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Sixth Edition

Logical Reasoning and Data Interpretation for CAT

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Nishit K. Sinha

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Logical Reasoning and Data Interpretation for CAT

Sixth Edition •

Nishit K. Sinha



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To

Papa and Ma

Kumar Kalyan Prasad Sinha and Sanjila Sinha

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Preface to the Sixth Edition

Logical Reasoning and Data Interpretation for CAT was envisaged to provide a complete preparation resource for every management aspirant, irrespective of training levels and preparation styles. Since its first edition, the book has remained the preferred choice of students due to the superior quality of its content, the user-friendly pedagogy, and the proven methodologies and approaches.

In our continued endeavor to raise the standard further and to ensure an upgraded and improved experience, we present the sixth edition.

Highlights

- An exclusive section containing 100 LRD^I questions
- Solutions to all questions
- Explanations and answers to CAT 2017 LRD^I paper (based on memory)
- Previous years questions for XAT and IIFT
- Embedded console with test papers on the Pearson website

I am sure this book will continue being the first choice among test takers.

Nishit K. Sinha

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Preface

Among the many resources in the market for CAT and other B school entrance examinations, there are none that place adequate emphasis for concept building in LRDI. This book fills this gap by bringing together concept building, application methodology, as well as question practice. Special care has been taken in this book to ensure that even a person who does not have a formal experience of LR or DI will find him/herself in a comfortable position with a little bit of effort. Besides, this book puts as proportionate an emphasis on LR and DI as put by the CAT in the recent years.

This unique book is useful for all kinds of students—those who are good at solving LR and/or DI questions as well as those who are not so. There are plenty of worked-out examples to enable the students to understand the techniques before moving on to the practice problems. Apart from this, once the practice questions at all the three levels—Foundation, Moderate and Advanced—have been tried, this book puts forth a mechanism to help the student in evaluating him/herself in a controlled, simulated environment in the form of Benchmarking Tests. And finally some more tests are there to evaluate oneself in the format of review tests.

The table below will give a fair idea of the proficiencies and approaches for different students for LRDI.

Student's Type/ response	Novices	Apprentices	Practitioners	Experts
Interpretation	Do not understand the basic concepts	Do not understand all the concepts underlying the problems. So, unable to attempt all the questions.	Understand all the concepts and attempt most of the main problems.	Can solve the problems correctly.
Approach	Do not know the methods to solve the problems	Unable to pick the correct method; mostly rely on luck to get the right answer.	Know and pick the correct method; have a sound strategy and solve the problems with skill, not luck.	Can use more than one strategy to solve the problem for a good number of questions.
Accuracy level	Unable to get correct answers most of the time	Mostly get the correct answer, with few errors.	Correct answers with hardly any mistakes. Use appropriate units.	Excellent level of accuracy as well as speed.

This book is designed to take care of students at all these four levels by giving them a customized preparation through the questions at different difficulty levels. This focus on providing customized content is at the heart of our drive to help every user be prepared for the LRDI in CAT.

STRUCTURE OF THE BOOK

This book is divided into four parts:

- **Part 1** facilitates framework and concept building in Logical Reasoning.
- **Part 2** guides the student in concepts building and development of the skills to apply these in Data Interpretation.

- **Part 3** consists of test papers with varying levels of difficulty and
- **Part 4** contains six previous years' CAT papers with solutions.

Each part has three different levels of problems: Foundation, Moderate and Advanced. These levels are hierarchical and sequential. Students are expected to progress through them in the same order. Movement from one level to another is largely a function of sufficient experience with the specific content. A student is unlikely to perform well at a particular level without the experience of the preceding level. Time spent at one level will help the student in imbibing and assimilating the methods and approach to solve problems, which in turn will make it easier for the student to tackle problems at the next, higher stage. In other words, hard work put at one level will allow an intuitive functioning later. If one level is not mastered before moving on to the next, though good students would appear to perform well at that higher level and may get the right answers, it would be without any sound reasoning for most of the times.

Benchmarking tests are also given at the end with comparative scores and then finally review tests to track your progress.

Although I have tried to be meticulous in preparing this text, some errors may have crept in. I invite each one of you to be a co-author of this book for the subsequent editions by making contribution in enhancing the value of this book with your suggestions and by bringing to our notice the errors, if any, so that they can be corrected in future.

I can be reached at *nsinha.alexander@gmail.com*

Nishit K. Sinha

About the Author

Nishit K. Sinha, an IIM Lucknow alumnus, has been training students for the CAT and other B-school entrance examinations for more than a decade. During this period, he has successfully trained more than 10,000 students of varying backgrounds to clear various MBA entrance examinations. To best analyze the pattern of all the major B-school entrance tests, as well as to remain up to date himself on the examination pattern, he appears for important examinations, such as the CAT and XAT every year.

He is Founder–Partner at his test prep organization dueNorth Academics LLP, based at Dehradun.

Acknowledgements

This book bears the imprint of many people—my colleagues, my students and my teachers who have had a significant impact on my thought process and have generously extended help whenever I needed.

With immense pride and humility, I acknowledge that the *decade long journey of this book* (1st edition came out almost a decade back) has been made possible because of the constructive feedback of the users' of this book, ideas generated through brainstorming with my friends in the coaching industry, Pearson's market intelligence reports and my own understanding of the entrance exams.

My special thanks to my brothers Ravi Shankar Prasad, Sharat Chandra Mayank, Amit Kumar and Vinit Kumar.

