in the previous question)  
 1. 125      2. 165      3. 130      4. 105
90. If the number of families who read only Times Now is 80, what will be the ratio of number of families who read Times Now to that of India Today?  
 1. 1 : 2      2. 3 : 5      3. 3 : 4      4. 2 : 5
91. Look at this series: g3, \_\_, k8, M12, o17, ... What number should fill the blank?  
 1. i6      2. H4      3. I5      4. h3
92. X can complete the work in 8 days, what part of the work will be done in 4.5 days?  
 1. 6/13      2. 1/2      3. 9/16      4. 2

**Directions for questions 93 to 96:** Below is given a statement followed by two conclusions numbered I and II. You have to assume everything in the statement to be true, then consider the two conclusions together and decide which of them logically follows beyond a reasonable doubt from the information given in the statement.

**Give answer:**

- 1. If only conclusion I follows
  - 2. If only conclusion II follows
  - 3. If either I or II follows
  - 4. If neither I nor II follows
93. **Statements:** The best evidence of India's glorious past is the growing importance of Ayurvedic medicines in western countries.
- Conclusions:** I. Ayurvedic medicines are not famous in India.  
 II. Allopathic medicines are more famous in India.

94. **Statements:** Parents can pay any price to give an elite education to their children.  
**Conclusions:** I. All parents these days are very rich.  
 II. Parents have an obsession for the perfect development of their children through good education.
95. **Statements:** The average number of persons per household is 5 in cities whereas it is 7 in villages, the national average is 6.  
**Conclusions:** I. The population per unit area in villages is higher than in cities.  
 II. More persons live in the same household in villages as compared to those in city areas.
96. **Statements:** The best way to get away from a problem is to solve it.  
**Conclusions:** I. Your life will be boring if you don't face a problem.  
 II. To get away from problems, you should always have some solutions with you.
97. If A's speed is increased by 20%, his time to cover the journey will decrease by  
 1. 25%                    2. 23%                    3. 22%                    4. 16.66%

**Directions for questions 98 and 99:** First, you will be given a list of three "nonsense" words and their English word meanings. The question(s) that follow will ask you to reverse the process and translate an English word into the artificial language.

98. Here are some words translated from an artificial language.  
 'dirt hfe' means 'fort nix'; 'hfe spif' means 'fort cox'; 'ytew spif' means 'down cox'. Which word could mean "down fort"?  
 1. sif ytew                    2. dirt spif                    3. ytew spif                    4. hfe ytew
99. Here are some words translated from an artificial language.  
 'sdf fgf reg' means 'I am good'; 'fgf reg dsf' means 'I am bad'; 'wer try ghn' means 'truth is ugly'. Which of these could mean "good is bad"?  
 1. sdf reg dsf                    2. fdg dfg yjy                    3. reg fgf try                    4. sdf ghn dsf

**Directions for questions 100 and 101:** Each problem consists of three statements. Based on the first two statements, the third statement may be true, false, or uncertain.

100. A is younger than B.  
 B is younger than C.  
 C is younger than A.

If the first two statements are true, the third statement is \_\_\_\_\_

1. True                            2. False  
 3. Uncertain                            4. Can't be determined

101. Pens cost more than pencils.

Pens cost less than erasers.

Erasers cost more than both pencils and pens.

If the first two statements are true, the third statement is \_\_\_\_\_

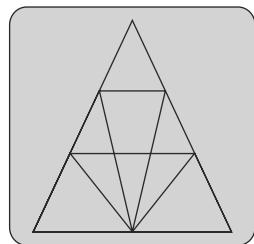
1. True                            2. False  
 3. Uncertain                            4. Can't be determined

102. Rajiv ranks 22nd in the class of 60. What is his rank from the last?

- |       |       |
|-------|-------|
| 1. 38 | 2. 40 |
| 3. 41 | 4. 39 |

103. Find the number of triangles in the given figure created by Satnam.

- |       |       |
|-------|-------|
| 1. 12 | 2. 18 |
| 3. 22 | 4. 26 |



104. Pointing to Ajay, a lady said, "The father of his brother is only son of the father of my father." How is the lady related to Ajay?

- |           |           |             |          |
|-----------|-----------|-------------|----------|
| 1. Mother | 2. Sister | 3. Daughter | 4. Niece |
|-----------|-----------|-------------|----------|

105. If 'LITHUANIA' is coded as 392831591, how will 'VIETNAM' be coded?

- |            |            |            |            |
|------------|------------|------------|------------|
| 1. 4952524 | 2. 4952514 | 3. 4953514 | 4. 3853514 |
|------------|------------|------------|------------|

106. The average weight of 20 college students increases by 1.5 kg when a new student gets enrolled. What might be the weight of the new person?

- |       |       |       |                    |
|-------|-------|-------|--------------------|
| 1. 80 | 2. 85 | 3. 90 | 4. Data Inadequate |
|-------|-------|-------|--------------------|

107. In a hall, there is sitting space for 240 men or 400 children. If 300 children have already taken the seats, how many men can be seated in the remaining space?

- |       |       |       |       |
|-------|-------|-------|-------|
| 1. 40 | 2. 60 | 3. 80 | 4. 90 |
|-------|-------|-------|-------|

108. The diameter of the circle is measured 20% more than the actual diameter by mistake, what would be increment in circle's area?

- |          |         |           |        |
|----------|---------|-----------|--------|
| 1. 4.04% | 2. 4.4% | 3. 44.44% | 4. 44% |
|----------|---------|-----------|--------|

109. 0, 2, 6, 12, 20, 30, \_\_\_\_

- |       |       |       |       |
|-------|-------|-------|-------|
| 1. 42 | 2. 36 | 3. 51 | 4. 61 |
|-------|-------|-------|-------|

110. Ajay said to a woman, "Your father's only daughter is the mother of Anjali". How is the women related to Anjali?

- |             |           |          |           |
|-------------|-----------|----------|-----------|
| 1. Daughter | 2. Sister | 3. Niece | 4. Mother |
|-------------|-----------|----------|-----------|

### Answer Key

#### Section 1: Verbal Test

- |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1. 4  | 2. 1  | 3. 3  | 4. 3  | 5. 3  | 6. 3  |
| 7. 1  | 8. 4  | 9. 1  | 10. 4 | 11. 1 | 12. 1 |
| 13. 2 | 14. 2 | 15. 3 | 16. 4 | 17. 1 | 18. 3 |
| 19. 4 | 20. 1 | 21. 3 | 22. 1 | 23. 1 | 24. 3 |
| 25. 3 |       |       |       |       |       |

#### Section 2: Quantitative Aptitude

- |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 26. 3 | 27. 2 | 28. 3 | 29. 1 | 30. 3 | 31. 2 |
| 32. 3 | 33. 3 | 34. 4 | 35. 2 | 36. 2 | 37. 4 |
| 38. 2 | 39. 3 | 40. 4 | 41. 2 | 42. 1 | 43. 4 |
| 44. 4 | 45. 4 | 46. 4 | 47. 1 | 48. 3 | 49. 2 |
| 50. 4 |       |       |       |       |       |

**Section 3: Technical Ability**

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|              |              |              |              |              |              |
|--------------|--------------|--------------|--------------|--------------|--------------|
| <b>51.</b> 3 | <b>52.</b> 2 | <b>53.</b> 1 | <b>54.</b> 1 | <b>55.</b> 4 | <b>56.</b> 2 |
| <b>57.</b> 4 | <b>58.</b> 1 | <b>59.</b> 3 | <b>60.</b> 3 | <b>61.</b> 2 | <b>62.</b> 1 |
| <b>63.</b> 4 | <b>64.</b> 1 | <b>65.</b> 2 | <b>66.</b> 1 | <b>67.</b> 1 | <b>68.</b> 4 |
| <b>69.</b> 3 | <b>70.</b> 4 | <b>71.</b> 3 | <b>72.</b> 2 | <b>73.</b> 3 | <b>74.</b> 3 |
| <b>75.</b> 2 | <b>76.</b> 4 | <b>77.</b> 2 | <b>78.</b> 4 | <b>79.</b> 2 | <b>80.</b> 1 |
| <b>81.</b> 2 | <b>82.</b> 4 | <b>83.</b> 1 | <b>84.</b> 2 | <b>85.</b> 3 |              |

**Section 4: Logical Reasoning**

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|               |               |               |               |               |               |
|---------------|---------------|---------------|---------------|---------------|---------------|
| <b>86.</b> 3  | <b>87.</b> 2  | <b>88.</b> 3  | <b>89.</b> 2  | <b>90.</b> 3  | <b>91.</b> 3  |
| <b>92.</b> 3  | <b>93.</b> 4  | <b>94.</b> 2  | <b>95.</b> 2  | <b>96.</b> 4  | <b>97.</b> 4  |
| <b>98.</b> 4  | <b>99.</b> 4  | <b>100.</b> 2 | <b>101.</b> 1 | <b>102.</b> 4 | <b>103.</b> 2 |
| <b>104.</b> 2 | <b>105.</b> 2 | <b>106.</b> 4 | <b>107.</b> 2 | <b>108.</b> 4 | <b>109.</b> 1 |
| <b>110.</b> 4 |               |               |               |               |               |

# Practice Paper 3

## (Based on Recent Question Papers of *Capgemini\**)

Total no. of questions: 65

Total duration: 80 min.

No. of sections: 3

- There is negative marking (1/4th of a mark)
- No sectional cut off

### **Section 1: Verbal Ability (15 questions in 20 minutes)**

**Directions for questions 1 to 5:** Read the following paragraph carefully and answer the questions that follow.

So, what are the better things about our civilization? Top of the list, there are order and safety. If today two men quarrel, the law makes sure that even if the physically weaker one gets beaten up, justice is at hand. The wronged one can approach the court and it will decide as fairly as it can between the two.

Might has now been substituted by right. No one may dare steal my possessions, kidnap my children, or burgle my house. That is not to say that no one does it; crimes still occur. But they are now far less frequent and one can be sure of the culprits being punished whenever the law catches up with them.

Sometimes, we may not grasp the gravity of this safety. Without it, humankind will be rendered helpless from indulging in those higher acts which enrich our civilisation. The inventor won't be able to invent, the artist to create. Therefore, safety and order, though not civilization in themselves, are as necessary to our progression as the very air we breathe. And just like the air, the modern man has grown not to notice them; until they disappear.

1. An artist can create beautiful things only if \_\_\_\_\_  
1. there is disorder                                  2. there is no safety  
3. there is safety                                      4. there is neither safety nor order
2. According to the passage, burglars are \_\_\_\_\_  
1. many                                                2. rare                                                    3. found nowhere                                    4. not punished
3. According to the writer, man does not notice order and safety as \_\_\_\_\_  
1. he does not notice the air he breathes            2. he does not notice the food he eats  
3. he does not notice the shelter he needs            4. none of the above is correct

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\* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of *Capgemini*, a leading multinational IT firm.

4. The first and foremost better things about civilization are \_\_\_\_\_  
 1. order and insecurity  
 2. only insecurity  
 3. order and safety  
 4. insecurity and lawlessness
5. In disputes between man and man \_\_\_\_\_  
 1. right has taken the place of might  
 2. might has taken the place of right  
 3. might is right  
 4. none of the above

**Directions for questions 6 to 10:** Out of the given options, find the word nearest in meaning to the original word.

6. **Grow**  
 1. Wizened                    2. Sprout                    3. Dilapidate                    4. Exasperate
7. **Imperfect**  
 1. Skimpy                    2. Prickle                    3. Flawed                            4. Bourgeois
8. **Cellar**  
 1. Basement                    2. Attic                            3. Bunker                            4. Vault
9. **Drunk**  
 1. Inebriated                    2. Abrogated                    3. Alcoholic                            4. Whimsical
10. **Cerebral**  
 1. Puerile                    2. Lucid                            3. Intellectual                            4. Inference

**Directions for questions 11 to 15:** Out of the given options, select the pair of words which have the same relationship as the capitalized pair.

11. **Agreement: Dissent**  
 1. Touchdown: Win  
 2. Concede: Resistance  
 3. Schism: Juncture  
 4. Impasse: Deadlock
12. **Hypocrisy: Honesty**  
 1. Anthropology: Philosophy  
 2. Arrogant: Notorious  
 3. Seldom: Regularly  
 4. Murder: Sincerity
13. **Valueless: Invaluable**  
 1. Expensive: Cut-rate  
 2. Miserly: Philanthropic  
 3. Avarice: Wealth  
 4. Thriftiness: Inexpensive
14. **Lively: Dull**  
 1. Affecting: Sensitive  
 2. Flower: Bloom  
 3. Employed: Jobless  
 4. Happy: Gay
15. **Taxonomist: Classify**  
 1. Haggler: Bargain  
 2. Doctor: Drug  
 3. Cash: Alms  
 4. Engineer: Architecture

## Section 2: Quantitative Aptitude (25 questions in 30 minutes)

16. If  $f(y) = |(y^2 - 40)|$ , what is the value of  $f(-6)$ ?  
 1. 5                            2. 4                            3. -6                                    4. 6

17. Each chef can prepare 3 large pizzas or 20 small pizzas per hour. The kitchen is available for 4 hours and 12 large pizzas and 400 small pizzas are needed. How many chefs are required?  
 1. 6                    2. 5                    3. 1                    4. 12
18. If  $f(y) = (y + 4) / (y - 4)$  for all integers except  $y = 4$ , which of the following has the smallest value?  
 1.  $f(0)$                 2.  $f(-1)$                 3.  $f(1)$                 4.  $f(4)$
19. If  $a$  and  $b$  are perfect cubes, which of the following will not necessarily be a perfect cube?  
 1.  $27ab$                 2.  $ab$                 3.  $ab + 8$                 4.  $64ab$
20. A gift-wrap 4 yards long is used to wrap gifts. One gift requires 16 inches of wrapping paper. What is the maximum number of gifts that can be wrapped?  
 1. 8                    2. 9                    3. 12                    4. None
21. If  $P = 24Q/(q + Q)$ , then  $Q =$   
 1.  $Pq / (24 - P)$                 2.  $Pq + P/24$                 3.  $Pq - 24$                 4.  $P/q - 24$
22. Between 1 p.m. and 3.30 p.m. the hour hand of a clock moves by \_\_\_\_\_.  
 1. 720 degrees                2. 180 degrees                3. 75 degrees                4. 65 degrees
23.  $(x + 3)(3x - 5) = px^2 + qx + r$ . What is the value of  $p - r + q$ ?  
 1. 22                    2. 8                    3. 27                    4. 10
24. If the diameter of a base of the cylinder is increased by 40%, the volume is increased by  
 1. 96%                    2. 144%                    3. 120%                    4. 40%
25. If the area of two circles is in the ratio 121: 169, then the ratio of their radii is  
 1. 10 : 11                2. 12 : 11                3. 11 : 13                4. 13 : 14

**Directions for questions 26 to 29:** In each question below is given a statement followed by two assumptions numbered I and II. Consider the statement and decide which of the given assumption/s is/are implicit. Give answer

1. if only I is implicit;
  2. if only II is implicit;
  3. If either I or II is implicit;
  4. if neither I nor II is implicit
  5. if both I and II are implicit.
26. **Statement:** It is desirable to put the child in kindergarten at the age of 3 or so.

**Assumptions:**

- I. At that age the child reaches appropriate level to learn.
- II. The kindergarten does not admit children after 3 years of age.

27. **Statement:** The government reduced customs on electronics.

**Assumptions:**

- I. The domestic market price of electronics may go up in the near future.
- II. The domestic manufacturers may not like the decision.

28. **Statement:** Because of great demand, no one will be given more than 4 tickets of the concert.

**Assumptions:**

- I. The band does not want to sell tickets.
- II. No one wants more than 4 tickets.

29. **Statement:** Airlines have decided to increase the charges by 10% in view of the possibility of incurring losses.

**Assumptions:**

- I. Airlines will go back to earlier prices.
- II. The amount generated may fulfil the loss.

30. There are 4 white balls and 3 black balls. What is the probability that when placed in a line, they are arranged alternately?
1. 1/35            2. 1/40            3. 1/50            4. 1/25
31. Two trains are 100 m apart both moving east. Speed of the first train is 15 m/s and the other train is running at 20 m/s. The faster train is running behind the slower train. Lengths of the trains are 300 m and 400 m. In how much time (seconds) will the faster train cross the slower train from now?
1. 60            2. 160            3. 40            4. 140
32. A large wooden box contains 400 studs, each of 50 g and 200 nuts each of 250 g. If the entire box weighs 87.2 kg, the weight of the empty box (kg) is
1. 12.8 kg            2. 10.8 kg            3. 17.2 kg            4. none of these
33. A car travels the first half of the distance at 60 km/h and the remaining at 80 km/h. What is the average speed (km/h) for the entire journey?
1. 70            2. 66.6            3. 68.6            4. 72.4
34. Ram is three times as old as Shyam. After 15 years, Ram will be 2 times as old as Shyam's age at that time. Hence, Ram's present age is \_\_\_\_\_.
1. 36            2. 42            3. 45            4. 48
35. Which of the following is greatest?
1. 30% of 60            2. 2/7 of 35            3. 7.5% of 150            4. Three more than the square of 4
36. Kamal weighs 25% more than Raj and 60% of Kuldeep's weight. What percentage of Kuldeep's weight is Raj's weight?
1. 70%            2. 64%            3. 50%            4. 48%
37. A number is divisible by both 4 and 7, but when it is divided by 9, it gives the remainder 2. The number is
1. 74            2. 28            3. 56            4. 92
38. Given a quadratic,  $bx^2 + cx + d = 0$   
If the ratio of the sum of the roots and the product of roots is 6 : 21, what can be the possible values of  $c$  and  $d$ ?
1.  $c = 6, d = 21$             2.  $c = 14, d = 2$             3.  $c = -4, d = -21$             4.  $c = -2, d = 7$
39. A sum of money becomes Rs 25,279 at 15% simple interest p.a. The period of investment is 3.5 years, what was the initial amount?
1. Rs 16576.3            2. Rs 15,500            3. Rs 16,300            4. Rs 18,500
40. 250 Coca-Cola bottles are placed in such a way that there are 22 bottles in the bottom row, 21 in the next row, 20 in the row next, and so on. In how many rows will 250 bottles be placed?
1. 22 rows            2. 20 rows            3. 18 rows            4. 8 rows

### Section 3: Analytical Ability (25 questions in 30 minutes)

**Directions for questions 41 to 45:** Follow the directions given below to answer the questions that follow. Your answer for each question below would be:

- A, if ALL THREE items given in the question are exactly ALIKE.
- B, if only the FIRST and SECOND items are exactly ALIKE.
- C, if only the FIRST and THIRD items are exactly ALIKE.
- D, if only the SECOND and THIRD items are exactly ALIKE.

- |                                                          |      |      |      |      |
|----------------------------------------------------------|------|------|------|------|
| 41. 03254–789, 03264–789, 03254–789                      | 1. A | 2. B | 3. C | 4. D |
| 42. vfbkaudyfv, vfbkaudyfv, vfbkavdyfv                   | 1. A | 2. B | 3. C | 4. D |
| 43. DGDHDGHDGHGGHHH , DGDHDGHDGHGDGHHH, DGDHDGHDGHGDGHHH | 1. A | 2. B | 3. C | 4. D |
| 44. 6846518218.5466, 6846513218.5466, 6846513218.5466    | 1. A | 2. B | 3. C | 4. D |
| 45. 110011010.0101, 110011010.0101, 110011010.01101      | 1. A | 2. B | 3. C | 4. D |

**Directions for questions 46 to 50:** What should come in place of the question-mark (?) in the following number series?

- |                          |          |          |          |                  |
|--------------------------|----------|----------|----------|------------------|
| 46. 1.21 4.84 10.89 ?    | 1. 18.36 | 2. 17.51 | 3. 18.20 | 4. 19.36         |
| 47. 607.5 405 ? 180      | 1. 200   | 2. 270   | 3. 355   | 4. None of these |
| 48. 14 214 3314 ? 555514 | 1. 3144  | 2. 666   | 3. 2214  | 4. 44414         |
| 49. 17 24 37 ? 65        | 1. 48    | 2. 50    | 3. 62    | 4. 64            |
| 50. 21 24 29 36 45 ?     | 1. 54    | 2. 65    | 3. 56    | 4. 54            |

**Directions for questions 51 to 55:** Read the following instructions carefully and answer the questions given below it:

From a group of five boys A, B, C, D, E and five girls F, G, H, I, J, a team of FIVE is to be selected. Some of the criteria of selection are as follows:

- A and C are in one team.
- D and I are in different teams.
- H and J are enemies.
- B goes with E.
- G and E have to be together.
- F and D are in different teams.

Unless otherwise stated, these criteria are applicable to all the following questions:

51. If the team consists of two girls and H is one of them, the other members are \_\_\_\_\_.  
 1. GBEF            2. BDGI            3. BDEG            4. ACFJ
52. If the team has TWO boys including A and C, the members of the team other than I are \_\_\_\_\_.  
 1. EJ            2. FJ            3. JH            4. FE
53. If four members are boys, which of the following cannot constitute the team?  
 1. Cannot be determined            2. ABGE  
 3. EJFC            4. None of these
54. If both D and G are members of the team and three boys in all are included in the team, the other members of the team are \_\_\_\_\_.  
 1. BEH            2. ACF            3. FIJ            4. EHF
55. Which is one of the possible team?  
 1. BCFIH            2. BDEHF            3. ACFIJ            4. ACFHG

**Directions for questions 56 to 60:** Answer the following questions based on the paragraph given below.

Four persons A, B, C, and D were playing cards, each had some money initially. Whoever lost doubled the money of the others from his share. They played 4 rounds and each person lost one round in the order A, B, C, D. At the end of the 4th round, each person had Rs. 16,000.

56. What was the amount with A to start with (in Rs)?  
 1. 37000            2. 33000            3. 14000            4. 30000
57. What was the amount with C at the end of the second round (in Rs)?  
 1. 8000            2. 18000            3. 36000            4. 9000
58. Considering all 4 rounds, who had the lowest amount always?  
 1. D            2. A            3. B            4. C
59. After first round B had (in Rs)  
 1. 34000            2. 40000            3. 36000            4. 32000
60. After second round D had (in Rs)  
 1. 8000            2. 18000            3. 36000            4. 20000

**Directions for questions 61 to 65:** Refer to the data given below and answer the questions that follow:

- (i) 6 persons A, B, C, D, E and F are sitting on a circular table facing towards centre.
- (ii) C and D are sitting opposite to each other.
- (iii) F is between C and B.
- (iv) C is between A and F.
- (v) Three of them are ladies.
- (vi) E the Lady is sitting on right of D.
- (vii) Ladies and Gentlemen are sitting alternatively.

61. Which member is sitting third to the left of D?  
 1. B            2. A            3. C            4. F
62. What is true about C and E?  
 1. C is male, E is female            2. C is male  
 3. Both are male            4. None of these
63. How many persons are seated between D and B?  
 1. 1            2. 0            3. 2            4. 3

64. Who among the following are three male members?  
1. F, D, and B      2. D, F, and C      3. D, F, and A      4. C, D and A
65. Who among the following is seated on right of E?  
1. A      2. C      3. B      4. None of these

 **Answer Key**

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**Section1: Verbal Ability**

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1. 3  | 2. 2  | 3. 1  | 4. 3  | 5. 1  | 6. 2  |
| 7. 3  | 8. 1  | 9. 1  | 10. 3 | 11. 2 | 12. 3 |
| 13. 2 | 14. 3 | 15. 1 |       |       |       |

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**Section 2: Quantitative Ability**

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 16. 2 | 17. 1 | 18. 3 | 19. 3 | 20. 2 | 21. 1 |
| 22. 3 | 23. 1 | 24. 1 | 25. 3 | 26. 1 | 27. 2 |
| 28. 4 | 29. 2 | 30. 1 | 31. 2 | 32. 3 | 33. 3 |
| 34. 3 | 35. 4 | 36. 4 | 37. 3 | 38. 4 | 39. 1 |
| 40. 2 |       |       |       |       |       |

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**Section 3: Analytical Ability**

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 41. 3 | 42. 2 | 43. 4 | 44. 4 | 45. 2 | 46. 4 |
| 47. 2 | 48. 4 | 49. 1 | 50. 3 | 51. 3 | 52. 2 |
| 53. 3 | 54. 1 | 55. 3 | 56. 2 | 57. 3 | 58. 2 |
| 59. 1 | 60. 4 | 61. 3 | 62. 4 | 63. 2 | 64. 3 |
| 65. 1 |       |       |       |       |       |

# **Practice Paper 4**

**(Based on Recent Question Papers of Cognizant\*)**

*Total no. of questions: 45*

*Total duration: 50 min.*

*No. of sections: 2*

- There is negative marking
- No sectional cut off

## **Section 1: Logical Reasoning (30 questions in 30 minutes)**

**Directions for questions 1–5:** Using the data in the table below, answer the following questions:

| DATA PROFILE                            |             |             |
|-----------------------------------------|-------------|-------------|
| PUNJAB : 2011 (Provisional)*            |             |             |
| Indicator                               | 2011 Census | 2001 Census |
| Population (in crores)                  | 2.77        | 2.44        |
| Sex Ratio                               | 895         | 874         |
| Population (0–6) (in million)           | 3.07        | 3.17        |
| Sex Ratio (0–6)                         | 846         | 961         |
| Literacy rate (above 6 years age group) |             |             |
| Overall                                 | 75.84       | 69.65       |
| Male                                    | 80.44       | 79.66       |
| Female                                  | 62.52       | 60.53       |

\*actual data from Punjab census

1. What has been the percentage rise in overall population from 2001–2011?  
1. 15.56%                  2. 13.52%                  3. 12.8%                  4. 18%
2. By how much percentage have males outnumbered women in literacy rate (for above-6 years age group) in the year 2011?  
1. 18%                  2. 28%                  3. 17%                  4. 31%

\* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of *Cognizant*, a leading multinational IT firm.

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3. What has been the percentage fall in sex ratio from 2001 to 2011 (for 0–6 years age group)?  
1. 12.8%      2. 11.9%      3. 11.2%      4. 13%
4. What is the ratio of literacy rate of male over female in the year 2001 (for above 6 years age group)?  
1. 1.3:1      2. 2.5:3      3. 1:3.5      4. none of these
5. Percentage change in population (for above 6 years age group) from 2001 to 2011?  
1. 4.2%      2. 8%      3. 6%      4. none of these

**Directions for questions 6 to 9:** Find the missing number in the series.

6. 1, 3, 15, 105, 945, \_\_\_\_.  
1. 9808      2. 8505      3. 10395      4. 12565
7. 3, 5, 10, 12, 24, 26, \_\_\_\_.  
1. 64      2. 52      3. 62      4. 78
8. 0, 5, 8, 17, 24, \_\_\_, 48.  
1. 35      2. 37      3. 36      4. 38
9. -1, 0, 7, 26, 63, \_\_\_.  
1. 78      2. 88      3. 124      4. 224
10. If  $A < B$  and  $a < b$ , which of the following is definitely false?  
1.  $A - B < a - b$       2.  $A + B < a + b$       3.  $A + B > a - b$       4. none of these

**Directions for questions 11 and 12:** Refer to the following data and answer the questions that follow:

Tam, Tim, and Tom have some coins of Re 1 each with them. Tam gave Tim and Tom the same amount of coins each of them already had. Then, Tim gave Tom and Tam the same amount of coins they already had with them at that time. Then Tom gave Tam and Tim the same amount of coins they had then. At the end all had equal amount.

11. If  $a, b, c$  are the coins initially with Tam, Tim, and Tom respectively, the number of coins Tim has at the end are \_\_\_\_.  
1.  $2(a - b - c)$       2.  $2(a - b - c)$       3.  $2(3b - a - c)$       4.  $a + b - c$
12. If the total amount of coins is 72, then the amount of coins with Tam at the starting was  
1. 20      2. 30      3. 32      4. 39
13. A square is inscribed in a circle, the length of side of square is  $a$ . What is the area of the circle?  
1.  $22a^2/7$       2.  $11a^2/7$       3.  $11a^2/14$       4.  $a^2/7$
14. On 22<sup>nd</sup> street, London, the buildings are built in such a way that they are back to back. And the building no. 20 was behind no 9. How many buildings are there on that particular street?  
1. 29      2. 30      3. 27      4. 28
15. There are 11 coins of equal value and same weight (similar looking) except 1 which is weighing more than other coins. The least number of weights required to find the heavy coin using a weighing balance is  
1. 2      2. 3      3. 4      4. 5
16. What is the product of prime numbers between 1 and 22?  
1. 1782470      2. 6729030      3. 3956827      4. 9699690

**Directions for questions 17 to 20:** Find the next term in the alphabetical series.

- |                     |        |        |        |                  |
|---------------------|--------|--------|--------|------------------|
| 17. aCCffJ Jo?      | 1. ou  | 2. oV  | 3. ou  | 4. None of these |
| 18. bAcBdCeD?       | 1. fe  | 2. fE  | 3. Fe  | 4. None of these |
| 19. BY DW FU?       | 1. JL  | 2. HT  | 3. HS  | 4. None of these |
| 20. ACB DFE GIH JK? | 1. NMO | 2. MPN | 3. MNO | 4. None of these |

**Directions for questions 21 to 25:** Each question below is followed by two statements labelled I and II. Select your answer as:

- if statement I alone is sufficient but II alone is not.
  - if statement II alone is sufficient but I alone is not.
  - if both I and II together are sufficient but neither alone is so.
  - if each statement alone is sufficient
  - if I and II are together insufficient and additional data is needed.
21. 2 months before the price of laptop was increased by 20%, what is the current price?  
 I. The cost of a laptop 2 months earlier was Rs 35500.  
 II. 20% increase on the laptop comes to Rs 5220.
22. In a certain language, ‘tre fri huy’ means ‘trees are green’. Which word means ‘green’ in that language?  
 I. ‘syr fby ksf kld’ means ‘his pants are green’.  
 II. ‘syr fby jks’ means ‘green are leaves’.
23. In a code, ‘yoo rur tee’ means ‘I love you’. What is the code for ‘love’?  
 I. ‘yoo tee wuw’ means ‘I hate you’.  
 II. ‘yoo foi’ means ‘love all’.
24. How many people attended the concert?  
 I. One ticket holder can take a maximum of 3 persons with him/her.  
 II. A total of 453 tickets were sold.
25. What was the company’s revenue in a year?  
 I. The company sold 80 laptops worth Rs 2500000 in that year.  
 II. This company only makes laptops.
26. The average age of a three-member family fell by 10 when a child was born in the family. After 10 years, one member of the family dies and the average age falls to 33.33. What was the age of the member of the family when he/she died?  
 1. 60                    2. 50                    3. 55                    4. 70
27. The marked price of a toy is Rs 300. After giving 20% + 20% discount, the owner still earns a 10% profit. What is the cost price of the product?  
 1. Rs 174.50            2. Rs 176.50            3. Rs 192                    4. None of these

**Direction for Questions 28 to 30:** Gerrard, Xavi, Ronaldo, and Rooney were playing poker. The rule is that the loser in each game will double other's money. Xavi, Ronaldo, and Rooney lost in the same order. After 3 games, the amount Gerrard and Xavi had was 80 each, Rooney had 32, and Ronaldo had 160.

28. Who started with the least money?  
 1. Gerrard      2. Xavi      3. Ronaldo      4. Rooney
29. Who started with the maximum amount?  
 1. Gerrard      2. Xavi      3. Ronaldo      4. Rooney
30. What amount did Xavi start with?  
 1. 186      2. 167      3. 190      4. 200

## Section 2: Verbal Ability (15 questions in 20 minutes)

**Directions for questions 31 and 32:** Out of the given options, choose the one which is most nearly the same in meaning as the underlined word and replace it without altering the meaning of the sentence.

31. The head of the nunnery wasn't popular, but no one could question her moral chastity.  
 1. rectitude      2. tilt      3. demagogue      4. beliefs
32. The album got rave reviews from all the industry critics.  
 1. devastating      2. enthusiastic      3. foiled      4. defeated
33. The following sentence is divided into 4 parts. One of the parts has an error. Select that part as the answer.  
 1. They are as      2. bad if not      3. worse than the      4. rest
34. Find the correctly spelt word.  
 1. Omineous      2. Ominoeous      3. Ominous      4. Ommenous

**Directions for questions 35 and 36:** In each of the following sentences, a word or phrase is underlined. Out of the given options, select the word or phrase that replaces the underlined word/phrase.

35. There are barely such people who are so acclaimed that they are commonly referred to by their short names only.  
 1. initials      2. images      3. last names      4. signatures
36. If he would have paid attention, this debacle wouldn't have been possible.  
 1. would have paid attention      2. would pay attention  
 3. had paid attention      4. paid attention

**Directions for questions 37 to 40:** In the questions below, the passage consists of six sentences. In some questions, the first and sixth sentences are given at the beginning and at the end respectively. The middle four sentences in each have been removed and jumbled up. These are labelled as P, Q, R, and S. Find out the proper order for the four sentences.

37. S1: For a brief period in his youth, Abraham Lincoln was managing a shop.  
 P : And then a chance customer would come by.  
 Q : His way of keeping the shop was wholly unlike anyone else's.  
 R : Lincoln would quickly jump up, attend to their needs, and then revert to his reading.  
 S : He would lie down full length on the shop counter idly reading books.  
 S6: Never before had he had so much free time for reading as then.
1. SRQP      2. QSPR      3. SQRP      4. QPSR

38. P: But when hundreds gathered on September 15th, in front of a parking garage next to Microsoft's office, it was to protest against the "Windows Tax".  
 Q: Customers who use any other operating system, such as Linux, ought to get a refund.  
 R: Usually, when Silicon Valley nerds stage such a demonstration, it is to show off their latest technology.  
 S: Computer users, they contend, have paid dues to Microsoft, as almost all PCs are installed with Windows.
1. SRQP                  2. RPSQ                  3. PQRS                  4. QSRP
39. S1: For decades, the American soil has been termed as a melting pot  
 P : Differences remained though—in speech, customs, appearances, beliefs, and more.  
 Q : The phrase has long been a cliché and more of a half-truth.  
 R : But homogenization was never attained.  
 S : Yes, immigrants from assorted cultures did cast off the vestiges of their native lands and became almost unnoticeably woven in to the American fabric.  
 S6: In recent times, these differences – accentuated by the arrival of immigrants from Asia and other parts of the world – have become something to nurture, to celebrate.
1. QRSP                  2. SQRP                  3. SQPR                  4. QSRP
40. P: Regrettably, today, there is mounting evidence of bias and discrimination against minorities in the country.  
 Q: Even as the rest of the globe makes swift progress in science, we Indians continue to struggle with issues like personal laws, religions, castes, and languages.  
 R: Equality and dignity form the bedrock on which the Indian constitution stands firm and from which the fabric of democracy flows.  
 S: Although the facts prove to be fallacious, a myth has been successfully created about Muslim appeasement.
1. PQSR                  2. SRQP                  3. QPRS                  4. RPQS

**Directions for questions 41 and 42:** Out of the given options, choose the one that best expresses the given sentence in passive voice.

41. After driving professor Syed to the museum, she dropped him at his hotel.  
 1. Professor Syed was being driven dropped at his hotel.  
 2. After being driven to the museum, Professor Syed was dropped at his hotel.  
 3. After she was driven Professor Syed to the museum she had dropped him at his hotel.  
 4. After she had driven Professor Syed to the museum she had dropped him at his hotel.
42. Do you appreciate others?  
 1. Are others being appreciated by you?                  2. Are others appreciated by you?  
 3. Have others being appreciated by you?                  4. Were others being appreciated by you?
43. Choose the word which is the exact OPPOSITE of the given word: GARISH  
 1. Shiny                  2. Natural                  3. Decorative                  4. Gaudy
44. In the question below, a sentence is broken into five or six parts. Join these parts to make a meaningful sentence:  
 1. was                  2. and                  3. Ishan                  4. rich  
 5. generous  
 1. 31425                  2. 54213                  3. 34251                  4. 15243

45. A part of the sentence is underlined. Below are given alternatives to the underlined part which may improve the sentence Choose the correct alternative.

Had I realized how close I was to signing it, I would not have gone for a vacation.

1. Had I realized how close                            2. If I would have realized  
3. Had I realize how close                            4. When I realized how close

### **Answer Key**

#### **Section 1: Logical Reasoning**

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|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1. 2  | 2. 1  | 3. 2  | 4. 1  | 5. 4  | 6. 3  |
| 7. 2  | 8. 2  | 9. 3  | 10. 4 | 11. 3 | 12. 4 |
| 13. 2 | 14. 4 | 15. 2 | 16. 4 | 17. 1 | 18. 2 |
| 19. 3 | 20. 4 | 21. 4 | 22. 5 | 23. 4 | 24. 5 |
| 25. 3 | 26. 1 | 27. 1 | 28. 1 | 29. 2 | 30. 1 |

#### **Section 2: Verbal Ability**

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|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 31. 1 | 32. 2 | 33. 2 | 34. 3 | 35. 1 | 36. 3 |
| 37. 2 | 38. 2 | 39. 4 | 40. 4 | 41. 2 | 42. 2 |
| 43. 2 | 44. 1 | 45. 1 |       |       |       |

# Practice Paper 5

(Based on Recent Question Papers of Convergys\*)

Total no. of questions: 75

Total duration: 85 min.

No. of sections: 3

- There is negative marking ( 1/3<sup>rd</sup> of a mark)
- No sectional cut off

## Section 1: Logical Reasoning (20 questions in 30 minutes)

**Directions for questions 1 to 5:** A cuboid is cut such that two equal cubes of  $6 \times 6 \times 6$  are formed. The opposite faces of the 1<sup>st</sup> cube are coloured red, blue, and green. The opposite faces of the 2<sup>nd</sup> cube are coloured red, black, and yellow. Then, both the cubes are cut into 216 small cubes each of  $1 \times 1 \times 1$  dimensions.

1. How many small cubes have only two coloured faces?  
1. 64                  2. 96                  3. 72                  4. 48
2. How many small cubes have no coloured face at all?  
1. 120                  2. 240                  3. 162                  4. 128
3. How many small cubes have only one face coloured red?  
1. 64                  2. 32                  3. 16                  4. 128
4. How many small cubes have only two faces coloured, one face red and another green?  
1. 16                  2. 64                  3. 32                  4. 8
5. What is the number of small cubes with at least one red face?  
1. 128                  2. 186                  3. 232                  4. 144

**Directions for questions 6 to 9:** P, Q, R, S, T, and U are standing in a row facing east. T is standing to the left of Q. R is standing to the left of T, but U is to the right of T. Q is between U and P. R is at extreme end. S is to the right of Q. P is to the right of U.

6. Where is P standing?  
1. Extreme right.          2. Extreme left.          3. Right of S          4. Right of Q
7. U is standing between  
1. T and Q          2. Q and P          3. Q and S          4. R and T

\* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of Convergys, a leading multinational IT firm.

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8. Which of the following statements is true?
1. T is to the immediate left of Q.
  2. T is at one of the ends.
  3. Q is second to the left of S.
  4. R is to the immediate right of T.
9. Who are to the right of U?
1. Q, P
  2. Q, P, and T
  3. Q, P, and S
  4. Q, R, T and P

**Directions for questions 10 and 11:** If A & B means B is the father of A, A ? B means A is the sister of B, A @ B means A is the father of B then

10. Which of the following relates L as B's father?
1. B @ L ? P
  2. L ? P @ B
  3. B ? P @ L
  4. None of these
11. Which of the following relates X as G's granddaughter?
1. G& B @ F @ X
  2. X ? B & F & G
  3. B @ F \$ @& X
  4. X& B @ F @ G

**Directions for questions 12 to 15:** 6 Students are studying in a library sitting on a circular table. Deepika is sitting adjacent to Pragya. Preety is between Mahesh and Laddo. Ishan is sitting right to Mahesh. Pragya and Mahesh are sitting opposite each other.