I would like to thank Sharel Simon and Vipin Kumar for giving the book the final shape. Thanks to Vikas Sharma and H. Nagaraja for ensuring that I get the timely and accurate feedback of the users.

Thanks is going to be a small word for my wife, who took care of family and home, giving me enough time to complete this project. Love to my young son who has started helping me with the errands. Sudhir, my man-Friday, who took care of small necessities, your contribution is noteworthy.

I may have forgotten some names here. I wish to express my gratitude towards all who have contributed in the making of this book.

Nishit Sinha

CAT Demystified

CAT stands for Common Admission Test. It is a test conducted by IIMs for admission into several programs offered by them. Besides IIMs, there are a good number of colleges which accept CAT score in their 1st round of selection process. As of now, there are 20 IIMs offering PGP at following locations: Ahmedabad, Bangalore, Calcutta, Lucknow, Indore, Kozhikode, Shillong, Ranchi, Rohtak, Raipur, Udaipur, Tiruchirappalli, Kashipur, Nagpur, Visakhapatnam, Jammu, Sambalpur, Sirmaur, Bodhgaya, Amritsar.

HISTORY OF CAT

In its history of almost four decades, CAT has changed its colours many a times in terms of number of questions, sections asked and orientation of the questions. Here we will discuss the examination pattern of the CAT from 2000 onwards.

	Number of sections	Total number of questions	Total Marks	
CAT 2000	3	165	N.A.	120 minutes
CAT 2001	3	165	N.A.	120 minutes
CAT 2002	3	150	N.A.	120 minutes
CAT 2003	3	150	N.A.	120 minutes
CAT 2004	3	123	150	120 minutes
CAT 2005	3	90	150	120 minutes
CAT 2006	3	75	300	150 minutes
CAT 2007	3	75	300	150 minutes
CAT 2008	3	90	360	150 minutes
CAT 2009	3	60	450 (scaled score)	135 minutes
CAT 2010	3	60	450 (scaled score)	135 minutes
CAT 2011	2	60	450 (scaled score)	140 minutes
CAT 2012	2	60	450 (scaled score)	140 minutes
CAT 2013	2	60	450 (scaled score)	140 minutes
CAT 2014	2	100	300	170 minutes
CAT 2015	3	100	300	180 minutes
CAT 2016	3	100	300	180 minutes
CAT 2017	3	100	300	180 minutes

Chart 1: Time Allotted Per Question

CAT 2011 had two sections: (a) Quantitative Ability & Data Interpretation (b) Verbal Ability & Logical Reasoning with 30 questions in each section. CAT 2011 also had sectional time limit of 70 minutes for each section.

Before CAT 2004, CAT did not mention that how many marks one question stands for? Marks carried per questions was announced for the first time in CAT 2004.

Quite obvious from the above table that time allotted to per question has risen sharply from CAT 2000 to CAT 2014 taking a small dip further. One possible conclusion drawn from here is that CAT is focussing more upon accuracy than speed, and secondly it expects students to gain a certain level of competence across all the areas in a particular section. With number of questions going down and time going up, students didn't have much of the choices of questions to choose from. Further, introduction of sectional timers has forced students to attempt questions in that particular section only.

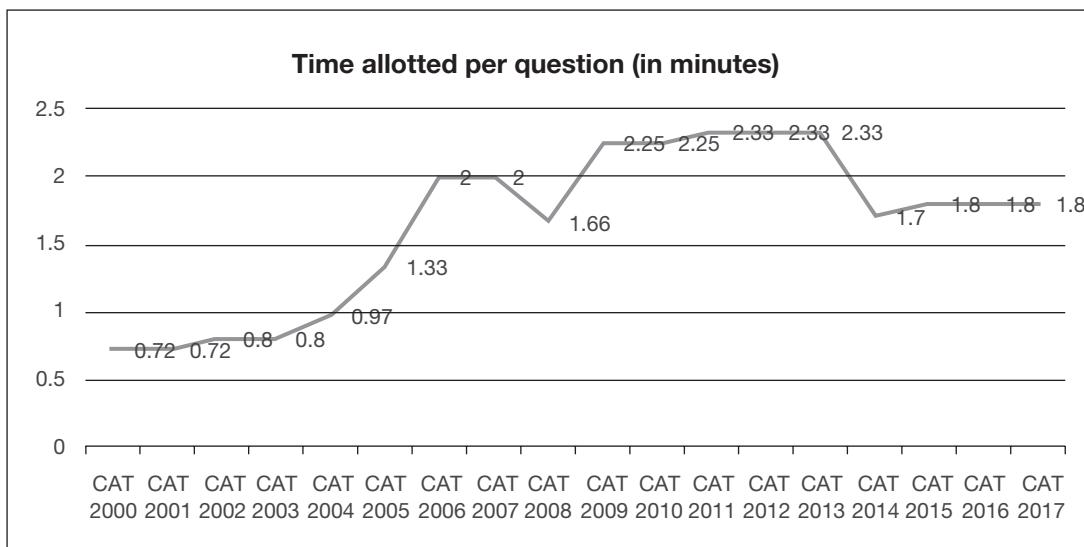


Chart 2: Sectional Breakups and Getting IIM Call

One thing that has remained constant during this period of CAT 2000 - CAT 2010 is the number of sections and the way these sections have been grouped – Quantitative Aptitude (QA), Logical Reasoning and Data Interpretation (LR / DI), and English Usage / Reading Comprehension (EU / RC).

Though CAT 2011 changed it all:

Year	QA	LR DI	EU RC	Total no. of questions
CAT 2000	55	55	55	165
CAT 2001	50	50	50	150
CAT 2002	50	50	50	150
CAT 2003	50	50	50	150
CAT 2004	35	38	50	123

CAT 2005	30	30	30	90
CAT 2006	25	25	25	75
CAT 2007	25	25	25	75
CAT 2008	25	25	40	90
CAT 2009	20	20	20	60
CAT 2010	20	20	20	60
CAT 2011	30 (QA + DI)		30 (Verbal + LR)	60
CAT 2012	30		30	60
CAT 2013	30		30	60
CAT 2014	50		50	100
CAT 2015	34	32	34	100
CAT 2016	34	32	34	100
CAT 2017	34	32	34	100

2-sections pattern continued till CAT 2014. From CAT 2015, total number of sections were three. CAT 2015 brought some questions in non-MCQ format –fill in the blanks questions, where an aspirant is required to type the answer. These questions had no negative marking.

Chart 3: Marks required to get atleast one IIM Call

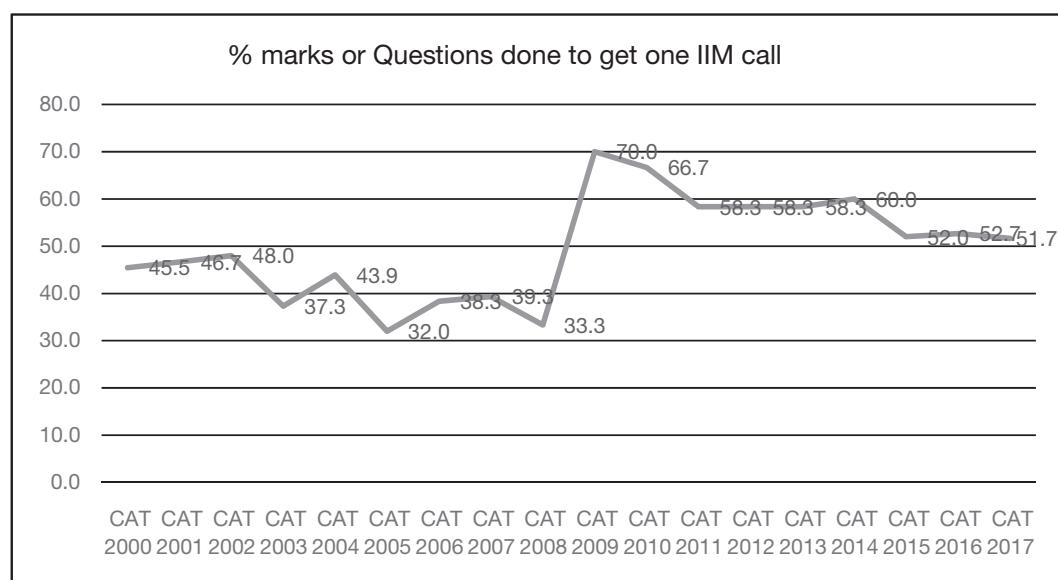
Past CAT trends show that a student is required to get around 70% of the marks to get atleast one IIM call (with clearing the sectional cut-off). Following table and bar chart gives us some clarity regarding the same:

Year	Total marks or questions	Marks /Qs required to get atleast one IIM call
CAT 2000	165	75
CAT 2001	150	70
CAT 2002	150	72
CAT 2003	150	56
CAT 2004	123	54
CAT 2005	150	48
CAT 2006	300	115
CAT 2007	300	118
CAT 2008	360	120

CAT 2009	60	42
CAT 2010	60	40
CAT 2011	60	35
CAT 2012	60	35
CAT 2013	60	35
CAT 2014	300	180
CAT 2015	300	156
CAT 2016	300	158
CAT 2017	300	155

Chart 4: Percentage obtained for IIM Call

Following line chart gives questions solved or marks required as a percentage of total marks or total questions (as applicable):



Note: Above calculation is based upon the data collected from the students who got IIM calls in that particular year.

So, to get atleast one IIM call in CAT 2008, a student was required to get 33.33% Marks out of total with clearing the cut-off across the sections. Though in the online format of CAT (since 2009), percentage questions to be done to get atleast one IIM call has gone up. Post 2011, % marks required to get atleast one IIM call has hovered in between 50%–60%.