12. Who is sitting on the left of Preety?
1. Deepika
  2. Pragya
  3. Laddo
  4. Ishan
13. Who is sitting between Pragya and Ishan?
1. Deepika
  2. Laddo
  3. Mahesh
  4. They are adjacent
14. Who are the neighbours of Laddo?
1. Pragya and Preety
  2. Preety and Deepika
  3. Laddo and Mahesh
  4. Mahesh and Preety
15. If Deepika turns her chair away from centre, then who will be on her left?
1. Laddo
  2. Mahesh
  3. Preety
  4. Pragya
16. In a party of 50 people, 15 were drinking alcohol, 25 were drinking juice, and 10 were drinking both. What is the probability that a randomly chosen person was drinking alcohol?
1. 40%
  2. 35%
  3. 30%
  4. 25%
17. 3, 8, 15, 24, 35,?
1. 55
  2. 41
  3. 65
  4. 48
18. 1, 5, 13, 25, 41,?
1. 72
  2. 65
  3. 61
  4. 68
19. AEB, BGC, CID, ?
1. DJE
  2. DLE
  3. DKE
  4. DME
20. If P is to the east of Q, N is to the north of Q, R is to the east of N, and T is to the south east of Q then T is to which direction of P?
1. South
  2. North-West
  3. North-East
  4. South-East

**Section 2: Technical Ability (40 questions in 40 minutes)**

21. `Float_ptr = new float[100]`  
In order to deallocate this memory, use \_\_\_\_\_.

1. delete float\_ptr  
3. deletefloat\_ptr [100]
22. cin, cout are \_\_\_\_\_.  
1. Class      2. Methods
23. What will be output of the following code?  
`cout<<(cout<< "Hello" )<< "World"`  
1. World      2. Hello World      3. Hello Hello World      4. None of these
24. What is the output of the following code?  
`i=0;  
a = 1;  
b = 4;  
swap(int a, intb)  
{  
int temp;  
temp = a;  
a = b;  
b = a;  
i = 1;  
}  
  
printf("%d%d%d",a,b,i);`  
1. 1 4 0      2. 0 4 1      3. 1 4 1      4. Error
25. If Class B is the subclass of Class A, which of the following describes the relationship?  
1. \_ is a      2. \_ has a \_      3. \_ implemented as \_      4. None of these
26. Which of the following is not a storage class in C?  
1. Static      2. Auto      3. Register      4. Intern
27. Which of the following is used to assign numeric value to a non-numeric variable?  
1. define      2. function      3. pointer      4. enum
28. What is used to override base class function?  
1. Override      2. New      3. Virtual      4. Friend
29. Runtime polymorphism is achieved by using \_\_\_\_\_.  
1. friend functions      2. function overloading  
3. virtual functions      4. none of these
30. Which one is not a command in tcl?  
1. COMMIT      2. ROLLBACK      3. SAVEPOINT      4. REVOKE
31. What does I stand for in ACID property of Data Base?  
1. Isolation      2. independence      3. Integrity      4. None of these
32. BCNF is also known as \_\_\_\_\_.  
1. 3NF      2. 3.5 NF      3. 4NF      4. None of these
33. Which of the following is not a DBMS language?  
1. DDL      2. DML      3. SDL      4. TCL

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34. 5th Normal Form depends upon \_\_\_\_\_.  
1. multivalued dependency      2. functional dependency  
3. transitive dependency      4. none of these
35. How many types of locks are used in a database?  
1. 1      2. 2      3. 3      4. 4
36. The set of permitted values which an attribute can take is known as \_\_\_\_\_.  
1. domain      2. tuple      3. relation      4. schema
37. In wound-wait and wait-die, which of the following is true?  
1. The younger process always waits.      2. The older process always waits.  
3. The younger process always dies.      4. The older process always dies.
38. If a binary tree has  $N$  internal nodes then the total number of nodes in the tree is \_\_\_\_\_.  
1.  $N(N+1)$       2.  $2N$       3.  $2N + 1$       4.  $2(N+1)$
39. The postfix expression for  $*+pq-rs$  is \_\_\_\_\_.  
1.  $pq+rs-$  \*      2.  $pqrs+-*$       3.  $pq^*+rs-$       4.  $pq+-rs^*$
40. Java Byte code is dependent of \_\_\_\_\_.  
1. Java platform      2. operating system      3. IDE      4. none of these
41. What was the first name given to the Java programming language?  
1. Oak - Java      2. Small Talk      3. Oak      4. None
42. When a ‘C’ function call is made, the order in which parameters passed to the function are pushed into the stack is  
1. left to right  
2. right to left  
3. bigger variables are moved first than the smaller variables  
4. smaller variables are moved first than the bigger ones
43. The command grep first second third/usr/you/myfile?  
1. prints lines containing the words first, second or third from the file /usr/you/myfile  
2. searches for lines containing the pattern first in the files second, third, and /usr/you/myfile and prints them  
3. searches the files /usr/you/myfile and third for lines containing the words first or second and prints them  
4. replaces the word first with the word second in the files third and /usr/you/myfile
44. The redirection operators > and >>?  
1. do the same function  
2. differ : > overwrites, while >> appends  
3. differ : > is used for input while >> is used for output  
4. differ : > write to any file while >> write only to standard output
45. Routers are \_\_\_\_\_ layer devices.  
1. network      2. physical      3. transport      4. datalink
46. What is the output of the following code?  

```
int *p, *q;
p=(int *)1000;
```

- q=(int \*)2000;  
 printf("%d", (q-p))  
**1.** 1000                   **2.** 500                   **3.** 250                   **4.** 100
47. Find the number of iterations of the following loop.  
 for(i=1;i<10;i++){  
 i=i+2;  
}  
**1.** 2                   **2.** 5                   **3.** 4                   **4.** 3
48. What will be the output of the following code?  
{ int a=5,b=10;  
a=a++;  
b=b++;  
printf("%d,%d",a,b);}  
**1.** 5 10                   **2.** 5,10                   **3.** 6 10                   **4.** 6,10
49. What is the output of the following code?  
int a =5, b =10, c =15;  
intarr[3]={&a, &b, &c};  
cout<<\*arr[\*arr[1]-8];  
return0;  
**1.** 10                   **2.** 15                   **3.** garbage value           **4.** Compile time error
50. What will be the output of the following code?  
int \*p,b;  
b=sizeof(p);  
printf("%d",b);  
**1.** 2                   **2.** 4                   **3.** runtime error           **4.** compile time error
51. What is the output of the following code?  
chararr[10];  
arr="world";  
printf("%s",arr);  
**1.** World                   **2.** Garbage Value  
**3.** Runtime Error           **4.** Compile Time Error
52. What is the output of the following code?  
int a=10;  
void \*p=&a;  
int \*ptr=p;  
printf("%u",\*ptr);

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1. 10

3. Runtime Error

2. garbage value

4. Compile Time Error

53. What is the output of the following code?

```
register a=10;
int *p;
p=&a;
printf("%d", *p);
return 1;
```

1. 10

3. Runtime Error

2. garbage value

4. Compile Time Error

54. What is the output of the following code?

```
int a=10;
int *p;
p=&a;
printf("%d", *p);
return 1;
```

1. 10

3. Runtime Error

2. garbage value

4. Compile Time Error

55. What is the output of the following code?

```
int a=10, b=0;
b=++a + ++a + ++a;
printf("%d, %d", a, b);
```

1. 13,36

2. 13,30

3. 13,37

4. Runtime error

56. What will be the output of the following code?

```
printf(5+"Hello world\n");
```

1. Hello

3. World

2. Hello world

4. Compile Time error

57. What is the output of the following code?

```
class B {
public: void display() {
cout<<"Content of base class.\n";
}
};
class D : public B {
public: void display() {
cout<<"Content of derived class.\n";
} };
```

```

int main() {
 B *b;
 D d;
 b = &d;
 b->display(); return 0;
}

```

1. Content of derived class  
 2. Content of base class  
 3. Compile Time error  
 4. Runtime Error
58. Write a program to multiply two matrices.  
 59. Write a program which can reverse a linked list in  $O(n)$  time complexity?  
 60. Write a program to remove duplicate values from an array.

### Section 3: Verbal Ability (15 questions in 15 minutes)

**Directions for questions 61 to 75:** The passages given below contain blanks, each blank has been numbered. Against each number, four choices have been suggested. Select the most appropriate option as the correct answer.

Earth, currently, remains the sole place humankind knows of in the universe that can sustain human life. (61) ... human choices and actions are rendering the planet less fit to live on. As the western population (62) ... on devouring two-thirds of the planet's resources. While one half of the populace do so (63) ... to stay alive we are swiftly ravaging the (64) ... support system we have on which everyone can survive; nay, thrive. In almost all places, fertile soil is (65) ... being built on or washed away into the sea. Renewable resources are being depleted so much that we will never be able to recover (66) ... Our systems discharge pollutants into the environment without a single thought of the consequences. As a (67) ... the earth's ability to support humankind is being (68) ... at the very time when an inflating human count and consumption are (69) ... progressively heavy demands on it. The earth's (70) ... resources can't be available forever for us to use. We need water, food, air, medicines, shelter, energy, and minerals to (71) ... us healthy, alive, and comfortable. If we are judicious in how we use these gifts they will (72) ... indefinitely. But if we use them thoughtlessly and wastefully, they will soon run out and everyone will suffer.

- |                    |               |             |               |
|--------------------|---------------|-------------|---------------|
| 61. 1. Although    | 2. Still      | 3. Yet      | 4. Despite    |
| 62. 1. continues   | 2. repeats    | 3. carries  | 4. follows    |
| 63. 1. already     | 2. just       | 3. for      | 4. entirely   |
| 64. 1. alone       | 2. individual | 3. lone     | 4. only       |
| 65. 1. sooner      | 2. neither    | 3. either   | 4. rather     |
| 66. 1. quite       | 2. greatly    | 3. utterly  | 4. completely |
| 67. 1. development | 2. result     | 3. reaction | 4. product    |
| 68. 1. stopped     | 2. narrowed   | 3. reduced  | 4. cut        |
| 69. 1. doing       | 2. having     | 3. taking   | 4. making     |
| 70. 1. natural     | 2. real       | 3. living   | 4. genuine    |
| 71. 1. hold        | 2. maintain   | 3. stay     | 4. keep       |
| 72. 1. last        | 2. stand      | 3. go       | 4. remain     |

Most of us are born with a natural ability to weave and/or narrate stories, but only a rare minority have the fortitude to embrace it professionally, and even fewer actually can experience the elation of seeing their books top the (73) ... of bestsellers. Some of the famous crime writers have accomplished the (74) ... success ever. Who can (75) ... the fascination of famous detectives like Sherlock Holmes or Hercule Poirot? Even if you aren't someone who has read the original books, you will have surely seen them on TV or on the silver screen.

- |                |             |            |          |
|----------------|-------------|------------|----------|
| 73. 1. queue   | 2. list     | 3. row     | 4. line  |
| 74. 1. largest | 2. greatest | 3. highest | 4. prime |
| 75. 1. deny    | 2. refuse   | 3. insist  | 4. hide  |

### **Answer Key**

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#### **Section 1: Logical Reasoning**

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- |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1. 2  | 2. 4  | 3. 1  | 4. 1  | 5. 4  | 6. 4  |
| 7. 1  | 8. 3  | 9. 3  | 10. 4 | 11. 2 | 12. 3 |
| 13. 1 | 14. 1 | 15. 4 | 16. 3 | 17. 4 | 18. 3 |
| 19. 3 | 20. 1 |       |       |       |       |

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#### **Section 2: Technical Ability**

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- |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 21. 2 | 22. 3 | 23. 2 | 24. 1 | 25. 1 | 26. 4 |
| 27. 4 | 28. 3 | 29. 3 | 30. 4 | 31. 1 | 32. 2 |
| 33. 4 | 34. 1 | 35. 2 | 36. 1 | 37. 3 | 38. 3 |
| 39. 1 | 40. 1 | 41. 1 | 42. 2 | 43. 2 | 44. 2 |
| 45. 1 | 46. 3 | 47. 4 | 48. 4 | 49. 4 | 50. 2 |
| 51. 4 | 52. 1 | 53. 4 | 54. 1 | 55. 3 | 56. 3 |
| 57. 2 |       |       |       |       |       |

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#### **Section 3: Verbal Ability**

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- |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 61. 3 | 62. 3 | 63. 2 | 64. 4 | 65. 3 | 66. 4 |
| 67. 2 | 68. 3 | 69. 4 | 70. 1 | 71. 4 | 72. 1 |
| 73. 2 | 74. 2 | 75. 1 |       |       |       |

# **Practice Paper 6**

**(Based on Recent Question Papers of CSC\*)**

*Total no. of questions: 110*

*Total duration: 80 min.*

*No. of sections: 2*

- There is negative marking ( 1/3<sup>rd</sup> of a mark)
- No sectional cut off

## **Section 1: Technical Ability (70 questions in 40 minutes)**

1. In immediate addressing mode, the immediate data is \_\_\_\_\_.  
1. constant data      2. variable data      3. symbolic data      4. 1 and 3 both
2.  $0001 \times 101 =$  \_\_\_\_\_.  
1. 101101      2. 1010101      3. 100101      4. 101010.
3. The operating system that reads and reacts in terms of actual time is \_\_\_\_\_.  
1. batch system      2. quick response system  
3. real time system      4. time sharing system
4. Which of the following is a spreadsheet package?  
1. Corel Draw      2. Wordstar      3. EXCEL      4. MS-WORD
5. The *Find and Replace* option is placed under the \_\_\_\_\_ menu.  
1. Edit      2. Insert      3. View      4. File
6. Which of the following types of memory loses data when power is switched off?  
1. Magnetic tape      2. Static random access memory  
3. Magnetic disk      4. CD-ROM
7. The instructions/programs that are loaded into the main memory when a computer is booted are \_\_\_\_\_.  
1. internal commands      2. external commands      3. utility programs      4. loader
8. The \_\_\_\_\_ unit coordinates the sequencing of events within the central processor of a computer.  
1. logic unit      2. arithmetic unit      3. storage unit      4. control unit

---

\* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of CSC, a leading multinational IT firm.

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9. What is the output of the following program?

```
main ()
{ int x = 2, y = 5;
if (x < y) return (x = x+y); else printf ("z1");
printf("z2");
}
```

1. z2                  2. z1z2                  3. Compilation error                  4. None of these

10. Choose the correct option:

1. Address operator cannot be applied to register variables.
2. Address operator can be applied to register variables.
3. Use of register declaration will increase the execution time.
4. None of the above.

11. What is the following program doing?

```
main ()
{ int d = 1;
do
printf("%d\n", d++);
while (d <= 9);
```

1. Adding 9 integers                  2. Adding integers from 1 to 9
3. Displaying integers from 1 to 9                  4. None of these

12. If  $x$  is a one-dimensional array then pick up the correct answer.

1.  $*(\text{x} + \text{i})$  is same as  $\&\text{x}[\text{i}]$                   2.  $*\&\text{x}[\text{i}]$  is same as  $\text{x} + \text{i}$
3.  $*(\text{x} + \text{i})$  is same as  $\text{x}[\text{i}] + 1$                   4.  $*(\text{x} + \text{i})$  is same as  $*\text{x}[\text{i}]$

13. Consider the following code segment.

```
int a[10] , *p1, *p2;
p1 = &a[4] ;
p2 = &a[6] ;
```

Which of the following statements is incorrect with respect to pointers?

1.  $p1 + 2$                   2.  $p2 - 2$                   3.  $p2 + p1$                   4.  $p2 - p1$

14. In the for statement: `for (exp1; exp2; exp3) { ... }` where `exp1`, `exp2`, and `exp3` are expressions, what is optional?

1. None of the expressions is optional.
2. Only `exp1` is optional.
3. Only `exp1` and `exp3` are optional.
4. All the expressions are optional.

15. The output of the following code segment will be\_\_\_\_\_.

```
char x = 'B';
switch (x) {
case 'A': printf("a");
```

```

case 'B': printf("b");
case 'C': printf("c");
}

```

- 1.** B                  **2.** b                  **3.** BC                  **4.** bc

16. What will be the output of the following code segment?

```

main() {
char s[10] ;
strcpy(s, "abc");
printf("%d %d", strlen(s), sizeof(s));
}

```

- 1.** 3 10                  **2.** 3 3                  **3.** 10 3                  **4.** 10 10

17. Which of the following is the odd one out?

- 1.** j = j + 1;                  **2.** j = + 1;                  **3.** j ++;                  **4.** j += 1;

18. Which is not a dynamic memory allocation function?

- 1.** malloc                  **2.** free                  **3.** alloc                  **4.** calloc

19. Which header file is used for screen-handling function?

- 1.** IO.H                  **2.** STDLIB.H                  **3.** CONIO.H                  **4.** STDIO.H

20. Choose the directive that is used to remove previously defined definition of the macro name that follows it.

- 1.** #remdef                  **2.** # pragma                  **3.** # undef                  **4.** # define

21. The output of the following is \_\_\_\_\_.

```
x = 'a';
```

```
printf("%d", x);
```

- 1.** 'a'                  **2.** a                  **3.** 97                  **4.** None of the above

22. Consider the following statement:

```

int j, k, p;
float q, r, a;
a = j/k;
p=q/r;

```

If q = 7.2, r = 20, j = 3, k = 2

The value of a and p is

- 1.** a = 1.5, p = 3.6                  **2.** a = 2, p = 3                  **3.** a = 1.5, p = 4                  **4.** a = 1, p = 3

23. Choose the function that returns the remainder of x/y .

- 1.** remainder( )                  **2.** mod( )                  **3.** modulus( )                  **4.** rem( )

24. What is the output of the following program?

```
int q, *p, n;
```

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q = 176; If the address of q is 2801

p = &q; and p is 2600

n = \*p;

printf("%d", n);

1. 2801

2. 176

3. 2600

4. None of the above

25. Consider the following statements.

x = 5;

y = x > 3 ? 10 : 20;

The value of y is

1. 10

2. 20

3. 5

4. 3

26. In Reverse Polish notation, expression  $A*B + C*D$  is written as \_\_\_\_\_.

1.  $AB*CD*+$

2.  $A*BCD*+$

3.  $AB*CD+*$

4.  $A*B*CD+$

27. SIMD represents an organization that \_\_\_\_\_.

1. refers to a computer system capable of processing several programs at the same time

2. represents organization of single computer containing a control unit, process or unit and a memory unit

3. includes many processing units under the supervision of a common control unit

4. none of the above

28. Floating-point representation is used to store \_\_\_\_\_.

1. Boolean values

2. whole numbers

3. real integers

4. integers

29. Suppose that a bus has 16 data lines and requires 4 cycles of 250 ns each to transfer data. The bandwidth of this bus would be 2 Megabytes/second. If the cycle time of the bus was reduced to 125 ns and the number of cycles required for transfer stayed the same what would the bandwidth of the bus?

1. 1 Megabyte/second

2. 4 Megabytes/second

3. 8 Megabytes/second

4. 2 Megabytes/second

30. Assembly language \_\_\_\_\_.

1. uses alphabetic codes in place of binary numbers used in machine language

2. is the easiest language to write programs

3. need not be translated into machine language

4. None of these

31. In computers, subtraction is generally carried out by \_\_\_\_\_.

1. 9's complement

2. 10's complement

3. 1's complement

4. 2's complement

32. The amount of time required to read a block of data from a disk into memory is composed of seek time, rotational latency, and transfer time. Rotational latency refers to

1. the time it takes for the platter to make a full rotation

2. the time it takes for the read-write head to move into position over the appropriate track

3. the time it takes for the platter to rotate the correct sector under the head

4. none of the above

33. What characteristic of RAM memory makes it not suitable for permanent storage?

1. Too slow

2. Unreliable

3. It is volatile

4. Too bulky

34. Computers use addressing mode techniques for \_\_\_\_\_.  
 1. giving programming versatility to the user by providing facilities as pointers to memory counters for loop control  
 2. to reduce number of bits in the field of instruction  
 3. specifying rules for modifying or interpreting address field of the instruction  
 4. all the above
35. The circuit used to store one bit of data is known as \_\_\_\_\_.  
 1. register            2. encoder            3. decoder            4. flip-flop
36. (2FAOC)16 is equivalent to \_\_\_\_\_.  
 1. (195 084)10  
 2. (00101111010 0000 1100)2  
 3. Both 1 and 2  
 4. None of these
37. The average time required to reach a storage location in memory and obtain its contents is called the \_\_\_\_\_.  
 1. seek time            2. turnaround time            3. access time            4. transfer time
38. Which of the following is not a weighted code?  
 1. Decimal number system  
 2. Excess 3-code  
 3. Binary number system  
 4. None of these
39. The idea of cache memory is based \_\_\_\_\_.  
 1. on the property of locality of reference  
 2. on the heuristic 90–10 rule  
 3. on the fact that references generally tend to cluster  
 4. all of the above
40. The \_\_\_\_\_ register keeps track of the instructions stored in program stored in memory.  
 1. AR (Address Register)  
 2. XR (Index Register)  
 3. PC (Program Counter)  
 4. AC (Accumulator)
41. The addressing mode used in an instruction of the form ADD X Y, is \_\_\_\_\_.  
 1. absolute            2. indirect            3. index            4. none of these
42. The most important feature of the spiral model is \_\_\_\_\_.  
 1. requirement analysis  
 2. risk management  
 3. quality management  
 4. configuration management
43. The worst type of coupling is \_\_\_\_\_.  
 1. data coupling  
 2. control coupling  
 3. stamp coupling  
 4. content coupling
44. IEEE 830-1993 is the IEEE recommended standard for \_\_\_\_\_.  
 1. software requirement specification  
 2. software design  
 3. testing  
 4. both 1 and 2
45. One of the fault-base testing techniques is \_\_\_\_\_.  
 1. unit testing            2. beta testing            3. stress testing            4. mutation testing
46. Changes made to an information system to add the desired but not necessarily the required features is called \_\_\_\_\_.  
 1. preventative maintenance  
 2. adaptive maintenance  
 3. corrective maintenance  
 4. perfective maintenance

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47. All the modules of the system are integrated and tested as complete system in the case of \_\_\_\_\_.  
1. bottom-up testing    2. top-down testing    3. sandwich testing    4. big-bang testing
48. A fault simulation testing technique is \_\_\_\_\_.  
1. mutation testing                      2. stress testing  
3. black-box testing                      4. white-box testing
49. If the modules X and Y operate on the same input and output data then the cohesion is \_\_\_\_\_.  
1. sequential                              2. communicational                              3. procedural                              4. logical
50. If the objects focus on the problem domain then we are concerned with \_\_\_\_\_.  
1. object-oriented analysis                      2. object-oriented design  
3. object-oriented analysis and design              4. none of the above
51. SRS is also known as specification of \_\_\_\_\_.  
1. white-box testing                              2. stress testing  
3. integrated testing                              4. black-box testing
52. Which of the following relational algebra operations do not require the participating tables to be union-compatible?  
1. Union                                      2. Intersection                              3. Difference                              4. Join
53. Which of the following is not a property of transactions?  
1. Atomicity                                      2. Concurrency                              3. Isolation                                      4. Durability
54. Relational algebra does not have \_\_\_\_\_.  
1. selection operator                              2. projection operator  
3. aggregation operators                              4. division operator
55. Checkpoints are a part of \_\_\_\_\_.  
1. recovery measures                              2. security measures  
3. concurrency measures                              4. authorization measures
56. Tree structures are used to store data in the \_\_\_\_\_.  
1. network model                                      2. relational model  
3. hierarchical model                                      4. file-based system
57. The language that requires a user to specify the data to be retrieved without specifying exactly how to get it is  
1. Procedural DML                                      2. Non-Procedural DML  
3. Procedural DDL                                      4. Non-Procedural DDL
58. Precedence graphs help to find a  
1. serializable schedule                              2. recoverable schedule  
3. deadlock-free schedule                              4. cascadeless schedule
59. The rule that a value of a foreign key must appear as a value of some specific table is called a  
1. referential constraint                              2. index  
3. integrity constraint                                      4. functional dependency
60. The clause in SQL that specifies that the query result should be sorted in ascending or descending order based on the values of one or more columns is  
1. view                                              2. order by                                      3. group by                                      4. having

61. What is a disjoint-less constraint?  
 1. It requires that an entity belongs to no more than one level entity set.  
 2. The same entity may belong to more than one level.  
 3. The database must contain an unmatched foreign key value.  
 4. An entity can be joined with another entity in the same level entity set.
62. According to the levels of abstraction, the schema at the intermediate level is called \_\_\_\_\_.  
 1. logical schema                          2. physical schema  
 3. subschema                                4. conceptual schema
63. The decimal equivalent of the hex number 1A53 is \_\_\_\_\_.  
 1. 6793                                     2. 6739                                     3. 6973                                     4. 6379
64.  $(734)_8 = ()_{16}$   
 1. C 1 D                                    2. D C 1                                    3. 1 C D                                    4. 1 D C
65. The simplification of the Boolean expression  $C + (BC)$  is \_\_\_\_\_.  
 1. 0                                            2. 1                                            3. C                                             4. BC
66. The number of control lines for an 8-to-1 multiplexer is \_\_\_\_\_.  
 1. 2                                            2. 3                                            3. 4                                             4. 5
67. How many flip-flops are required for a mod-16 counter?  
 1. 5                                            2. 6                                            3. 3                                             4. 4
68. EPROM contents can be erased by exposing it to \_\_\_\_\_.  
 1. ultraviolet rays                        2. infrared rays  
 3. burst of microwaves                    4. intense heat radiations
69. The hexadecimal number 'A0' has the decimal value equivalent to \_\_\_\_\_.  
 1. 80                                            2. 256                                    3. 100                                            4. 160
70. The Gray code for decimal number 6 is equivalent to \_\_\_\_\_.  
 1. 1100                                     2. 1001                                     3. 0101                                            4. 0110

## Section 2: Quantitative Ability (40 questions in 40 minutes)

**Directions for questions 71 to 75:** A cuboid has 5 m length, 6 m breadth, and 7 m height.

- Two faces of  $7 \text{ cm} \times 5 \text{ cm}$  are coloured violet.
  - Two faces of  $5 \text{ cm} \times 6 \text{ cm}$  are coloured blue.
  - Two faces of  $7 \text{ cm} \times 6 \text{ cm}$  are coloured green.
  - Now the cuboid is divided into small cubes of 1 cm side each.
71. How many small cubes will have three faces coloured?  
 1. 8                                            2. 6                                            3. 4                                             4. 16
72. How many small cubes will have only one face coloured?  
 1. 100                                        2. 108                                        3. 76                                             4. 94
73. How many small cubes will have no faces coloured?  
 1. 72                                            2. 64                                            3. 56                                             4. 60
74. How many small cubes will have two faces coloured violet and green?  
 1. 20                                            2. 36                                            3. 32                                             4. 44

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75. How many small cubes will have only one blue coloured face?  
1. 24                    2. 30                    3. 35                    4. 48
76. By selling a washing machine at a certain price, a shopkeeper earns 10% profit. If the shopkeeper raises the selling price by 20% and gives 10% discount, what will be the profit now?  
1. 18.8%                2. 12.8%  
3. 16.66%                4. No profit, no loss
77. After spotting a tiger, a deer runs and has a 300 m start over the tiger. If the tiger runs 3 km/h faster than the deer, after how much time will the tiger catch the deer?  
1. 2 minutes              2. 6 minutes              3. 10 minutes              4. 12 minutes
78. Sony LED TV is 20% costlier than Samsung LED TV. Samsung LED TV is \_\_\_\_\_ % cheaper than Sony LED TV.  
1. 16.66                2. 20                    3. 18.23                4. Can't determine
79. The cost of 40 products is recovered by selling 20 of them. What is the percentage profit when only 5 are sold?  
1. 25%                    2. 40%                    3. 60%                    4. 100%
80. A truck travels a 100 km journey with the speed of 60 km/h in the forward journey and at the speed of 80 km/hr during the return journey. What is the average speed of the journey?  
1. 68.57 km/h            2. 70 km/h              3. 72.8 km/h              4. None of these
81. A man takes 40 minutes to walk along the boundary of the field in the shape of a square at the rate of 3 kmph. The area of the square field is  
1.  $\frac{1}{3}$  sq. km            2.  $\frac{1}{2}$  sq. km              3.  $\frac{8}{5}$  sq. km              4.  $\frac{1}{4}$  sq. km
82. Due to sudden fog in between the journey, a train starts moving at  $\frac{2}{3}$ rd of its original speed. Due to this, it is 30 minutes late. Find the original time for the journey beyond the point of fog.  
1. 60 min                2. 90 min                3. 100 min                4. 120 min
83. Pipe P fills a tank in 5 hours. Pipe Q fills the same tank in 10 hours. Pipe R empties the same tank in 15 hours. In how much time will they together make an empty tank HALF filled?  
1. 2.75 hours            2. 1 hour                3. 2.14 hours            4. 1.75 hours
84. A man on the North Pole walks 5 km towards south and then 12 km towards east. How far is he from his initial position?  
1. 5 km                    2. 13 km                3. 0 km                    4. 3 km
85. A biased coin that has a probability of 0.7 to show head is tossed four times. What is the probability to get at least 3 heads?  
1. 0.3352                2. 0.6517                3. 0.216                4. 0.36
86. Two females are to be selected from a group such that the product of their ages is a square number less than 2000. If the age of each of them is a 2-digit number and a multiple of 11, what is the sum of their ages?  
1. 33                    2. 77                    3. 55                    4. 65
87. What is the maximum power of 5 that can be extracted from 130!?  
1. 33                    2. 32                    3. 31                    4. None of these
88. 35 men are assembled in a meeting. Each one of them has an integral amount of money more than Rs 35. No two have the same amount. What is the minimum amount can they have in total (in Rs)?  
1. 2000                2. 1550                3. 1855                4. 2060

89. All yellow are blue. All blue are red. Which conclusion can be derived?  
 1. All yellow are red.  
 2. No yellow is blue.  
 3. No white is yellow.  
 4. Both 1 and 2 are correct.
90. 3 kiwis and 3 bananas cost Rs 45. A dozen bananas cost Rs.108. How much are 5 kiwis and 5 bananas for?  
 1. Rs 84                    2. Rs 80                    3. Rs 75                    4. Rs 78
91. 22% of 44% of 124 is  
 1. 12                        2. 57                        3. 55                        4. 20
92. If Robin got 20% more marks, he would have exactly passed. If he got 30% more marks, he would have scored 169. What are the minimum passing marks?  
 1. 130                      2. 150                      3. 156                      4. 160
93. Raj, Aman, Varun, and Rajiv decide to share some money among them, such that they have consecutive amount of rupees. The total amount they have is sure to be  
 1. divisible by 4            2. indivisible by 4  
 3. cannot be determined    4. none of these
94. A sum of money is divided among Ajit, Bhuvan, and Chetan such that for each rupee, Ajit gets 40 paisa and Chetan gets the sum of what Ajit and Bhuvan get. If Chetan's share is Rs 1120, the sum is....  
 1. 2240                    2. 2400                    3. 6400                    4. 7600
95. In the previous question, what is the positive difference in shares of Ajit and Bhuvan?  
 1. 240                      2. 224                      3. 672                      4. 662

**Directions for questions 96 to 100:** Read the given information carefully and answer the questions that follow. Three brothers are married to three sisters. The brothers are Bharat, Rajat, and Manish. The sisters are Zenia, Bharti, and Chandra.

- Chandra is the only sister having short hair.
  - One of the sisters, who is a dancer, lives in Kolkata.
  - Bharat's wife is not a dancer.
  - The sister with short hair does not like to write letters.
  - Zenia rings her dancer sister every Saturday.
  - The only sister who does not like to write letters lives in New Delhi.
  - Chandra receives a letter from Kolkata once a week
  - Rajat is married to the dancer.
  - The sister in Mumbai is married to Manish.
96. Which sister has short hair?  
 1. Zenia                      2. Chandra  
 3. Bharti                    4. Can't be determined
97. Which sister lives in Kolkata?  
 1. Bharti                    2. Zenia  
 3. Chandra                   4. None of these
98. Who is Zenia's husband?  
 1. Manish                    2. Rajat  
 3. Bharat                    4. None of these
99. Who lives in Mumbai?  
 1. Bharat                    2. Bharti                    3. Manish                    4. Chandra

100. Which couple lives in New Delhi?
1. Bharat and Chandra
  2. Rajat and Bharti
  3. Manish and Zenia
  4. Bharat and Bharti
101. The length of a rectangle is decreased by  $a\%$  and the breadth is increased by  $(a + 50)\%$ . Find  $a$  if the area of the rectangle is unaltered.
1. 25
  2. 30
  3. 50
  4. 15
102. Thrice the square of a number is 4 less than 79. Find the number.
1. 4
  2. 8
  3. 5
  4. 7
103. How much discount should be offered on a shirt worth Rs 420, so that the selling price becomes Rs 22.50 more than five-seventh of marked price?
1. 20%
  2. 30%
  3. 35%
  4. 23%
104. If today is Thursday, what will be the day of the week after 129 days?
1. Wednesday
  2. Saturday
  3. Sunday
  4. None of these
105. If the price of diesel is increased by 20%, what should be the % decrease in the consumption of diesel so that the expense does not change?
1. 16.66
  2. 14.44
  3. 30
  4. 20
106. A train passes a man standing on a platform in 10 seconds. And it passes the platform in 1 min. If the train is travelling at the speed of 36 kmph, find the length of the platform in metres.
1. 100
  2. 500
  3. 600
  4. None of these
107. A boat crosses a river 6 km wide at the rate of 18 km/h and comes back. The speed of the river is 3 km/h. How far will the boat finally be from where it started?
1. 1 km
  2. 2 km
  3. 4 km
  4. 8 km
108. What is the minimum period of time in which the hands of clock can overlap each other 5 times?
1. 130.90 min
  2. 196.36 min
  3. 261.81 min
  4. 327.25 min
109. Complete the series: 5, 13, 25, 41, .....
1. 68
  2. 47
  3. 56
  4. 61
110. If the clock starts at 3 o' clock, after how much time will the hour and minute hands make an angle of 90 degrees with each other?
1. 15 min
  2. 27 min
  3. 33 min
  4. None of these

### Answer Key

#### Section 1: Technical Ability

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1. 1  | 2. 1  | 3. 3  | 4. 3  | 5. 1  | 6. 2  |
| 7. 1  | 8. 4  | 9. 4  | 10. 4 | 11. 3 | 12. 1 |
| 13. 3 | 14. 4 | 15. 4 | 16. 1 | 17. 4 | 18. 3 |
| 19. 4 | 20. 3 | 21. 3 | 22. 3 | 23. 3 | 24. 2 |
| 25. 1 | 26. 1 | 27. 3 | 28. 3 | 29. 4 | 30. 1 |
| 31. 4 | 32. 1 | 33. 3 | 34. 4 | 35. 4 | 36. 2 |
| 37. 3 | 38. 2 | 39. 1 | 40. 3 | 41. 1 | 42. 2 |
| 43. 4 | 44. 1 | 45. 4 | 46. 4 | 47. 4 | 48. 1 |

|              |              |              |              |              |              |
|--------------|--------------|--------------|--------------|--------------|--------------|
| <b>49.</b> 2 | <b>50.</b> 1 | <b>51.</b> 4 | <b>52.</b> 4 | <b>53.</b> 2 | <b>54.</b> 3 |
| <b>55.</b> 1 | <b>56.</b> 3 | <b>57.</b> 2 | <b>58.</b> 1 | <b>59.</b> 1 | <b>60.</b> 2 |
| <b>61.</b> 1 | <b>62.</b> 4 | <b>63.</b> 2 | <b>64.</b> 4 | <b>65.</b> 2 | <b>66.</b> 2 |
| <b>67.</b> 4 | <b>68.</b> 1 | <b>69.</b> 4 | <b>70.</b> 3 |              |              |

## Section 2: Quantitative Aptitude

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|               |               |               |               |               |               |
|---------------|---------------|---------------|---------------|---------------|---------------|
| <b>71.</b> 1  | <b>72.</b> 4  | <b>73.</b> 4  | <b>74.</b> 1  | <b>75.</b> 1  | <b>76.</b> 1  |
| <b>77.</b> 2  | <b>78.</b> 1  | <b>79.</b> 4  | <b>80.</b> 1  | <b>81.</b> 4  | <b>82.</b> 1  |
| <b>83.</b> 3  | <b>84.</b> 1  | <b>85.</b> 2  | <b>86.</b> 3  | <b>87.</b> 2  | <b>88.</b> 3  |
| <b>89.</b> 1  | <b>90.</b> 3  | <b>91.</b> 1  | <b>92.</b> 3  | <b>93.</b> 2  | <b>94.</b> 1  |
| <b>95.</b> 3  | <b>96.</b> 2  | <b>97.</b> 1  | <b>98.</b> 1  | <b>99.</b> 3  | <b>100.</b> 1 |
| <b>101.</b> 3 | <b>102.</b> 3 | <b>103.</b> 4 | <b>104.</b> 3 | <b>105.</b> 1 | <b>106.</b> 2 |
| <b>107.</b> 2 | <b>108.</b> 3 | <b>109.</b> 4 | <b>110.</b> 3 |               |               |

# Practice Paper 7

**(Based on Recent Question Papers of Deloitte\*)**

*Total number of questions: 90*

*Total duration: 90 min.*

- No. of sections: 3
- There is no negative marking
- No sectional cut off

## **Section 1: Verbal Ability (30 Questions in 20 Minutes)**

**Directions for questions 1 to 4:** Read the following passage and answer the questions that follow:

*Like words, Art, too, is a mode of communication. Words, both spoken and written, have been the carriers of knowledge of the best and foremost minds of one generation to all its successive ones. Art, too, renders it possible for people of one generation to access the feeling experienced by the predecessors. The evolution of knowledge progresses by uprooting and replacing that which is flawed or incomplete. Art proceeds similarly. Feelings less humane and less conscious for the emancipation of the human spirit are substituted by others more essential and kinder to that end. This, perhaps, then is the purpose of all art. And the more an art meets this intent, the better an art it is, and vice versa.*

1. The author progresses the passage chiefly by \_\_\_\_\_  
1. theory and refutation                           2. example and generalization  
3. comparison and similarity                      4. question and answer
2. According to the author, knowledge is  
1. evolutionary and emotional                      2. cumulative and progressive  
3. static and unmoving                               4. dynamic and cyclical
3. According to the passage, art is characterized by which of the following?  
I. It can never be bad.  
II. It refines human sensibilities.  
III. It preserves for later generations experiences of previous generations.  
1. I only                                                  2. II only                                                  3. III only                                                  4. II and III only
4. The style of the passage can be best described as \_\_\_\_\_  
1. speculative                                           2. expository                                           3. poetic                                                   4. sarcastic

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\* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of *Deloitte*, a leading multinational IT firm.

**Directions for questions 5 and 6:** There is a relationship in the first pair of words given. Identify another pair of words with the same relationship.

5. Pain: Ache :: Lazy: \_\_\_\_\_  
 1. Exercise      2. Lethargic      3. Arid      4. Dank
6. Preface: Book :: Preamble.....  
 1. Resume      2. Constitution      3. Dictionary      4. Contract

**Directions for questions 7 to 9:** From the given choices, fill in the following blanks with an appropriate preposition/word:

7. We are ready..... battle.  
 1. of      2. to      3. for      4. none of these
8. Leave your dirty shoes ..... the door before you enter.  
 1. on      2. for      3. around      4. at
9. The scouts must commit this .....memory.  
 1. by      2. to      3. on      4. from

**Directions for questions 10 to 14:** Fill in the following blanks with the most suitable option:

10. The pup ..... at her in fondness and tenderness.  
 1. gazed      2. leered      3. glared      4. peeped
11. One could ..... the entire worthwhile content of this thesis into no more than one page.  
 1. condense      2. decrease      3. shorten      4. contract
12. A ..... firms are facing tensions in their industrial relations.  
 1. ample amount of      2. great many      3. great deal of      4. big part of
13. Far too often, the press refuses to ..... the privacy of the celebrities.  
 1. stop before      2. respect      3. regard      4. give away to
14. The focus of a lot of election rallies was the nation's ..... situation  
 1. economic      2. finance      3. commercial      4. economist

**Directions for questions 15 and 16:** Select the pair of words that has the same relationship as the given pair.

15. Address: Envelope  
 1. By-line: Paragraphs      2. Tailpiece: Article  
 3. Name: Visiting card      4. Autograph: Notebook
16. Frayed: Fabric  
 1. Watered: Lawn      2. Dilapidated: Building  
 3. Frozen: Water      4. Crumpled: Pages

**Directions for questions 17 to 21:** The following sentences have been divided into 4 parts. One of the parts has an error. Select the part that has an error.

17. 1. As the government was bankrupt,  
 3. to quell the violence had  
 2. most of the soldiers which were sent  
 4. not been paid in months.
18. 1. Even those who claim to care  
 3. realise how their daily choice  
 2. about the “green” issue often fail to  
 4. effect the environment.
19. 1. Bees, which have inhabits our planet for at least hundred million years,  
 2. are undoubtedly the

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- 3. most successful of all the social insects of the high manopetra, an
- 4. order that also includes wasps and ants.
- 20. 1. For my cousin and I, the trip to New Zealand was
- 2. the fulfilment of a lifelong wish we
- 3. could barely
- 4. dare to even express.
- 21. 1. The activists, upon discovering that
- 2. a huge number of the rural children
- 3. were infected by bacteria from unclean drinking water,
- 4. decide to make the potable-water project their top priority.

**Directions for questions 22 to 26:** *Each sentence is divided into 4 parts. There is an error in one of these parts. Identify the part that has an error.*

- 22. 1. The cabinet has unanimously decided to
- 2. stick with their established foreign policy not to
- 3. interfere in the internal affairs of any neighbour.
- 4. No error
- 23. 1. No staff member and no guard were
- 2. present in the premise when the miscreants
- 3. were beating the minister
- 4. No error
- 24. 1. His recent comments quoted in the newspapers
- 2. over the issue of khap panchayat's authority
- 3. has been denied by the company.
- 4. No error
- 25. 1. In these Olympics,
- 2. a number of stalwarts are struggling to
- 3. sustain their winning sprees.
- 4. No error
- 26. 1. Once selected by the Chairman,
- 2. the Working Committee
- 3. is held responsible for the event
- 4. No error

**Directions for questions 27 to 30:** *The sentence given in each question, when properly sequenced, forms a coherent paragraph. Choose the most logical order of sentences from among the given choices to construct a coherent paragraph.*

- 27. A. Leroy seriously endorses the students' facility to think critically about their educational state of affairs.
- B. Realizing one's consciousness ("conscientization") initiates one into "Praxis".
- C. Critical pedagogy was heavily influenced by the works of Zumi Leroy, arguably the most celebrated critical educator.
- D. A cyclical process of theory, application, evaluation, reflection, and consequently reverting to theory is a brief outline of Praxis.
- 1. CABD      2. DBAC      3. BDCA      4. ABDC      5. ADCB
- 28. A. The cheering crowds had lined up for almost miles down the MG Road to catch one glimpse of the King of Pop in person.
- B. Sydney was a no-show, but the unending queues had lasted for days.

- C. The draw was his line of parkas, tuxedos and trench coats for the Norwegian retailer L&V.  
 D. Jackson has invaded Tokyo.
- 1. DCAB      2. ACBD      3. CBAC      4. DABC      5. BDAC**
29. A. The growth of low-cost carriers was believed to reduce prices for everyone, but that didn't happen.  
 B. Air Lilac might be relishing a bit of blue sky, but its CEO understands the frustrations of airline travel.  
 C. "People are guarded in their opinion," she says, "and wonder what game is underway as they don't comprehend what the new system intends to do."  
 D. Pricing is a huge one.
- 1. CDBA      2. BDCA      3. DABC      4. CADB      5. DBAC**
30. A. Grape computer CEO, Ponis Tasks, is not known for modesty, so few people will be surprised to hear him calling the latest version of the Vac OS EE operating system the "biggest leap forward" since the Vac arrived a decade ago.  
 B. Actually, the new version, called Eagle, is an incremental improvement, but it does make a very good piece of software even better.  
 C. The most notable feature of Eagle is a built-in search tool called *Khoj*, that finds information tucked away in the thousands of files that reside on your hard drive.  
 D. In one sense, this application lets Vac catch up with the Doors world, where a clutch of search tools have erupted, efficient and mostly free, add-on search tools that make up for the lack of built-in capability.  
 E. But *Khoj* has the considerable advantage of being integrated into the operating system, making it always instantly available.
- 1. ABCDE      2. ACDEB      3. DEABC      4. DBCEA      5. EABCD**

## Section 2: Quantitative Ability (30 questions in 40 minutes)

31. A sum of money doubles itself in 3 years when compounded annually. In how many years will it become 8 times of itself?  
**1. 9      2. 8      3. 6      4. 12**
32. A bag contains 12 yellow, 14 red, and 16 green balls. If Ram has to pick at least 1 red and 1 green ball, what minimum number of balls should he pick randomly?  
**1. 15      2. 29      3. 17      4. 26**
33. How many zeroes are there at the end of  $200!$ ?  
**1. 200      2. 49      3. 194      4. Cannot be determined**
34. What is the remainder left when  $81 + 82 + 83 + \dots + 88$  is divided by 7?  
**1. 3      2. 2      3. 4      4. 5**
35. 2 men and 3 women can do equal amount of work in one day. If 4 men and 6 women complete a piece of work in 6 days, how many women are required to do the same work in 9 days?  
**1. 8      2. 12      3. 6      4. 10**

36. A horse is tied with a rope on a pole in the ground such that he can run in a circle with the pole at the centre. If the length of the rope is 14 m and the horse runs with an average speed of 40 km/h for 90 minutes, how many times did he complete the circle?
1. 681.8
  2. 743.6
  3. 97
  4. Cannot be determined
37. A bag contains 4 green and 8 blue balls. If two balls are drawn one by one at random without replacement, what is the probability of getting balls of both the colours?
1. 21/66
  2. 16/33
  3. 4/9
  4. None of these
38. A vendor sells a dozen mangoes for Rs 90. If he suffers a 10% loss, what is the cost price of 3 dozen mangoes?
1. Rs 100
  2. Rs 300
  3. Rs 150
  4. Rs 275
39. A cook has to peel 150 vegetables in 6.5 hours. It takes twice as much time to peel a potato as compared to an onion. If there are 45 potatoes and rest are onions, what was time spent in minutes in peeling all potatoes?
1. 172
  2. 200
  3. 180
  4. 165
40. A mixture contains milk and water in the ratio 4:3. How many parts of water should be added to the mixture to make it 60% of the mixture?
1. 3
  2. 7
  3. 4
  4. 8
41. A coin is tossed 6 times. Find the probability that there will be heads at least 5 times.
1. 1/64
  2. 7/64
  3. 5/64
  4. 1/32
42. There are 100 coins of the be denominations of Re 1 and Rs 2. If the total amount of money is Rs 142, find the number of coins of Rs 2.
1. 36
  2. 64
  3. 42
  4. 58
43. If 8 eggs boil in 8 minutes, then 5 eggs will boil in \_\_\_\_ minutes?
1. 3
  2. 5
  3. 8
  4. none of these
44. Harneet invested a total sum of Rs 10,000 in two different banks at simple interest. In one bank she invested at 10% p.a. for 2 years and in the other she invested at 15% p.a. for 3 years. She received a total interest of Rs 3625. Find the amount invested in each of the banks.
1. 4000, 6000
  2. 2500, 7500
  3. 3000, 7000
  4. 3500, 6500
45. If a sum of money increases by 60% at simple interest in 3 years, what will be the interest on ₹ 24,800 at the same rate when compounded annually for 2 years?
1. 10912
  2. 10324
  3. 9876
  4. 9472
46. Two trains A and B are moving in the same direction. A is moving at a speed of 36 km/h and B at 72 km/h. Sachin is sitting in train A and he observes that it takes 45 seconds for train B to completely overtake train A. What is the total length of train A and train B?
1. 450 m
  2. 425 m
  3. 400 m
  4. 375 m
47. There are a total of 100 flowers in a garden now. 8 days ago a gardener started planting these flowers and increases the number of flowers he plants by 3 each day. How many flowers were planted on the 4<sup>th</sup> day?
1. 2
  2. 11
  3. 15
  4. 8

48. Which one of the following statements is not true?
1.  $\log_{14}14 = 1$
  3.  $\log_{77}1 = 0$
  2.  $\log(5/2) = \log(5 - 2)$
  4.  $\log(280) = \log 2 + \log 4 + \log 7 + \log 5$
49. Find the number divisible by 13.
1. 74371
  2. 74372
  3. 74373
  4. 74374
50. If all the letters of the word YAHOO are arranged alphabetically, what will be the rank of the word YAHOO?
1. 51
  2. 50
  3. 48
  4. 49
51. If I make groups of 6, 14, or 15 of a certain number of balls, no ball is left but when I make groups of 13, there are 2 balls left. Find the minimum number of balls.
1. 180
  2. 420
  3. 210
  4. 250
52. Rajesh deposited an amount of Rs 2500 at 20% p.a. in a bank for 1.5 years. Find the amount that he will receive if the interest was compounded half yearly?
1. Rs 3847.5
  2. Rs 3327.5
  3. Rs 4274.5
  4. Rs 4175.5
53. In how many ways can the word ‘RATIONAL’ be arranged such that all the consonants come together?
1. 1440
  2. 1880
  3. 1420
  4. 1250
54. If  $\log(2187) = p$ , what is the value of  $\log(27)$ ?
1.  $p/3$
  2.  $7p/3$
  3.  $3p/7$
  4. 0
55. A red box contains 6 erasers and 8 sharpeners and a blue box contains 13 erasers and 5 sharpeners. If one item from the red box is transferred randomly to the blue box, what is the probability of taking a sharpener out from blue box after transfer?
1.  $73/266$
  2.  $56/133$
  3.  $45/266$
  4.  $39/133$
56. In a group of students, there are 5 girls and 7 boys. In how many ways can a committee of 4 members be formed which contains at least 3 girls?
1. 75
  2. 79
  3. 100
  4. 80
57. What is the least number which must be added to 8059 so that the sum is divisible by 3, 7, 12 and 16?
1. 3
  2. 4
  3. 5
  4. 6
58. If Rohan mixes red paint of Rs 30/litre and blue paint of Rs 60/litre in the ratio 4:5 to form a purple paint, what will be the price of 6 litres of this purple paint?
1. Rs 150
  2. Rs 300
  3. Rs 280
  4. Rs 184
59. Two trucks start towards each other from points P and Q, which are at a distance of 62.5 km. After meeting, truck from P reaches Q in  $15/4$  hours while truck from Q reaches P in  $5/3$  hours. Find the distance travelled by truck that started from P at the time they meet each other?
1. 25 km
  2. 37.5 km
  3. 35 km
  4. 27.5 km
60. The HCF of two numbers is 14 and the LCM is 84. If one number is 28, find the other.
1. 48
  2. 42
  3. 32
  4. 36

### Section 3: Logical Reasoning (30 questions in 30 minutes)

61. Complete the series: DAG, KHN, ?, YVB
1. ROU
  2. QOS
  3. RSU
  4. None of these

**Directions for questions 62 to 66:** 250 families live in a colony. 240 families read at least one of the two newspapers, TOI or HT, and 40 families read both the newspapers.

62. How many families do not read any of the newspapers?  
 1. 20                  2. 30                  3. 10                  4. 12
63. How many families read exactly one newspaper?  
 1. 210                  2. 200                  3. 240                  4. 235
64. If 85 families read HT, find the ratio of the number of families reading HT to that reading TOI.  
 1. 17:33                  2. 17:46                  3. 17:39                  4. 8:13
65. How many families do not read HT? (Use the information in above problem)  
 1. 125                  2. 165                  3. 130                  4. 105
66. If the number of families who read only HT is 80, what will be the ratio of number of families who read HT to that of TOI?  
 1. 1:2                  2. 3:5                  3. 3:4                  4. 2:5
67. Find the next number 0, 7, 26, 63,....  
 1. 106                  2. 94                  3. 124                  4. 152

**Directions for questions 68 to 71:** Answer the questions after reading through the passage.

In an event of 7 days, there are 6 performers, A, B, C, D, E and F. The event will go on from Monday till Sunday and only one person can perform on one day.

- There is a 2-day gap between performances of C and D.
  - E performs immediately after F.
  - A does not perform on Tuesday and Thursday.
  - B performs on Friday and is immediately followed by D.
  - There will be a no-show day, which cannot be Monday, Wednesday or Saturday.
68. No-show day is on  
 1. Sunday                  2. Saturday                  3. Thursday                  4. Tuesday
  69. On which day will F perform?  
 1. Monday                  2. Tuesday                  3. Sunday                  4. Saturday
  70. Who is the last one to perform?  
 1. C                  2. F                  3. A                  4. E
  71. How many shows have been there between C and F?  
 1. 2                  2. 1                  3. 3                  4. None of these
  72. Find the missing number: 5, 7, 10, 12, 9, 11, ?, 16, 13, 15, 18, 20  
 1. 14                  2. 15                  3. 13                  4. 12
  73. Find the next number: 4, 5, 10, 12, 22, 26, 46, ?  
 1. 62                  2. 84                  3. 52                  4. 54
  74. If PLAYER is coded as @#\$%^& and TREAT is coded as \*%&^\$, how will you code LATER?  
 1. #\*\$^&                  2. #\$/%^&                  3. #\$/%^&                  4. #^\$%&
  75. In a word ABANDONMENT, the first and last letters are interchanged. Similarly second and second last letters are interchanged, and so on, up to fifth and seventh. What will be the third letter to the right of fifth letter?

1. M

2. O

3. N

4. B

76. Complete the series: DGK, LOS, TWA, \_\_\_\_\_, JMQ

1. BEH

2. BEI

3. CFI

4. CEG

77. If  $\times$  means +, + means -, - means / and / means  $\times$ , what is the value  $10 - 2 \times 3 / 5 + 6 - 2?$ 

1. 9

2. 17

3. 15

4. 30

78. Abhinav travelled 15 km towards north-east direction from his office. Then he turned towards East and travelled for 23 km. He again turned towards south-west direction and travelled 15 km. And finally he travelled 13 km towards west and reached his home. How far is his office from his home?

1. 12 km

2. 6 km

3. 10 km

4. 15 km

**Directions for questions 79 to 83:** Six boys Albert, Buffon, Cameroon, Dennis, Earl and Fang are standing in a line during school prayer. They are arranged according to their height in ascending order.

- Earl is shorter than Dennis but taller than Cameroon who is taller than Albert.
- Earl and Fang have two boys between them. Fang is between Buffon and Albert.
- Albert is not the shortest among them.

79. Where is Albert?

1. Between Fang and Buffon  
2. Between Cameroon and Dennis  
3. Between Earl and Cameroon

2. Between Cameroon and Dennis  
4. In front of Cameroon

80. Who is standing at the end of the line?

1. Buffon

2. Dennis

3. Fang

4. Albert

81. If we start counting from the tallest, which boy is third one in the line?

1. Earl

2. Albert

3. Dennis

4. Cameroon

82. Who is standing at start of the line?

1. Cameroon

2. Dennis

3. Buffon

4. Fang

83. Which of these is neither tallest nor shortest?

1. Dennis

2. Buffon

3. Cameroon

4. None of these

84. The son of Kate's father has a son whose name is Jack. Bert is Jack's son. Kate is my mother. How is Bert related to me?

1. Cousin

2. Maternal uncle

3. Nephew

4. None of these

85. Pointing to a man a lady said, "He is the brother of daughter of my mother's only daughter." How is the man related to this lady?

1. Cousin

2. Brother

3. Father

4. Son

**Directions for questions 86 to 88:** Each of these questions is based on the following information:

86. P ? Q means P is the daughter of Q.

87. P &amp; Q means P is the sister of Q.

88. P \$ Q means P is the father of Q.

89. Which relation represents that P is the grandfather of S?

1. P \$ Q &amp; R \$ S

2. P ? Q \$ R &amp; S

3. P \$ Q ? R ? S

4. P &amp; Q \$ R ? S

90. If P ? Q \$ R ? S, how is S related to P?

1. Father -in-law

2. Sister

3. Daughter- in-law

4. Granddaughter

88. If P ? Q \$ R ? S, then how are Q and S related?  
 1. Mother–Son      2. Husband–Wife      3. Father–Daughter      4. Can't Say
89. Durga is moving in the east direction. She turns  $90^\circ$  right and moves some distance. Then she takes another turn to her right at  $45^\circ$  and moves some distance and finally she turns  $180^\circ$ . In which direction is she facing now?  
 1. North–West      2. South–East      3. South–West      4. North–East
90. Tripti was born on 20 December 1985, Friday. On which day of the week was her 7th birthday?  
 1. Monday      2. Tuesday      3. Saturday      4. Sunday

 **Answer Key**
**Section 1: Verbal Ability**

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1. 3  | 2. 2  | 3. 4  | 4. 2  | 5. 2  | 6. 2  |
| 7. 2  | 8. 4  | 9. 2  | 10. 1 | 11. 1 | 12. 2 |
| 13. 2 | 14. 1 | 15. 3 | 16. 2 | 17. 2 | 18. 4 |
| 19. 1 | 20. 1 | 21. 4 | 22. 2 | 23. 1 | 24. 3 |
| 25. 4 | 26. 4 | 27. 1 | 28. 4 | 29. 2 | 30. 1 |

**Section 2: Quantitative Ability**

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 31. 1 | 32. 2 | 33. 2 | 34. 3 | 35. 1 | 36. 1 |
| 37. 2 | 38. 2 | 39. 3 | 40. 1 | 41. 2 | 42. 3 |
| 43. 3 | 44. 4 | 45. 1 | 46. 1 | 47. 2 | 48. 2 |
| 49. 3 | 50. 4 | 51. 3 | 52. 2 | 53. 1 | 54. 3 |
| 55. 4 | 56. 1 | 57. 3 | 58. 3 | 59. 1 | 60. 2 |

**Section 3: Logical Reasoning**

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 61. 1 | 62. 3 | 63. 2 | 64. 3 | 65. 2 | 66. 3 |
| 67. 3 | 68. 3 | 69. 1 | 70. 3 | 71. 2 | 72. 1 |
| 73. 4 | 74. 1 | 75. 3 | 76. 2 | 77. 2 | 78. 3 |
| 79. 4 | 80. 2 | 81. 4 | 82. 3 | 83. 3 | 84. 3 |
| 85. 4 | 86. 1 | 87. 3 | 88. 2 | 89. 4 | 90. 4 |

# Practice Paper 8

## (Based on Recent Question Papers of HCL\*)

*Total number of questions: 90*

*Total duration: 95 min*

- No. of sections: 4
- There is negative marking ( $1/3^{\text{rd}}$  of a mark)
- No sectional cut off

### **Section 1: Quantitative Ability (25 questions in 30 minutes)**

1. At least  $3/4^{\text{th}}$  of 50 members of a group must vote ‘yes’ for a bill to pass. What is the greatest number of members who could vote ‘no’ for the bill and still have it passed?  
1. 19                    2. 13                    3. 16                    4. 12
2. Raj bought 6 books for Rs 130 from one shop and 8 books for Rs 140 from another. The average price (in rupees), he paid per book was  
1. 19.28                2. 20.50                3. 135                    4. 138
3. Rohan got 40% of the maximum marks in an exam and failed by 15 marks. However, Peter who took the same exam got 50% of the maximum marks and got 20 marks more than the passing marks. What were the maximum marks in the examination?  
1. 250                    2. 350                    3. 180                    4. 85
4. A two-year payment to the gardener is Rs 400 plus two shirts. The gardener leaves after 18 months and receives Rs 400 and a shirt. Then find the price of two shirts.  
1. Rs 180                2. Rs 200                3. Rs 400                4. None of these
5. A papaya weighs 4,000 g and 80% of its weight is water. It is kept in a drying room and after some time it turns out that only 70% of its weight is water. What is its weight now?  
1. 2,667 g                2. 3,667 g                3. 4,950 g                4. None of these
6. A bullet train passes a station platform in 30 s and a girl standing on the platform in 10 s. If the speed of the train is 60 km/h, find the length of the platform.  
1. 350 m                    2. 200 m                    3. 250 m                    4. 333 m

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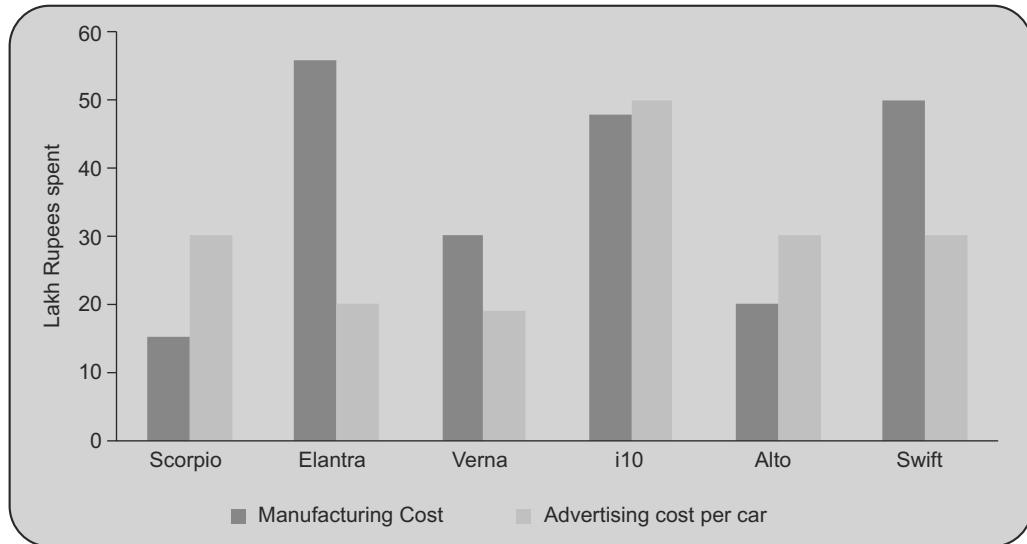
\* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of HCL, a leading multinational IT firm.

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7. Kunal bought 40 kg of rice at a cost of Rs 15/kg and 35 kg at a cost of Rs 9/kg. He mixes the two. At what price should he sell the mixture to have a 50% gain?  
1. Rs 14.5/kg      2. Rs 18.3/kg      3. Rs 17.5/kg      4. Rs 16.5/kg
8. Three bulbs change after 36, 60, and 96 seconds respectively. At 06:36:00, they all changed together. At what time will they again change together?  
1. 08 : 07 : 12      2. 07 : 00 : 00      3. 07 : 27 : 00      4. 08 : 00 : 00
9. P can do a piece of work in 9 days. Q can do the same work in 12 days. They both do the work for Rs 900. R joins them and they do the work in 4 days. How much did they pay R?  
1. Rs 100      2. Rs 200      3. Rs 500      4. Rs 600
10. Deepak purchased 67 stamps of 40 paise and 5 paise. The total amount he spent was Rs 19.1. What is the number of 40-paise and 5-paise stamps which he purchased?  
1. 32 and 35 respectively      2. 10 and 57 respectively  
3. 45 and 22 respectively      4. Can't be determined from the given data
11. If  $x$  type of rice costs Rs 2 per kg and  $y$  type costs Rs 6 per kg. What quantity of  $x$  type and  $y$  type should be mixed so that 50 kg of the mixture costs Rs 150?  
1. 3 : 1      2. 1 : 2      3. 4 : 5      4. 2 : 3
12. There are 6 questions in a question paper. In an examination, 10% students answered all questions and 10% answered none. 40% answered 4 questions, and 20% answered 3 questions, and 400 students answered only 2 questions. How many students appeared for the test?  
1. Data Insufficient      2. 1000      3. 1200      4. 1500
13. Two numbers ( $P, Q$ ) are generated by a computer routine, the first being a random number between 0 and 1000 inclusive, and the second being less than or equal to the cube root of the first. Each of the following pairs can be generated by routine EXCEPT  
1. (999,10)      2. (850,9)      3. (450,7)      4. (1,1)
14. An army warehouse had a square floor with area 10,00,000 sq. metres. A rectangular addition was built along one entire side of the warehouse that increased the floor by one-half as much as the original floor. How many metres did the addition extend beyond the original building?  
1. 100      2. 200      3. 500      4. 5000
15. A digital wristwatch was set accurately at 9.45 a.m. and then lost 3 seconds every 10 minutes. What time was indicated on the watch at 7.40 p.m. of the same day if the watch operated continuously for that time?  
1. 7:56      2. 6:58      3. 7.00      4. 7:37
16. A 6-litre jug contains 5 litres of a saltwater solution that is 20 percent salt. If 2.5 litres of the solution is thrown out of the jug, and the jug is then filled to capacity with water, approximately what percent of the resulting solution in the jug is salt?  
1. 8.3%      2. 8.5%      3. 7.5%      4. 9.3%
17. A fighter plane travelled  $X$  miles in the first 100 minutes of its flight time. If it completed the remaining 400 miles of the trip in 2 minutes, what was its average speed in miles per hour for the entire trip?  
1.  $(X + 300)/102$       2.  $60(X + 400)/102$       3.  $(X + 102)/300$       4.  $(X + 102)/300$
18. A billionaire bought a lot of caps  $3/4^{\text{th}}$  of which were brown. The billionaire sold  $3/5^{\text{th}}$  of the caps including  $3/5^{\text{th}}$  of the brown caps. What fractions of the unsold caps were brown?  
1. 1/60      2. 8/15      3. 3/8      4. 6/8

19. Manish purchased shares of stock at a certain price. If the stock increased in price by Rs 0.75 per share and the total increase for the shares was Rs 15.0, how many shares of stock had been purchased?  
 1. 25                    2. 20                    3. 30                    4. 100
20. At a special sale, 7 toys can be purchased for the price of 4 toys. If 10 toys are purchased at the sale, the amount saved will be what percent of the original price of the 10 toys?  
 1. 40%                2. 33.3%                3. 42.85%                4. 62.95%

**Directions for questions 21 to 25:** These questions are based on the line graph given below. Refer to the graph and answer the questions that follow:



21. For which of the following cars is the manufacturing cost as a percentage of advertising cost the maximum?  
 1. Alto                    2. Swift                    3. i10                    4. Elantra
22. In a certain year, 3,000 Verna cars, are produced, and are sold at Rs 54 lacs/car. If 3% of the total profit is given as a bonus to the 1,080 engineers, the amount received by each engineer as bonus is (in Rs)  
 1. 58,000                2. 33,333                3. 2 lacs                4. none of these
23. Which of the following statements is true?  
 1. The difference in the manufacturing and the advertising costs of Swift is same as that of Alto.  
 2. The ratio of the manufacturing to the advertising cost of Scorpio is same as that of Verna.  
 3. The total cost of Scorpio and Verna put together is less than the total cost of i10.  
 4. None of these.
24. The company that manufactures Scorpio produces 500 Scorpio cars per day while the company that manufactures Verna produces 600 Verna cars per day. They sell them at Rs 70 lacs/car and Rs 60 lacs/car, respectively. The profit made by the former is approximately what percent of the latter?  
 1. 250%                2. 208%                3. 20%                4. None of these
25. The ratio of the advertising cost to the total cost is the maximum for  
 1. Swift                2. Scorpio                3. Verna                4. i10

## Section 2: Logical Reasoning (25 questions in 25 minutes)

26. The question shows a pair of words in which the first is related to the second in some way. It is followed by a single word which bears a similar relation to one of the given alternatives. Find the correct alternative to complete the analogy.

Condense : Vapour :: Freeze : ?

1. Ice                  2. Melt                  3. Solid                  4. Crystal

27. Fill in the blank: Repentance is to Past as Hope is to \_\_\_\_\_  
 1. Present            2. Future            3. Today            4. Despair

28. From the given choices, select the odd man out:  
 1. Taj Mahal            2. Le Meridian            3. Red Fort            4. Rajghat

29. Find the missing pattern.  
 HEED : KHHG :: GNFC : ?  
 1. JQIF            2. JQIU            3. JQFU            4. JSQF

30. Find the missing number 6 : 37 :: 9 : ?  
 1. 73            2. 82            3. 57            4. 64

31. From the given choices, select the odd man out:  
 1. ADHM            2. TXBH            3. ORVA            4. CFJO

32. If LIGHT is coded as 39782 and DARK is coded as 4192, what will 12192 stand for?  
 1. SHOOT            2. SOFTY            3. START            4. SHART

33. Find the next number in the series: 1, 8, 17, 28, 41, .....  
 1. 54            2. 55            3. 56            4. 57

34. The question contains some statements followed by some conclusions. Decide which of the given conclusions logically follow from the given statements, disregarding commonly known facts.

### Statements:

- I) All mangoes are yellow.  
 II) All nuts are apples.

### Conclusions:

- I) All nuts are yellow.  
 II) Some mangoes are nuts.  
 1. Only conclusion I follows.            2. Only conclusion II follows.  
 3. Neither I nor II follows            4. Both I and II follow.

35. If Amita's daughter is my son's aunt, then what relation has Amita to my son?  
 1. Brother            2. Grandmother            3. Mother            4. Mother-in-law

36. Gopal was facing west. He walked 8 km forward, and then after turning to his left walked 10 km. Again, he turned to his left and walked 17 km. After this, he turned back. Which direction was he facing at this time?  
 1. West            2. North            3. South            4. East

37. Aman is not wearing grey and Suman is not wearing yellow. Aman and Saurabh wear different colours. Anand alone wears red. What colour is Saurabh wearing, if all four of them are wearing different colours?  
 1. Green            2. Black            3. Purple            4. Can't say

38. The question is followed by two arguments numbered I and II. You have to decide which of the arguments is a strong argument.

**Statement:** Should angling of fishes be totally banned?

**Arguments:** I. Yes, anglers make a hell lot of money.

II. No, bans on hunting and trapping don't prove to be effective.

- |                               |                                |
|-------------------------------|--------------------------------|
| 1. Only argument I is strong. | 2. Only argument II is strong. |
| 3. Either I or II is strong.  | 4. Neither I nor II is strong. |

39. The following question contains a statement followed by two assumptions I and II. Find out which assumption(s) is/are implicit.

**Statements:**

Aloe Vera tablets improve blood circulation and keep your skin in glowing condition.

**Assumptions:**

- |                                            |                                                      |
|--------------------------------------------|------------------------------------------------------|
| I. People like glowing skin.               | II. Skin becomes dull in the absence of circulation. |
| 1. Only assumption I is implicit.          | 2. Only assumption II is implicit.                   |
| 3. Both assumptions I and II are implicit. | 4. Neither assumption I nor II is implicit.          |

40. Study the statement(s) and the conclusions and select the correct option.

**Statement:**

The country Zambia is absolutely self-dependent these days.

**Conclusions:**

- |                                                                 |                                                   |
|-----------------------------------------------------------------|---------------------------------------------------|
| I. It is possible to grow and produce all that a Zambian needs. | II. Zambian people, in general, have become lazy. |
| 1. Only conclusion I follows.                                   | 2. Only conclusion II follows.                    |
| 3. Either conclusion I or II follows.                           | 4. Neither conclusion I nor II follows.           |

41. In the following question, a statement is followed by some courses of action. A course of action is a step or administrative decision to be taken for improvement, follow-up, or further action in regard to the problem, policy, etc. You have to assume everything in the statement to be true and then decide which of the given suggested course(s) of action logically follows for pursuing.

**Statement:**

'The UNO has approved a 3000 million Euro loan to finance a project to construct roads by Indian roadways'.

**Courses of Action:**

- |                                                                                                            |                                                                                   |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| I. India should take financial help from other international financial institutions to develop such roads. | II. India should not seek any help from the international financial institutions. |
| 1. Only I follows.                                                                                         | 2. Only II follows.                                                               |
| 3. Either I or II follows.                                                                                 | 4. Neither I nor II follows.                                                      |

**Directions for questions 42 to 46:** Refer the data below and answer the questions that follow:

P causes Q or R, but not both.

U occurs only if Q occurs.

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S occurs if Q or R occurs.

T occurs only if R occurs.

Y occurs only if T or U occurs.

S causes V, W or both.

W occurs if T occurs.

V occurs if U occurs.

42. If P occurs, which of the following must occur?

- I. V
- II. T and Y
- III. S

- 1. I only
- 2. II only
- 3. III only

- 4. I, II, III

43. If Q occurs, which must occur?

- 1. Y
- 2. S
- 3. U and V

- 4. 1 and 2 both

44. If Y occurs which must have occurred?

- 1. R
- 2. Either Q or R
- 3. Both U and W

- 4. Both Q and R

45. Which may occur as a result of cause not mentioned?

- (I) S
  - (II) P
  - (III) U
- 1. I only
  - 2. II only
  - 3. I, II

- 4. I, II, III

46. If T occurs, then which one doesn't occur?

- 1. Y
- 2. Q
- 3. S

- 4. W

**Directions for questions 47 to 50:** Read the following instructions carefully and answer questions given below: Each question below is followed by two numbered facts. You have to determine whether the data given in the statement is sufficient for answering the question. Choose one of the following choices best fitting the question and mark 1, 2, 3, 4, or 5 as explained below.

- If statement 1 alone is sufficient to answer the question, but statement 2 is not sufficient.
- If statement 2 alone is sufficient to answer the question, but statement 1 is not sufficient.
- If both statements together are needed to answer the question, but neither statement alone is sufficient.
- If either statement by itself is sufficient to answer the question.
- If enough facts are not available to answer the question.

47. Is  $A = B$ ?

- 1.  $A - B = A^2 - B^2$
- 2.  $A$  and  $B$  are greater than 2.

48. What is the value of  $(a + c)/(a - b)$ ?

- 1.  $a + c = 5$
- 2.  $b + c = 7$

49. A toy was initially listed at a price that would have given the store a profit of 30 percent of the wholesale cost. What was the wholesale cost of the dress?

- 1. The toy sold for 50 rupees.
- 2. After bargaining the asked price by 5 percent, the toy was sold for a net profit of 5 rupees.

50. What is the average age of the family?
1. There are a total of 5 members in a family.
  2. Sum of the ages of 4 members of the family is 190 years.

### **Section 3: Verbal Ability (25 Questions in 25 minutes)**

**Directions for questions 51 to 55:** Read the passage given below and answer the questions that follow:

*Alzheimer's is a disease which impairs the patient's ability to recollect memories; not just distant ones but even those which are just a few hours old. Even though currently there is no official cure for this illness, a fresh hope has surfaced in the form a protein called nerve growth factor. This protein happens to be produced by nerve cells in the same region of the brain which hosts Alzheimer's. Basing their cure on this relationship, scientists from the University of Indus and the University of Amazon have set up an experiment to validate the efficacy of doses of nerve growth factors in controlling Alzheimer's. They took a group of rats who had impaired memories. The scientists gave half of them dosages of the protein while a blood protein was administered as a placebo to the other half—establishing a control group. Once the four-week test concluded, they found that the rats running on the nerve growth factor performed at par with rats with healthy memory abilities. While such experiments do not confirm that nerve growth factor can cease the process of deterioration itself caused by Alzheimer's, they certainly reveal the potential of being a means to impede it and slow down the process substantially.*

51. The passage is mainly concerned with
  1. a possible cure for Alzheimer's
  2. impaired memory of Alzheimer's patients
  3. the usage of rats as experimental subjects
  4. nerve growth factor as a possible cure for Alzheimer's
52. According to the passage, where is the nerve growth factor produced in the body?
  1. In the pineal gland
  2. In the nerve cells in brain
  3. In white blood cells in the circulatory system
  4. In nerve cells in the spine
53. The word 'impairs' is most similar to which of the following?
 

|            |             |             |               |
|------------|-------------|-------------|---------------|
| 1. Affects | 2. Destroys | 3. Enhances | 4. Diminishes |
|------------|-------------|-------------|---------------|
54. Which of the following can be inferred from the passage?
  1. Alzheimer's disease is a deadly disease.
  2. Though not so successful, the experiments showed some benefits derived from nerve growth factors.
  3. The experiment did not reveal any significant benefits from nerve growth factor.
  4. More work needs to be done to see the effects of nerve growth factor.
55. The passage most closely resembles which of the following patterns of organizations?
 

|                       |                               |
|-----------------------|-------------------------------|
| 1. Chronological      | 2. Statement and Illustration |
| 3. Alphabetical order | 4. None of these              |

**Directions for questions 56 to 59:** Out of the given options, choose the word that is most similar in meaning to the capitalized word:

56. BONHOMIE
- |                 |          |         |          |
|-----------------|----------|---------|----------|
| 1. Friendliness | 2. Wrath | 3. Very | 4. Party |
|-----------------|----------|---------|----------|

57. OMINOUS

1. Threatening      2. Supreme      3. Ubiquitous      4. Burdensome

58. HIATUS

1. Atrocity      2. Gap      3. Subjugation      4. Insecure

59. FEIGN

1. Speedy      2. Pretend      3. Hesitate      4. Attend

**Directions for questions 60 to 63:** Out of the given options, choose the word that is most opposite in meaning to the capitalized word:

60. TRANSIENT

1. Original      2. Youthful      3. Urgent      4. Eternal

61. TIRADE

1. Censure      2. Debate      3. Distrust      4. Eulogy

62. NEBULOUS

1. Frigid      2. Porous      3. Basic      4. Clear

63. PROLIFIC

1. Barren      2. Retarded      3. Restless      4. Profound

**Directions for questions 64 to 68:** In each of the following questions, a part of the sentence is underlined. Beneath the sentence, four different ways of phrasing the underlined part are given. Choose the best alternative:

64. Except for him and I, everyone brought an eatable to the picnic.

1. With the exception of him and I, everyone brought  
2. Except for him and I, everyone had brought  
3. Except for him and me, everyone brought  
4. Except for him and me, everyone had brought

65. We want the mentor to be her who is the most empathetic with the students.

1. We want the teacher to be  
2. We want her to be the mentor  
3. We desire the mentor to be her  
4. We anticipate the mentor to be her

66. He does not exercise, nor he diets

1. nor he does diet      2. neither he does diet  
3. nor does he diet      4. no change

67. He always dreamt his career could be as illustrious as the other men but not prepared to work as they had.

1. as illustrious as the other men's  
2. more illustrious than the career of the other men  
3. illustrious  
4. no change

68. Modern cinema has a harmful effect on children's psyche for they make the children think that brutality is acceptable.

1. for it make the children think that brutality is acceptable  
2. for these films make them think that brutality is acceptable

3. for they make them think that brutality is acceptable
4. they make those children think that brutality is acceptable

**Directions for questions 69 to 71:** In each of the following questions, different parts of a sentence are underlined. One of the parts has an error. Select that part as the answer:

- |                                           |                                      |
|-------------------------------------------|--------------------------------------|
| 69. 1. The ways of                        | 2. tourist travelling has changed    |
| 3. noticeably since                       | 4. the late twentieth century        |
| 70. 1. The first year of an infant's life | 2. is characterized                  |
| 3. in                                     | 4. speedy physical and mental growth |
| 71. 1. The gentleman                      | 2. said that he preferred            |
| 3. the grey blazer than                   | 4. the navy blue one                 |

**Directions for questions 72 to 73:** Make the correct sequence out of the given four statements:

- |                                                                                                                                                                                  |                                                                                                                                                        |               |             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------|
| 72. A. Then, a 17-year old shepherd boy chanced upon the soldiers and enquired, "Why don't you fight the giant?"                                                                 | B. We all know the story of David and Goliath, in which the Israeli army was at a loss of a warrior to combat the giant Goliath, a Philistine soldier. |               |             |
| C. To which David replied, "Don't you see—he is too big to miss."                                                                                                                | D. The soldiers were petrified and responded, "Don't you see he is too big to hit?"                                                                    |               |             |
| 1. BADC                                                                                                                                                                          | 2. ACDB                                                                                                                                                | 3. BACD       | 4. BDCA     |
| 73. A. In the previous decades, the local tailoring needs of a town or city were met by customised tailoring units.                                                              | B. Customarily, Indians always favoured custom-made clothing over the ready-to wear and the RMG industry is a relatively recent one.                   |               |             |
| C. Heightened consumer attentiveness to styling issues, and the handiness offered, enabled the RMG industry begin small inroads in the domestic industry in the 80s.             | D. Customized tailoring outfits have always remained a key source of clothing for domestic consumers.                                                  |               |             |
| 1. BCDA                                                                                                                                                                          | 2. BDAC                                                                                                                                                | 3. CDBA       | 4. DBAC     |
| 74. Vasudha doesn't need to take any lessons in _____ and ethics from such a consummate liar.                                                                                    |                                                                                                                                                        |               |             |
| 1. moral                                                                                                                                                                         | 2. morality                                                                                                                                            | 3. immorality | 4. modality |
| 75. Indecency is when you humiliate and cheat people emotionally, when you use and _____ the people you care for, when you lie with a _____ face to everybody when it suits you. |                                                                                                                                                        |               |             |
| 1. disabuse, straight                                                                                                                                                            | 2. abuse, crooked                                                                                                                                      |               |             |
| 3. abused, straight                                                                                                                                                              | 4. abuse, straighten                                                                                                                                   |               |             |

## Section 4: Technical Ability (15 questions in 15 minutes)

76. Which of the following about the following two declarations is true:
  - i. int \*F()
  - ii. int (\*F)()
  1. Both are identical.
  2. The first is a correct declaration and the second is wrong.
  3. The first declaration is a function returning a pointer to an integer and the second is a pointer to the function returning int.
  4. Both are different ways of declaring pointers to a function.