Chart 5: No. of Questions and Time Per Question

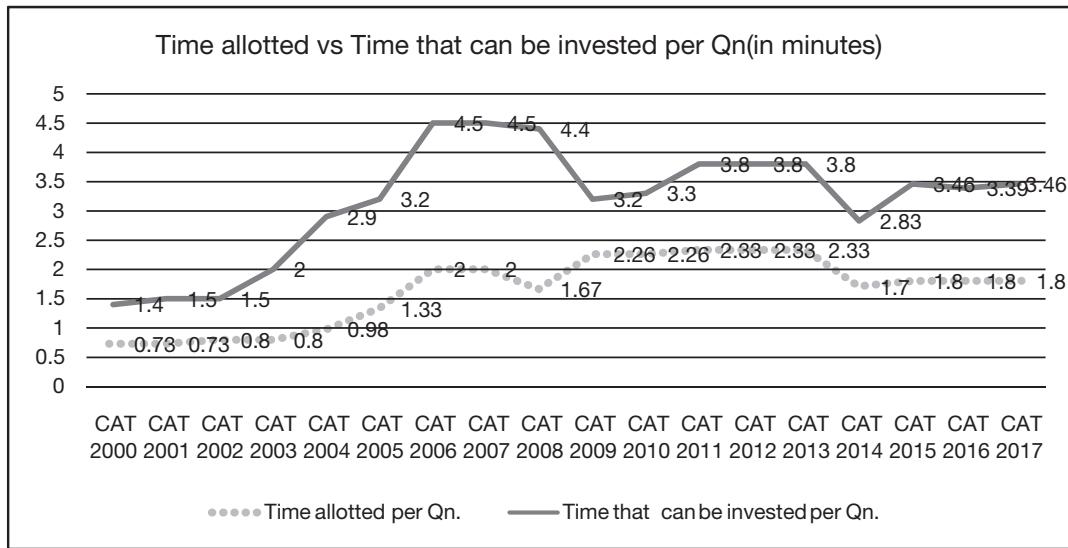
If we convert the requirement of marks to be obtained from the above line chart into questions to be done, we get the following table:

Year	No. of questions to be solved	Time allotted	Time invested per qn.
CAT 2000	85	120 minutes	1.4
CAT 2001	80	120 minutes	1.5
CAT 2002	81	120 minutes	1.5
CAT 2003	60	120 minutes	2.0
CAT 2004	42	120 minutes	2.9
CAT 2005	38	120 minutes	3.2
CAT 2006	33	150 minutes	4.5
CAT 2007	33	150 minutes	4.5
CAT 2008	34	150 minutes	4.4
CAT 2009	42	135 minutes	3.2
CAT 2010	40	135 minutes	3.3
CAT 2011	35	135 minutes	3.8
CAT 2012	35	135 minutes	3.8
CAT 2013	35	135 minutes	3.8
CAT 2014	60	170 minutes	2.83
CAT 2015	52	180 minutes	3.46
CAT 2016	53	180 minutes	3.39
CAT 2017	52	180 minutes	3.46

Chart 6: Time Allotted vs Time that can be Invested Per Question

For CAT 2000 to CAT 2008, at 90% accuracy with 1/4th negative marking, these are the approximate number of questions to be done. For CAT 2009 to CAT 2011, net of these many questions to be done.

To summarize this whole discussion till now, we will compare chart 2 with chart 6 and present them in a unified line chart given below.



This line brings to us an important information—For CAT 2006, CAT 2007 or CAT 2008, Even if a student has taken approximately 4.5 minutes to solve a question correctly, s/he has got enough marks to get atleast one IIM call (provided s/he clears the sectional cut-off too). For the last three CAT papers (2015 – 2017), even if a student has taken 3.4 minutes to solve a question correctly, s/he would get sufficient marks to get atleast one IIM Call.

It also points out towards other side of story that a student can get calls from IIM by solving nearly half of the total questions, skipping entire half of the questions.

How to Use This Book

There are few important guidelines mentioned below that we must keep in our mind while going through any book, be it a text book or a reference book or a book on LR/DI or QA of CAT:

1. Passive reader Vs Active learner

A passive reader is a person who goes through any content in real time frame without putting any efforts to induce the learning, assuming that there will be a tomorrow when he would come back to the same content and learn the things given. We know that either tomorrow never comes or it comes so late that everything is almost over.

An active learner is a person who keeps a piece of paper and a pencil/pen with him so that he can integrate the various activities like reading–learning–practicing at the same time. At the end of the process, this person realizes that she/he has a better understanding than the passive reader.

2. Mechanical process Vs Logical process

Mechanical process is the assembly line production system—put the input into the controlled system and we will receive the output. But unfortunately in CAT, now a days, neither the input (the fundas to be used) nor the output (process to arrive at the end) is given.

The logical process of solving the question not only involves the mechanical process of solving the question as the 1st step of learning, but also uses visualization of the problem scenario as the 2nd step of mental development. In this process, we slowly move towards a stage where a good number of problems can be done through mental mapping only, without using pen or paper.

In the past also, CAT used to be logical, but in the recent years, the need of being strong in visualization has become more.

Now, I treat the above written points as a choice—whether you want to be in the 1st category (Passive reader + Mechanical Process) or in the 2nd category (Active Learner + Logical Process). The choice made here will have a very serious implication on our capacity building and ability to use the same in cracking CAT.

HOW TO GO AHEAD WITH THIS BOOK?

When you start going through this book, I would request you to have above-mentioned points in your mind.

Let us see this in steps:

Step 1

Go through learning objectives and as you go through each and every word of the learning objectives, you should have the end result of getting into the IIMs in your mind. This will also help you in understanding all that is to be achieved in the chapter.

Step 2

I have given absolute freedom to the individuals to start with either Part 1 or Part 2 of the book, but definitely not the rest of the parts.

Start with the concept first and before proceeding towards the next concept, solve all the worked out examples related to that concept and move ahead only when you have internalized the same. Sometime, this might appear to be

drudgery, but see that you do it. Also, make sure you don't succumb to temptations like finishing the topic as fast as possible.