**506** Campus Placements

77. What are the values printed by the following program?

```
#define dprint(expr) printf(#expr "=%d",expr)
main()
{
 int x=7;
 int y=3;
 dprintf(x/y);
}
```

- 1.** #2 = 2              **2.** expr=2              **3.** x/y=2              **4.** none

78. Which of the following is true of the following program ?

```
main()
{
 char *c;
 int *ip;
 c =(char *)malloc(100);
 ip=(int *)c;
 free(ip);
}
```

- 1.** The code functions properly releasing all the memory allocated.  
**2.** The code functions but does not release all the memory.  
**3.** There is an error in the code.  
**4.** None of these.

79. What will be the output of the following program?

```
main()
{
 int i;
 char *p;
 i=0X89;
 p=(char *)i;
 p++;
 printf("%x",p);
}
```

- 1.** 0X89              **2.** 0X8A              **3.** 0X90              **4.** Error

80. Which of the following is not an ANSI C language keyword?

- 1.** extern              **2.** auto              **3.** break              **4.** typedefs

81. When an array is passed as a parameter to a function, which of the following statements is correct?

- 1.** The function can change values in the original array.

2. In C, parameters are passed by value. The function cannot change the original value in the array  
 3. It results in compilation error when the function tries to access the elements in the array.  
 4. Results in a runtime error when the function tries to access the elements in the array.
82. The type of the controlling expression of a switch statement cannot be of the type \_\_\_\_\_.  
 1. int                  2. char                  3. short                  4. float
83. What is the value of the expression  $(3^2) + (2^a)$ ?  
 1. 9                  2. 10                  3.  $1024 * 1087 + 9$                   4. None
84. What is the value assigned to the variable X if b is 7 ?  
 $X = b > 8 ? b << 3 : b > 4 ? b >> 1 : b;$   
 1. 7                  2. 28                  3. 3                  4. 14
85. What is the output produced by the following program?  

```
main()
{
int n=2;
printf("%d %d", ++n, n*n);
}
```

  
 1. 3, 6                  2. 3, 4                  3. 2, 4                  4. Can't determine
86. What is the output of the following program?  

```
int x= 0x65;
main()
{
char x;
printf("%d", x)
}
```

  
 1. compilation error                  2. 'A'  
 3. 65                  4. unidentified
87. What is the output of the following program?  

```
main()
{
int a=10;
int b=6;
if(a=3)
b++;
printf("%d %d
", a, b++);
}
```

  
 1. 10, 6                  2. 10, 7                  3. 3, 6                  4. 3, 7

**508** Campus Placements

88. What can be said of the following program?

```
main()
{
 enum Months {JAN =1,FEB,MAR,APR};
 Months X = JAN;
 if(X==1)
 {
 printf("Jan is the first month");
 }
}
```

- 1.** Does not print anything                   **2.** Prints : Jan is the first month  
**3.** Generates compilation error               **4.** Results in runtime error

89. What is the output of the following program?

```
main()
{
 char *src = "Hello World";
 chardst[100];
 strcpy(dst,src);
 printf("%s",dst);
}

strcpy(char *dst,char *src)
{
 while(*src) *dst++ = *src++;
}
```

- 1.** "Hello World"           **2.** "Hello"                   **3.** "World"                   **4.** NULL

90. What is the output of the following program?

```
main()
{
 int l=6;
 switch(l)
 { default : l+=2;
 case 4: l=4;
 case 5: l++;
 break;
}
printf("%d",l);
}
```

- 1.** 8                           **2.** 6                           **3.** 5                           **4.** 4

 **Answer Key**
**Section 1: Quantitative Ability**

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1. 4  | 2. 1  | 3. 2  | 4. 3  | 5. 1  | 6. 4  |
| 7. 2  | 8. 2  | 9. 2  | 10. 3 | 11. 1 | 12. 1 |
| 13. 1 | 14. 3 | 15. 4 | 16. 1 | 17. 2 | 18. 4 |
| 19. 2 | 20. 3 | 21. 4 | 22. 2 | 23. 3 | 24. 2 |
| 25. 2 |       |       |       |       |       |

**Section 2: Logical Reasoning**

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 26. 2 | 27. 2 | 28. 2 | 29. 1 | 30. 2 | 31. 2 |
| 32. 3 | 33. 3 | 34. 3 | 35. 2 | 36. 1 | 37. 4 |
| 38. 2 | 39. 2 | 40. 1 | 41. 1 | 42. 3 | 43. 2 |
| 44. 2 | 45. 2 | 46. 2 | 47. 3 | 48. 3 | 49. 4 |
| 50. 5 |       |       |       |       |       |

**Section 3: Verbal Ability**

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 51. 4 | 52. 2 | 53. 2 | 54. 2 | 55. 4 | 56. 1 |
| 57. 1 | 58. 2 | 59. 2 | 60. 4 | 61. 4 | 62. 4 |
| 63. 1 | 64. 3 | 65. 2 | 66. 3 | 67. 1 | 68. 1 |
| 69. 2 | 70. 3 | 71. 3 | 72. 1 | 73. 2 | 74. 2 |
| 75. 2 |       |       |       |       |       |

**Section 4: Technical Ability**

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 76. 3 | 77. 2 | 78. 1 | 79. 2 | 80. 4 | 81. 1 |
| 82. 4 | 83. 4 | 84. 3 | 85. 2 | 86. 4 | 87. 4 |
| 88. 2 | 89. 4 | 90. 3 |       |       |       |

# **Practice Paper 9**

**(Based on Recent Question Papers of IBM\*)**

*Total no. of questions: 56*

*Total duration: 60 min*

- No. of sections: 3
- There is negative marking ( $1/4^{\text{th}}$  of a mark)
- There is no sectional cut off.

## **Section 1: Series Completion (18 questions in 20 minutes)**

**Directions for questions 1 to 18:** Complete the series:

- |                                                |           |           |           |           |
|------------------------------------------------|-----------|-----------|-----------|-----------|
| 1. 28, 33, 39, 46, 54, ...                     | 1. 62     | 2. 72     | 3. 63     | 4. 73     |
| 2. 2, 4, 8, 6, 8, 48, 10, 12,.....             | 1. 120    | 2. 8      | 3. 34     | 4. 36     |
| 3. 3.8, 6.35, 8.9, 11.45,.....                 | 1. 15.35  | 2. 12.9   | 3. 14     | 4. 14.75  |
| 4. 32, 21, 28, 25, 24, 29, .....               | 1. 25     | 2. 33     | 3. 20     | 4. 42     |
| 5. 9, 65, 217,.....                            | 1. 556    | 2. 513    | 3. 730    | 4. 1001   |
| 6. 5, 7, 11, 13, 17,.....                      | 1. 19     | 2. 21     | 3. 23     | 4. 29     |
| 7. 11, 19, 46, 110, 235,.....                  | 1. 384    | 2. 520    | 3. 451    | 4. 636    |
| 8. 123, 234, 456, 789, .....                   | 1. 1018   | 2. 101112 | 3. 1233   | 4. 987    |
| 9. 2, 4, 6, .... , 16, 26, 42, .... , 110, 178 | 1. 12, 58 | 2. 10, 78 | 3. 10, 68 | 4. 12, 68 |

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\* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of IBM, a leading multinational IT firm.

10. 32, 1024, 7776, ....  
     1. 9872                  2. 24576                  3. 32768                  4. 10328
11. 10, 101, ..., 10101, 101010  
     1. 100                  2. 1010                  3. 0101                  4. None of these
12. 2, 8, 20, 44, 92, ....  
     1. 236                  2. 192                  3. 178                  4. 188
13. 1, 9, 49, 169, ....  
     1. 225                  2. 361                  3. 441                  4. 676
14. 137, 126, 114, 101, ....  
     1. 64                  2. 90                  3. 93                  4. 87
15. 1, 2/3, 2/15, 4/45, 4/225, ....  
     1. 8/675                  2. 4/675                  3. 8/1125                  4. 4/1125
16. BB, CC, DE, EH, FL, ....  
     1. GP                  2. GQ                  3. HQ                  4. HP
17. 9, -3, 1, ....  
     1. 0                  2. -6                  3. 1/3                  4. -1/3
18. 11, 100, 101, 110, 111, ...  
     1. 1011                  2. 1000                  3. 1101                  4. 0110

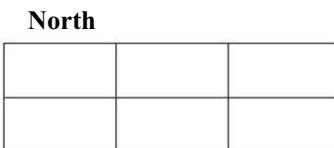
## Section 2: Quantitative Aptitude (18 questions in 20 minutes)

19. There are 56 boys in a class. Of the total number of students, 22.22% are girls. What is the strength of the class?  
     1. 72                  2. 81                  3. 63                  4. None of these
20. A mixture has milk and water in the ratio 5:1. If we add 117 litres of water in this mixture, the ratio becomes 1:2. How many litres of water were there in the original mixture?  
     1. 147 litres                  2. 28 litres                  3. 13 litres                  4. 128 litres
21. How many small cuboids of dimension  $3\text{ m} \times 5\text{ m} \times 7\text{ m}$  can be accommodated in a cube of 25 m side?  
     1. 260                  2. 280                  3. 135                  4. 364
22. There is a triangle of all three sides equal to 6 units. The ratio of areas of its circumcircle and incircle is  
     1. 1:2                  2. 2:1                  3. 3:1                  4. 4:1
23. A pair of mother and daughter and another pair of mother and daughter went to a garden. If each of them ate a whole apple, what is the minimum number of apples they need to pluck from the tree?  
     1. 2                  2. 5                  3. 4                  4. 3
24. If “fta kpl prm” stands for “you shall run” and “xyz fta qab” stands for “we shall sing” and “bok prm bok” stands for “let’s run together”, what is the code for “you”?  
     1. fta                  2. kpl                  3. prm                  4. Cannot be determined
25. The amount of weight lost by a person is inversely proportional to the number of calories taken by him. If a person takes 400 calories and loses 2 pounds, how much calories does he take if he loses 2.8 pounds?  
     1. 197                  2. 134                  3. 286                  4. 442

**512** Campus Placements

26. There are some flowers in a garden. 5 flowers wilt every day in the morning. Also, the gardener plants exactly the same number of flowers as are left in the garden every day in the evening. On the 4th day, the gardener plucks 9 flowers in the afternoon. Now the number of flowers remaining in the garden is same as the initial number at that time. What was the initial number of flowers?
1. 36      2. 21      3. 20      4. 12
27. If 2 metres of thread is made from 50 mg of cotton, how many boxes containing 20 spools each can be made from 5 kg of cotton? (1 spool contains 250 m of thread, 1 box = 2 m × 3 m × 5 m)
1. 250      2. 1000      3. 40      4. 2000
28. Three different numbers are in A.P. The product of the first two numbers is same as the product of the last two numbers. What is the middle number?
1. 0      2. -1      3. 1      4. 2
29. In a 300 m round racing track, the time taken by horse A to complete 20 rounds is same as the time taken by horse B to complete 16 rounds. How much start can the horse A give to horse B in a race of 2 rounds?
1. 80 m      2. 120 m      3. 100 m      4. None of these
30. A pair of dice is thrown together. What is the probability that the sum will be 7 or 8?
1.  $1/3$       2.  $7/18$       3.  $11/36$       4.  $2/9$

**Directions for questions 31 to 33:** In the figure there are 6 people: P, Q, R, S, T, and U sitting on 6 different chairs, all facing north. Q is sitting between R and T. T can see S but S cannot see T. P is sitting to the left of S and adjacent to T.



31. Who is sitting in the top right corner?
1. U      2. R      3. P      4. S
32. Who cannot see Q?
1. T      2. S      3. R      4. None of these
33. Who is sitting adjacent to S?
1. P      2. Q      3. U      4. All of these
34. Ram eats  $1/3$ rd of the total biscuits and Shyam eats  $3/10$ th of the total biscuits. What fraction of the total biscuits does Vijay eat if only these 3 people are eating?
1.  $1/10$       2.  $3/10$       3.  $11/30$       4.  $2/5$
35. A machine X can pack 14 boxes per minute and a machine Y can pack 42 boxes per minute. If machine X starts at 2:12 p.m. and machine Y starts at 2:24 p.m., at what time will both have packed the same number of boxes?
1. 2 : 34 p.m.      2. 2 : 36 p.m.      3. 2 : 42 p.m.      4. None of these
36. A store has an inventory of 8 boxes with 2497 packs of cigarettes in each box. If the store sells 2942 packs of cigarettes in the first week, 1497 in the second week, 5246 in the third week, and 1004 in the fourth week, how many packs of cigarettes are left in the store?
1. 8877      2. 9287      3. 10277      4. 7987

### Section 3: Verbal Ability (20 questions in 20 minutes)

**Directions for questions 37 to 41:** In the following questions, sentences are given in active/passive voice. From the given alternatives, choose the one that best expresses the given sentence in active/passive voice:

37. One should open the cheese about an hour before one uses it.
  1. Cheese should be opened about an hour before use.
  2. Cheese should be opened by one about an hour before use.
  3. Cheese should be opened about an hour before one uses it.
  4. Cheese should be opened about an hour before it is used.
38. You need to clean your cupboard thoroughly.
  1. Your cupboard is needed to clean thoroughly.
  2. You are needed to clean your cupboard thoroughly.
  3. Your cupboard needs to be cleaned thoroughly.
  4. Your cupboard are needed to clean thoroughly.
39. The instructor was reading out the instructions.
  1. The instructions were read by the instructor.
  2. The instructions were being read by the instructor.
  3. The instructions had been read out by the instructor.
  4. The instructions had been read by the instructor.
40. He is said to be very formidable.
 

|                                                                                                                                |                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. He said he is very formidable.</li> <li>3. He said it is very formidable.</li> </ol> | <ol style="list-style-type: none"> <li>2. People say he is very formidable.</li> <li>4. People say it is very formidable.</li> </ol> |
|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
41. Could you buy some eggs for me?
 

|                                                                                                                           |                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. Eggs should be bought.</li> <li>3. You are ordered to buy some eggs.</li> </ol> | <ol style="list-style-type: none"> <li>2. You are requested to buy some eggs for me.</li> <li>4. Eggs must be bought.</li> </ol> |
|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|

**Directions for questions 42 to 44:** Out of the given options, fill in the blanks with an appropriate choice:

42. I haven't baked an orange cake \_\_\_\_\_ a long while.
 

|         |          |        |          |
|---------|----------|--------|----------|
| 1. from | 2. since | 3. for | 4. until |
|---------|----------|--------|----------|
43. The \_\_\_\_\_ brought against the policy was discarded by a resounding majority in the Lower House.
 

|         |           |           |         |
|---------|-----------|-----------|---------|
| 1. bill | 2. motion | 3. decree | 4. suit |
|---------|-----------|-----------|---------|
44. The school comprises \_\_\_\_\_ seventy rooms.
 

|                                                                        |                                                                                             |
|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. of</li> <li>3. by</li> </ol> | <ol style="list-style-type: none"> <li>2. into</li> <li>4. no preposition needed</li> </ol> |
|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|

**Directions for questions 45 to 48:** In these questions, some of the sentences have errors and some have none. Find out which part of the sentence has an error.

45. 1. I apologise
- 
3. at the conference
- 
46. 1. The cook ordered
- 
3. to laid
- 
47. 1. She has promised
- 
3. isn't it?
- 
48. 1. Which will get us there
- 
3. the metro and
- 
2. I am forgetting what he told me
- 
4. last week
- 
2. the servant
- 
4. the table
- 
2. to turn up for the event,
- 
4. No error
- 
2. faster—
- 
4. the auto?

**514** Campus Placements

49. Which of the following is most advisable when writing business correspondence?
1. To use varied italics, colours, and stylish fonts because they are pleasing to the eye.
  2. To keep the content relatively short, precise and polite, with pertinent questions relating to what you expect to happen.
  3. To make detailed demands in elaborate paragraphs, with the implication of wrongdoing on the part of the receiver.
  4. To panic, but then recover, and decide to send the message by regular mail, as this is definitely more secure.
50. When writing an email, it is usually better to keep your paragraphs \_\_\_\_\_.  
1. long                                    2. short  
3. in a big font making them easier to read                            4. indented  
5. none of the above
51. What is the appropriate way to address someone in cyber correspondence if you are unsure of how he or she would like to be addressed?
1. Use their first name, it is always the friendliest option.
  2. Use their last name, such as Mr Sharma or Ms Sharma.
  3. Use their full name, with their first name in parentheses afterwards.
  4. Use Dear xyz to demonstrate your uncertainty, and they will probably correct you.
52. If you are chatting via an instant messenger and the person writes 'BRB', what does it imply?  
1. Been Ready Buddy    2. Been Really Busy    3. Being Really Busy    4. Be Right Back
53. What is the aim of icon-emotions or so-called 'emoticons' in the cyber-world communication?  
1. They contain important information such as credit card numbers.  
2. They indicate that the email is urgent.  
3. They are meant for fun and entertainment value.  
4. They act as a signature which is added at the end of each sent mail.

**Directions for questions 54 to 56:** In these questions, choose the word which can be substituted for the given word:

54. Incapable of doing any wrong:  
1. Correct                                    2. Perfect                                    3. Incorrigible                                    4. Infallible
55. A presentation with exaggerated features for a comic effect:  
1. Panorama                                    2. Caricature                                    3. Pantomime                                    4. Satire
56. The study of coins  
1. Numerology                                    2. Entomology                                    3. Numismatics                                    4. Metallurgy

 **Answer Key**

**Section 1: Series Completion**

- |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1. 3  | 2. 1  | 3. 3  | 4. 3  | 5. 2  | 6. 1  |
| 7. 3  | 8. 3  | 9. 3  | 10. 3 | 11. 2 | 12. 4 |
| 13. 3 | 14. 4 | 15. 1 | 16. 2 | 17. 4 | 18. 2 |

## Section 2: Quantitative Aptitude

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|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 19. 1 | 20. 3 | 21. 3 | 22. 4 | 23. 4 | 24. 2 |
| 25. 3 | 26. 4 | 27. 3 | 28. 1 | 29. 2 | 30. 3 |
| 31. 1 | 32. 2 | 33. 4 | 34. 3 | 35. 4 | 36. 2 |

## Section 3: Verbal Ability

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|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 37. 4 | 38. 3 | 39. 2 | 40. 2 | 41. 2 | 42. 3 |
| 43. 2 | 44. 4 | 45. 2 | 46. 3 | 47. 3 | 48. 3 |
| 49. 2 | 50. 2 | 51. 2 | 52. 4 | 53. 3 | 54. 4 |
| 55. 2 | 56. 3 |       |       |       |       |

# Practice Paper 10

(Based on Recent Question Papers of *iGate\**)

Total no. of questions: 50

Total duration: 50 min

- No. of sections: 2
- There is no negative marking
- There is sectional cut off

## Section 1: Quantitative Aptitude (30 questions in 30 minutes)

1. Two trains A and B start from the same station P towards Q at speeds 60 km/h and 90 km/h respectively. After reaching station Q, train B immediately turns back towards station P and meets A at a distance 60 km from station Q. Find the distance between both the stations.  
1. 225 km      2. 250 km      3. 300 km      4. 200 km
2. How many 1's are there in the binary form of  $8 \times 1000 + 3 \times 100 + 87$ ?  
1. 4      2. 3      3. 5      4. None of these
3. Rishav starts playing a game with Rs 4. If he wins he gets Rs 2 and if he loses the game, he loses Rs 2. He can lose only 5 times. If he earns Rs 10, he is automatically out of the game. Find the number of ways in which this is possible.  
1. 14      2. 16      3. 20      4. None of these
4. If there are  $1920 \times 1080$  pixels on a screen and each pixel can have around 16 million colours, find the memory required for this.  
1. 4 MB      2. 16 MB      3. 2 MB      4. 6 MB
5. At 6.40 a.m., what will be the approximate angle between the two hands of the clock?  
1. 40      2. 90      3. 60      4. None of these
6. If all students of a class stand in a row, Ankita is standing 12th from the right and 5th from left. How many students are there in the class?  
1. 19      2. 17      3. 16      4. 15
7. Simran has 6 times more marbles than Priya. If the total number of marbles is 70, how many marbles does Priya have?  
1. 9      2. 6      3. 10      4. 11

\* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of *iGate*, a leading multinational IT firm.

8. The cost of 2 oranges is 5 cents. What will be the cost of three and a half dozen oranges?  
 1. 1 dollar and 5 cents    2. 2 dollar and 10 cents    3. 1 dollar    4. 145 cents
9. If a clock is late by 2 minutes 50 seconds in one month, how many seconds will it be late by in 2 days?  
 1. 11.3    2. 13.9    3. 11.9    4. 15.9
10. Arjun, Bibin, and Chetan invest \$16000, \$4000, and \$8000 respectively and they get a profit of \$1200. How much more share did Arjun get than Bibin and Chetan (in fractions)?  
 1.  $\frac{3}{7}$  and  $\frac{2}{7}$     2.  $\frac{4}{7}$  and  $\frac{5}{7}$     3.  $\frac{3}{7}$  and  $\frac{5}{7}$     4.  $\frac{5}{7}$  and  $\frac{6}{7}$
11. What is the average speed of Messi (in kmph) if he covers laps of equal distances at the speeds of 15 kmph, then at 25 kmph, then at 30 kmph, and finally at 40 kmph?  
 1.  $200/33$     2.  $800/99$     3.  $600/33$     4.  $800/33$
12. If  $p + q + r = 11$ , what is the maximum value of p? (q and r are different positive integers)  
 1. 8    2. 9  
 3. 11    4. Data insufficient
13. A, B, C, and D together collected 200 stickers of Pokemon. No one had less than 20. And each had an even and a different number. What is the maximum number of stickers a person can have?  
 1. 154    2. 134    3. 124    4. 60
14. A shirt costing Rs 190 is sold at 15% discount on the mark-up price and still a profit of 10% is made. What is the selling price after discount?  
 1. 209    2. 198    3. 219    4. 229
15. 8 years ago, Shivali was five times as old as her sister, and now she is thrice as old as her sister. Find her sister's age.  
 1. 48 years    2. 24 years    3. 16 years    4. 18 years
16. If I blow a whistle standing at a point, my friend who is at a distance of 1500 m and moving away from me at 54 kmph hears it after some time. Find the duration after which he hears the sound of the whistle. (Speed of sound = 330 m/s).  
 1. 3.6    2. 4.76    3. 40    4. None of these
17. Apoorva's age is  $\frac{1}{12}$ th her mother's age. Her mother's age will be thrice that of Rohan after 12 years. If Rohan celebrated his ninth birthday 3 years ago, what is Apoorva's present age?  
 1. 6 years    2. 10 years    3. 7 years    4. 5 years
18. If all the vowels come together, in how many ways can you arrange the word 'BENDING'?  
 1. 1360    2. 1420    3. 720    4. 960
19. The least number that must be added to 1067 so that the sum is divisible by 27 is \_\_\_\_\_.  
 1. 18    2. 13    3. 3    4. 21
20. 9 identical machines produce a total of 450 candies per minute running at a constant rate. If there are 12 such machines which work for 2 minutes, how many candies can be produced?  
 1. 1200    2. 2400    3. 20000    4. 2100
21. Find the missing term 40, \_\_, 1.6, 0.32  
 1. 8    2. 10    3. 15    4. 20
22. A to Z are 26 players in a league where each plays against every other player. There are 2 points for a win, 1 point for a draw and 0 points for loss. If the rank list of the players happens to be in alphabetical order and in all there were 0 draws and scores of no two players match, which of the following statements is true?

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1. A won all the matches      2. B lost to A  
3. M won over N      4. All of these
23. BFD, DHF, FJH, \_\_\_\_.  
1. GLJ      2. HIL      3. HLI      4. HLJ
24. Rohit points to a woman and says “She is the wife of my grandmother’s only son”. What is the relation between the two?  
1. Sister      2. Mother      3. Daughter      4. Daughter-in-law
25. 7, 13, 19, \_\_\_\_.  
1. 25      2. 39      3. 31      4. 37
26. 22, 15, 21, 18, 20, 21, 19, \_\_\_\_.  
1. 42      2. 24      3. 21      4. 23
27. 16, 2, 32, 4, 64, 6, \_\_\_\_.  
1. 128      2. 96      3. 130      4. 132
28. CDC, DED, EFE, \_\_\_\_.  
1. FGF      2. GHG      3. HJH      4. JKJ
29. On Sunday, Amit and Daman decide either they would speak the truth or lie. Ishan asks Amit whether he was lying or telling the truth. He answers and Daman was listening to the answer. Ishan then asks Daman about what Amit has said. Daman says “Amit says he is a liar”. What is Daman speaking?  
1. Truth      2. Lie  
3. Truth when Amit lies      4. Can’t be determined
30. 312, 423, 534, \_\_\_\_.  
1. 645      2. 654      3. 564      4. 666

**Section 2: Verbal Ability (20 questions in 20 minutes)**

**Directions for questions 31 to 35:** The following sentences are divided into 4 parts. One part has an error. Select the incorrect part as the answer. If there is no error, the answer is ‘D’. (Ignore the errors of punctuation, if any.)

1. 1. The cruise      2. on its maiden journey  
3. got drowned in the Atlantic Ocean      4. No error
2. 1. Due to sudden rush of tourists      2. and heavy booking  
3. I could not put up in a hotel      4. No error
3. 1. A lot of travel delays are caused      2. on behalf of the  
3. administration      4. No error
4. 1. One of the followers      2. expressed doubt if  
3. the Group Chief was an atheist      4. No error
5. 1. I have got      2. my Masters degree      3. in 1993      4. No error

**Directions for questions 36 to 40:** Fill in the blanks with appropriate word out of the given options:

6. \_\_\_\_\_ of old monuments is best left to the experts.  
1. Resurrection      2. Retrieval      3. Restoration      4. Resumption
7. During festival days, the market is \_\_\_\_\_ of people.  
1. busy      2. full      3. crowded      4. bubbling

8. The journey to glory leads \_\_\_\_\_ to the pyre.  
 1. directly      2. but      3. in      4. straight
9. If negotiations are to prove productive, there must not only be authenticity on each side, but there must also be \_\_\_\_\_ in the authenticity of the other side.  
 1. certainty      2. belief      3. substance      4. faith
10. Unlike Sharapova, Serena was up \_\_\_\_\_ more than her match.  
 1. for      2. into      3. against      4. to

**Directions for questions 41 to 45:** In the following questions, choose the word which is the exact OPPOSITE to the given words.

11. PROVOCATION  
 1. Vacation      2. Pacification      3. Vocation      4. Destruction
12. REMISS  
 1. Regretful      2. Watchful      3. Beautiful      4. Harmful
13. METICULOUS  
 1. Associated      2. Shaggy      3. Slovenly      4. Meretricious
14. EXODUS  
 1. Return      2. Homecoming      3. Influx      4. Revert
15. COMIC  
 1. Painful      2. Tragic      3. Fearful      4. Emotional

**Directions for questions 46 to 48:** In the following questions, choose the word which best expresses the meaning of the given word.

16. CANNY  
 1. Adamant      2. Tight      3. Stout      4. Clever
17. AUGUST  
 1. Petty      2. Ridiculous      3. Dignified      4. Common
18. STERILE  
 1. Arid      2. Dry      3. Childless      4. Barren

**Directions for questions 49 and 50:** Each question consists of two words which have a certain relationship to each other followed by four pairs of related words. Select the pair which has the same relationship.

19. GRAIN : SALT  
 1. shard : pottery      2. shred : stone      3. blades : grass      4. chip : paper
20. PAIN : SEDATIVE  
 1. comfort : stimuli      2. mourn : consolation  
 3. trance : narcotic      4. stress : tranquillizer

### Answer Key

#### Section 1: Quantitative Aptitude

- 
1. 3      2. 3      3. 4      4. 4      5. 1      6. 3

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|              |              |              |              |              |              |
|--------------|--------------|--------------|--------------|--------------|--------------|
| <b>7.</b> 3  | <b>8.</b> 1  | <b>9.</b> 1  | <b>10.</b> 1 | <b>11.</b> 4 | <b>12.</b> 1 |
| <b>13.</b> 2 | <b>14.</b> 1 | <b>15.</b> 3 | <b>16.</b> 2 | <b>17.</b> 4 | <b>18.</b> 3 |
| <b>19.</b> 2 | <b>20.</b> 1 | <b>21.</b> 1 | <b>22.</b> 4 | <b>23.</b> 4 | <b>24.</b> 2 |
| <b>25.</b> 1 | <b>26.</b> 2 | <b>27.</b> 1 | <b>28.</b> 1 | <b>29.</b> 2 | <b>30.</b> 1 |

**Section 2: Verbal Ability**

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|              |              |              |              |              |              |
|--------------|--------------|--------------|--------------|--------------|--------------|
| <b>1.</b> 3  | <b>2.</b> 3  | <b>3.</b> 2  | <b>4.</b> 2  | <b>5.</b> 1  | <b>6.</b> 3  |
| <b>7.</b> 2  | <b>8.</b> 1  | <b>9.</b> 4  | <b>10.</b> 3 | <b>11.</b> 2 | <b>12.</b> 2 |
| <b>13.</b> 3 | <b>14.</b> 3 | <b>15.</b> 2 | <b>16.</b> 4 | <b>17.</b> 3 | <b>18.</b> 4 |
| <b>19.</b> 3 | <b>20.</b> 4 |              |              |              |              |

# Practice Paper 11

## (Based on Recent Question Papers of Infosys\*)

Total no of questions: 65

Total duration: 90 min

- No of sections: 3
- There is no negative marking
- There is no sectional cut off

### Section 1: Quantitative Aptitude (15 questions in 25 minutes)

1. *A* is chasing *B*; the distance between them is 100 m. After 8 seconds, the distance between them is 84 m. *A* is faster than *B* by  
1. 2 m/s                  2. 3 m/s                  3. 4 m/s                  4. 1 m/s
2. Ajay and Vijay can finish a certain work in 12 hours by working together. One of them can finish the work 10 hours faster than the other. How many hours does the faster one take to finish the work?  
1. 30 hours                  2. 25 hours                  3. 20 hours                  4. 35 hours
3. A garland is to be made of 8 different flowers. How many different garlands could be made?  
1. 2520                  2. 5040                  3. 40320                  4. 20160
4. How many different words can be made from the word ‘ARRANGE’ if all the vowels come together?  
1. 120                  2. 180                  3. 90                  4. 30
5. A four-digit number is to be formed using the digits 2, 3, 4, and 6 without repeating the digits. What is the probability that the number thus formed is an odd number and is greater than 4000?  
1. 1/6                  2. 1/3                  3. 1/2                  4. None of these
6. What is the unit’s digit of the expression  $(213^{129} + 344^{128}) \times (657^{131} - 548^{130})$ ?  
1. 3                  2. 9                  3. 6                  4. 1

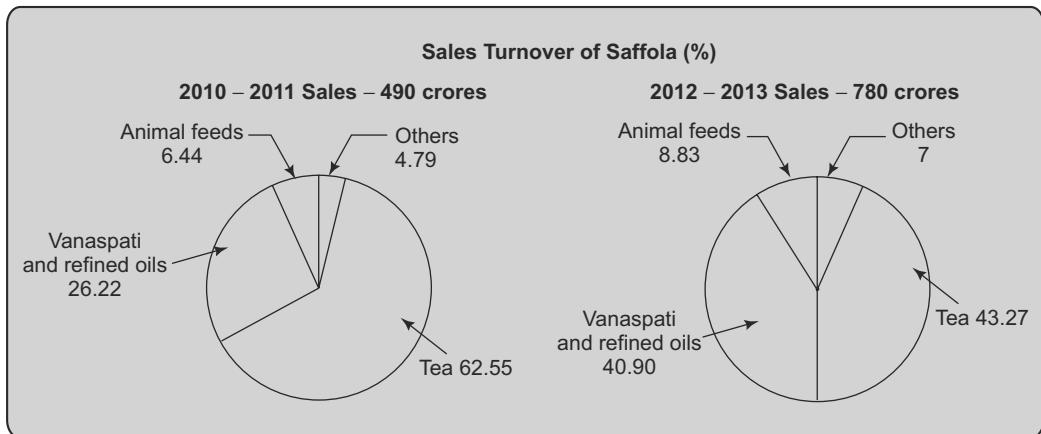
**Directions for questions 7 to 11:** Each item is followed by two statements, A and B. Answer each question using the following instructions. Choose

1. if the question can be answered by one of the statements alone and not by the other
2. if the question can be answered by using either statement alone

\* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of Infosys, a leading multinational IT firm.

3. if the question can be answered by using both the statements together, but cannot be answered by using either statement alone
4. if the question cannot be answered even by using both statements together
7. What are the values of  $A$  and  $B$ ?
  1.  $A$  is an odd integer,  $B$  is an even integer,  $A > B$ .
  2.  $A \times B = 60$
8. Is the income-tax collection of the country  $A$  higher than the country  $B$ ?
  1. Tax collected by countries  $A$  and  $B$  have grown over the past 5 years at compounded annual rate of 6% and 7%, respectively.
  2. 5 years ago, income tax collected by the country  $A$  was higher than that of the country  $B$ .
9. What will be the time for downloading a movie?
  1. Transfer rate is 3 megabytes per second.
  2. The size of the movie is 3 gigabytes.
10. Is  $A = B$ ?
  1.  $A((A + B)/AB) + B((A + B)/AB) = 4$
  2.  $(A - 40)^2 = (B - 40)^2$
11. What is the average score of the class in mathematics?
  1. Half the class scored above 60 and half the class scored below 60.
  2. The highest marks in mathematics are 90 and lowest marks are 30.

**Directions for questions 12 to 15:** The following 4 questions are based on the pie charts below:



12. Tea sales increased by  $x$  crores from 2010–11 to 2012–13 where  $x$  is approximately equal to
  1. Rs 20 crores
  2. Rs 24 crores
  3. Rs 28 crores
  4. Rs 31 crores
13. In 2010–2011, the sector tea represented  $z$  where  $z$  equalled (in crores)
  1. 323.22
  2. 344.58
  3. 325.18
  4. 306.49
14. Percentage increase in sales from 2010–11 to 2012–13 is \_\_\_\_\_.
  1. 41.4%
  2. 35.42%
  3. 59.18%
  4. 37.14%
15. If refined oils account for  $\frac{1}{4}$ th of the total sales of ‘vanaspati’ and ‘refined oils’, the rupee sales of refined oil in 2012–13 was almost \_\_\_\_\_.
  1. Rs 64.32 crore
  2. Rs 79.75 crore
  3. Rs 78 crore
  4. Rs 70.22 crore

## Section 2: Logical Reasoning (10 questions in 25 minutes)

16. Looking at the portrait of a man, Ramesh said, "The wife of my father's son is his mother. I am the only child." At whose portrait was Ramesh looking?

1. His cousin      2. His son      3. His uncle      4. None of these

**Directions for questions 17 to 19:** Answer the following questions based on the passage below.

A group of four and five has to be selected from nine persons. Among the nine are three women—Fanny, Deepika and Kavya—and six men: Raj, Sam, Dravid, Pankaj, Ankit, and Rahul. Raj would not like to be in the group if Sam is also selected. Sam and Rahul want to be selected together in the group. Kavya would like to be in the group only if Dravid is also there. Dravid, if selected, would not like Pankaj in the group. Raj would like to be in the group only if Pankaj is also there. Dravid insists that Fanny be selected in case he is there in the group. Ankit and Pankaj are good friends and they also want to be in the same group.

17. Which of the following is a feasible group of four?

1. Dravid, Raj, Rahul, Pankaj      2. Pankaj, Sam, Rahul, Ankit  
3. Kavya, Dravid, Sam, Pankaj      4. Fanny, Dravid, Raj, Ankit

18. Which of the following is a feasible group of five?

1. Raj, Pankaj, Fanny, Rahul, Kavya      2. Sam, Rahul, Raj, Sam  
3. Sam, Rahul, Fanny, Dravid, Deepika      4. Fanny, Dravid, Raj, Pankaj, Sam

19. Which of the following statements is true?

1. Kavya and Raj can be part of a group of four.  
2. A group of five can have three women.  
3. A group of four can have all four men.  
4. None of the above.

**Directions for questions 20 to 22:** Answer the questions on the basis of the information given below.

5 women decided to go shopping to Palika Bazar, New Delhi. They arrived at the meeting place in the following order: 1. Aparna, 2. Chetna, 3. Darpan, 4. Heena, and 5. Samira. Each woman spent at least Rs 2100. Below are some additional facts about how much they spent during their shopping spree.

- One woman spent Rs 3517 and she was not Aparna, and another woman spent Rs 1278 more than Chetna.
- Heena spent less than Darpan.
- The woman who spent Rs 3334 arrived before the lady who spent Rs 2293.
- One woman spent Rs 2340 and she was not Darpan.
- Samira spent the largest amount and Chetna, the smallest.

20. What was the amount spent by Heena?

1. Rs 2293      2. Rs 2340      3. Rs 2294      4. Rs 3517

21. Which of the following amounts was spent by one of them?

1. Rs 3343      2. Rs 2923      3. Rs 3571      4. Rs 3204

22. The woman who spent Rs 2293 is \_\_\_\_\_.

1. Aparna      2. Chetna      3. Darpan      4. Heena

23. An auto-rickshaw has 4 new tyres (one is the spare tyre). Each tyre can cover a maximum distance of 100 km. What is the maximum distance (approx.) that an auto-rickshaw can cover using all the tyres?

1. 150 km      2. 233 km      3. 166 km      4. 133 km

24. The distance between Amritsar and Delhi is greater than 400 km. From Amritsar, a train starts towards Delhi at a speed of 80 km/h and at the same point of time, another train starts from Delhi towards Amritsar at a speed of 85 km/h. What is the distance between the trains 40 min before meeting each other?

1. 48 km                  2. 110 km                  3. 135 km                  4. 65 km

**Directions for question 25:** Read all the conclusions and then decide which of the given conclusions logically follows from the given statements disregarding commonly known facts.

25. Statements: All green are pink. Some pink are black.

Some black are blue. All blue are white.

**Conclusions:**

- I. Some black are white.
- II. Some blue are pink.
- III. Some pink are green.
- IV. No green is white.

- 1. Only I and III follow.
- 2. Only III follows.
- 3. Only either I or II follows.
- 4. None of these.

### Section 3: Verbal Ability (40 questions in 35 minutes)

**Directions for questions 26 to 35:** Read the passages and answer the questions given after them.

#### PASSAGE 1

Long labelled as intensely personal and unpredictably subjective, dreams are now slowly being pulled out from under the bed and being examined in the light of research; only to spill the secrets of volition, consciousness, and the realm of our imagination. But at the very cutting edge of this dream research stands the study of a mysterious, unusual type of dream named a “lucid dream”. In the simplest explanation, a lucid dream is one in which one dreams with the awareness that he/she is dreaming, and hence can manipulate the course of the dream. Although currently a very small proportion of the population is known to indulge in these dreams, methods are now emerging to help induce such dreams in people.

Wethro Rull of the University of Atlan and LeClipiton of Madford University, put some basics together and discerned that if a lucid dreamer could somehow manage to communicate with the external world, it could open an entire new world which subsists between the conscious and the unconscious; a dialogue, an exchange. Rull leveraged the fact that the eyes move while we are dreaming. She hypothesised that perhaps a lucid dreamer could use eye movement, in a predetermined pattern, as a cue or signal; and in 1983, successfully managed to make a volunteer move his eyes right and left nine times successively. Thence, they simply connected the movements to the Morse code to make entire sentences. The next step forward envisages linking these Morse signals to a speech synthesizer to stage a real, actual conversation.

What do we seek to gain from all this? For starters, it could help us resolve the on-going debate about the nature of our dreams. The old school of thought stubbornly cling to the Freudian concept of dreams being manifestations of our unconscious desires' fulfilment while the new school holds that dreams are nothing but random bursts of electrochemical activity which the brain tries to cope with by employing some coherent visual imagery. If Rull's experiment goes through, this tiresome debate could finally be put to rest.

Additionally, this could also enable researchers to stimulate numerous regions of the brain through electrodes to examine what, if any, effects it incurs on the content of a person's dream, while simultaneously receiving feedback from the dreamer. But as of now, for both sides, this research is almost like a dream come true.

26. The author is unlikely to agree with any of the following except \_\_\_\_\_.  
 1. dream research is chiefly developing strategies for research into the eye movement  
 2. research shows that the dreamer can be made to simultaneously participate in the real world  
 3. visual imagery and its relation with the Morse code is indeed very complex  
 4. none of the above
27. The most important aspect of dream research is the way it has made \_\_\_\_\_.  
 1. its link of subconscious with the unconscious  
 2. Its link of the conscious with the Morse code  
 3. its relationship of volition with the Morse code  
 4. none of the above
28. According to the passage, the Freudian concept of dreams \_\_\_\_\_.  
 1. has now been antiquated  
 2. relies heavily on the unfulfilled part of the unconscious  
 3. relies heavily on the wishful thinking of the subconscious  
 4. both (a) and (b)
29. The concept of ‘lucid dreamer’ has been highlighted in the passage because  
 1. it shows a way of analyzing dreams simultaneously with the real world  
 2. lucid dreamers are a typical class of dreamers  
 3. dream research required the help of non-lucid dreamers  
 4. real dreamers and lucid dreamers are closely related
30. The tone of the author can be best described as \_\_\_\_\_.  
 1. informative      2. critical      3. disillusioned      4. argumentative

## PASSAGE 2

There's no refuge. We are ingesting heaps of GM, i.e., Genetically Modified, food. The milk in which our cereal floated this morning was sourced from a genetically modified cow, and the cereal itself features GM wholegrain goodness. For lunch we'll relish chips from genetically modified potatoes. Not to forget the bucket of the genetically modified fried chicken pieces. And if we don't have any commitments later in the afternoon, we'll probably wash these down with premium genetically modified grains, hops and barley, brewed to excellence.

Everything we consume is the product of genetic modification. When a farmer in the faraway country of Lagos tabbed a stud bull to mate with a chosen cow to reproduce the calf that eventually yielded the milk for our breakfast cereal, he manipulated genes. Sounds tasty, right? Sorry. But you get it now, right?

Centuries before we were even born, peasants were grafting genes and manipulating seeds to craft more robust crops and plants. The only difference is then it used to be referred to as “breeding”. We have now made it jump up a few notches.

Returning to the matter at hand, breeding doesn't sound scary enough, so the anti-technologists call it “genetic modification”; desperate to project biotechnology, which is merely a more stringent and effective breeding method, as some kind of threat to our very existence, rather than the blessing that it actually is.

Has anyone seen corn in its natural form sans genetic modification? It's repulsive. Yes, I'm talking about that gnarled, multicoloured rubbish used to ornament our Thanksgiving displays. The fear hawkers should try eating that the next time before they cry themselves hoarse against GM food.

Actually, they are waging a very thriving campaign against biotech, especially in parts of Europe where they've lobbied to bind the accessibility of “genetically modified” foods. Even in the technology-liberal US, the terror is spreading. In fact, let's wake up to the fact that we've been thriving on these foods enhanced by

biotechnology in some way or the other for most of the last decade. And the outcome is only good—more food abundance and that too at lower prices.

And looking towards the future, the promise to eradicate human suffering is massive. Today, according to the World Health Organization, millions of children perish annually due to deficiency of vitamins in their diets. Millions more turn blind. Additionally, WHO estimates that almost a billion people suffer from anaemia, which is caused by deficiency of iron. What if GM could help us develop pulses enriched with all these essential vitamins?

Personally, I wouldn't mind having an entire day's requirement of nutrition bio-engineered into a candy or a pizza, but I am aware of the advantages of more nutritious foods. More reasonable people though disagree on the optimum applications of this technology.

And even then, all that the critics want to discuss is the menace of genetically modified crops. Haters going to hate, I guess. The EPA, Environmental Protection Agency, wishes to regulate the use of particular bio-engineered seeds because they contain a resistance to pests. More specifically, certain corn seeds are bred to consist of a toxin called JP that wipes the little creatures called corn borers, so farmers needn't spray pesticides.

That's a good thing, you'd say. But according to the EPA, the same toxin in the corn can kill Emperor butterflies, too. Now these butterflies don't eat corn, but the EPA is troubled by the possibility that the corn pollen will get carried by the wind and stick to a milkweed; which may confuse the Emperor caterpillars who will inadvertently eat it.

Well. Not exactly the end of earth, but it sounds cruel. That is, until we chew over the alternatives. According to Professor Pipa Nadaloff, Professor of Life Sciences at Garver University, "A wide-spectrum pesticide which is plane-sprayed will exterminate a lot more insects and life than by any in-plant toxin."

Now, the anti-tech group will proclaim that we shouldn't like pesticides either. These people encourage organic farming; whereby we use more land to produce the same quantity of food and wipe out more wilderness. Why stop at that—we also pay more to fill our stomachs. Because? Because we don't like technology. That might not be a concern for you or me, but it is discouraging news for those millions of malnourished children.

Says Nadaloff, "I suspect that most residents of contemporary societies don't have a clue about how laborious it is to grow adequate quantities of food for the current human population, when competing with fungi, bacteria, animals, insects and animals and facing floods, droughts and such climatic variations." That might be true, but most Americans do realize the positive side of technology. And that is why they will eventually not give in to this entire scare campaign against GM and biotechnology.

31. Which of the following statements is going to meet with an approval from the author?
  1. Cloning can have disastrous implications but it is okay to clone for medical research.
  2. Genetically modified food is gradually taking a toll on human life.
  3. For a poor nation, genetically modified food may be the only source of cheap food.
  4. All technological inventions and achievements should be embraced with open arms.
  
32. The central idea of the passage is to \_\_\_\_\_.
  1. propagate the idea that genetically modified food is the only solution to feed the growing population
  2. dissuade critics against opposing genetically modified food
  3. make the readers aware of the benefits that can be reaped out of genetically modified food
  4. make the readers take what opponents of genetically modified foods say with a pinch of salt
  
33. The passage has possibly been culled from \_\_\_\_\_.
  1. a journal on genetic engineering
  2. a popular science magazine

3. an article in a weekly or a magazine  
 4. an article in a lepidopterists' book for high-school students
34. The assumption that EPA makes regarding Emperor butterflies is that \_\_\_\_\_.  
 1. they might eat wheat mistaking it for barley  
 2. bio-engineering will have a deep impact on Emperor butterflies  
 3. Emperor caterpillars which feed on barley may eat the pollens of wheat injected with DPT  
 4. none of the above
35. The nature of the passage is best described as \_\_\_\_\_.  
 1. analytical      2. narrative      3. factual      4. argumentative

**Directions for questions 36 to 40:** A sentence is written in four different forms. Only one of them is grammatically correct. Mark the number of the correct sentence as your answer.

36. 1. John F Kennedy was executed while he was on his way to address a meeting.  
 2. John F Kennedy was slaughtered while he was on his way to address to a meeting.  
 3. John F Kennedy was murdered while he was on his way to address in a meeting.  
 4. John F Kennedy was assassinated while he was on his way to address a meeting.
37. 1. He was infuriated despite of that he maintained her composure.  
 2. He maintained his composure despite of being infuriated.  
 3. Despite of being infuriated he maintained her composure.  
 4. He maintained his composure despite being infuriated.
38. 1. His workers were asking him for an increment for a long time.  
 2. His workers were asking him for an increment from a long time.  
 3. His workers have been asking him for an increment for a long time.  
 4. His workers were been asking him for an increment for a long time.
39. 1. There are no less than eighty students in the hall.  
 2. There are no fewer than eighty students in the hall.  
 3. There are not fewer than eighty students in the hall.  
 4. There are not lesser fewer than eighty students in the hall.
40. 1. I request your favour of granting me permission to leave early.  
 2. I am requesting your favour in granting me permission to leave early.  
 3. I request for your favour to grant me permission in leaving early.  
 4. I request the favour of your granting me permission to leave early.

**Directions for questions 41 to 43:** In the questions below, fill in the blanks with the appropriate choices:

41. Gust Nevak, whose social writing was often flamboyant, was a surprisingly a \_\_\_\_\_ man in his private life: he lived in rented places, barely ate, and wore drab clothes.  
 1. simple      2. controversial      3. sordid      4. comfortable
42. As long as Republicans cannot accumulate enough physical power themselves and dominate all others, they must rely on their \_\_\_\_\_.  
 1. allies      2. resources      3. freedom      4. education
43. While encouraging parents can compensate for adversity, distant or inconsistent parents may \_\_\_\_\_ it.  
 1. exacerbate      2. eradicate      3. neutralize      4. ameliorate

**Directions for questions 44 to 51:** In each problem below, either part or the entire sentence is underlined. The sentences are followed by five ways of writing the underlined part. Answer choices [1] repeats the origi-

*nal: the other answer choices vary. If you think that the original phrasing is the best, select choice [1]. If you think one of the other answer choices is the best, select that choice.*

44. Akhil, along with his oldest brothers, are going to make a large manufacturing investment.
  1. Akhil, along with his oldest brothers, are
  2. Akhil, along with his oldest brothers, is
  3. Akhil, in addition to his oldest brothers, are
  4. Akhil, as well as his oldest brothers, are
45. Many tourists state unequivocally that the streets in Rome are more beautiful than any other city.
  1. that the streets in Rome are more beautiful than any other city
  2. that the streets in Rome are more beautiful than those in any other city
  3. that, unlike any other city, Roman streets are more beautiful
  4. that the streets of Roman are more beautiful than the streets in any other city
46. Dr Kaushal's findings that moods affect blood pressure are different from those published by his colleague, Dr Mishra.
  1. affect blood pressure are different from those
  2. affect blood pressure are different from that
  3. affect blood pressure are different than those
  4. affect blood pressure are different than those
47. Was the message written with pencil or with ink?
 

|                            |                          |
|----------------------------|--------------------------|
| 1. with pencil or with ink | 2. with pencil or in ink |
| 3. in pencil or in ink     | 4. with lead or with pen |
48. He has lain his baseball mitten on the bench.
 

|             |             |              |              |
|-------------|-------------|--------------|--------------|
| 1. has lain | 2. has laid | 3. have lain | 4. have laid |
|-------------|-------------|--------------|--------------|
49. No sooner had he come from Coimbatore when he was asked to proceed to Kolkata.
  1. had he come from Coimbatore than he was asked to proceed
  2. did he come from Coimbatore when he was asked to proceed
  3. had he come from Coimbatore when he was asked to proceed
  4. when he came from Coimbatore when he was asked to proceed
50. He is one of the wiliest people that is in the office.
 

|                               |                              |
|-------------------------------|------------------------------|
| 1. that is in the office      | 2. that the office is having |
| 3. that will be in the office | 4. that are in the office    |
51. His address was broadcasted from Chennai.
 

|                        |                         |
|------------------------|-------------------------|
| 1. was broadcast       | 2. was broadcasted      |
| 3. will be broadcasted | 4. had been broadcasted |

**Directions for questions 52 to 57:** Each of the following questions has a paragraph from which the last sentence has been deleted. From the given options, choose the one that completes the paragraph in the most appropriate way.

52. Most organizations consider specialist individuals to be too volatile, elitist, egotistic, and tricky to work with. Try to compel such folks to join forces on a high-stakes project and they might even come to fist-cuffs. Even the very thought of overseeing such a group seems inconceivable. So most organizations fall into default mode, setting up project teams of people who get along nicely. \_\_\_\_\_ .
  1. The outcome, however, is ruinous.
  2. The outcome is mediocrity.

3. The outcome is creation of specialists who then become elitists.  
4. Naturally, they encourage innovations.
53. The fans of Sudoku and crosswords, intelligibly, overlap significantly but there are disparities, too. While crossword captivates a more scholarly person, Sudoku caters to a vigorously rational mind. Many crossword aficionados turn up their noses at Sudoku because they deem that it lacks depth. A sound crossword requires mental acumen, flexibility, and vocabulary, of course, and at times even a sense of humour to finish it. It involves several domains of life and gifts you an “Aha!” or two while doing so.
1. Sudoku, by the way, is gaining popularity faster than crosswords.
  2. Sudoku, on the other hand, is just a dry exercise in logic, each one no different from the last.
  3. Sudoku, on the other hand, can be pursued and relished even by children.
  4. Sudoku, however, is nowhere as exciting; not in any sense of the term.
54. Meteorologists in Siberia have observed that snow flurries are usually preceded by a new moon. They are convinced that the new moon somehow generates the flurry.
- Which of the following, if true, would weaken the meteorologist's conviction?
1. The temperature must fall below -5 degrees Celsius for snow flurries to occur.
  2. Absence of a cloud cover cools the ground which causes flurries.
  3. Meteorologists are superstitious.
  4. No one has proven that the moon causes flurries.
55. Professor Funmeg told her class that the system of students' evaluation of teachers is not a credible measure of their teaching quality. Students ought to fill in the questionnaires only towards the end of the semester when courses have been concluded.
- Which of the following, if true, provides support for Professor Funmeg's proposal?
1. Professor Funmeg received low ratings from her students.
  2. Students filled out questionnaires after the midterm exam.
  3. Students are interested in teacher evaluation.
  4. Teachers are not obligated to use the survey results.
56. In a famous experiment by Fakmok, when a cat smelled food, it salivated. Afterwards, a buzzer was pressed whenever food was offered to the cat to eat. After numerous trials, only the buzzer was rung, whereupon the cat would salivate even though no food was present.
- What conclusion may be drawn from the above information?
1. Two stimuli are stronger than one.
  2. Cats are motivated only by the sound of a buzzer.
  3. The ringing of a buzzer was associated with food.
  4. A conclusion cannot be reached on the basis of one experiment.
57. In triumphing in its caustic, protracted battle to acquire Gold Industries, Inc., Senorita Industries has accomplished its ambition of lessening its reliance on liquor holdings, while the \$8.7 billion deal may stimulate more takeover activity in the telecom industry, analysts said.
- Which of the following can be inferred from the passage?
1. Gold Industries is in the liquor industry.
  2. Senorita Industries is in the telecom business.
  3. Gold Industries is in the telecom business.
  4. More divestment takes place in the liquor industry than in the telecom industry.

**Directions for questions 58 to 65:** Fill in the blanks with the appropriate choices

58. When I left graduate college, I saw it as a temporary state. I believed I'd \_\_\_\_\_.  
 1. go back      2. return back      3. go forth      4. come back
59. For youngsters today, there are entrepreneurial opportunities few that existed \_\_\_\_\_.  
 1. after      2. before      3. now      4. then and there
60. He feared that his show was a little too highbrow and possibly wouldn't reach out \_\_\_\_\_.  
 1. to the rich      2. to the famous masses      3. to the masses      4. to the masseurs
61. Aruna writes more beautifully \_\_\_\_\_.  
 1. than me      2. than I      3. to me      4. to I
62. Unknown to her brother, she kept meeting him on the \_\_\_\_\_.  
 1. sly      2. cry      3. sty      4. sloth
63. We need a large number of \_\_\_\_\_ referees.  
 1. over-interested      2. disinterested      3. uninterested      4. under-interested
64. Biofeedback exercising rests on the \_\_\_\_\_ that we can achieve control on our bodily actions functions.  
 1. understanding      2. aspect      3. feeling      4. premise
65. The clear cracking of a sprig combined with a \_\_\_\_\_ made a sharp impact on her.  
 1. cry      2. shriek      3. squawk      4. scream

**Answer Key****Section 1: Quantitative Aptitude**

- |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1. 1  | 2. 3  | 3. 2  | 4. 2  | 5. 1  | 6. 4  |
| 7. 4  | 8. 4  | 9. 3  | 10. 1 | 11. 4 | 12. 4 |
| 13. 4 | 14. 3 | 15. 2 |       |       |       |

**Section 2: Logical Reasoning**

- |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 16. 2 | 17. 2 | 18. 3 | 19. 3 | 20. 2 | 21. 3 |
| 22. 2 | 23. 4 | 24. 2 | 25. 1 |       |       |

**Section 3: Verbal Ability**

- |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 26. 2 | 27. 4 | 28. 2 | 29. 1 | 30. 1 | 31. 3 |
| 32. 2 | 33. 2 | 34. 3 | 35. 4 | 36. 4 | 37. 4 |
| 38. 3 | 39. 2 | 40. 2 | 41. 3 | 42. 1 | 43. 1 |
| 44. 2 | 45. 2 | 46. 4 | 47. 2 | 48. 2 | 49. 1 |
| 50. 4 | 51. 1 | 52. 2 | 53. 4 | 54. 2 | 55. 2 |
| 56. 3 | 57. 3 | 58. 4 | 59. 2 | 60. 3 | 61. 2 |
| 62. 1 | 63. 2 | 64. 4 | 65. 2 |       |       |

# **Practice Paper 12**

## **(Based on Recent Question Papers of L&T Infotech\*)**

*Total no. of questions: 90*

*Total duration: 90 min*

- No. of sections: 3
- There is no negative marking
- No sectional cut off

### **Section 1: Verbal Ability (30 questions in 30 minutes)**

**Directions for questions 1 to 5:** Read the passage below and answer the questions that follow:

#### **The Great Wall of China**

Walls have played a crucial role in the Chinese culture. The Chinese, arising from the misty times of pre-history have been wall-conscious; right from the Neolithic period—when barricades were erected using pounded earth—to the Communist revolution, walls have been an intrinsic element of every village. Not just the villages and towns; the buildings, temples, and houses contained in them were somehow walled, too, with the houses minus any windows overlooking the street—feeling of roaming around in a big maze. Linguistically, the love for walls is no less. The Chinese word for “city” (ch’eng) means a wall. Over all these walled structures presides the god of mounts and walls, whose duty till date, is to protect and take care of the residents’ welfare. And so, a greatly arduous and laborious task like erecting a wall, so humongous that it runs throughout the country, must not seem like an absurdity at all.

However, as erroneous it would be to think of the Great Wall as a single architectural structure, it would be to assume that the Wall came together under a single dynasty. For, its construction spanned various dynasties, each of which somehow added to the refurbishment, improvement, and elongation of the structure whose foundation was laid centuries earlier. It was only in the fourth and third century BC that each of the warring states built its own wall to fortify its kingdom; against one another as well as the northern nomads. Three states, the Ch’in, the Chao, and the Yen, secured the foundation on which Ch’in Shih Huang Di would initiate the building of the first, unbroken Great Wall.

On review, this Wall has held a central place in the growth of the Chinese economy. As time passed, many new settlements came up along the new border. The garrison troops were deployed to reclaim the wastelands and plant crops on them, waterways and roads were built—to recognize a few of the works done. The collective impact of these undertakings helped boost the trade and cultural exchanges with numerous remote areas

\* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of *L&T Infotech*, a leading multinational IT firm.

within China, as also with the western, central, and southern Asia—the primary basis of the legendary Silk Route. Artisans, builders, garrisons, peasants, and traders left behind a trail of articles like household items, inscribed tablets, written texts, which today prove to be an invaluable archaeological evidence for us.

1. Chinese cities resembled a maze \_\_\_\_\_.  
 1. because they were walled                    2. because the houses had no windows  
 3. because the Chinese word of the cities means "wall"                    4. because walls were important there
2. Constructing the Great Wall \_\_\_\_\_.  
 1. honoured the god of walls and mounts                    2. was an absurdly laborious task  
 3. may have made sense within Chinese culture                    4. the country look like a huge maze
3. The Great Wall of China \_\_\_\_\_.  
 1. was built in a single dynasty                    2. was refurbished in the fourth and third centuries BC  
 3. used existing foundations                    4. was built by Ch'in, the Chao, and the Yen
4. Crops were planted \_\_\_\_\_.  
 1. on wasteland                    2. to reclaim wasteland  
 3. on reclaimed wasteland                    4. along the canals
5. The Great Wall \_\_\_\_\_.  
 1. helped build trade only inside China                    2. helped build trade in China and abroad  
 3. helped build trade only abroad                    4. helped build trade only to remote areas

**Directions for questions 6 to 10:** For the following questions, find a word that is opposite to the capitalized word:

- |               |                |                 |                |
|---------------|----------------|-----------------|----------------|
| 6. SENTIENT   |                |                 |                |
| 1. Irregular  | 2. Abnormal    | 3. Unconscious  | 4. Elemental   |
| 7. PRODIGIOUS |                |                 |                |
| 1. Explicit   | 2. Continuous  | 3. Premature    | 4. Slight      |
| 8. PRISTINE   |                |                 |                |
| 1. Reckless   | 2. Productive  | 3. Contaminated | 4. Chaos       |
| 9. MENDACITY  |                |                 |                |
| 1. Modern     | 2. Impugn      | 3. Truthfulness | 4. Peculiarity |
| 10. LACONIC   |                |                 |                |
| 1. Blithe     | 2. Incompetent | 3. Aromatic     | 4. Garrulous   |

**Directions for questions 11 to 15:** Read the following sentences carefully. Decide which answer is the most inappropriate in the sentence.

11. **Truculent:** The truculent stances maintained by both the countries will not help world peace.  
 1. obstinate                    2. belligerent                    3. pugnacious                    4. antagonistic
12. **Canker:** Caste-based politics remains a canker in our country.  
 1. scourge                    2. blight                    3. pestilence                    4. mystery
13. **Vindictive:** harbouring vindictive thoughts for a person will obstruct your own well-being.  
 1. vengeful                    2. benevolent                    3. rancorous                    4. villainous
14. **Vex:** The client questioned the justification of negotiating on that vexed issue at every meeting.  
 1. contentious                    2. contested                    3. impertinent                    4. problematic

15. **Boomerang:** Most people forget that strategies which provide instant gratification in the short term, tend to boomerang in the long run.

1. recoil                    2. ricochet                    3. fail                    4. backfire

**Directions for questions 16 to 20:** A sentence is written in four different ways. Only one of these is grammatically correct. Select the correct sentence.

16. 1. The committee are not unanimous in the report.  
       2. The committee is not unanimous in its report.  
       3. The committee are not unanimous by their report.  
       4. The committee are not unanimous in its report.
17. 1. The Himalayas form a great barrier on the south of China.  
       2. Himalayas form a great barrier in the south of China.  
       3. Himalayas form a great barrier on the south of China.  
       4. The Himalayas form a great barrier in the south of China.
18. 1. Each of the guests were given a gift.                    2. Everyone of the guests were given a gift.  
       3. All of the guests was given a gift.                    4. Each of the guests was given a gift
19. 1. There are no less than ninety students in the auditorium.  
       2. There are no fewer than ninety students in the auditorium.  
       3. There are not fewer than ninety students in the auditorium.  
       4. There are not lesser than ninety students in the auditorium.
20. 1. He proclaimed that he will steal again.  
       2. He proclaimed remorsefully that he would never steal again.  
       3. He expressed his readiness that he may steal again.  
       4. He proclaimed remorsefully that he will never steal again.

**Directions for questions 21 to 25:** In each of the following questions, a sentence is split into four parts labelled A, B, C, and D. Rearrange the parts to form the original sentence and select the correct order.

21. A. that she will not speak for other backward classes  
       B. because she decisively believed that it was essential then  
       C. she happened to do so on that one occasion  
       D. although the scholar had previously asserted  
       1. ACBD                    2. BACD                    3. CBAD                    4. DACB
22. A. remains the same amount of milk  
       B. the research revealed that kids can  
       C. that a pint of milk poured from a small tumbler into a large one  
       D. learn to count long before identification  
       1. CDBA                    2. BCDA                    3. BDCA                    4. BADC
23. A. he first made copies of more than thirty  
       B. in order to raise funds  
       C. the artist treasured his painted canvases  
       D. that he had composed previously that  
       1. BACD                    2. CDBA                    3. CDAB                    4. CADB
24. A. all over the stark landscape  
       B. many of them chiselled from mountainous rocks ages ago  
       C. hundreds of monasteries  
       D. dot the regions  
       1. DBAC                    2. DABC                    3. CBAD                    4. CBDA

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25. A. to grant a special consideration for oil exploration to the firm  
 B. it was the sharp loss of revenue from tourism  
 C. that would later be known by the name of Gramco  
 D. that in 1999 led to the state authorities  
 1. ADBC      2. BDAC      3. BDCA      4. BADC

**Directions for questions 26 to 30:** An idiom with four possible meanings is given. Choose the correct meaning.

26. To eat humble pie  
 1. to have a big feast      2. to work modestly      3. to apologize      4. to stay in jail
27. To play fast and loose  
 1. To dance brashly      2. To behave dishonestly  
 3. To show generosity      4. To say something and do something else
28. In the nick of time  
 1. just on time      2. after a small delay      3. long before time      4. just before time
29. Hand and glove  
 1. warm and cozy      2. on intimate terms      3. safe and sound      4. opposites
30. In apple-pie order  
 1. acting sweetly      2. neat arrangement      3. in a great disorder      4. in a sequence

**Section 2: Quantitative Ability (30 questions in 30 minutes)**

31. If

$$A = \begin{bmatrix} 1 & 4 \\ 5 & -7 \end{bmatrix}, B = \begin{bmatrix} 2 & 3 \\ 4 & -8 \end{bmatrix}, C = \begin{bmatrix} -7 & 8 \\ 9 & 10 \end{bmatrix}$$

then what is  $\frac{1}{2}(4A + 6B - 8C)$ ?

1.  $\begin{bmatrix} 20 & 12 \\ 12 & 14 \end{bmatrix}$       2.  $\begin{bmatrix} 20 & 15 \\ 12 & 14 \end{bmatrix}$       3.  $\begin{bmatrix} 36 & -15 \\ -14 & -78 \end{bmatrix}$       4.  $\begin{bmatrix} 36 & -15 \\ -54 & -78 \end{bmatrix}$

32. Two objects are located on the same side of a tower, such that the tower and two objects are along the same line. Observed from the top of the tower, their angles of depression are  $30^\circ$  and  $45^\circ$ . If the height of the tower is 250 m, the distance between the objects is  
 1. 183 m      2. 163 m      3. 105.66 m      4. 190 m
33. The difference between the squares of two consecutive odd integers is always divisible by  
 1. 2      2. 4      3. 8      4. all of these
34. The least number which should be added to 3587 so that the sum is exactly divisible by 7, 3, 5, and 6 is  
 1. 173      2. 183      3. 193      4. 203
35. A furniture factory employed 850 men and 650 women and the average wage was Rs 30.50 per day. If a woman got Rs 2.50 more per day than a man, what are their daily wages?  
 1. Man: Rs 24.91; Woman: Rs 22.41      2. Man: Rs 26.91, Woman: Rs 29.41  
 3. Man: Rs 30.01, Woman: Rs 27.51      4. Man: Rs 30.90, Woman: Rs 28.4

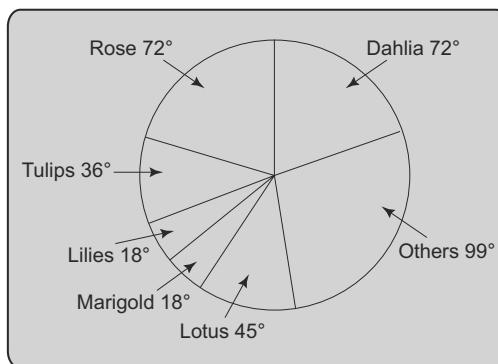
36. The ratio of the ages of Aman and his wife is  $6 : 4$ . After 3 years; this ratio will be  $13:9$ . If at the time of marriage, the ratio was  $5:3$ , how many years ago were they married?
1. 3 years
  2. 9 years
  3. 6 years
  4. Cannot be determined
37. When 65 is subtracted from a number, it reduces to its 80 percent. What is one-fifth of that number?
1. 80
  2. 90
  3. 70
  4. 65
38. If  $25\% \text{ of } X = 90\% \text{ of } Y$  and  $60\% \text{ of } Y = Z$ , then  $50\% \text{ of } (X + Y)$  is
1.  $30\% \text{ of } Z$
  2.  $60\% \text{ of } Z$
  3.  $75\% \text{ of } Z$
  4. none of these
39. The profit earned by selling an article for Rs 720 is equal to the loss incurred when the same article is sold for Rs 580. What should be the sale price for making 60% profit?
1. Rs 1920
  2. Rs 1040
  3. Rs 1060
  4. Rs 1020
40. A businessman sold  $\frac{3}{4}$ th of his stock at a gain of 30% and the rest at a gain of 20%. The overall percentage of gain to the businessman is
1. 12.5%
  2. 17.5%
  3. 27.5%
  4. 22.5%
41. The sides of a triangle are in the ratio  $(1/3) : (1/7) : (1/5)$  and its perimeter is 284 cm. The length of the shortest side is
1. 60 cm
  2. 50 cm
  3. 70 cm
  4. 80 cm
42. In a partnership, Amar invests half the capital for half the time; Babloo invests  $1/5^{\text{th}}$  of the capital for  $1/3^{\text{rd}}$  of the time; and Chaman invests the rest of the capital for the whole time. Out of a profit of Rs 10,000, Chaman's share is
1. Rs 7500
  2. Rs 4865
  3. Rs 9600
  4. Rs 7000
43.  $A$  and  $B$  together can complete a work in 15 days.  $A$  alone can complete it in 21 days. If  $B$  does the work only for half a day daily, in how many days can  $A$  and  $B$  together complete the work?
1. 11.5 days
  2. 16.5 days
  3. 17.5 days
  4. 20.5 days
44. A large tanker can be filled by two pipes  $A$  and  $B$  in 50 minutes and 30 minutes, respectively. How many minutes will it take to fill the tanker from the empty state if only  $B$  is used for half the time and  $A$  and  $B$  together fill it for the other half?
1. 17.03 min
  2. 33.07 min
  3. 27.03 min
  4. 23.07 min
45. A train running at  $8/13$  times its original speed reached a place in 26 hours. How much time could be saved if the train would have run at its original speed?
1. 7 hours
  2. 10 hours
  3. 14 hours
  4. 16 hours
46. A train leaves Meerut at 6 a.m. and reaches Delhi at 10 a.m. Another train leaves Delhi at 8 a.m. and reaches Meerut at 11.30 a.m. At what time do the two trains cross each other?
1. 8:36 a.m.
  2. 8:56 a.m.
  3. 9 a.m.
  4. 9:26 a.m.
47. A 300-metre long train running at the speed of 150 kmph crosses another train running in opposite direction at the speed of 90 kmph in 10 seconds. What is the length of the other train?
1. 367 m
  2. 267 m
  3. 300 m
  4. 360 m
48. A boat takes 20 hours for travelling downstream from the point  $A$  to the point  $B$  and coming back to a point  $C$  midway between  $A$  and  $B$ . If the velocity of the stream is 6 kmph and the speed of the boat in still water is 12 kmph, what is the distance between  $A$  and  $B$ ?
1. 140 km
  2. 144 km
  3. 160 km
  4. 180 m

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49. A vessel is filled with a liquid, 4 parts of which are water and 7 parts syrup. How much of the mixture must be removed and replaced with water so that the mixture may be half water and half syrup (in fraction)?
1.  $\frac{7}{14}$       2.  $\frac{9}{14}$       3.  $\frac{3}{14}$       4.  $\frac{5}{14}$
50. In how many ways can 17 identical books in English and 15 identical books in Hindi be placed in a row on a shelf so that two books in Hindi should not be together?
1. 720      2. 816      3. 680      4. 852
51. A card is drawn from a pack of 52 cards. The probability of getting a six of spade or jack of club or a king of hearts or a five of hearts is
1.  $\frac{1}{26}$       2.  $\frac{2}{13}$       3.  $\frac{1}{13}$       4.  $\frac{1}{52}$

**Directions for questions 52 to 56:** The pie-chart provided below gives the distribution of land (in a village) under various flowers. Study the pie-chart carefully and answer the questions that follow.

DISTRIBUTION OF AREAS (in acres) UNDER VARIOUS FLOWERS



52. Which combination of the flowers contributes to 50% of the total area under the flowers?
1. Rose, Tulips, and Lilies      2. Marigold, Lotus, Lilies, and others  
3. Dahlia, Rose, and Tulips      4. Both 2 and 3
53. If the total area under Lotus was 3.5 million acres, what was the area (in million acres) under Rose?
1. 6      2. 5.6      3. 4.6      4. 4.5
54. If the production of Lotus is 9 times that of Marigold, what is the ratio between the production per acre of Lotus and Marigold?
1. 12 : 5      2. 18 : 6      3. 18 : 5      4. 45 : 36
55. If the production per acre of Rose was 60% more than that of Lilies, what percent of Rose production is the production of Lilies?
1. 15.625%      2. 20.625%      3. 30.625%      4. 12.625%
56. If the total area goes up by 16%, and the area under Rose production goes up by 20%, what will be the angle for Rose in the new pie-chart?
1. 82.4°      2. 74.4°      3. 75.6°      4. Same
57. Two numbers  $A$  and  $B$  are such that their Geometric Mean is 40% lower than their Arithmetic Mean. Find the ratio between the numbers.
1. 3 : 2      2. 9 : 1      3. 4 : 1      4. 3 : 1

58. If  $b$  times the  $a^{\text{th}}$  term of an AP is equal to  $a$  times the  $b^{\text{th}}$  term, find the ratio of the first term and the common difference (where  $a$  and  $b$  are different):  
 1. 1                    2. 2                    3. 0                    4. 0.5
59. Find the value of the expression:  $2 - 5 + 6 - 9 \dots$  to 50 terms.  
 1. -150                2. -75                3. -50                4. 75
60. What is the least number of square tiles required to pave the floor of a hallway 7 m 40 cm long and 13 m 40 cm broad? (the dimension of tiles could be in cm, not any fraction of cm)  
 1. 2479                2. 2749                3. 2480                4. 2481

### **Section 3: Logical Reasoning (30 questions in 30 minutes)**

**Directions for questions 61 to 65:** In each question below, a statement followed by two assumptions numbered I and II is given. You have to consider the statement and the following assumptions and decide which of the assumptions is implicit in the statement.

Give answer (1) if only assumption I is implicit; (2) if only assumption II is implicit; (3) if either I or II is implicit; (4) if neither I nor II is implicit; and (5) if both I and II are implicit.

61. **Statement:** Apart from the entertainment value of television, its educational value cannot be ignored.

**Assumptions:** I. People take television to be a means of entertainment only.  
 II. The educational value of television is not realized properly.

62. **Statement:** Children are influenced more by their teachers nowadays.

**Assumptions:** I. The children consider teachers as their models.  
 II. A large amount of children's time is spent in school.

63. **Statement:** Read this notice before entering the club.

**Assumptions:** I. People are literate.  
 II. No blind person comes to the club.

64. **Statement:** "The programme will start at 6 p.m. but you can come there up to 7 p.m. or so and still there is no problem."

**Assumptions:** I. The programme will continue even after 7 p.m.  
 II. The programme may not even start by that time.

65. **Statement:** "Blue ties would help us identify our staff from others." — A suggestion in a company.

**Assumptions:** I. The Company needs to identify its staff.  
 II. Blue ties are the latest fashion.

66. Rajiv was previously married to Shimpa, and is now married to Shilpa. Shalini is Shilpa's stepdaughter. How is Shimpa related to Shalini?

1. Sister                2. Mother-in-Law                3. Mother                4. Stepmother

67. Varun is the son of Ram and has a brother Anuj. Bhushan is Ram's father. How is Anuj related to Bhushan?

1. Son                2. Grandson                3. Brother                4. Grandfather

68. Rani is the only daughter of her father. Rajiv is the only son of Rani. How is Rani's husband related to Rajiv?

1. Uncle                2. Father                3. Grandfather                4. Brother

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69. If (i) 1 is the brother of 2; (ii) 3 is the brother of 2; and (iii) 1 is the brother of 4, which of the following statements is definitely true?

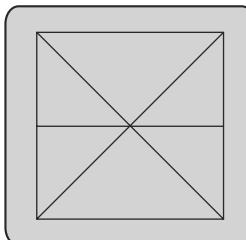
1. 2 is the brother of 3.  
2. 2 is the brother of 4.  
3. 1 is the brother of 3.  
4. 4 is the brother of 1.

70. Arun is the son of Rakhi. Dennis is the brother of Arun. Rakhi is the sister of Atul. How is Dennis related to Rakhi?

1. Son                  2. Brother                  3. Nephew                  4. Father

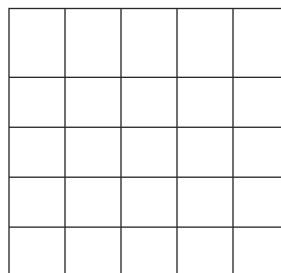
71. Count the number of triangles in the following figure:

1. 10                  2. 11                  3. 12                  4. 13



72. How many squares does the following figure contain?

1. 35                  2. 45                  3. 64                  4. 55



73. If BOMBAY is coded as 385328 and CALCUTTA as 42444332, how can DELHI be coded?

1. 56489              2. 59649              3. 56491              4. 56499

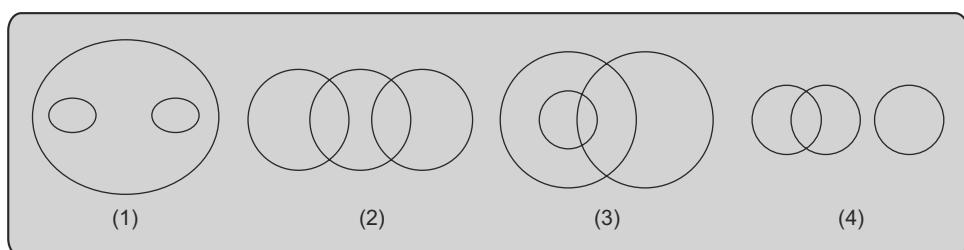
74. In a certain code, JACKET is written as LCEMGV and LIFE is written as NKHG. How is PLIER written in that code?

1. RNKGT              2. RNKGS              3. RNKFR              4. RNGHT

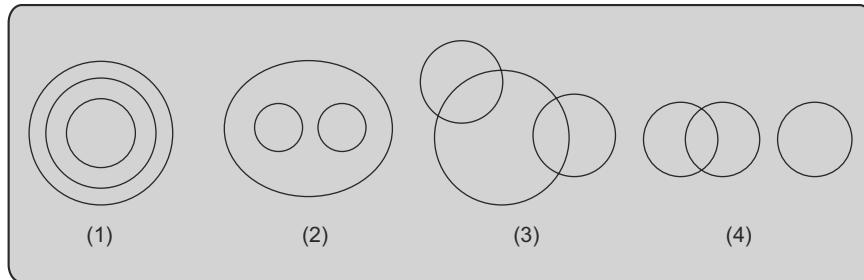
75. If TULIP is coded as G21O9K, TABLE is coded as G1Y12V, what will be the code for BATTLE?