Step 3

Once you have got the confidence over whatever you have done previously, do the foundation exercise. It is a precursor to the actual CAT problems. Solve it without any time-constraint. This level tests mostly your comprehension of the concept and a bit of application. Most of the questions in this exercise will check only your understanding of the concept, and not the application of it. Ideally you should not give more than 2 minutes to any question in foundation exercise. If you get less than 75% questions correct, revise the concepts for which you got the answers wrong. One more suggestion—try to solve one exercise in one sitting, whatever time it takes. If you get the answers right, its good and if you don't get the answers correct, attempt the same questions once again in next sitting (preferably the next day).

Solving these will

- help to gain thorough understanding of the concepts
- provide interaction with the problems that are being asked at basic level
- Lead to confidence building

Step 4

Welcome to the moderate exercise. Questions at this level matches with CAT level and sometimes, above that level as well. This level tests your ability to apply a particular concept and also combination of concepts in single problem. If you are not able to solve a particular question, do not go for the solution until you have attempted the question at least thrice.

Solving these will—

- hone the Ability to identify easy and difficult questions
- develop Mental imaging and visualization of the problems
- Help in creating a neural-network inside the mind to think about the different processes to solve the problems
- Establish a logical connection between concepts and their application.

Step 5

Don't go for advanced level right now. Relax and don't solve any question of LR/DI for one day. Then the next day, take the benchmarking test. Your performance in this test will help you to assess yourself. Ideally, you should aim for anything above 85 percentile.

Step 6

Once the whole book is covered with all the moderate exercises and bench marking tests, go for the revision of the topics. From here on, you can jump on to the advanced level of questions. Most of the questions which you will get here are above CAT level. The idea is to prepare you at a level which is above CAT. If you excel at this level, CAT will be a cakewalk for you. Go for Practice Questions based upon recent CAT pattern now. Attempt the questions, try to solve, if you cannot solve, try once again. Give a second chance and solve them. Now if you cannot solve the problems, go for hints and solutions.

Step 7

Go to the Part 3 - Benchmarking test and target anything above 98 percentile. If you get it consistently in all the tests you are prepared for CAT. And if not, repeat the process from Step 4.

If in any one of these tests, you get less than 85 percentile, repeat the process from Step 3.

All the best for life!

PART 1

LOGICAL REASONING

SECTION 1

UNDERSTANDING LOGICAL REASONING

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Chapter

1

INTRODUCTION TO LOGICAL REASONING

LEARNING Objectives

In this chapter, you will learn:

- Logic as tool for inference
- The strength of logical argument
- Logic and decision making
- Applying logic

Human life is full of situations where one is called to make a decision. This also includes making significant choices about what to believe and what not to. Although everyone prefers to believe what is true, we often disagree with each other about a particular issue due to the subjective nature of our judgements. We often find individuals or groups locked in conflict because our reactions to situations are guided by our impulses. Humankind has developed a mechanism through which we are able to move beyond our individualistic and idiosyncratic notions and establish indisputable facts. This mechanism is called Logical Reasoning and Logic has come to play a very important role in ascertaining what is more credible or whose reasoning is sounder.

It is imperative to understand that Logic is not mainly concerned about finding the ‘Truth.’ Logic’s prime interest lies in finding that, which can be established as a fact using several strands of reasoning supported by sophisticated arguments. It may seem like a big coincidence that the event or situation that is correct will have more substantial proofs or arguments in its favour, rather than the even or situation that is not so

For example, if we are discussing about the direction from which the sun rises, we will always have more proofs or stronger arguments in favour of east rather than west. However, if somehow we get more

proofs or stronger reasoning in favour of south, then it is more logical to say that the sun rises from south than to say that it rises from east.

An important application of the logic is in the area of law and the judicial system—an area where proceedings are heavily dependent on logical processes—of any civilized society. The following example tells a lot about the logic and its constituents:

While pronouncing his verdict in one of the most sensational murder cases in India, the judge said, “Though I know that this is the man who committed the crime, I acquit him, giving him the benefit of doubt.”

What is the judge saying?

Even though he knows that the defendant is indeed the culprit, the fact has not been proven, that is, it cannot be logically deduced on the basis of arguments and evidence; consequently the accused has to be acquitted.

Despite the above example some authoritativeness can indeed be attached to the way of logical reasoning. No matter how sceptical we are about the points from where we begin to reason, if we follow the rules of logic we will reach an acceptable conclusion. It is almost always possible to distinguish between correct from incorrect reasoning independent of our agreements or disagreements regarding substantive matters. Logic is the discipline that studies the distinction—both by

1.4 Logical Reasoning

determining the conditions under which the truth of certain beliefs leads naturally to the truth of some other belief, and by drawing attention to the ways in which we may be led to believe something without the respect for its truth. This provides no guarantee that we will always arrive at the truth, because the beliefs or assumptions with which we begin are sometimes erroneous. But following the principles of correct reasoning does ensure that no additional mistake creeps in during the course of our progress.

Hence, Logic can be seen as a tool using which we find out the strength of reasoning or the various arguments put forward in favour of or against something. This is reflected in the origin of the word ‘logic’. It takes its roots from the Greek word *logos* which means reason or principle. Taking a broad view, we can see several dimensions, or usages of the term logic. Some of these are given below:

1. A system of reasoning: Aristotle’s logic.
2. A mode of reasoning: By that logic, we should sell the company tomorrow.
3. The formal, guiding principles of a discipline, school, or science.
4. The relationship between elements and between an element and the whole in a set of objects, individuals, principles, or events: There’s a certain logic to the motion of rush-hour traffic.
5. In the field of Computer Science the term, logic, may mean any of the following:
 - a. The non-arithmetic operations performed by a computer, such as sorting, comparing, and matching, that involve yes-no decisions.
 - b. Computer circuitry.
 - c. Graphic representation of computer circuitry.