1. Y2F14H              2. Y1G20O5              3. X12G6H7              4. X1D14T2

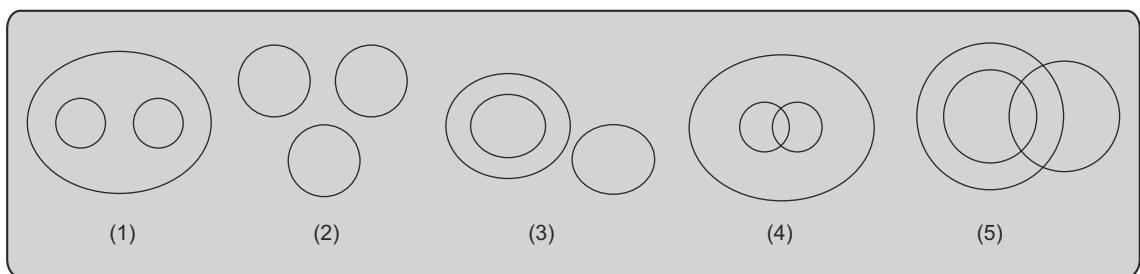
76. Which of the following diagrams correctly represent Apple, Banana, and Fruits?



77. Which of the following Venn diagrams correctly illustrates the relationship among classes: Banana, Food, and Fruit?



**Directions for questions 78 to 80:** In each of the following questions, choose the Venn diagram which best illustrates the relationship among three given items.



78. Viral diseases, Hepatitis, Smallpox
79. Long jump, Athletics, Shot put
80. Hatchback, Cars, Motorbike
81. Which terms will fill the blank spaces? N, L, J, H, F, (.....), (.....)
1. C, E
  2. B, D
  3. E, C
  4. D, B
82. Which term comes next in the sequence: by dw fu hs?
1. jr
  2. jp
  3. of
  4. jq
83. What will be the next term in ACE, ADG, AEI, ?
1. AFH
  2. AFJ
  3. AFK
  4. ADG
84. Which term will replace the question mark in the series DFE, HJI, LNM, PRQ, ?
1. TVU
  2. SUT
  3. RTS
  4. TUV
85. Choose the term which will continue the following series: d 3 c, e 5 d, f 8 e, g 12 f, ...
1. h 17 f
  2. h 17 e
  3. h 17 g
  4. f 16 h

**Directions for questions to 86 and 87:** In each of the following questions, four sets of three sentences are given. You have to identify whether the three sentences in each of four sets are logically related.

86. (A) No Mango is Pink. All Red is Mango. All Red is Pink.  
 (B) Astro are wrong. No Astro is Chile. No Chile are wrong.  
 (C) Some Chambers are Almonds. Most Chambers are right. Most Almonds are right.  
 (D) No Mango is Pink. All Red is Mango. No Red is Pink.
1. Only A
  2. Only B
  3. C and D
  4. None of these

87. (A) Either sister dances or brother dances. Sister dances. Brother dances.  
 (B) Some toys are green. Some green is red. All toys are red  
 (C) All Greeks are cyber. Some cyber is yellow. No Greek is yellow.  
 (D) Lions are sentimental. Sentimental dances. Lion dances.

1. Only B      2. A and B      3. Only D      4. C and D

**Directions for questions 88 to 90:** In each of the following questions, a main statement is followed by four statements: A, B, C, and D.

Choose the ordered pair of statements where the first statement implies the second, and the two statements are logically consistent with the main statement.

88. When it is not windy, kites fly.  
 (A) It is not windy.      (B) It is windy.      (C) Kites did not fly.      (D) Kites flew.  
 1. AC      2. CA      3. AD      4. DC
89. Arjun eats either apples or bananas.  
 (A) Arjun does not eat apples.      (B) Arjun eats apples.  
 (C) Arjun eats bananas.      (D) Arjun does not eat bananas.  
 1. AB      2. CD      3. AC      4. BC
90. 1 and 2 cannot be selected if 3 and 4 are selected in that order.  
 (A) 1 and 2 are selected.      (B) 3 and 4 are not selected in that order.  
 (C) 4 and 3 are selected in that order.      (D) 1 and 2 are not selected.  
 1. CA      2. BC      3. AB      4. AD

### Answer Key

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#### Section 1: Verbal Ability

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|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1. 2  | 2. 3  | 3. 3  | 4. 3  | 5. 2  | 6. 3  |
| 7. 4  | 8. 3  | 9. 3  | 10. 4 | 11. 1 | 12. 4 |
| 13. 2 | 14. 3 | 15. 3 | 16. 1 | 17. 1 | 18. 4 |
| 19. 2 | 20. 2 | 21. 4 | 22. 3 | 23. 2 | 24. 4 |
| 25. 2 | 26. 3 | 27. 4 | 28. 1 | 29. 2 | 30. 2 |

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#### Section 2: Quantitative Ability

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|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 31. 3 | 32. 1 | 33. 4 | 34. 3 | 35. 2 | 36. 3 |
| 37. 4 | 38. 4 | 39. 2 | 40. 3 | 41. 1 | 42. 2 |
| 43. 3 | 44. 4 | 45. 2 | 46. 2 | 47. 1 | 48. 2 |
| 49. 3 | 50. 2 | 51. 3 | 52. 4 | 53. 2 | 54. 3 |
| 55. 1 | 56. 2 | 57. 2 | 58. 1 | 59. 2 | 60. 1 |

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#### Section 3: Logical Reasoning

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|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 61. 5 | 62. 1 | 63. 5 | 64. 1 | 65. 1 | 66. 3 |
| 67. 2 | 68. 2 | 69. 3 | 70. 1 | 71. 3 | 72. 4 |
| 73. 3 | 74. 1 | 75. 2 | 76. 1 | 77. 1 | 78. 1 |
| 79. 1 | 80. 3 | 81. 4 | 82. 4 | 83. 3 | 84. 1 |
| 85. 3 | 86. 4 | 87. 3 | 88. 3 | 89. 3 | 90. 3 |

# **Practice Paper 13**

**(Based on Recent Question Papers of Oracle\*)**

*Total no. of questions: 65*

*Total duration: 60 min*

- No. of sections: 4
- There is no negative marking
- There is sectional cut off

## **Section 1: Technical Ability (20 questions in 20 minutes)**

1. What is the output of the following program?

```
main()
{
 int x=20;
 int y=10;
 swap(x,y);
 printf("%d %d",y,x+2);
}
swap(int x,int y)
{
 int temp;
 temp =x;
 x=y;
 y=temp;
}
```

- 1. 10,20                  2. 20,12                  3. 22,10                  4. 10,22**

2. What is the output of the following program?

```
#define INC(X) X++
main()
{
```

---

\* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of *Oraclers*, a leading multinational IT firm.

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```
int X=4;
printf ("%d", INC(X++));
}
```

1. 4  
3. 6

2. 5  
4. Compilation error

3. What can be said of the following?

```
struct Node {
char *word;
int count;
struct Node left;
struct Node right;
}
```

1. Incorrect definition.  
2. Structures cannot refer to other structures.  
3. Structures can refer to themselves. Hence, the statement is OK.  
4. Structures can refer to a maximum of one other structure.

4. What is the size of the following union? Assume that the size of int=2, size of float=4 and size of char=1.

```
Union Tag{
int a;
float b;
char c;
};
```

1. 2

2. 4

3. 1

4. 7

5. What is the output of the following program? (- has been used to indicate a space)

```
main()
{
char s[]={Hello,world};
printf(%3.10s,s);
}
```

1. Hello,World---  
3. Hello,Worl---

2. ---Hello,Worl  
4. None of the above

6. Two processes of different systems communicate through \_\_\_\_\_.

1. sockets  
3. remote procedure cal l  
2. shared memory  
4. none of these

7. A program uses a stack to visit each of the nodes of a binary tree starting at its root. After a node is visited, its children are added to the stack; in what order are the nodes of the following tree are added to the stack?

A-B,C (means A is the root and B, C are its children )

B-D,E  
C-F,G  
D-H,I  
G-J

1. A B C D E F G H I J                    2. A B D H I E C F G J  
 3. H I D E B F J G C A                    4. H D I B E A F C J G
8. How many different modes of parameters are used in functions and procedures?  
 1. 2                                            2. 1                                            3. 3                                            4. None of these
9. How many unique key constraints can be applied to a table?  
 1. 1                                            2. 2  
 3. Maximum 100                            4. n(n<= number of attributes of a table)
10. Modify command in SQL is \_\_\_\_\_.  
 1. DDL                                        2. DML                                            3. TCI                                            4. DCL
11. SNAPSHOT is used for \_\_\_\_\_.  
 1. synonym                                    2. table space  
 3. system server                            4. dynamic data replication
12. A database's overall structure is maintained in a file called \_\_\_\_\_.  
 1. Redolog file                              2. Data file  
 3. Control file                              4. All of the above
13. In a CLIENT/SERVER environment, which of the following would not be done at the client?  
 1. User interface part                      2. Data validation at entry line  
 3. Responding to user events              4. None of the above
14. Why is it better to use an INTEGRITY CONSTRAINT to validate data in a table than to use a STORED PROCEDURE?  
 1. An integrity constraint is automatically checked while data is inserted into or updated in a table while a stored procedure has to be specifically invoked.  
 2. The stored procedure occupies more space in the database than an integrity constraint definition.  
 3. A stored procedure creates more network traffic than an integrity constraint definition.  
 4. All of the above.
15. What does DLL stand for?  
 1. Dynamic Language Library              2. Dynamic Link Library  
 3. Dynamic Load Library                    4. None of the above
16. Database procedure is stored in the database \_\_\_\_\_.  
 1. in compiled form                        2. as source code                            3. both A and B                            4. not stored
17. Which data structure is best for reversing a string?  
 1. Stack                                      2. Queue                                      3. Array                                            4. Linked List
18. The OS may periodically collect all the free memory space to form a contiguous block of free space. This is called \_\_\_\_\_.  
 1. concatenation                            2. garbage collection  
 3. collision                                4. dynamic memory allocation
19. The searching technique that takes O (1) time to find a data is \_\_\_\_\_.  
 1. linear search                            2. binary search                            3. hashing                                    4. tree search
20. The complexity of multiplying two matrices of order  $a \times b$  and  $b \times c$  is \_\_\_\_\_.  
 1. abc                                        2. ab                                            3. ac                                            4. bac

## Section 2: Quantitative Ability (10 questions in 10 minutes)

21. A student reaches college 30 minutes early if he increases his speed of walking by 6 km/h, and 40 minutes late if he decreases his speed by 6 km/h. What is his original speed?  
 1. 32 km/h      2. 40 km/h      3. 42 km/h      4. None of these
22. A monkey is climbing a 40-feet high pole. He is able to cover 5 feet in one second and slips down by 2 feet in the next second, and so on. In how much time will he reach the top (in seconds)?  
 1. 14      2. 25      3. 13      4. 9
23. The water-storage tank in a house can be fully filled by pipe *A* in 12 hours, by pipe *B* in 16 hours. If pipe *A* is opened for 6 hours and then pipe *B* is opened for 8 hours, how much more time will pipe *A* and pipe *B* together take to fill the rest of the tank?  
 1. 0 hours      2. 10 hours      3. 15 hours      4. 20 hours
24. Train *A* and Train *B* are running at 60 km/h and 40 km/h, respectively, in the same direction. Train *A* completely passes the driver in the Train *B* in 6 seconds. What is the length of Train *A*?  
 1.  $\frac{100}{3}$  m      2. 30 m      3. 25 m      4.  $23\frac{2}{9}$  m

**Directions for questions 25 and 26:** Each of the questions given below consists of a question followed by three statements. You have to study the question and the statements and decide which of the statement(s) is/are necessary to answer the question.

25. By selling a microwave, what is the profit %?  
 I. 10% discount is given on cost price.  
 II. If discount is not given, the selling price is Rs 8000.  
 III. The cost price of the microwave is Rs 5000.  
 1. Only I and II      2. Only II and III      3. Only I and III      4. I, II, and III
26. What was the percentage of discount given?  
 I. 20% profit was earned by selling a scooter for Rs 12,000.  
 II. If there were no discount, the earned profit would have been 30%.  
 III. The cost price of the scooter was Rs 10,000.  
 1. I, II, and III      2. Only II and III      3. Only I and III      4. Only I and II
27. A powerboat with a speed of 25 km/h in still water goes 50 km downstream and comes back in a total of 7 hours 30 minutes. The speed of the stream (in km/h) is  
 1. 8.07      2. 12.07      3. 20.07      4. 17.07
28. Stations Chandigarh and Delhi are 220 km apart. One train starts from Chandigarh at 9 a.m. and travels towards Delhi at 40 km/h. Another train starts from Delhi at 10 a.m. and travels towards Chandigarh at a speed of 50 km/h. At what time will they meet?  
 1. 9 a.m.      2. 10 a.m.      3. 11 a.m.      4. 12 noon
29. 4 men or 8 women can do a piece of work in 6 days. In how many days can 3 men and 6 women finish the work working together?  
 1. 6 days      2. 4 days      3. 3 days      4. 4.5 days
30. 6 years ago, the average age of 9 college students was 20 years. If a 26-year-old trainee joins their group now, what will be their average age after 4 years from now?  
 1. 30      2. 33      3. 26      4. 28

### Section 3: Logical Reasoning (10 questions in 10 minutes)

31. What is the next term in this series: 5, 14, 30, 55, \_\_\_  
 1. 111                  2. 78                  3. 91                  4. 71
32. A 6-year-old, while going to tuition, goes seven steps further and three steps back, going towards the tuition class, which is 1 km away from his house. If he takes a step of one metre each second, find out in what time he will reach the tuition class.  
 1. 2566 seconds      2. 1569 seconds      3. 2494 seconds      4. 2500 seconds
33. What is the missing number in the series: 1, 2, 2, 5, 12, 62, \_\_\_?  
 1. 752                  2. 751                  3. 750                  4. 749
34. If VESPA is coded as 48796 and RAGE is coded as 4628, what is the coding for VERGE?  
 1. 48427              2. 48423              3. 48428              4. 48461
35. If SLEEPING = 7, SITCOM = 5, what is the value for RETRAINED?  
 1. 7                  2. 6                  3. 8                  4. 9

**Directions for questions 36 to 38:** In a class there are 7 students: P, Q, R, S, T, U, and V. They sit on three benches A, B, and C. There are a minimum of 2 students on a bench, and at least a girl. A girl student R does not sit with P, T, and S. The boy student U sits with only Q. P sits on the bench A with her best friends. V, a boy, sits on the bench C. S is the brother of R. T is the sister of U.

36. How many girls are there out of these 7 students?  
 1. 2                  2. 3                  3. 5                  4. 4
37. Who sits with Q?  
 1. U                  2. S                  3. P                  4. T
38. Which of the following is the group of girls?  
 1. QPST              2. QPUT              3. QRPT              4. RSUV
39. Pointing to a man, a girl said "He is the only son of my mother's father-in-law". How is the man related to the girl's daughter?  
 1. Father              2. Grandfather      3. Brother              4. Uncle
40. Ram walked from office, went 6 km in the south direction to reach the point A then turned left and travelled 8 km to reach the point B, and then he turned left and travelled 3 km. He then takes a left turn and goes on for 4 km. How far is he from his office now?  
 1. 8 km              2. 6 km              3. 5 km              4. 12 km

### Section 4: Verbal Ability (25 questions in 20 minutes)

**Directions for questions 41 to 45:** Read each sentence to find out whether there is any grammatical or idiomatic error in it. The error, if any, will be in one part of the sentence. (Ignore errors of punctuation, if any.)

41. 1. In the making of a short film  
 2. on essential societal issues  
 3. the main problem of a film maker faces  
 4. is the funding.  
 5. No error
42. 1. Having worked since 17 years with BARC,  
 2. Protima Basu is an unlikely candidate  
 3. for producing a documentary  
 4. hostile to nuclear power.  
 5. No error

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43. 1. The orchestra has a great success  
3. the music has evolved
44. 1. She feels if someone of us had  
3. he could                  4. be saved.
45. 1. The Central Education Ministry is much more active and powerful  
2. than its state-level counterpart and we can expect that the  
3. scheme implementation will be much fairer than  
4. what takes place this time.  
5. No error

**Directions for questions 46 to 49:** In each of these questions, two sentences I and II are given. Each sentence has a blank in it. Out of the given options, select the word that fits both the options in an appropriate manner:

46. I. Extremist Shaan-e-Islami leader and media doyen Zir Wasim Wali was ..... by an unusual Bangladeshi tribunal on charges of “crime against humanity” perpetuated during the 1971 liberation war.  
II. She had been ..... for possessing cocaine.  
1. acquitted                  2. honoured                  3. absolved                  4. indicted  
5. exonerated
47. I. What ..... F R Ganzara to turn against the very person whom she calls her ‘God’?  
II. The global recession has ..... consumers to cut back on buying.  
1. made                  2. predisposed                  3. enabled                  4. obstructed  
5. prompted
48. I. Self-styled godman Fansaram, lodged in the Ropar central jail over the alleged sexual molestation of a minor girl, ..... special permissions to conduct puja inside the prison premises.  
II. Eight people who ..... refuge in the Austrian embassy have left voluntarily.  
1. asked                  2. enjoyed                  3. sought                  4. gave  
5. took
49. I. The banking sector index on the Sensex ..... by over eleven percent as the new RBI governor’s taking over speech drove it to its peak intraday gain in over six years.  
II. For the first time in weeks, our spirits .....  
1. soared                  2. increased                  3. decreased                  4. jumped  
5. flew

**Directions for questions 50 and 51:** Refer to the following passage and answer the questions that follow:

*Famisla Pearling, a prolific feminist writer from the Victorian era, used her writings, both prose and poetry, to tackle a wide range of issues nagging her society, including and up to “the woman question.” In her long poem *Borealis Reigh*, she delves into this query as she depicts the evolution of both, the artist and the woman within. *Borealis Reigh* is not your typical Victorian woman—she is well educated and self-sufficient. Through the poem, Pearling argues that the boundaries placed around women, as opposed to the freedom their male counterparts enjoy, should incite women to raise their voice and affect a turnaround in their circumstances. Pearling’s writing, including *Borealis Reigh*, assisted the society to pave the way for an extensive social change in women’s lives.*

50. It can be inferred from the passage that the author believes the traditional Victorian woman \_\_\_\_\_  
1. wrote poetry  
3. fought for social change  
5. had a public role in society  
2. was portrayed accurately in *Aurora Leigh*  
4. was not well educated

51. As used in line 6, “affect” most nearly means

- |            |           |          |            |
|------------|-----------|----------|------------|
| 1. imitate | 2. result | 3. cause | 4. disturb |
| 5. prevent |           |          |            |

**Directions for questions 52 and 53:** Refer to the following passage and answer the questions that follow:

*Each evening, as it passes, brings with it more frustration. Tonight, like so many nights before, I spent an hour sitting in front of the typewriter, staring blankly at the silent keys, listening to the old woman upstairs play her violin and sing. I'd failed to notice her talent before; she was exceptional. It seems to me that everything she plays is born out of spontaneity, an absolute release of feeling. Her music is a painting, with lines so profound and colours so alive that it rises to exist above the realm of the material, conveying a desolate impression of the pianist. But even the exquisite beauty of such a pure work of art refused to inspire me, and once she stopped I was orphaned again.*

52. In line 2 the phrase “silent keys” implies that the narrator

- |                                    |                                     |
|------------------------------------|-------------------------------------|
| 1. can't play the piano            | 2. is suffering from writer's block |
| 3. is tone deaf                    | 4. is searching for clues           |
| 5. is annoyed by the girl upstairs |                                     |

53. The narrator uses the description of the woman's playing in line 3 (It seems...feeling) mainly to

- |                                            |                                         |
|--------------------------------------------|-----------------------------------------|
| 1. contrast it with his inability to write | 2. illustrate her talents as a musician |
| 3. compare it with painting                | 4. criticize her lack of skill          |
| 5. indicate his inferiority as an artist   |                                         |

**Directions for questions 54 and 55:** Refer to the following passage and answer the questions that follow:

*Nee's footfalls scrunching upon the dry, fallen leaves are heightened by the pre-twilight tranquillity which is gently setting upon the forest. The path ahead of her is slowly dissolving into the shadows, and even then the fear which is expected to invade her, is absent. Deep inside, she secretly finds the prospect of losing herself into the woods uplifting. As the light takes leave for the day, it takes along with it her daily burdens, replacing it with the emptiness of the night and the benevolent company of the spattered stars. But as the trail ahead leads to her backyard, Nee is amazed to find herself breaking into a jog to land herself in the familiar fold of her warm home.*

54. Nee's absence of fear (line 3) suggests that she \_\_\_\_\_.

- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| 1. is brave in the face of danger | 2. doesn't realize she is lost    |
| 3. is an apathetic person         | 4. longs for a change in her life |
| 5. knows exactly where she is     |                                   |

55. In the sixth line, “the emptiness of the night” is symbolic of \_\_\_\_\_.

- |                  |                             |
|------------------|-----------------------------|
| 1. everyday life | 2. a lack of responsibility |
| 3. being lost    | 4. loneliness               |
| 5. death         |                             |

**Directions for questions 56 to 59:** For each question in this section, a part of the sentence is underlined. 5 alternative ways of selecting the sentence are provided select the best answer from among the given choices.

56. Organized as an event for funding a new wing for the art museum, the museum's Advisory Council arranged a fundraiser for the construction of one.

1. Arranged as an event to for funding a new wing for the art museum
2. Having been arranged as an event to fund a new wing for the art museum
3. A new wing for the art museum needed an event for funding
4. Although an event for funding a new wing for the art museum
5. Realizing that the art museum needed funding for a new wing

57. His mother was almost as brilliant a pianist as she was at playing the drums.
1. almost as brilliant a pianist as she was at playing drums.
  2. almost brilliant at playing the piano and drums.
  3. almost equally brilliant, whether a pianist or a drummer.
  4. almost as brilliant a pianist as she was a drummer.
  5. a brilliant pianist, with almost as much brilliance as a drummer.
58. The changing colours of leaves have a particular fascination for those people which have an understanding of life cycles in them.
1. which have an understanding of life cycles in them
  2. who see the life cycles in them
  3. which have seen life cycles in them
  4. who understand that they have life cycles
  5. who see about them
59. It was mainly when I visited the Andaman Islands that I felt wistful for my childhood days, growing up on a small island.
- |                                   |                                        |
|-----------------------------------|----------------------------------------|
| 1. growing up on a small island   | 2. as I had grown up on a small island |
| 3. as on a small island I grow up | 4. which is on a small island          |
| 5. on a small island growing up   |                                        |

**Directions for questions 60 to 65:** Pick up the appropriate preposition/word to complete the following sentences:

60. I hope she will bear.....me for a few seconds.
- |       |       |            |            |
|-------|-------|------------|------------|
| 1. at | 2. on | 3. up with | 4. to with |
|-------|-------|------------|------------|
61. South African cricketers in the World Cup final gave ..... before thousands of audience in West Indies.
- |       |       |        |       |
|-------|-------|--------|-------|
| 1. in | 2. to | 3. for | 4. by |
|-------|-------|--------|-------|
62. I brought home ..... her the seriousness of the crime.
- |        |       |       |       |
|--------|-------|-------|-------|
| 1. for | 2. in | 3. to | 4. by |
|--------|-------|-------|-------|
63. Your current profile holds .....no promise for growth.
- |        |        |       |       |
|--------|--------|-------|-------|
| 1. out | 2. for | 3. up | 4. in |
|--------|--------|-------|-------|
64. He'd said he would give up smoking but he still keeps.....it.
- |          |           |            |          |
|----------|-----------|------------|----------|
| 1. in by | 2. on for | 3. on with | 4. by in |
|----------|-----------|------------|----------|
65. The spy team broke.....the building.
- |         |         |          |          |
|---------|---------|----------|----------|
| 1. with | 2. into | 3. above | 4. along |
|---------|---------|----------|----------|

### Answer Key

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#### Section 1: Technical Ability

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- |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1. 4  | 2. 4  | 3. 3  | 4. 2  | 5. 2  | 6. 1  |
| 7. 2  | 8. 3  | 9. 4  | 10. 1 | 11. 4 | 12. 3 |
| 13. 4 | 14. 1 | 15. 2 | 16. 3 | 17. 1 | 18. 2 |
| 19. 3 | 20. 1 |       |       |       |       |

## Section 2: Quantitative Ability

---

21. 3  
27. 4

22. 2  
28. 4

23. 1  
29. 2

24. 1  
30. 1

25. 4

26. 4

## Section 3: Logical Reasoning

---

31. 3  
37. 1

32. 3  
38. 3

33. 4  
39. 2

34. 3  
40. 3

35. 3

36. 4

## Section 4: Verbal Ability

---

41. 3  
47. 5  
53. 1  
59. 2  
65. 2

42. 1  
48. 3  
54. 4  
60. 3

43. 1  
49. 1  
55. 2  
61. 1

44. 1  
50. 4  
56. 5  
62. 3

45. 4  
51. 3  
57. 4  
63. 1

46. 4  
52. 2  
58. 2  
64. 3

## Practice Paper 14

(Based on Recent Question Papers of Samsung\*)

Total no. of questions: 80

Total duration: 80 min

- No. of sections: 2
- There is no negative marking
- There is sectional cut off

### Section 1: Technical Ability (30 questions in 30 minutes )

1. What is the output of \_\_\_\_\_.

printf ("%d", printf("tim") );

- 1. results in a syntax error
- 3. outputs garbage

- 2. outputs tim3
- 4. prints tim and terminates abruptly

2. Length of the string “correct” is \_\_\_\_\_.

- 1. 7
- 3. 6

- 2. 8
- 4. implementation dependant

3. Consider the following program fragment.

```
char c= 'a';
while(c++<= 'z')
putchar(xxx);
```

If the required output is abcd...wxyz then xxx should be \_\_\_\_\_.

- 1. c
- 2. c++
- 3. c-1
- 4. -c

4. Consider the function.

```
Find(int x, int y)
{
 return ((x<y)?0:x-y)
}
```

---

\* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of Samsung, a leading multinational IT firm.

The call `find(a, b)` can be used to find \_\_\_\_\_.

- 1. maximum of  $a, b$
  - 2. positive difference of  $a, b$
  - 3. sum of  $a, b$
  - 4. minimum of  $a, b$
5. If `abc` is the input, the following program fragment results in \_\_\_\_\_.
- ```
char x, y, z;
printf("%d", scanf("%c%c%c", &x, &y, &z));
```
- 1. a syntax error
 - 2. a fatal error
 - 3. segmentation violation
 - 4. printing of 3
6. Consider the statements
- ```
putchar(getchar());
putchar(getchar());
```
- If `ab` is the input, the output will be \_\_\_\_\_.
- 1. an error message
  - 2. this can't be input
  - 3. `ab`
  - 4. `<||=`
7. The operators `|| <=` if arranged in the ascending order of their precedence would be \_\_\_\_\_.
- 1. `|| <=`
  - 2. `= < ||`
  - 3. `= || <`
  - 4. `< || =`
8. What does the following program fragment print?
- ```
Unsigned i=-1;
int j = -4
printf("%u", i+j);
```
- 1. Garbage
 - 2. `-3`
 - 3. An integer that changes from machine to machine
 - 4. None of the above
9. What will be the value of `I` when the loop ends?
- ```
for(i=3; i<15;i+=3);
1. 15
2. 12
3. 16
4. 18
```
10. What is the result of the program?
- ```
int counter = 0, i;
for(i=0;;i++) {
    if (i< 100) continue;
    counter++;
    if (counter == 100) break;
}
printf("%d%d", i, counter);
1. 199 100
2. 200 100
3. 199 99
4. 200 0
```
11. The minimum number of temporary variables required for swapping two numbers is _____.
- 1. 3
 - 2. 2
 - 3. 1
 - 4. 0

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12. Choose the wrong thing for a description of the defined array.

```
int a [] = {10,20,30,40};
```

1. Successive one-dimensional array of elements in the array a[1], a[2] is located in the contiguous memory space.
2. a[1] and a*(a+1) is the same.
3. During initialization of an array; the array size must be specified otherwise compilation error occurs.
4. None of these.

13. Which operator performs bitwise exclusive or function?

1. ^ 2. | 3. || 4. None of these

14. What is the output of the following code?

```
main()
{ unsigned char i=0x80;
printf("i=%d",i<<1);
}
```

1. 255 2. 256 3. 128 4. 127

15. What is the output of the following code?

```
main()
{
Char c='a';
Printf("%d %d", sizeof(c),sizeof('a'));
}
```

1. 1 1 2. 2 2 3. 2 1 4. 1 4

16. What is the output of the following code?

```
#define Sqr(b) b*b;
main( )
{
int i=3;
printf("%d",SQR(i+2));
}
```

1. 10 2. 16 3. 25 4. 10

17. What is the output of the following code?