Terms related to Logic:

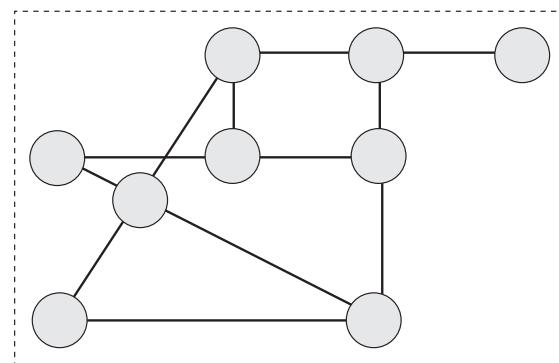
1. Consistency—An attribute of a logical system that is so constituted that none of the propositions deducible from the axioms contradict one another.
2. Completeness—This is an attribute of a logical system that is so constituted that a contradiction arises if any proposition is introduced that cannot be derived from the system.
3. Corollary—An inference that follows directly from the proof of the another proposition.
4. Non sequitur—A conclusion that does not follow from the premises.
5. Subject—The first term of a proposition
6. Predicate—What is predicted about the subject of a proposition.

7. Proof—A formal series of statements given showing that if something is a fact, then something else necessarily follows from it.
8. Paradox—A self contradiction (As in the statement—‘I always lie’ is a paradox.)
9. Postulate—A declaration of something self evident.
10. Proposition—A statement that affirms or denies something and is either true or false.
11. Negation—A proposition that is true if and only if another proposition is false.
12. Axiom—A proposition that is always true and does not require proofs or disproofs to be true.
13. Tautology—A statement that is always necessarily true (As in the statement—‘He is honest or he is not honest.’)
14. Contradiction—Opposite of consistency.
15. Logical relation—A relation between propositions.
16. Inductive Reasoning—Proceedings from particular facts to a general conclusion.
17. Deductive reasoning—Proceedings from general facts to a particular conclusion.

REASONING QUESTIONS AND PUZZLES

Puzzle 1

Put the digits from 1 to 9 into the given circles so that the sum of the numbers in each straight line is the same.



Puzzle 2

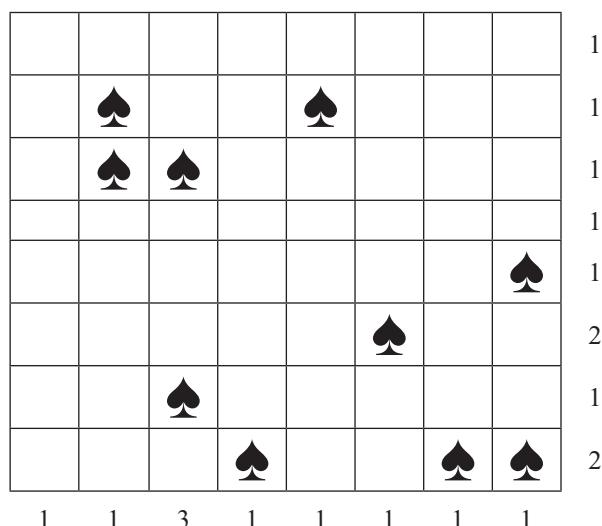
Our local town hall has a clock which strikes on the hour and also strikes just once on the half hour. While I was awake the other night, I heard the clock strike once, but I could not tell what time it was. Half an hour later it struck once again, but I still could not tell what time it was. Finally, half an hour later it struck once again and I knew what the time was. What time was it?

Puzzle 3

You are running in a marathon and you overtake the person in second place, what position are you now in?

Puzzle 4

Tree-Tent is a logical game (similar to minesweeper) in which the aim is to identify all tents in the grid. Each tree is exactly connected to only one tent. A tent can be found in a horizontally or vertically adjacent square of a tree. The tents are never placed adjacent to each other, neither vertical, horizontal, nor diagonal. The numbers outside the grid give the total number of tents in the corresponding row or column. A tree might be next to two tents, but is only connected to one, and vice versa. Find all the tents.

**Puzzle 5**

Find the highest total—you can only move up or right—using the mathematical signs coming on the way.

+	4	-	2	+	2
2	+	2	-	2	+
-	1	+	2	-	4
2	-	1	+	1	-
+	1	-	2	+	3
3	+	3	-	4	+

Puzzle 6

In the above question, if we can move up and left only, then what is the maximum sum that we can get?

Puzzle 7

Abhishek said that he was born on 29 February 1900. What birthday will he celebrate in the year 2000?

Puzzle 8

During a recent police investigation, IG Khan was interrogating five criminals—A, B, C, D and E—to try and identify who is the culprit. Below is a summary of their statements:

- A: it wasn't E
it was B
- B: it wasn't C
it wasn't E
- C: it was E
it wasn't A
- D: it was C
it was B
- E: it was D
it wasn't A

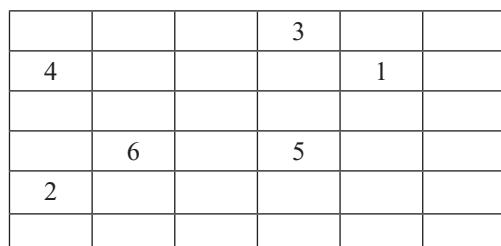
It was well known that each suspect told exactly one lie. Can you determine who the criminal is?