```
main()
{
i=2;
printf("i=%d i=%d",++i,++i)
}
1. i=2i=2
3. i=2i=3
```

2. i=3i=4
4. Varies from compiler to compiler

18. Which one does not involve direct recursion?

1. Backtracking
2. Divide and conquer
3. Dynamic programming
4. None of the above

19. Which of the following data structures is best suited for searching?
 1. B tree 2. BST 3. Array 4. Linked list
20. Sort time complexity is based on _____.
 1. number of comparisons 2. number of swaps
 3. number of copies 4. all of the above

Directions for questions 21 to 25: Select the odd one out.

21. 1. SQL 2. DB2 3. SYBASE 4. HTTP
 22. 1. Java 2. Lisp 3. Smalltalk 4. Eiffel
 23. 1. SMTP 2. WAP 3. SAP 4. ARP
 24. 1. Oracle 2. Linux 3. Ingres 4. DB2
 25. 1. Linux 2. Unix 3. Solaris 4. SQL Server
26. Which of the following companies makes mobile processors?
 1. Samsung 2. Apple 3. Nokia 4. Microsoft
27. IPv6 is _____ bytes long.
 1. 16 bytes 2. 32 bytes 3. 28 bytes 4. 48 bytes
28. Which of the following is a class B IP address?
 1. 127.255.255.100 2. 190.168.100.100
 3. 192.172.255.255 4. 221.152.148.122
29. Which protocol converts an IP address to a physical address?
 1. ARP 2. TCP/IP 3. WAP 4. SMTP
30. What is the 2's complement of 17?
 1. 11101110 2. 11011111 3. 1110 1111 4. 1110 1101

Section 2: Quantitative Aptitude and Data Interpretation (50 questions in 50 minutes)

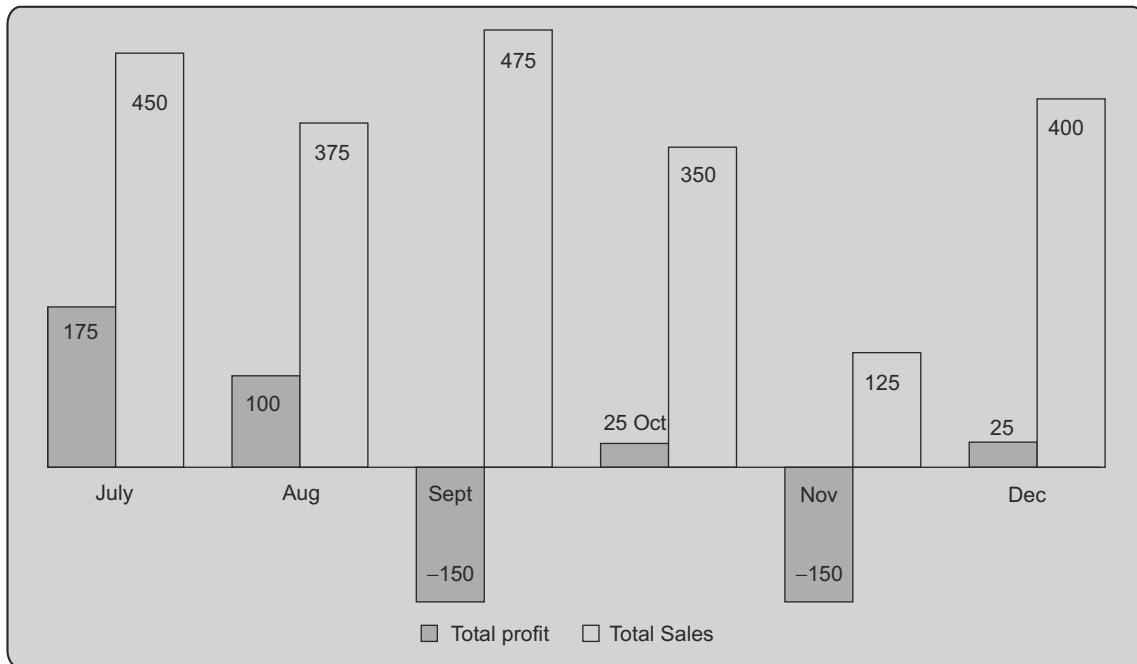
Directions for questions 31 to 35: Refer to the following table. For each question, select the best of the answer choices given.

STATE	Total Area (million hectares)	Percentage area under rice cultivation	Production (million tonnes)	Population (million)
Punjab	6	85	25	25
UP	23	75	70	170
Bihar	33	70	15	85
Andhra Pradesh	32	90	130	75
Tamil Nadu	15	60	32	55
Jharkhand	25	35	20	40
Karnataka	18	40	20	55

31. What is the percentage of rice production in the maximum rice-producing state to the total rice produced?
 1. 48.32% 2. 45.4% 3. 40.7% 4. 41.66%

32. Which of the following statements can be inferred from the data?
- I. Bihar has the highest area under cultivation.
 - II. The state producing the lowest quantity of rice is the state with the highest area.
 - I only
 - II only
 - Both of these
 - None of these
33. What is the total population in all given states (in million)?
- 675
 - 575
 - 505
 - 520
34. What is the percentage of the state with least area to total area of the given states?
- 5.7%
 - 3.9%
 - 6.03%
 - None of these
35. Which of these states has the highest production to population ratio?
- Punjab
 - UP
 - Andhra Pradesh
 - Tamil Nadu

Directions for questions 36 to 40: The following graph represents the profit and sales of coil steel and sheet steel imports (in million rupees). For each question, select the best of the answer choices given.



36. Which month's sales showed largest decrease than the preceding month?
- August
 - September
 - October
 - November
37. Total (in million Rs) sales for July-Dec. period are
- 1485
 - 2065
 - 2175
 - 2275
38. Which of the following months grossed for highest profit calculated as a percentage of sales?
- July
 - September
 - October
 - November
39. Difference between sales and profit for July–September period of the given year is (in million Rs):
- 865
 - 875
 - 870
 - 885
40. Which month's sales showed the largest increase than the preceding month?
- September
 - November
 - July
 - December

Directions for questions 41 to 43: A chessboard is given such that a 3×3 grid of 9 boxes at the centre is coloured white. The rest is kept same. Assume that the number of black boxes is still even in number.

41. How many black squares are there on the board?
 1. 30
 2. 28
 3. 26
 4. 24

42. What is the ratio of the number of black squares to the number of white squares?
 1. 0.68
 2. 0.72
 3. 0.77
 4. None of these

43. If two adjacent boxes at the boundary of an edge are cut and thrown away, then how many white boxes are left on the chessboard?
 1. 35
 2. 36
 3. 34
 4. 33

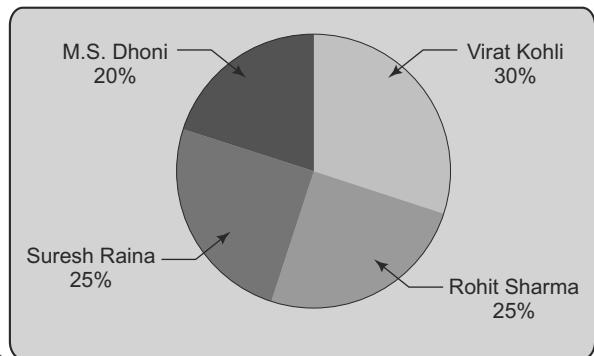
44. 5 balls are numbered 1, 2, 3, 4, and 5. What is the probability that a randomly chosen ball is either 2 or 4?
 1. 1
 2. 0.5
 3. 0.6
 4. 0.4

45. The ratio of pens and pencils in a box is 370:356, and that of erasers to pens is 105:37. If the number of pencils in a box is 6764, how many erasers are there in the box?
 1. 6764
 2. 19950
 3. 20292
 4. 20342

Directions for questions 46 to 49: Answer the questions on the basis of the following information:

Score Breakup of India Team

Batsman	4's(%)	6's(%)
M S Dhoni	33.3	20
Virat Kohli	40	20
Suresh Raina	26.6	8
Rohit Sharma	32	32



46. If the Indian cricket team has scored 300 runs, how many runs have Raina and Rohit scored in total?
 1. 130
 2. 165
 3. 142
 4. 150

47. If Kohli has scored 90 runs, how many 4's and 6's has he hit?
 1. 9,6
 2. 6,6
 3. 9,3
 4. Can't be determined

48. If Rohit has scored 75 runs, how many 4's and 6's has Dhoni hit?
 1. 5,2
 2. 5,3
 3. 5,4
 4. 4,5

49. Who hit maximum sixes in the innings?
 1. Kohli
 2. Dhoni
 3. Rohit
 4. Raina

50. How many 5-digit numbers can be formed with the digits 0, 3, 4, 5, and 6 when repetition of digits is not allowed?
 1. 120
 2. 96
 3. 72
 4. 144

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51. How many 5-digit numbers can be formed with digits 0, 2, 5, 7, and 6 when repetition of digits is allowed, such that the number formed is divisible by 2?
1. 1250 2. 1500
3. 680 4. Can't be determined
52. How many 5-digit numbers can be formed with the digits 0, 2, 5, 7, and 1 when repetition of digits is not allowed, such that the number formed is divisible by 3?
1. 96 2. 100
3. 104 4. Can't be determined
53. How many 4-digit numbers can be formed with the digits 1, 3, 5, 7, and 9 when repetition of digits is not allowed, such that the number formed is divisible by 11?
1. 24 2. 28 3. 14 4. 16
54. If 21% of 412 is y then 220% of 118 is _____.
1. $4y$ 2. $2y$ 3. $3y$ 4. $2.5y$
55. How many minimum throws of a fair dice are needed to make the probability of all 6's (6 in all throws) less than 0.03?
1. 4 2. 5 3. 4 4. 2

Directions for questions 56 to 60: Answer the questions on the basis of following statements.

A, B, C, D, and E stay in England, Patna, Mumbai, Hong Kong, and Amritsar, not necessarily in the same order. Three of them own a Ferrari, one owns Jaguar and one owns Porsche.

The person living in Amritsar owns a Porsche. A and C often come together on either of one's car or meet at each other's place. D is a policeman not staying in Mumbai. D and E do not have a Porsche. E is from Hong Kong. D's car is not the same as of A and C. A and D live in India.

56. Where does D stay?
1. Mumbai 2. Hong Kong 3. Amritsar 4. None of these
57. Which of the following is definitely true?
1. B has a Ferrari. 2. B has a Porsche.
3. C stays in England. 4. D stays in Patna.
58. Which of these combinations is definitely not correct?
1. Mumbai–FERRARI 2. C–England 3. B–FERRARI 4. E–Hong Kong
59. Which car does D own?
1. Jaguar 2. Ferrari
3. Porsche 4. Cannot be determined
60. Which car does A own?
1. Ferrari 2. Porsche
3. Jaguar 4. Cannot be determined

Directions for questions 61 to 65: Answer the following questions based on the information given below.

A cube of 12-inch side is cut into similar pieces of $12 \times 1 \times 1$. Before cutting into pieces, the cube was coloured green on all the faces.

61. How many smaller cuboids are formed?
1. 12 2. 144 3. 1728 4. None of these

62. How many smaller cuboids are green on exactly three faces?
 1. 24 2. 44 3. 40 4. 28
63. How many smaller cuboids are green on exactly two faces?
 1. 60 2. 80 3. 120 4. 100
64. How many smaller cuboids are green on exactly one face?
 1. 0 2. 2 3. 18 4. 36
65. How many smaller cuboids are green on exactly four faces?
 1. 0 2. 2 3. 4 4. 8
66. Complete the series: 10, 20, 34, 52, 74, _____
 1. 88 2. 100 3. 94 4. 121
67. Complete the series: 22.5, 33.5, 43.5, 52.5, _____
 1. 61.5 2. 60.5 3. 62.5 4. 63.5
68. If today, 15 February 2015 is Sunday, and World Cup Cricket is starting today, and the next World Cup will begin from 18 March 2019, what day of the week will it be?
 1. Sunday 2. Friday 3. Monday 4. Thursday
69. Which of the following will come in place of the question mark “?” $yAxB ? vD$
 1. Wc 2. uC 3. wC 4. wE
70. At 6.00 a.m., Sanjay was standing in his garden facing the sun. Then his neighbour who was standing in his garden on Sanjay's right called him up. They went for a run together towards the left of the house. After 2 km, they took a turn towards west and ran for 1 km, then took a left and again ran for 2 km. Which direction from their house are they standing right now?
 1. East 2. North-east 3. South 4. West

Directions for questions 71 to 73: Six course books of Mathematics, Science, Social Studies, Computer, English, and Hindi weigh 3 kg, 3 kg, 4 kg, 1 kg, 1 kg, and 1.4 kg, respectively. The order of priorities to stack them on a shelf is as under:

- Weighing more
 - Initials of subject of book occurring earlier in dictionary
- The highest priority book is kept at the bottom, and so on.

71. Which book will be at the top?
 1. English 2. Science 3. Computer 4. Hindi
72. If the Science book is removed, at what position (from the top) is the Computer book placed?
 1. 2nd 2. 3rd 3. 4th 4. Middle
73. If the highest priority book is kept at the top, at which place from the bottom will the Mathematics book be kept?
 1. 2nd 2. 4th 3. 5th 4. At the bottom
74. There are four groups; each can enrol a maximum 4 persons. P and Q are part of all four. R, S, and T are part of two of them. What can be the maximum number of groups in which U can participate?
 1. 1 2. 2 3. 3 4. None of these
75. In the previous question, if each group can enrol 5 persons, what can be the maximum number of groups in which U can enrol (other conditions remaining same)?
 1. 1 2. 2 3. 3 4. 4

76. The mother of my father's daughter has an only son whose wife's name is Amanda. How is Amanda related to me?
 1. Wife 2. Daughter-in-law 3. Daughter 4. None of these
77. Find the next term of the sequence. AE, EI, IM, MQ, _____
 1. QV 2. QU 3. QR 4. QT
78. The area of one of the six equilateral triangles formed in a regular hexagon of 6 cm side is (in square cm)
 1. 68.6 2. 13.2 3. 12.36 4. 15.59
79. Find the next number: 1027, 400125, 9000343, _____
 1. 2000729 2. 25000512 3. 25000729 4. 160000729
80. Ajay, Brij, and Chander are overweight and have weights above 110 kg. Daman, Eshan, and Ferdinand are obese and have weights over 150 kg. What is the minimum total weight they have if all of them have integral and different weights?
 1. 769 kg 2. 796 kg 3. 729 kg 4. 792 kg

 **Answer Key**
Section 1: Technical Ability

1. 2	2. 1	3. 3	4. 2	5. 4	6. 3
7. 3	8. 3	9. 1	10. 2	11. 4	12. 3
13. 1	14. 2	15. 4	16. 3	17. 4	18. 4
19. 1	20. 4	21. 4	22. 2	23. 3	24. 2
25. 4	26. 1	27. 1	28. 2	29. 1	30. 3

Section 2: Quantitative Aptitude

31. 4	32. 2	33. 3	34. 2	35. 3	36. 4
37. 3	38. 1	39. 2	40. 4	41. 2	42. 3
43. 1	44. 4	45. 2	46. 4	47. 3	48. 1
49. 3	50. 2	51. 2	52. 1	53. 1	54. 3
55. 4	56. 4	57. 4	58. 2	59. 4	60. 4
61. 2	62. 3	63. 4	64. 1	65. 3	66. 2
67. 2	68. 3	69. 3	70. 4	71. 1	72. 1
73. 3	74. 2	75. 4	76. 1	77. 2	78. 4
79. 4	80. 4				

Practice Paper 15

(Based on Recent Question Papers of Syntel*)

Total no. of questions: 65

Total duration: 65 min.

- No. of sections: 3
- There is no negative marking
- There is sectional cut off

Section 1: Quantitative Aptitude (20 questions in 20 minutes)

1. The LCM of three numbers is 240. Which of the following numbers must not be their HCF?
1. 16 2. 24 3. 48 4. 28
2. A box contains 5 white balls and 8 black balls. Three balls are drawn at random. What is the probability that all are of the same colour?
1. $4/13$ 2. $3/13$ 3. $5/13$ 4. $5/8$
3. What is the smallest number by which 3757 must be divided to get a perfect square?
1. 7 2. 11 3. 13 4. 17
4. If an article costs Rs 12 in 1990 and Rs 262 in 2014, what is the percentage increase in price?
1. 125/6% 2. 250% 3. 125/12% 4. None of these
5. A pipe *A* can fill a tank in 60 minutes; pipe *B* can fill the same in 40 minutes. If both are opened initially, after what time should pipe *B* be closed so that the tank gets filled in 30 minutes?
1. 30 minutes 2. 40 minutes 3. 20 minutes 4. 60 minutes
6. Two trains *A* and *B* start from the same station *P* towards *Q* at speeds 60 km/h and 90 km/h, respectively. After reaching station *Q*, train *B* immediately turns back towards station *P* and meets *A* at a distance 60 km from station *Q*. Find the distance between both the stations.
1. 320 km 2. 270 km 3. 250 km 4. 300 km
7. Varun deposited half of an amount at 6% p.a. for 2 years simple interest and the other half at 12% p.a. for 2 years compounded annually. If the final amount he had after 2 years was Rs 47,488, what was the initial amount he had?
1. Rs 15,000 2. Rs 25,000 3. Rs 30,000 4. Rs 40,000

* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of Syntel, a leading multinational IT firm.

8. Find the dictionary rank of the word "SURYA".
1. 64 2. 36 3. 72 4. 54

9. The petrol tank of an automobile can hold 'l' litres. If 'a' litres was removed when the tank was full, what part of the full tank was NOT removed?
1. $1-a$ 2. $1/a$ 3. a/l 4. $1-(a/l)$

10. Find the number of '0's in the end of $102!$.
1. 25 2. 22 3. 27 4. 24

11. A train takes 5 seconds to cross a man standing on a platform, while it takes 20 seconds to cross the platform. If the speed of the train is 72 km/h, find the length of platform.
1. 300 m 2. 225 m 3. 375 m 4. 250 m

12. Aman, Boman, and Raman subscribe Rs 90,000 for a business. Aman subscribes Rs 7000 more than Boman and Boman subscribes Rs 10,000 more than Raman. Out of a total profit of Rs 51,000, Aman receives (approx.)
1. Rs 23,000 2. Rs 22,500 3. Rs 20,000 4. Rs 21,500

13. In a factory, running at the same constant rate, 16 identical machines can produce a total of 800 metres of cloth per minute. At this rate, how much cloth could 22 such machines produce in 4 minutes?
1. 4400 m 2. 4200 m 3. 3660 m 4. 4620 m

14. $(64)^{13.5} \times (8)^7 \div (4096)^{3.5} = 64^?$
1. 14.5 2. 10 3. 15 4. None of these

15. A person wants to sell his scooter. There are two offers, one at Rs 17,000 cash and the other on credit of Rs 19,790 to be paid after 11 months, money being at 17% per annum. Which is the better offer for the buyer?
1. Rs 17,000 cash 2. Rs 19,790 credit
3. Both are equal 4. Can't be determined

16. In how many ways can the alphabets of the word 'GEOGRAPHY' be arranged such that all the vowels come together?
1. $6! \times 3!$ 2. 15120 3. 23600 4. $9! - 3!$

17. For a number to be divisible by 72, it must be divisible by _____.
1. 4 and 18 2. 6 and 12 3. 8 and 9 4. 6

18. A can give a start of 100 m to B in a kilometre race; while A can give a start of 118 m to C in the same race. How much start can B give to C in a half-kilometre race?
1. 18 m 2. 15 m 3. 10 m 4. 12 m

19. What will be the remainder of $32127 \div 7$?
1. 1 2. 3 3. 6 4. 4

20. $\log_{14}2744 - \log_{16}256 + \log_{34}1156 = ?$
1. 0 2. 1 3. 2 4. 3

Section 2: Logical Reasoning (25 Questions in 25 minutes)

21. If HEATER is coded as GDZSDQ then COOLER is coded as “_____”?
1. BNNKDS 2. BNNMDQ 3. BNNKDO 4. BMMKDQ

22. If COLOURED is coded as OCOLRUDE then LAPTOP is coded as “_____”?
 1. ALPTPO 2. ALTPOP 3. ALPOTP 4. ALTPPO
23. Ram's father's mother is Shivani; Shivani's husband is Vrij; Vrij's brother is Sham; and Sham's grandson is Varun. Then what is the relation between Ram and Varun?
 1. Brother 2. Cousin
 3. Sister 4. Either brother or sister
24. 5, 9, 6, 8, 7, __
 1. 6, 7 2. 7, 7 3. 7, 8 4. 5, 7
25. 4, 9, 16, 25, 36, 49, __
 1. 60 2. 6 3. 64 4. 73
26. In a jobseekers line of 49 people, every 4th person is a liar and every 5th person is a B.Tech holder. Then how many B.Tech holders are liars?
 1. 0 2. 1 3. 2 4. 3
27. m, p, s, v, ?
 1. y, b 2. w, z 3. a, c 4. None of these
28. The missing number in the sequence: 6, 10, __, 18, 22 is
 1. 13 2. 15 3. 14 4. 16
29. P is west of Q but south-west of R. R is north-west of Q. S is north-west of R and north of P but in line with Q and R. In which direction of Q is S located?
 1. North-east 2. South 3. East 4. North-west

Directions for questions 30 to 32: Anita is Ram's daughter. Shanti is Ram's sister. Shanti's daughter is Chitra and son is Daman. Lavina is Chitra's maternal aunt.

30. Anita is Lavina's
 1. niece/daughter 2. nephew 3. aunt 4. none of these
31. Chitra is Ram's
 1. nephew 2. niece 3. uncle 4. cannot say
32. Daman is Lavina's
 1. niece 2. aunt 3. nephew 4. none of these
33. The town P is located on Lake. The town A is west of P. Town T is east of A but west of P. Town K is east of town B but west of T and A. If they are all in the same district, which town is the farthest in east from town K?
 1. T 2. P 3. A 4. B
34. Vijay started moving towards. After taking 124 turns in towards his left, which will be the opposite direction at the end of Vijay's facing?
 1. South 2. West 3. North 4. East
35. In a row of girls, Anju was sitting 9th from left while Manju was 12th from right. If they interchange their positions, Anju occupies the 19th place from left. What is the current position of Manju from the right?
 1. 21st 2. 20th 3. 22nd 4. 19th

36. While pointing to a person in a car, a lady said "He is the son of my father's only daughter's brother." How is the person related to the lady's daughter?
 1. Nephew 2. Aunt 3. Cousin 4. Son

Directions for questions 37 to 40: *P, Q, R, S, and T are five integers. When written in the descending order of values, the difference between any two adjacent integers is 5. T is the greatest and S the least. Q is greater than P but less than R. The sum of the integers is 2 less than the greatest integer.*

37. The sum of R and T is
 1. 19 2. 20 3. 15 4. none of these
38. The least number has the value
 1. -4 2. -3 3. 3 4. -8
39. The sum of the integers is
 1. 25 2. 16 3. 10 4. none of these
40. The product of the integers is
 1. 4032 2. -4032 3. 4015 4. none of these
41. If FIN = 756 and BIN = 252 then TIN will be equal to
 1. 3018 2. 2082 3. 2520 4. 4125

Directions for questions 42 to 45: *Read the following data and answer these questions:*

Six boys Aashish, Batish, Chetan, Daman, Eshant, and Fahid are marching in a line. They are arranged according to their height, the tallest being at the back and the shortest in the front.

- Fahid is between Batish and Aashish.
 - Eshant is shorter than Daman but taller than Chetan who is taller than Aashish.
 - Eshant and Fahid have two boys between them.
 - Aashish is not the shortest among them.
42. Where is Aashish?
 1. Between Fahid and Batish 2. Between Chetan and Daman
 3. Between Eshant and Chetan 4. In front of Chetan
43. Who is the tallest?
 1. Batish 2. Daman 3. Fahid 4. Aashish
44. If we start counting from the tallest, which boy is third in the line?
 1. Eshant 2. Aashish 3. Daman 4. Chetan
45. Who is the shortest?
 1. Chetan 2. Daman 3. Batish 4. Fahid

Section 3: Verbal Ability (20 questions in 20 minutes)

Directions for questions 46 to 49: *In each of the following questions, some part of the sentence or the entire sentence is underlined. Beneath each sentence, you will find four ways of phrasing the underlined part. Choose the answer that expresses most effectively what is presented in the original sentence.*

46. The Chairperson does not know as to whether she should follow the new rules.
 1. as to whether she should follow 2. whether she should follow
 3. as to she should follow 4. if she can follow

47. My another sister is a wrestler.
 1. My another sister
 2. Another my sister
 3. My other sister
 4. Of my another sister
48. The MD must compensate this loss to the workers.
 1. this loss to the workers
 2. the workers for this loss.
 3. the loss to the workers
 4. to the workers this loss.
49. Supposing if the law catches up with him, where will he hide our records?
 1. Supposing the law catches up with him
 2. If supposing the law catches up with him
 3. Supposing if the law catches up with him
 4. If supposing the law catches with him
50. Find the wrongly spelt word.
 1. Formulating 2. Formidable 3. Formane 4. Formation
51. Find the wrongly spelt word.
 1. Monarchy 2. Prophecy 3. Beaureaccuracy 4. Aristocracy

Directions for questions 52 to 54: The following sentences have been divided into 4 parts. One of the parts contains an error. Mark that part of the sentence as the answer:

52. 1. Any of 2. these two books 3. will serve 4. its purpose.
53. 1. A group 2. of doctors, engineers, scientists, and geologists
 3. have gone to Antarctica 4. to conduct new experiments.
54. 1. None is 2. authorised to 3. miss their 4. presentation.

Directions for questions 55 to 60: Choose the word or phrase which best completes the sentence. Rely upon, grammatical accuracy as well as the choice that would complete the meaning of the sentence.

55. Many educationists stress the study of rhetoric, grammar, poetry and _____.
 1. studying history 2. learning about history
 3. history 4. historically
56. You are planning to meet them, _____.
 1. are you not? 2. are you 3. did you 4. aren't you?
57. Everybody _____ a pass should stand in queue.
 1. who have not purchased 2. who has not bring
 3. who has not purchased 4. who has not
58. A number of candidates _____ interviewed.
 1. are already been 2. have already been 3. are 4. who have been
59. Upon hearing the _____ words from the master, she left the place _____.
 1. wrongful immediately 2. misuse ... abashedly
 3. obnoxious ... amiably 4. acrimonious ... amicably
60. The _____ that 'A bird in hand is worth two in the bush' is _____ in this context.
 1. metaphor ... cavil 2. adage ... inappropriate
 3. talk ... evil 4. sentence ... anomalous

Directions for questions 61 to 63: Read the following five sentences and rearrange them to make a coherent and logical paragraph. After deciding the sequence, answer the questions given below.

- In her literary work, she spoke of that region of human life which mere intellect cannot express.
- She has also given the joy of innocence to millions of children with her stories like *Gubbarewalah*.
- These songs are sung not only in her home state but all over the country.
- Ragini Nath's great works sprang from intensity of vision and feelings which she experienced.
- She sang of beauty and heroism, dignity and charm.

61. Which sentence should come **fourth** in the paragraph?

1. 1 2. 2 3. 4 4. 5

62. Which sentence should come **third** in the paragraph?

1. 1 2. 2 3. 4 4. 5

63. Which sentence should come **first** in the paragraph?

1. 1 2. 2 3. 4 4. 5

Directions for questions 64 and 65: In the questions below, each passage consists of six sentences.

The first and sixth sentence are already given. The middle four sentences in each have been removed and jumbled up. These are labelled as P, Q, R, and S. Find out the proper order for the four sentences.

64. S1: One may be physically confined within thick, brick walls.

P: But one's mind and spirit will still, and always, be free.

Q: Therefore one's freedom of action may be inhibited.

R: One's ambitions and hopes still accompany one.

S: Thus, one will be free spiritually even if not physically.

S6: No tyranny can daunt a lover and upholder of liberty.

The proper sequence should be

1. PQRS 2. SRQP 3. QPRS 4. QPSR

65. S1 : Once upon a time there lived five young men in a certain town of the kingdom.

P: All the families in the neighbourhood were mortally fearful of them.

Q: They were so powerful that they could strangle growling lions and tear them apart.

R: One day, someone told them that they would become immortal if they killed Death.

S: The young men believed themselves to be very close friends.

S6: All of them together set out in a hunt for their foe called Death.

The proper sequence should be

1. QPRS 2. SQPR 3. RSQP 4. SRPQ



Answer Key

Section 1: Quantitative Aptitude

1. 4	2. 2	3. 3	4. 4	5. 3	6. 4
7. 4	8. 1	9. 4	10. 4	11. 1	12. 4
13. 1	14. 2	15. 1	16. 2	17. 3	18. 3
19. 4	20. 4	21. 3	22. 4	23. 2	24. 3
25. 3					

Section 2: Logical Reasoning

26. 3

32. 3

38. 4

44. 4

27. 1

33. 2

39. 3

45. 3

28. 3

34. 2

40. 1

29. 4

35. 3

41. 3

30. 1

36. 3

42. 4

31. 2

37. 1

43. 2

Section 3: Verbal Ability

46. 2

52. 1

58. 2

64. 1

47. 3

53. 3

59. 1

65. 2

48. 2

54. 3

60. 2

49. 1

55. 3

61. 4

50. 3

56. 4

62. 2

51. 3

57. 3

63. 3

Practice Paper 16

(Based on Recent Question Papers of TCS*)

Total no. of questions: 30

Total duration: 80 min

- No of sections: 1
- There is no negative marking
- No sectional cut off

1. Simmy and Rimmy are playing a game. There are 14 matchsticks on the table and each player must pick up at least one matchstick but not more than four. The person picking up the last matchstick loses. Simmy starts and they pick matchsticks in turns. How many should she pick up at the start to ensure a win no matter what strategy Rimmy uses?

1. 3

2. 4

3. 2

4. 5

2. What is the area of the triangle made by Vasudha with sides of 8 cm, 15 cm and 17 cm?

1. 15 sq. cm

2. 30 sq. cm

3. 60 sq. cm

4. 90 sq. cm

3. In the given figure, DC is the diameter of the circle and AB is a chord parallel to DC . If $AB = BC$ then angle $BDC = ?$

1. 45 degrees

2. 60 degrees

3. 30 degrees

4. 15 degrees

4. If $(p - 5)(q - 2)(r - 10) = 1000$, then what is the least value of $p + q + r$? (p, q , and r are integers)

1. 54

2. 63

3. 27

4. 7

5. Vicky and Ricky are two friends. The sum of their ages is 80. Vicky is five times as old as Ricky was when Vicky was as old as Ricky is now. What is the present age of Vicky (in years)?

1. 30

2. 50

3. 35

4. 45

6. Out of 4 red, 3 white, 5 pink, and 2 blue balls, in how many ways can we select one or more balls?

1. 2122

2. 131071

3. 5413

4. 16383

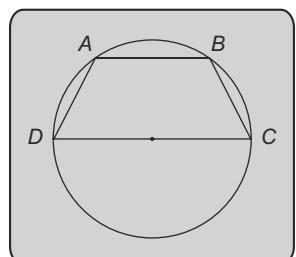
7. Rinku and Pinku each throw a dice. What is the probability that Rinku's throw is greater than Pinku's throw?

1. $5/12$

2. $1/2$

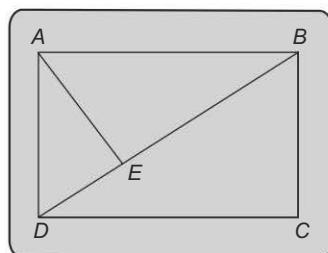
3. $7/12$

4. $3/4$



* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of TCS, a leading multinational IT firm.

8. A lion began chasing a deer that started running one hour ago. The lion started to run with an average speed of 18 km/h, crossed a 15-metre wide creek and two small ponds with a depth of 3 m, and two small caves each having a length of 100 metres. After travelling for 4 hours, 1 hour after sunset, it could catch up with the deer. Compute the speed of the deer.
1. 15.4 km/h 2. 14.4 km/h 3. 15.5 km/h 4. 14.5 km/h
9. How many 5-digit palindrome numbers are there?
1. 800 2. 850 3. 900 4. 950
10. Sanjay has 3 sons whose ages are respectively a , b , and c ; and the ages are all natural numbers. The grandfather bought an encyclopedia for the eldest son, and the mother bought a bag for the youngest one which cost Rs 250/. The difference of ages of the eldest son and one son is 5. The age of the eldest son is five times the difference between the ages of the other two sons. What is the age of the eldest son?
1. 9 years 2. 6 years 3. Cannot be determined 4. 15 years
11. Two pipes can fill a water tank in 5 hours and 6 hours, respectively. If they are turned one after the other for 2 hours each, the tank will be filled in _____.
1. 4 hours 2. 5 hours 3. 5.33 hours 4. 5.8 hours
12. A military camp has stocks to last for 8 days for 185 soldiers. How many soldiers should stay for the stocks to last for 10 days?
1. 148 2. 145 3. 185 4. 180
13. One face of a rectangular box has an area of 30 square inches. Another face is of 35 square inches and the third face is of 42 square inches. What is the volume of the box (in inches^3)?
1. 160 2. 240 3. 105 4. 210
14. The angle of elevation of a building is 60° from the first point, which is eastwards of the building. The second point is southward of building such that the angle of elevation of the building from the second point is 45° . If the distance between the points is 200 metre, what is the height of the building (in metres)?
1. $200\sqrt{3}$ 2. 200 m 3. $100\sqrt{3}$ 4. $150\sqrt{3}$
15. When 7% of the total oil is lost in refining, India can export 5 million litres of oil, but when 8% of the total oil is lost in refining, it needs to import 3 million litres of oil. What is the total production of oil in India? (in million litres)
1. 400 2. 1300 3. 800 4. 550
16. Ravi, a painter, decided to paint a room. For painting the room, he had to mix red, blue, and green paint in the ratio $9 : 7 : 5$. The red paint costs Rs 300 a box which contains 5 litres of paint. He has spent Rs 3300 to buy red paint. How much will he have to spend for the blue paint which costs Rs 90 for a 3-litre box?
1. Rs 1283.3 2. Rs 1456 3. Rs 1210 4. Rs 1500
17. In the following figure, $ABCD$ is a rectangle. If AE is perpendicular to DB and the angle DAE is 30° , what is the ratio of the area of the triangle ADE to the area of the rectangle $ABCD$?
1. 4:7 2. 5:8 3. 1:8 4. 7:12



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18. An ascending escalator moves with a speed of 5 steps/min. Dhruv can walk up the moving escalator in 8 minutes and walk it down in 12 minutes. How many steps could be seen on the escalator when it is stationary?
1. 260 2. 280 3. 120 4. 240
19. A right-angled triangle shaped floor has sides as 210 cm, 280 cm, and 350 cm. What is the minimum number of identical similar triangle-shaped tiles required to cover the floor, if the sides of the tiles have integral value in cm? (The dimensions of the tile are not equal to those of the floor)
1. 2 2. 3 3. 9 4. 4
20. The original price of a diamond is Rs 92,400. The owner increased the price to 140% of its original price to earn more. After a month, it was still unsold. So the owner then discounted the price by 25%, and the diamond was finally sold. What price was the diamond sold for (in Rs)?
1. 97,020 2. 95,600 3. 10,280 4. 1,06,288
21. Two trains travel eastwards at 36 km/h with a regular distance between them. A train comes from the opposite direction at 54 km/h. It meets the two trains at a gap of 12 seconds. What is the distance between the two trains?
1. 100 m 2. 300 m 3. $800/9$ m 4. 72 m
22. A dice is rolled to select food from a menu which has been divided into two groups. The first group has 10 veg and 6 non-veg options and group II has 10 non-veg and 6 veg options. If the number 2 or 4 turns up, a food option from group I is selected, otherwise it is selected from group II. The probability that a non-veg food item is selected ultimately is
1. $3/8$ 2. $13/24$ 3. $5/8$ 4. $\frac{1}{2}$
23. A sum of Rs 6000 is to be awarded among six friends by lottery system. If put in an order, the six prizes have a difference of Rs 300 between them, what is the value of the highest prize in rupees?
1. 2500 2. 1500 3. 1750 4. 1700
24. A solid cylinder of 5 cm radius is melted into a solid cone. If the radius of the base of the cone is 10 cm and its height is 25 cm, find the height of the cylinder.
1. 32.8 cm 2. 29.6 cm 3. 33.3 cm 4. 34.5 cm

Directions for questions 25 and 26: Use the 9×9 Sudoku puzzle given below to solve these questions:

					5		2	
			3	7				8
3				2			7	9
2		9		5				
		5	8		4	2		
				9		1		3
6	7			8				4
5				4	1			
	2		7					

Reference for correction in mock TCS

25. What number should come at the 9th row of the 6th column?
 1. 6 2. 4 3. 2 4. 5
26. What number should come at the 6th row of the 8th column?
 1. 1 2. 4 3. 2 4. 5
27. A, B, and C distributed some money amongst themselves. B received an amount which is $\frac{2}{5}$ th of what A received and 4 times of what C received. C has $\frac{1}{10}$ th of what A had. What is the ratio of B and C's sum together with A's?
 1. 2:5 2. 3:7 3. 1:3 4. 1:2
28. Find the missing number in the series: 6, 10, __, 18, 22, 26
 1. 32 2. 14 3. 20 4. None of these
29. If QFSSDBS is written as RETREAT, what is the code for MAGNET?
 1. NZHMFS 2. NZHNFS 3. LBHNFS 4. LBHJFD
30. In a family, each boy has twice the number of brothers as sisters and each girl has 4 brothers more than sisters. How many boys and girls are there in the family?
 1. 5 boys and 2 girls 2. 4 boys and 3 girls
 3. 5 boys and 3 girls 4. none of these

Answer Key

1. 1	2. 3	3. 3	4. 4	5. 2	6. 4
7. 1	8. 2	9. 3	10. 3	11. 3	12. 1
13. 4	14. 3	15. 3	16. 1	17. 3	18. 4
19. 4	20. 1	21. 2	22. 2	23. 3	24. 3
25. 1	26. 4	27. 4	28. 2	29. 1	30. 1

Practice Paper 17

(Based on Recent Question Papers of Tech Mahindra*)

Total no. of questions: 170

Total duration: 80 min.

- No. of sections: 2
- There is no negative marking
- There is sectional cut off

Section 1: Verbal Ability (100 questions in 40 minutes)

Directions for questions 1 and 2: In each of the questions below, there is some grammatical error. From the given options, select the one which contains the error.

1. 1. He prides his skill as a carpenter.
2. He is definite about what is wrong and what is right.
3. Do you want him to help us out with something?
4. How could you deal with somebody who doesn't listen to a reason.
2. 1. The newborn was a bundle of joy for the entire family.
2. The number of students have significantly gone down, in the last two years.
3. Did she leave the door open, before going out?
4. Within a second, she burst into laughter.

Directions for questions 3 to 7: Select the correct word or phrase to complete the given sentence.

3. She has lived this street twelve years.
1. onduring 2. in.....for 3. near.....since 4. with.....for
4. She was ill a full fortnight, and the entire duration, her husband never left her bedside.
1. during..... in 2. in in 3. since for 4. for during
5. He was fined parking his truck a no parking area.
1. while on 2. on in 3. for in 4. to within

* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of *Tech Mahindra*, a leading multinational IT firm.

6. She advised the people to work the betterment their nation; the crowd received her counsel shouts contempt.
1. to ... for ... with ... in
 2. for ... of ... with ... of
 3. towards ... for ... by ... of
 4. on ... of ... among ... of
7. Go back the bus terminal, and wait there he calls for you.
1. to ... before
 2. in ... so that
 3. to ... until
 4. towards ... after

Directions for questions 8 to 12: Choose the correct word from the options given below so as to make the sentence logically and grammatically correct.

8. His mother always maintained the perks of a good education.
1. in
 2. on
 3. with
 4. for
9. Parul is stronger than
1. him
 2. he
 3. I
 4. None of these
10. I responded to my mentor the affirmative.
1. by
 2. of
 3. with
 4. in
11. Everybody benefits a transparent working system.
1. out of
 2. with
 3. of
 4. from
12. No sooner did the concert begin,the crowd started hooting.
1. when
 2. than
 3. then
 4. as

Directions for questions 13 to 20: Read the questions given below and choose the option which is most nearly similar to the word in question.

13. Lucid
1. Comfort
 2. Vitality
 3. Wisdom
 4. Clarity
14. Intrepid
1. Ugly
 2. Irregular
 3. Bold
 4. Sick
15. Transgress
1. To exceed/violate limits
 2. To watch from a distance
 3. To learn/adapt a new skill
 4. To go to a foreign country
16. Stridency
1. Harshness
 2. Stressful
 3. Flippant
 4. Progressive
17. Debilitate
1. To make homeless
 2. To respect
 3. To weaken
 4. To outlaw
18. Terse
1. Mean
 2. Determined
 3. Transparent
 4. Brief
19. Fester
1. Embrace
 2. Graduate
 3. Long for
 4. Rot
20. Xenophobia is the fear of
1. authority
 2. open spaces
 3. foreigners
 4. crows

Directions for questions 21 to 25: In each of these questions, each sentence has 4 underlined words or phrases marked 1, 2, 3, and 4. Choose one word or phrase that must be changed for the sentence to be correct.

21. 1. You must know that smart work
2. often results in a rise
 3. not only in one's
 4. earning, but also in your self-esteem.

22. 1. Caffeine
3. harmless only if people drink
23. 1. The woman
3. the maroon saree than
24. 1. More than
2. have contributed
25. 1. It is
3. alcoholics
2. in tea is relative
4. it moderately.
2. remarked that she preferred
4. the green one.
2. one researcher
4. to the success of this study
2. impossible of
4. to drink reasonably

Directions for questions 26 to 30: Choose the option that is most nearly opposite to the word given in question.

- | | | | | |
|----------------|----------------|----------------|---------------|-----------------|
| 26. Ameliorate | 27. Gorgeous | 28. Former | 29. Deceit | 30. Dearth |
| 1. Hasten | 1. Frantic | 1. Consecutive | 1. Realty | 1. Extravagance |
| 2. Hasten | 2. Plain | 2. Later | 2. Discreet | 2. Sparse |
| 3. Fatten | 3. Fashionable | 3. Consequent | 3. Truthful | 3. Abundance |
| 4. Worsen | 4. Luxurious | 4. Latter | 4. Fictitious | 4. Sufficient |

Directions for questions 31 to 35: Select one of the phrases given below in each sentence which should replace the phrase printed in bold type to make the sentence grammatically correct:

31. **She need not come unless she wants to**
1. She doesn't need to come unless she wants to.
 2. She come only when she want to.
 3. She come unless she doesn't want to.
 4. She needn't come until she doesn't want to.
32. There are not many people who become so famous that they are commonly referred to by their **short names** only.
- | | | | |
|-------------|-------------|---------------|-----------------|
| 1. initials | 2. pictures | 3. signatures | 4. middle names |
|-------------|-------------|---------------|-----------------|
33. The lady **to who I sold** my car was a fraud.
- | | | | |
|-------------------|------------------|--------------------|-------------------|
| 1. to whom I sell | 2. to who I sell | 3. who was sold to | 4. to whom I sold |
|-------------------|------------------|--------------------|-------------------|
34. They **were all awed at** his performance in the game.
- | | |
|---------------------|---------------------------|
| 1. were awed at all | 2. had all awed at |
| 3. had all awed by | 4. No correction required |
35. He **need not offer** any justification regarding that incident—his demeanour **is speaking for itself**.
- | | |
|-------------------------|------------------------|
| 1. will speak to itself | 2. speaks for itself |
| 3. has been speaking | 4. speaks about itself |

Directions for questions 36 to 40: Fill in the blanks with the correct preposition from the options given below:

36. They grieve and convey their despair the way Vivekananda has been forgotten in his land.
- | | | | |
|---------|-------|-------|---------|
| 1. over | 2. of | 3. in | 4. with |
|---------|-------|-------|---------|

37. The public is ushering a new era.
 1. into 2. in 3. of 4. over
38. The festival passed without any untoward incidents.
 1. of 2. on 3. off 4. away
39. He is a traitor the nation.
 1. for 2. to 3. in 4. of
40. Research in the offices reveals that people choose to work for many reasons
 1. beside money 2. besides money 3. than money 4. money besides

Directions for questions 41 to 45: From the options given under each word which are wrongly spelt, choose the one which spells the word correctly.

- | | | | |
|--------------------|---------------|---------------|---------------|
| 41. 1. Abberration | 2. Aberretion | 3. Aberration | 4. Abarretion |
| 42. 1. Fastidious | 2. Fastiduous | 3. Fastedous | 4. Fastiduous |
| 43. 1. Locacious | 2. Locqacous | 3. Loqcacuous | 4. Loquacious |
| 44. 1. Bonhomie | 2. Baunhomie | 3. Bonhomei | 4. Bonhoumie |
| 45. 1. Desaltery | 2. Desultory | 3. Desoltery | 4. Desultary |

Directions for questions 46 to 50: Choose the correct option from the alternatives given below in each question.

46. To make a clean breast of
 1. To gain popularity 2. To praise bravery
 3. To confess without reserve 4. To destroy before it grows
47. To keeps one's temper
 1. To become thirsty 2. To be in good mood
 3. To conserve ones energy 4. To be aloof from
48. To be down in the dumps
 1. To look for leftovers 2. To feel sad and miserable
 3. To lose energy 4. To lose one's path
49. To drive someone up the wall
 1. To use physical force against someone 2. To run over someone
 3. To annoy someone 4. To give rewards and appreciation
50. The tip of the iceberg
 1. something that suggests a much larger problem than what is seen
 2. to get arrested for fraud
 3. to be at the top position
 4. to be very successful and set an example for the rest

Directions for questions 51 to 60: Fill in the following blanks with the correct articles:

51. He can read Quran.
 1. a 2. an
 3. the 4. no article required
52. She is sloppy nurse.
 1. a 2. an
 3. the 4. no article required

53. moon shines brightly tonight.
 1. a
 2. an
 3. the
 4. no article required
54. Life is not bed of roses.
 1. a
 2. an
 3. the
 4. no article required
55. higher you climb, cooler it gets.
 1. a, the
 2. a, a
 3. the, the
 4. no article required
56. In market I saw one-legged beggar.
 1. a, a
 2. the, the
 3. the, a
 4. no article required
57. Ahmedabad is Manchester of India.
 1. a
 2. an
 3. the
 4. no article required
58. Help destitute and hungry.
 1. a, the
 2. a, a
 3. the, the
 4. no article required
59. bat cannot see at all.
 1. a
 2. an
 3. the
 4. no article required
60. He became quality actor.
 1. a
 2. an
 3. the
 4. no article required

Directions for questions 61 to 80: Read the passages given below and answer the questions that follow.

Passage 1

We reside in a split society; on the one side the fortunate rich are critical of our persisting poverty—on the other, they caution us against their own ways. We try not to impoverish the environment any longer and yet we cannot ever forget the stark poverty of such a large section of our population. After all, is there a bigger polluter than poverty and greed? For example, until we are able to generate employment and a purchasing power on a perpetual basis for our tribal people or those who subsist in or around forests, we cannot prohibit them from exploiting the natural abundance for their livelihood and food or from poaching the animals and despoiling the vegetation. When humans themselves appear deprived, how can society suggest the preservation of animals? How can the inhabitants of villages and slums be urged to keep the oceans, rivers, and the atmosphere clean when their own lives are corrupted at the source? The environment cannot be bettered in conditions of poverty, nor can it be eradicated without the support of science and technology.

61. Which of the following four statements is true?
 1. We live in a united world.
 2. The rich ones do not criticize our poverty.
 3. The rich countries readily allow us to apply their own methods.
 4. Poverty and need are the biggest polluters.

62. One of the following statements is not true: which one is it?
1. We live in a divided world.
 2. We do not want to pollute the environment any more.
 3. The environment can be improved even in conditions of poverty.
 4. We cannot prevent the people living in or near forests from combing the forests unless we provide them employment and purchasing power for their daily needs.
63. We can uproot poverty _____
1. by providing employment to every person
 2. with the use of science and technology
 3. by distributing wealth to everyone
 4. by educating everyone
64. The word ‘poaching’ means _____
1. killing of animals
 2. illegal killing of animals
 3. deforestation
 4. spoiling the environment
65. Why do the tribal people and those who live in or around forests exploit the forest?
1. To earn money
 2. For food and livelihood
 3. To pollute the environment
 4. They do so because they want to do so

Passage 2

Man's fixation with time has reached such a crescendo that we agonize intensely whenever we end up meeting people and being in cultures which are not as obsessed with the passing seconds. The casualness in punctuality in the Orient, as an illustration, is almost blasphemous to those who arrive freshly from a land of fixity of meal times and flawless transport service. For a modern Westerner, waiting of any duration is a deep agony bordering on the edge of torture. And an Asian naturally accepts the empty hours with resignation; even satisfaction. He is yet to unlearn the fine art of doing nothing. Our material notion of time as an accumulation of minutes, each of which must be successful by giving us amusement or benefit, and not a single second of which, must not be wasted at any cost, is entirely alien to the Oriental. For a person who resides in the pre-industrialized world, time is abundant and moves leisurely. He is not bothered about each hour, for the simple reason that he has not been made conscious of its existence.

66. Why does man suffer acutely?
1. In the company of people conscious of time
 2. Among the people careless of time
 3. On account of much awareness of time
 4. On account of the unpunctuality of the orient
67. How does an Indian accept blank hours?
- | | | | |
|------------|--------------|--------------|-------------|
| 1. Happily | 2. With ease | 3. Unhappily | 4. Uneasily |
|------------|--------------|--------------|-------------|
68. ‘Pre-Industrial’ means
1. before the Industrial revolution
 2. after the Industrial revolution
 3. before there the industry in India was privatized
 4. before watches started being manufactured on a large scale

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69. The opposite word for ‘pre’ is
1. post 2. past 3. future 4. late
70. The word ‘appalling’ means
1. pitiable 2. praiseworthy 3. hateful 4. horrible

Passage 3

We find ourselves in a world where technology has suddenly eliminated distance between people. In the tangible, physical world, two people might be neighbours, but psychologically they are complete strangers to each other. Our consciousness of variety has hit an all-time peak. In what way will these two strangers-yet-neighbours respond when they come to such close quarters? Will this awareness of abundance and variety make them fear and/or hate each other? In that event, we are dooming ourselves to wipe each other out. Or, can we learn to live and subsist like a single family? This, perhaps, is our sole and ultimate alternative to mutual destruction, but to attain this level of amity, we need to begin valuing the diversity of the human heritage. Let’s not be limited to appreciation of our neighbour’s distinctive contribution to that heritage, but try to love these as precious, indispensable parts of our common treasure. Not a love which exposes our family members to the ominous danger of being wiped out by atomic warfare. And it is due to this reason that India’s conspicuous achievement of variety-in-unity is of global significance.

71. Technology has eliminated _____.
1. variety 2. unity
3. psychological differences 4. physical differences
72. Consciousness of variety is the result of
1. annihilation of technology 2. meeting the strangers closely
3. physical neighbourhood 4. psychological and physical distance
73. The antonym of ‘amity’ is _____.
1. enmity 2. friendship
3. variety 4. unity
74. The word ‘conspicuous’ means _____.
1. importance 2. admirable
3. distinct 4. by leaps and bounds
75. ‘Heritage’ is _____.
1. land grabbed by the children
2. physical difference
3. mental development of the other people
4. cultural traditions coming from ancestors
76. Which word from the passage can be used to fill in the blank to make it meaningful?
There is no to this plan.
1. conspicuous 2. alternative 3. mutual 4. consciousness
77. Which word from the passage can be used to fill in the blank to make it meaningful?
You are your healthy body by smoking too much.
1. not living 2. wiping 3. dooming 4. appreciating
78. Choose the word in the passage which means ‘aware’.
1. Conscious 2. Conspicuous 3. Close 4. Mutual

79. Choose the word in the passage which means ‘invaluable’.
1. Conspicuous
 2. Treasure
 3. Common
 4. Precious
80. Fill in the blanks: You shouldn’t if he abuses you.
1. hate
 2. react
 3. achieve
 4. fear

Directions for questions 81 to 90: *Fill in the blanks with appropriate tenses:*

81. She told the instructor that she her gloves at home.
1. leave
 2. left
 3. has left
 4. will leave
82. I have never a motorcycle.
1. drive
 2. driven
 3. let out
 4. buy
83. I Brussels for three years now.
1. visited
 2. visit
 3. have been visiting
 4. had been visiting
84. While I partied, he
1. slept
 2. was sleeping
 3. has slept
 4. will be sleeping
85. He told me that he me in the park.
1. meets
 2. met
 3. would meet
 4. has met
86. The earth around the sun.
1. moved
 2. moves
 3. will move
 4. has moved
87. The coach a new tactic tomorrow.
1. discusses
 2. would discuss
 3. will be discussing
 4. discussed
88. He cried when she him.
1. has insulted
 2. insulted
 3. had insulted
 4. did insult
89. The binoculars broken.
1. is
 2. are
 3. am
 4. none
90. The instrument in the corner.
1. are
 2. is
 3. had been
 4. would be

Directions for questions 91 to 100: *In the questions given below, a part of the sentence is underlined.*

Below are given alternatives to the underlined part which may improve the sentence. Choose the correct alternative.

91. The protestors are hell bent at getting what is due to the community.
1. hell bent on getting
 2. hell bent for getting
 3. hell bent upon getting
 4. No improvement
92. When it was feared that the slaves might go too far and gain their freedom, the clergy leaders joined the princes at crushing them.
1. into crushing
 2. in crushing
 3. without crushing
 4. No improvement
93. If the room had been brighter, I would have been able to sketch a bit more before bedtime.
1. if the room was brighter
 2. If the room are brighter
 3. Had the room been brighter
 4. No improvement

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94. The record for the biggest elephant hunt has not been met since 1895 when Lord Gunnera, the then Viceroy, shot one that measured 1.7 m.
1. improved
 2. broken
 3. bettered
 4. No improvement
95. His powerful desire brought about the debacle.
1. His intense desire
 2. His desire for power
 3. His fatal desire
 4. No improvement
96. Will you please help me open this knot?
1. untie
 2. break
 3. loose
 4. No improvement
97. He sent a word to me that they would be joining us late.
1. sent word
 2. had sent a word
 3. sent words
 4. No improvement
98. Jatin had told me he hasn't finished it yet.
1. told
 2. tells
 3. was telling
 4. No improvement
99. If she had time she will call you.
1. would have
 2. would have had
 3. has
 4. No improvement
100. Will you please lend me few rupees in this hour of need?
1. lend me any rupees
 2. borrow me a few rupees
 3. lend me a few rupees
 4. No improvement

Section 2: Quantitative Aptitude and Logical Ability (70 questions in 40 minutes)

101. Three consecutive whole numbers are such that the sum of the digits of their product is $\frac{1}{4}$ th of the product of the three numbers. Find the product of the three numbers.
1. 12
 2. 18
 3. 24
 4. All of these
102. The arithmetic mean of 2 numbers is 10 and their geometric mean is 6. Which of the following represents one of the two numbers?
1. 8
 2. 4
 3. 18
 4. 36
103. If $a\%$ of p and $b\%$ of q give the same value, then what will be $c\%$ of q ?
1. $(ab/c)\%$ of p
 2. $(bc/a)\%$ of p
 3. $(ac/b)\%$ of p
 4. None of these
104. The letters of the word TABLE are written in alphabetical order like in a dictionary. What will be the rank of the word 'TABLE'?
1. 98
 2. 99
 3. 97
 4. 100
105. The least number that must be subtracted from 4910 so that it is exactly divisible by 75 is
1. 35
 2. 25
 3. 110
 4. none of these
106. If $3203 / 0.5 = 6406$ then $32.03/0.5 = ?$
1. 6.406
 2. 64.06
 3. 640.6
 4. None of these

107. Which pair of rational numbers lie between $\frac{3}{20}$ and $\frac{1}{4}$?
1. $\frac{152}{1000}, \frac{225}{1000}$
 2. $\frac{462}{1000}, \frac{524}{1000}$
 3. $\frac{154}{1000}, \frac{256}{1000}$
 4. $\frac{155}{1000}, \frac{255}{1000}$
108. The value of the expression $3\log_6 3 + \log_6 8$ is?
1. 3
 2. 2
 3. 1
 4. 0
109. What is the probability of getting the sum 5 in two throws of the dice?
1. $\frac{5}{36}$
 2. $\frac{1}{5}$
 3. $\frac{1}{12}$
 4. $\frac{1}{9}$
110. 6 men can finish a piece of work in some days. If, however, there were 3 men less, it will take 8 days more for the work to be finished. How much time did it take for 6 men to complete the job?
1. 10 days
 2. 6 days
 3. 12 days
 4. None of these
111. A certain sum amounts to Rs 460 in 3 years and Rs 500 in 5 years when put under simple interest at a fixed rate. What is the sum?
1. Rs 280
 2. Rs 360
 3. Rs 400
 4. Rs 420
112. A sum of money doubles itself in 3 years when compounded annually? In how many years will it become 4 times of itself?
1. 6
 2. 8
 3. 5
 4. 12
113. Two trains move in the same direction at 70 kmph and 34 kmph, respectively. A man in the slower train observes that 10 seconds elapse before the faster train completely passes by him. What is the length of the faster train?
1. 120 m
 2. 100 m
 3. 80 m
 4. 150 m
114. $2p\%$ of q is same as $q\%$ of _____.
1. $2p/q$
 2. $2q$
 3. $2p$
 4. can't be determined
115. The oil prices have increased by 50%. By what percentage should a housewife reduce the consumption of oil so that expenditure on oil remains the same?
1. 66.66%
 2. 33.33%
 3. 50%
 4. 20%
116. b, d, g, k, ?
1. o
 2. p
 3. q
 4. m
117. m, p, s, v, ?, ?
1. y, b
 2. w, z
 3. a, c
 4. None of these
118. pb, qa, rd, sc, _
1. et
 2. ft
 3. te
 4. tf
119. 1, 3, 5, 8, 11, 15, _
1. 19
 2. 17
 3. 16
 4. 18
120. ez, fy, gx, _
1. hw
 2. wh
 3. ia
 4. cw
121. w ___ 1 h ___ c b
1. q, e
 2. r, d
 3. q, d
 4. r, e
122. ___, jhf, pnl, vtr, bzx
1. awx
 2. dbz
 3. cyw
 4. zxv

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123. 2, 4, 6, 12, 22, 40, ____
1. 60 2. 72 3. 62 4. 74
124. 1, 3, 2, 4, 5, 7, 10, 12, 17, ____
1. 18 2. 21 3. 19 4. 23
125. 3, 2, 11, 14, 27, ____
1. 75 2. 49 3. 34 4. 36
126. abbc, bcab, bced, cdbc, cdde, ____
1. decd 2. cedd 3. eddc 4. dcde
127. acf, bdg, ceh, ____.
1. dfi 2. dfh 3. dgj 4. dgi
128. pqpr, qroq, rsnp, ____.
1. stqo 2. stmo 3. sqmo 4. smto
129. p q n, q r o, r s p, ____.
1. q s p 2. s p q 3. s t u 4. s t q
130. Fill in the blanks: e, g, i, ____, u, w.
1. j, l, n, p, r 2. k, l, n, p, r 3. k, m, o, q, s 4. j, k, m, p, s
131. E, g, J, n, _, y?
1. S 2. s 3. t 4. T
132. All doors are windows. All windows are wood.
1. All wood are doors.
2. All doors are wood.
3. No doors are wood.
133. No red is an orange. All yellow are orange.
1. All red are orange.
2. Some red are orange.
3. No red is a yellow.
134. All shirts are skirts. Some skirts are jeans.
1. Some shirts are jeans.
2. All shirts are jeans.
135. All balls are bats. No bats are wickets.
1. All balls are wickets.
2. Some balls are wickets.
3. No balls are wickets.
136. Many uncles are snowmen. All snowmen are carpenter.
1. No uncle is a carpenter.
2. Many uncles are not carpenters.
3. Many uncles are carpenters.
137. Some rainbows are trees. No trees are forests.
1. No rainbows are forests.
2. Some rainbows are forests.
3. All trees are rainbows.
138. If the word “COMPUTER” is represented as DPNQVUFS then the word “CAMPUS” will be ____
1. DBNQVT 2. DBNVQT 3. DNBVQT 4. DNBQVT
139. If in a certain code “CHAIR” is coded as 12345 and “CHARMING” is coded as 12356478 then the code for the word “GRAIN” would be
1. 85347 2. 83475 3. 85374 4. 85473

Directions for questions 140 to 142: Refer to the data given below and answer the questions that follow.
 In a class of 250 students, 135 read Times of India, 140 read the Hindustan Times, and 50 read neither of the two newspapers.

140. How many read both the newspapers?
 1. 70 2. 60 3. 75 4. 65
141. How many read only *Hindustan Times*?
 1. 55 2. 45 3. 65 4. None of these
142. How many read at least one of the two newspapers?
 1. 200 2. 125 3. 150 4. 175
143. In a certain language, if SHAHRUKH is coded as TIBISVLI, how is SALMAN coded?
 1. TBNBMO 2. TBMNBO 3. TMNBOB 4. TNOMNB
144. If ALTER is written as 98765 and FROZEN is written as 493261, how is ZEALOT coded?
 1. 269378 2. 269837 3. 296387 4. 269738
145. In a certain code, 23456 is coded as SLOPE, 17536 is coded as MAPLE then how is 63127 coded?
 1. EMLSA 2. ELMAS 3. ELMSA 4. ESLAM
146. If SOCIAL is coded as SAICOL, how is BLACK coded?
 1. BKLAC 2. KCALB 3. KLACB 4. BCALK
147. If GLOBAL is coded as 5 and WONDERFUL as 8, what is the code number for LADYFINGER?
 1. 7 2. 8 3. 9 4. 10
148. If FASTER is coded as 611259 then SHOWER will be coded as _____.
 1. 186449 2. 185469 3. 186559 4. 186459
149. If COVERING is written as BPUFQJMH, how would MORNING be written in this code?
 1. NPQHOOH 2. LPQOHOH 3. LPSOJOH 4. NPSOJOH
150. If SECOND is written as RTDFBDNPMOC, how would the word GIRL be written in that code?
 1. JFFQMSKH 2. HFFJQMKS 3. FHOHJSKM 4. FHHJQSKM
151. If SPARE is coded as 59, how will we code SCARE?
 1. 56 2. 57 3. 48 4. 46
152. If ‘space’ is called ‘matter’, ‘matter’ is called ‘physics’, ‘physics’ is called ‘clock’, ‘clock’ is called ‘science’, where do you see time?
 1. Space 2. Physics 3. Clock 4. Science
153. If ‘stone’ is called ‘scissors’, ‘scissors’ is called ‘paper’, ‘paper’ is called ‘pen’, and ‘pen’ is called ‘box’, where do you write?
 1. Stone 2. Paper 3. Pen 4. Box
154. If ‘rainbow’ is called ‘school’, ‘school’ is called ‘cinema’, ‘cinema’ is called ‘scale’, ‘scale’ is called ‘jacket’, and ‘jacket’ is called ‘bed’, what will you wear?
 1. Jacket 2. Bed 3. Scale 4. School
155. In a certain language, ‘she ma sui’ means ‘boy is talking’, ‘chi she doe’ means ‘boys knows nothing’, and ‘kim doe san’ means ‘she knows everything’. Which of the following means ‘talking’ in that language?
 1. she 2. ma
 3. sui 4. Can’t be determined

156. In a certain language, if ‘tae me jis’ means ‘short fat dog’, ‘mes jis glex’ means ‘too short length’, ‘ne mes par’ means ‘too many games’ and ‘mes me nes’ means ‘too fat girl’, which word in that language stands for ‘dog’?
1. me
 2. jis
 3. mes
 4. None of these
157. In a certain language, ‘les por ne’ means ‘lets play guitar’, ‘fer les shim’ means ‘guitar looks good’ and ‘sam fer kenn’ means ‘she looks stunning’. Which of the following means ‘good’ in that language?
1. shim
 2. fer
 3. les
 4. Cannot be determined
158. In a certain code, ‘837’ means ‘exams are tough’, ‘316’ means ‘I hate exams’, and ‘7345’ means ‘tough exams for me’. Which digit stands for ‘I’ in the code?
1. 3
 2. 1
 3. 6
 4. Cannot be determined
159. If the signs ‘ \times ’ and ‘ $+$ ’ are interchanged, which of the following statements is true?
1. $3 + 2 \times 2 = 8$
 2. $5 \times 3 + 2 = 17$
 3. $4 + 3 \times 1 = 14$
 4. $2 \times 3 + 3 = 9$
160. If we interchange the signs ‘ $+$ ’ and ‘ $-$ ’, and numbers ‘3’ and ‘4’, which relation is correct?
1. $3 - 4 + 2 = 5$
 2. $3 + 4 - 1 = 6$
 3. $3 - 4 + 4 = 6$
 4. $3 + 4 - 5 = 5$
161. If the following replacements are done: ‘ $+$ ’ means ‘multiplied by’, ‘ $-$ ’ means ‘divided by’, ‘ \times ’ means ‘plus’ and ‘ $/$ ’ means ‘minus’, what will be the value of $15 - 3 \times 3 + 2 / 4$?
1. 6.5
 2. 7
 3. 21.5
 4. 9
162. The sign $+$ is represented as P, $-$ is represented as Q and \times is represented as R, then what is the value of (6P4)RQ3R(4Q1) ?
1. 90
 2. 80
 3. -90
 4. -80
163. What was the day of the week on 12 March 2009?
1. Thursday
 2. Saturday
 3. Friday
 4. Sunday
164. In an accurate clock, the time is 10 o’clock in the morning. By what angle would the hour hand have moved when it will be 4 o’clock in the evening?
1. 164°
 2. 150°
 3. 138°
 4. 180°
165. A clock is started at 1 o’clock. By 10 minutes past 6, the hour hand has turned through
1. 145°
 2. 150°
 3. 155°
 4. 160°
166. Find the odd one out: 6, 15, 24, 33, 46, 54
1. 15
 2. 24
 3. 46
 4. 54
167. Find the odd one out: 9, 25, 64, 125, 225, 256
1. 9
 2. 125
 3. 225
 4. 256
168. What least number must be added to 2620 so that the sum is completely divisible by 41?
1. 4
 2. 3
 3. 37
 4. 41
169. The difference between a two-digit number and the number obtained by interchanging its digits is 9. The sum of the two digits of this number is
1. 14
 2. 9
 3. 12
 4. cannot be determined

170. The difference between a two-digit number and the number obtained by interchanging the digits is 54. The ratio of the digits of this number is 1:3. What is the difference between the sum and the difference of the digits of the number?

1. 2

2. 6

3. 3

4. None of these

 **Answer Key**
Section 1: Verbal Ability

1. 1	2. 2	3. 2	4. 4	5. 3	6. 2
7. 3	8. 2	9. 3	10. 4	11. 4	12. 2
13. 4	14. 3	15. 1	16. 1	17. 3	18. 4
19. 4	20. 3	21. 3	22. 2	23. 3	24. 3
25. 2	26. 4	27. 2	28. 4	29. 3	30. 3
31. 1	32. 1	33. 4	34. 4	35. 2	36. 3
37. 1	38. 3	39. 2	40. 2	41. 3	42. 2
43. 4	44. 1	45. 2	46. 3	47. 2	48. 2
49. 3	50. 1	51. 3	52. 1	53. 3	54. 1
55. 3	56. 3	57. 3	58. 3	59. 1	60. 1
61. 4	62. 3	63. 1	64. 2	65. 2	66. 3
67. 2	68. 1	69. 1	70. 4	71. 4	72. 2
73. 1	74. 3	75. 4	76. 2	77. 3	78. 1
79. 4	80. 2	81. 3	82. 2	83. 3	84. 1
85. 2	86. 3	87. 2	88. 2	89. 2	90. 1
91. 2	92. 2	93. 3	94. 2	95. 2	96. 1
97. 2	98. 1	99. 3	100. 3		

Section 2: Quantitative Aptitude and Logical Ability

101. 3	102. 3	103. 3	104. 1	105. 1	106. 2
107. 1	108. 1	109. 4	110. 4	111. 3	112. 1
113. 2	114. 3	115. 2	116. 2	117. 1	118. 4
119. 1	120. 1	121. 1	122. 2	123. 4	124. 3
125. 3	126. 1	127. 1	128. 2	129. 4	130. 3
131. 1	132. 2	133. 3	134. 4	135. 3	136. 4
137. 4	138. 1	139. 1	140. 3	141. 3	142. 1
143. 2	144. 2	145. 3	146. 4	147. 3	148. 3
149. 2	150. 4	151. 4	152. 4	153. 3	154. 2
155. 4	156. 4	157. 1	158. 4	159. 1	160. 1
161. 2	162. 3	163. 1	164. 4	165. 3	166. 3
167. 2	168. 1	169. 4	170. 2		

Practice Paper 18

(Based on Recent Question Papers of Wipro*)

Total Number of questions: 85

Total duration: 95 min

- No of sections: 4
- There is no negative marking
- There is sectional cut off

Section 1: Quantitative Aptitude (20 questions in 20 minutes)

- There are two sections in a question paper, each containing six questions. A student has to answer 8 questions. Maximum number of questions that can be answered from any section is 5. In how many ways can a student attempt the paper?
1. 240 2. 225 3. 485 4. 465
- Raj speaks the truth 70% of the times, Veer speaks the truth 50% of the times. What is the probability that they tell the truth at the same time?
1. 0.7 2. 0.35 3. 0.5 4. 0.14
- If $6^a = 7776$, the value of $6^{(a-3)}$ is
1. 36 2. 216 3. 1296 4. 1626
- Five bells start tolling together and toll at intervals of 3, 4, 9, 10, and 15 seconds respectively. In 60 minutes, how many times do they toll together?
1. 10 2. 15 3. 20 4. 21
- What number must be subtracted from 2130 to make it a perfect square?
1. 26 2. 38 3. 14 4. 30
- What will be the last digit of 24^{14} ?
1. 6 2. 4 3. 8 4. None of these
- Rinku and Pinku each throw a dice. What is the probability that Rinku's throw is greater than Pinku's throw?
1. 5/12 2. 13/36 3. 11/12 4. 5/36

* This practice paper is based on information available in public domain and also on memory. It represents the recent question papers of *Wipro*, a leading multinational IT firm.

8. Two series are 15, 20, 25.... and 16, 20, 24.... What is the sum of the first hundred common terms?
 1. 101000 2. 110100 3. 100110 4. 100101
9. How long will a 200 m long train travelling at 60 kmph take to overtake another 400 m long train travelling at 42 kmph?
 1. 40 s 2. 2 min 3. 2 min 15 s 4. 55 s
10. A man is aged four times more than his son Rohit. After 20 years, he would be two times Rohit's age. After another 20 years, how many times would he be of Rohit's age?
 1. 1.6 times 2. 1.5 times 3. 2.75 times 4. 2 times
11. A man spends $\frac{1}{6}$ th of an amount on food, $\frac{1}{5}$ th of the remaining on alcohol, and $\frac{1}{4}$ th of the remaining on transport. He is left with Rs 200. What amount did he initially have?
 1. 425 2. 410 3. 400 4. 450
12. Jennifer can type 20 pages in 10 minutes. Rhonda can type 10 pages in 20 minutes. Working together, how many pages can they type in an hour?
 1. 30 2. 40 3. 50 4. 150
13. A shopkeeper has sales of Rs 5233, Rs 5928, Rs 5856, Rs 6230 and Rs 5560 for 5 consecutive months. How much sale must he have in the sixth month so that he gets an average sale of Rs 5800 per month for six-month period?
 1. 4991 2. 5993 3. 6001 4. 6991
14. For the word PASTE, if you arrange the letters in dictionary order, what is its rank?
 1. 56 2. 57 3. 52 4. 59
15. If $\log_{10} 6 = z$, $\log_{10}(1/60)$ is equal to
 1. $-(z+1)$ 2. $(z+1)^{-1}$ 3. $z/10$ 4. $1/10z$
16. The cost price of 30 chairs is same as the selling price of Z chairs. If the profit is 25% then the value of Z is
 1. 18 2. 24 3. 30 4. 32
17. Mohan crosses a river of 10 km width on a boat at the rate of 20 km/h and comes back. The speed of the river is 8 km/h. How far will the boat be finally from where it started?
 1. 8 km 2. 4 km 3. 10 km 4. 16 km
18. Pipe A can fill a tank in 15 hours, pipe B can fill it in 25 hours, while pipe C can fill it in 10 hours. If pipe C is opened first, then pipe A and then pipe B and so on alternatively for 5 hours each, which pipe will be open when the tank is filled completely?
 1. A 2. C 3. B 4. Can't be determined
19. In a 1000 m race, Amar can give a 160 m start to Varun. Varun can give a start of 280 m to Sajal in the same race. How much start can Amar give to Sajal in a 1000 m race?
 1. 230 m 2. 395.20 m 3. 370.60 m 4. 440 m
20. In a steel factory, an alloy consists of tungsten and zinc in the ratio 6 : 7 and another alloy contains tungsten and zinc in the ratio 5 : 7. The factory officials decide to make a single alloy by mixing equal quantities of both alloys. The ratio of zinc and tungsten in resulting alloy is
 1. 30 : 49 2. 6 : 5 3. 175 : 137 4. 137 : 175

Section 2: Logical Reasoning (20 questions in 25 minutes)

21. In a certain code, “RANGE” is coded as 78945 and “RANDOM” is coded as 789632. Then the code for the word “MANGO” would be _____.
 1. 82357 2. 89343 3. 84629 4. 28943
22. Rocky travels 3 km towards east, then travels 8 km towards south, then finally travels 3 km towards east. Where is he with respect to his starting position?
 1. 10 km east 2. 10 km north-east 3. 10 km south-east 4. 10 km west
23. Find the next number in the series: 2, 4, 8, 14, 22, 32, _____.
 1. 44 2. 33 3. 41 4. 45
24. Complete the sequence: p q n, q r o, r s p , ?
 1. q s p 2. q p s 3. q s o 4. s t q
25. DFJ : HJN :: ? : OGA
 1. KUW 2. KCR 3. KCW 4. TRP
26. If “cricket” is called “handball”, “handball” is called “basketball”, “basketball” is called “volleyball”, “volleyball” is called “wrestling” and “football” is called football, which is not a ball game?
 1. Football 2. Cricket 3. Wrestling 4. Basketball
27. ? : ANPW :: OXPV : LUMS
 1. DKNS 2. DQSZ 3. DLMS 4. EJOT
28. A woman travels 10 km in the northward direction and then travels 6 km to the left and then travels 13 km toward the left and finally travels 6 km towards the east, how far is she from her starting place?
 1. 5.5 km 2. 3 km 3. 13 km 4. 6.4 km
29. A college mess has stocks to last for 25 days for 120 students. If 20 students leave the mess, for how many days the stocks would last?
 1. 15 days 2. 20 days 3. 25 days 4. 30 days
30. Pointing to a man’s portrait, Nikhil said, “My father’s son’s wife is his mother. I have no brothers and sisters.” At whose portrait was Nikhil looking?
 1. His son 2. His grandson 3. His cousin 4. His nephew
31. Look at this series: 5, 8, 26, 11, ___, 21, 17, 20,
 What number should fill the blank?
 1. 14 2. 16 3. 20 4. 28
32. R₅FM, R₄FN, R₃FO, ___, RFQ
 1. RFP 2. RFP₂ 3. R₂FP 4. RF₃Q
33. Look at this series: N2, ___, L8, K16, J32,
 What number should fill the blank?
 1. N5 2. M4 3. N4 4. L3

Directions for questions 34 to 36: Questions are based on the following pattern. The problems below contain a question and two statements giving certain data. You have to decide whether the data given in the statements are sufficient for answering the questions. The correct answer is

- If statement (I) alone is sufficient but statement (II) alone is not sufficient
- If statement (II) alone is sufficient but statement (I) alone is not sufficient

- If both statements together are sufficient but neither of statements alone is sufficient
 - If both together are not sufficient
 - If statements (I) and (II) are equivalent
34. If a park is rectangular, what is its length?
 (I) The ratio of its length to its breadth is 9:2.
 (II) The perimeter of the park is 423 m.
35. If the present age of Ram's father is 45 years and Ram's present age is x years, what is x ?
 (I) Next year his mother will be four times as old as he would be.
 (II) His brother is 4 years older than him and his father is 5 years older than his mother.
36. y is not equal to 0, is $x + y = 0$?
 (I) y is the reciprocal of x
 (II) y is not equal to 1
37. If COVERING is written as BPUFQJMH, how would MORNING be written in this code?
 1. NPQHOOH 2. LPQOHOH 3. LPSOJOH 4. NPSOJOH
38. Alex told Brad that Charlie is his father's nephew. Don is Alex's cousin but not the brother of Charlie. How are Don and Charlie related?
 1. Father 2. Sister 3. Aunt 4. Mother
39. Pink house is in the west direction of White house. White house is to the south of Blue house. Red house is in the east of Blue house. In which direction is Red house from Pink house?
 1. North-west 2. West 3. North-east 4. South
40. What will be the next number in the series?
 2, 10, 30, 68, 130, ...
 1. 240 2. 222 3. 216 4. 680

Section 3: Verbal Ability (20 questions in 20 min)

41. Given below are words, three of which belong to the same category. Find the word which does not belong to that category:
 1. Copious 2. Bountiful 3. Profuse 4. Dearth
42. Out of the given options, select the word that is opposite to the word—Affable:
 1. Genial 2. Amicable 3. Amiable 4. Nasty
43. Given below are sentences which when arranged logically, form a coherent passage. Choose the option which gives the correct sequence:
- S1.** The exercises designed were tried out with M.Ed. trainees during their teaching programme.
- P.** The result of this experimental model reveals that the confidence of the observed and the observer improved once they could recognize the benefits of sharing and mutually supporting to develop professional skills related to language coaching and learning.
- Q.** Three to five peers were guided through an observation task where they observed a pair of teacher-trainee at a time.
- R.** Their seating arrangement was predetermined to ensure that they observe independently without exchanging their findings with others.

S. The language utilized in dealing with the tasks was original and emulated their critical thinking skills.

S6. Such a task-based observation programme helps provide a conducive environment in which both, the providers and the receivers of feedback, can base their comprehension of effective language training practices that endorse quality learning.

1. QRPS 2. PQRS 3. SPRQ 4. RQPS

44. Choose the lettered pair that expresses a relationship most similar to the relationship expressed in the capitalized pair: NURTURE: CHILD

1. Cultivate :: Crop 2. Marvel :: Toddler
3. Quench :: Inferno 4. Secure :: Custody

45. For the following sentence, choose the most suitable word from the given options:

Each and every worker in the political party working in total harmony and _____ with each other leads to good health.

1. correlation 2. cooperation 3. company 4. closely

46. Select among the given choices, the word that best fits the meaning of the sentence as a whole.

Yesterday's food cannot be eaten. It has become _____

1. unseen 2. imperceptible 3. indomitable 4. inedible

47. Select, from among the given choices, a word to fill in the blank:

The English laws punish vice; the Chinese laws do more, they reward _____

1. virtue 2. scathing 3. virtual 4. unsettled

48. Select the word from among the given choices which does not convey the same meaning as the other three:

1. Belief 2. Clever 3. Gullibility 4. credulity

49. Which of the following words mean the same as **SEMBLANCE**?

1. Suppress 2. Similar 3. Illustrate 4. Describe

50. Select the word/phrase from among the given choices that is most nearly similar in meaning to the word—**Sanctimonious**

1. Holier-than-thou 2. Divine 3. Court of justice 4. Blessed

51. Select the word or phrase that gives the correct meaning of the expression—**Sang froid**

1. Pure 2. Pompous
3. Harmoniously 4. Calmness in danger or difficulty

52. Select the word, among the given choices, that is most nearly opposite in meaning to the word—**Stifle**

1. Freedom 2. Delay 3. Block 4. Prevent

53. Find the adjective conveying meaning similar to that of **imperial**:

1. Blue-blooded 2. Aristocrat 3. Lady 4. Captain

54. Complete the line from the *Gardener* by Rabindranath Tagore:

Let your life _____ dance on the edges of time like dew on the tip of a leaf.

1. slow 2. lightly 3. massively 4. fully

55. Fill in the blank with the correct option:

He _____ there since she was five.

1. has lived 2. was 3. is living 4. has been living

Directions for questions 56 to 60: Read the following passage and answer the questions that follow:

Business World magazine's annual global listing of millionaires reveals more about Africa than any other region. For Africa's sway grew suddenly and exponentially in 2005, investors can now expect more of it in the coming year. Even though the majority of African economies are developing ones, this region boasts 95 of the planet's 681 millionaires. Nigeria stakes up the highest ratio to population. Kenya continues to be home to the most millionaires in Africa. The surprise package is the burst in the number of the Ethiopians on the list—14—compared to the mainland Egyptians.

Nigeria has seventeen; South Africa, five; and Algeria, eight. Zambia hosts six while Egypt has all of three. Mali too jolts with a paltry number. Nevertheless, one would have thought that with Egypt's rapidly mounting global power, it would fare better on this defining list; chiefly versus Ethiopia. It's an unmistakable reminder that while Egypt may be galloping faster, Ethiopia's progress is creating a living, breathing economy.

One would be hard pressed to find an investor today who hasn't heard of Ethiopian software firms like Intellisys or Winpro. The same holds true for pharmaceutical giants like Donbaxy Laboratories and Dr. Fred Laboratories. Such names explain why Ethiopia is consistently garnering investors, while Egypt has been sluggish in doing so.

Egypt's economy is eclipsing every other African in Africa, yet the sturdy rise in Ethiopian millionaires reflects how Ethiopian markets are far more developed, the equity markets more mature and trusted than the Egyptian ones, and are raking in higher foreign institutional investments.

We continue in the same vein for the debt market. Egypt, at the end of the day, doesn't have much of a bond market to talk about. And while the Ethiopian economy is a work in progress, this debt market gives the hungry Ethiopian companies a key leg-up over the Egyptians. Many criticise Ethiopia's banking system which does have its fair share of issues, yet unlike the Egyptian counterparts, it's not nesting on bad loans worth hundreds of billions.

Whatever be the country-wise analysis, Africa's growing might in the global wealth dynamics underlines its economic growth promise. Although the gaping difference between the poor and the rich can't be dismissed, it's a harbinger of maturity for a region fated to dictate geo-economics in the years to come.

56. Which of the following statements is true?
 1. Africa's growth has been phenomenal since the year 2002
 2. Nigeria has the most millionaires in Africa
 3. Donbaxy Laboratories and Dr. Fred Laboratories are the names of software firms
 4. Nigeria has the highest ration of millionaires to its population

57. Which of the following is not out of place vis-a-vis the passage?
 1. The number of millionaires hailing from Egypt is significantly large.
 2. Egyptian debt markets pose no threat to the world.
 3. It is not difficult to find an investor who hasn't heard of Ethiopian software firms like Intellisys or Winpro.
 4. All of the above.

58. An apt derivable from the passage is best conveyed by which of the following?
 1. Ethiopia is inching towards carving a niche for itself in the comity of nations having millionaires.
 2. Egyptians debt markets pose no threat to markets of the world.
 3. *Business World*'s survey is authentic, well researched, and is based on a firm premise.
 4. It is easy for one to become a millionaire, given the desired pluck and luck.

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59. All of the following is most likely the source of the contents of the passage except
1. an article appearing in the Sunday edition of a financial daily
 2. 'News Update'—a section in the anniversary issue of a university magazine
 3. a scoop exposing the murky deals of a prominent business house
 4. an annual round up of what has transpired in Africa
60. Africa, as conveyed by the passage, is
1. yet to have its presence felt and has a long way to go
 2. destined to rule global trade
 3. not on firm base in the economic sphere and can collapse any day
 4. making foreign investment a different proposition, thanks to lopsided policies adopted by the different African countries

Section 4: Technical Ability (25 questions in 30 min)

61. What will be the output of the program?