Puzzle 9

At the local school, I was chatting to my sister's friends and noticed a number of things. Jessica has mousey coloured hair and the girl with black hair was wearing a green dress. Lucy is not blonde and Lauren does not have brown hair, Chloe was wearing a blue dress. The blonde girl was not wearing red and Lauren was not wearing green. I can't remember which girl was wearing a yellow dress. Can you determine the colours of the girl's dresses and their hair?

Puzzle 10

Draw a continuous line that travels in order from 1 to 6. You can only move horizontally and vertically, the line must not cross itself and every square is visited.



Puzzle 11

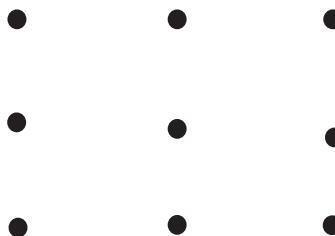
A bank customer had ₹100 in his account. He then made 6 withdrawals, totalling ₹100. He kept a record of these withdrawals, and the balance remaining in the account, as follows:

Withdrawls (₹)	Balance left (₹)
50	50
25	25
10	15
8	7
5	2
2	0
100	99

When he added up the columns as above, he assumed that he must owe ₹1 to the bank. Was he right?

Puzzle 12

Can you draw exactly 4 straight lines that pass through ALL 9 spots, without removing your pen from the paper?

**Puzzle 13**

In a football syndicate, the winnings amounted to ₹7657. There were more than 30 people in the syndicate but less than 100. Each won exactly the same number of rupees and no paise were involved. How much did each win?

Puzzle 14 to 16

Here is a snippet of curious multiple-choice entrance exam.

14. The answer to question 15 is
 - (a) B
 - (b) C
 - (c) A
15. The first question with (B) as the correct answer is
 - (a) Q3
 - (b) Q1
 - (c) Q2
16. The only option not used so far is
 - (a) A
 - (b) B
 - (c) C

Puzzle 17

If yesterday was Saturday's tomorrow and tomorrow was Wednesday's yesterday, what day would it be today?

Puzzle 18 to 20

Directions for questions 18 to 20: *Read the passage given below and solve the questions based on it.*

In a shooting competition, a person is allowed to shoot at four targets successively, followed by the next shooter. When all the shooters have finished one such round, the process is repeated. If a target is hit, the shooter gets 2 points and if he misses the target, the other shooters are awarded one point each. The first shooter to get 60 points wins the shooting competition. In a contest among three persons—Akhil, Bharat and Chand, their score at the end is as follows:

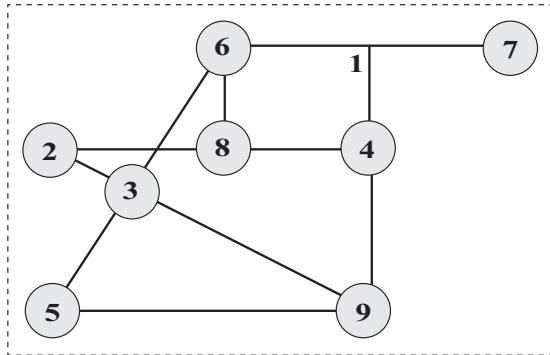
Akhil = 60, Bharat = 53 and Chand = 43.

Out of a total of 78 shots being fired, only 43 hit the target.

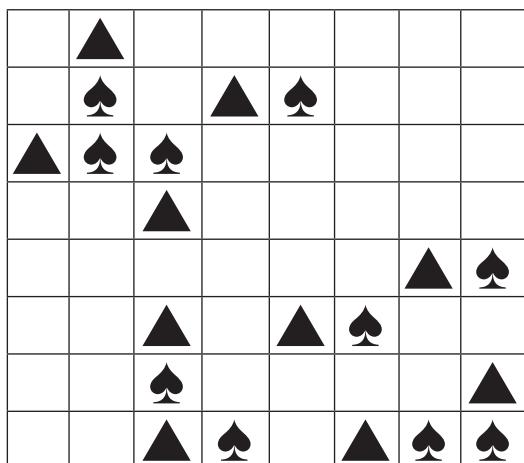
18. Who was the first to shoot?
 - (a) Akhil
 - (b) Bharat
 - (c) Chand
 - (d) Cannot be determined
19. Who was the second to shoot?
 - (a) Akhil
 - (b) Bharat
 - (c) Chand
 - (d) Cannot be determined
20. Who was the third to shoot?
 - (a) Akhil
 - (b) Bharat
 - (c) Chand
 - (d) Cannot be determined

Hints and Explanations

1.



2. 1.30 in the morning. The initial single strike was at 12.30.
3. If you think that you are now in first place, then think again! If you overtake the person in second place, you are now in second place yourself.
- 4.