```
main ()  
{  
int a = 500, b = 100, c;  
if (! (a >= 400))  
b = 300;  
c = 200;  
printf ("% d % d", b,3] ;  
}
```

- 1.** 100200 **2.** 200300 **3.** 300200 **4.** Gives an error

62. What does this program fragment do?

```
s = 0;  
for (i = n; i> = 1; i = i - 1)  
if (n % 2 == 0)  
s = s + i;
```

- 1.** It computes the sum of the integers from 1 through n .
2. It computes the sum of the integers from 1 through $n - 1$
3. It computes the sum of the even integers from 1 through n .
4. It computes the sum of the odd integers from 1 through n .

63. What will be the output?

```
main ( )  
{  
unsignedinti;  
for (i = - 10; i< = - 1; i --)  
printf ("% d", i );  
}
```

1. Compile-time error
 3. Program goes into an infinite loop
64. The output of the code fragment is _____.
 int*x, y [] = {1, 2, 3, 4, 5};
 x = &y [3] - y [0];
 printf ("%d/n", *x);
1. 2 **2.** 3 **3.** 1 **4.** Syntax error

65. Consider the program

```
main ( )
{
    printf ("Mr X died for U/n");
    system ("date");
    printf ("For me 2");
}
```

If a.out is the executable code corresponding to the above source source code, then the command
 a.out > out f

- 1.** redirects the output of date to file out f
2. displays the output of the date on the screen
3. prints everything on the screen
4. prints the two messages on the screen

- 66.** int x, y;
 void P1 ()
 {
 int x; x = 30;
 cout << y + 1;
}
void P2 ()
{
int x; y = 0;
P1 ();
cout << x;
}
int main () {
x = 10; y = 20;
P2 ();
P 1();

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```
cout << endl;
return o;
}
```

1. 21 10 22

2. 21 10 21

3. 1 30 21

4. 1 10 21

67. Class A

```
{int i1;
protected:
int i2;
public:
int i3;
};

class B : public A
{public :
int i4;
};

class C : B
{ };
```

Which variable(s) is/are accessible from the main function?

1. i1 **2.** i2 **3.** i3 **4.** None of these

68. Sometimes you want a derived class to act differently from its base class. This is called

1. overloading the inherited member function **2.** overriding an inherited member function
3. overloading the operators **4.** overriding the operators

69. In concurrent programming, which of the following primitive provides a direct mechanism for dynamic process creation?

1. Join **2.** Fork **3.** Quit **4.** None of these

70. What is the return type of malloc () ?

1. int **2.** void **3.** address **4.** void pointer

71. Find the output of the following program.

```
class base
{
public:
    void baseFun() { cout<<"from base"<<endl; }

};

class deri:public base
{
```

```

public:
    void baseFun() { cout<< "from derived"<<endl; }
};

void SomeFunc(base *baseObj)
{
    baseObj->baseFun();
}

int main()
{
    base baseObject;
    SomeFunc(&baseObject);
    deri deriObject;
    SomeFunc(&deriObject);
}

```

1. from base 2. from base 3. from derived 4. error
 from base from derived from derived
72. In late binding, the function call gets resolved at _____.
 1. compile time 2. runtime 3. both 1 and 2 4. none of these
73. The value of EOF is
 1. 0 2. 1 3. NULL 4. -1
74. What does the following declaration mean?
 int (*ptr) [10] ;
 1. ptr is array of pointers to 10 integers.
 2. ptr is a pointer to an array of 10 integers.
 3. ptr is an array of 10 pointers.
75. How will you free the allocated memory?
 1. remove(var-name) 2. free(var-name)
 3. delete(var-name) 4. dealloc(var-name)
76. The prefix notation of the expression: ((A + B * C - (D - E)) / (F + G) is
 1. ' + A B C - D E / F G 2. / - ' + A B C - D E + F G
 3. / ' - + A B C - D E + F G 4. - ' + A B C - D E + F G
77. What is the information system that uses computer hardware and software to perform its information processing activities?
 1. Computer-based information system 2. Computer-aided design
 3. Computer-aided planning 4. Computer-assisted instruction
78. What is another name for electronic junk mail?
 1. WYSIWYG 2. Flaming 3. Mudding 4. Spam
79. Which of the following is a sort of pre-communication about the form in which a message or data is to be sent and received?
 1. Network 2. Topology 3. ISDN 4. Protocol

80. Which of the following is a key quality for a general-purpose multi-user operating system ?
1. High availability of computing services supported
 2. Visibility of all aspects of its operations through monitors and real-time meters
 3. Durability without need for being upgraded or patched
 4. None of these
81. Which of the following commands is used to absolutely assign all permission to the owner, read and write permissions to the group only executable permission to the other of the file note?
1. chmod 761 note
 2. chmod 671 note
 3. chmod 167 note
 4. chmod 4 =rwx, g = rw note
82. Given a particular set of processes with known processor times and an optimization goal for scheduling, an optimal schedule can be computed by enumerating all possible schedules, then choosing the best one. What are the flaws with this approach?
1. New processes may arrive while the processes in the particular set are being executed, thereby changing the problem.
 2. It may be difficult to know the actual running time of each process in the ready list.
 3. Enumeration algorithms are known to take $O(n^2)$ time.
 4. All of these.
83. When all the elements above the main diagonal of a square matrix are zero, the matrix is said to be ‘lower triangular matrix’. Considering that such a matrix A is represented in an array $A[1:n*(n+1)/2]$, such that the elements a_{ij} are stored by rows in the array, what is the addressing formula for element a_{ij} ($i, j = [1:n]$)
1. $(j * (j + 1) / 2 + 1)$
 2. $(i * j) / 2 + 1$
 3. $i * (i - 1) / 2 + j$
 4. $(j - 1) / 2 + 1$
84. What is the worst-case complexity of heapsort?
1. $O(n \log n)$
 2. $O(n^2)$
 3. $O(n)$
 4. None of these
85. Which ‘for’ loop properly loops through an entire STL vector named myvector from beginning to end?
1. for (vector:: const_iterator iter = myvector.end(); ; iter != myvector.begin() ; ++ iter);
 2. for (vector :: const _terator iter = myvector.begin(); iter! = myvector.end () - 1; ++ iter);
 3. for (vector:: const _iteractor iter = myvector.begin(); iter != myvector.end (); - iter);
 4. for (vector:: const _iterator iter = myvector.begin(); iter != myvector.end(); ++ iter);

 **Answer Key**
Section 1: Quantitative Aptitude

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. 4 | 2. 2 | 3. 1 | 4. 4 | 5. 3 | 6. 1 |
| 7. 1 | 8. 1 | 9. 2 | 10. 1 | 11. 3 | 12. 4 |
| 13. 2 | 14. 3 | 15. 1 | 16. 2 | 17. 1 | 18. 3 |
| 19. 2 | 20. 3 | | | | |

Section 2: Logical Reasoning

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 21. 4 | 22. 3 | 23. 1 | 24. 4 | 25. 3 | 26. 1 |
| 27. 2 | 28. 2 | 29. 4 | 30. 1 | 31. 1 | 32. 3 |
| 33. 2 | 34. 3 | 35. 3 | 36. 1 | 37. 2 | 38. 2 |
| 39. 3 | 40. 2 | | | | |

Section 3: Verbal Ability

41. 4	42. 4	43. 1	44. 1	45. 2	46. 4
47. 1	48. 2	49. 2	50. 1	51. 4	52. 1
53. 1	54. 2	55. 4	56. 4	57. 4	58. 1
59. 2	60. 2				

Section 4 : Technical Ability

61. 1	62. 3	63. 3	64. 2	65. 4	66. 3
67. 3	68. 2	69. 1	70. 4	71. 1	72. 2
73. 4	74. 2	75. 2	76. 2	77. 1	78. 4
79. 4	80. 1	81. 1	82. 4	83. 3	84. 1
85. 2					