5. 10

+	4	-	2	+	2
2	+	2	-	2	+
-	1	+	2	-	4
2	-	1	+	1	-
+	1	-	2	+	3
3	+	3	-	4	+

6. 14

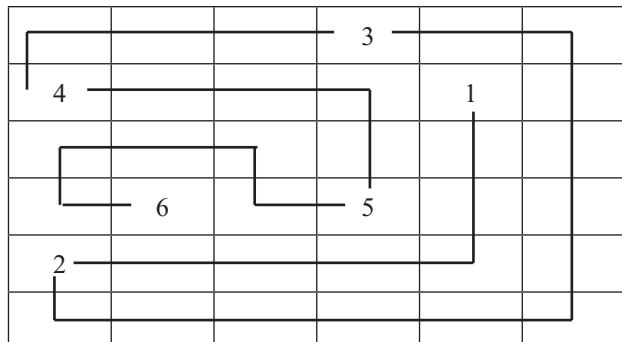
+	4	-	2	+	2
2	+	2	-	2	+
-	1	+	2	-	4
2	-	1	+	1	-
+	1	-	2	+	3
3	+	3	-	4	+

7. Abhishek was lying, 1900 was not a leap year.
8. C committed the terrible crime. The way to solve this puzzle is to look at each clue. We know that exactly one of each person's statements is true. Looking at A statements, let's check to see 'it was B is true? If 'it was B is true, then we know the other statement is false, hence it was E. This is a contradiction. Hence, we now know it wasn't B, nor E (as 'it wasn't E must be the true statement). Looking at C statement, we can similarly determine that it wasn't A either. E statement gives us that it wasn't D, which leaves only C as the culprit.

9.

Name	Dress colour	Hair colour
Jessica	Red	Mousey
Lauren	Yellow	Blonde
Lucy	Green	Black
Chloe	Blue	Brown

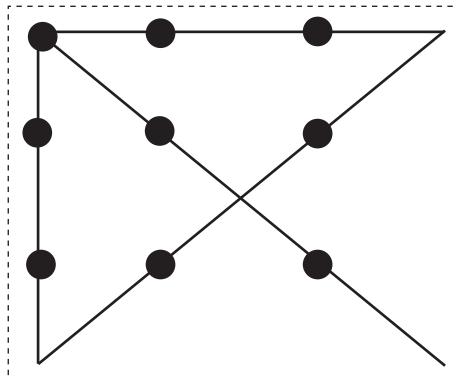
10.



1.8 Logical Reasoning

11. There is no reason what ever why the customer's original deposit of ₹100 should equal the total of the balances left after each withdrawal. The total of withdrawals in the left-hand column must always equal ₹100, but it is purely a coincidence that the total of the right-hand column is close to ₹100.

12.



13. 31 Each one won ₹247.

14 to 16

14. (c)
15. (a)
16. (b)
17. Monday

18 to 20

Scenario—The problem set given above involves many facts—the scheme of firing shots, the way the points are awarded, the number of shots fired and the number of shots hitting the target.

Observation—After going through the set up given above, following points should come of the surface:

- One round of firing involves 12 shots being fired, four shots by each shooter.
- Since 12 shots are being fired in one round, so a total of 72 shots are being fired in six such rounds. Out of the 72 shots, 24 shots have been fired by each of them. Now, in the next six shots, 4 shots must have been fired by the person who was the first person to shoot and rest two must have been fired by the person who was the second person to shoot.
- So, total number of shots fired by the 1st person
 $= 28$

$$\text{Total number of shots fired by the 2nd person} = 26$$

$$\text{Total number of shots fired by the 3rd person} = 24$$

Problem—Besides the problems given in the question set, let us raise some more pertinent points regarding this set:

- Since Akhil was the first on to get 60 points, can we assume that Akhil was the first one to shoot? If yes, then why and if no, then why?
- Since Bharat was the second ranker, can we assume that Bharat was the second one to shoot? If yes, then why and if no, then why?

FLAW DETECTOR—While operating on the surface only gives us an idea that Akhil was the first one to shoot because he got 60 points first, it also gives us the reason why we get this conclusion—because we were operating on surface only.

Understand the points scheme—A person can get points without hitting any target or even without firing shots. As it is given that two points are awarded for a hit and one point is awarded to the opponents in case of a miss. It might be a possibility that Akhil would have got 59 points or 58 points or so in his round, and then other shooters go to shoot, they miss and in turn Akhil gets the point, and thus he gets 60 points.

And otherwise also, a deep thinking tells us that game ends with second shooter (because a total of 78 shots are fired), so Akhil could be at best second shooter and not the first shooter.

Explanation—As we have discussed above also, this question set involves many facts and hence lets make some equations.

	Hits	Miss	Points
Akhil	A	b	$2a + d + f$
Bharat	C	d	$2c + b + f$
Chand	E	f	$2e + b + d$

We are using six variables above, so we need to have six equations to solve this set. Let us make the equations—

$$\begin{aligned}
 \text{Points scored by Akhil} &= 2a + d + f = 60 & \dots & \text{(i)} \\
 \text{Points scored by Bharat} &= 2c + b + f = 53 & \dots & \text{(ii)} \\
 \text{Points scored by Chand} &= 2e + b + d = 43 & \dots & \text{(iii)} \\
 \text{Total hits} &= a + c + e = 43 & \dots & \text{(iv)} \\
 \text{Total misses} &= b + d + f = 35 & \dots & \text{(v)}
 \end{aligned}$$

Till now we have been able to construct only five equations. Since we have used all the given information, we cannot have a sixth equation directly from the given set. Hence, we will introduce the ‘hypothetical equations’ now that will work as sixth equation.

Assume that Akhil is the first one to start, so $a + b = 28$ (vi)

Doing (i) – (v) gives us: $2a - b = 25$ (vii)

Adding (vi) and (vii),

$3a = 53$, since we are not getting the integral value of ‘a’ from here, we would conclude that (vi)th equation $a + b = 28$ is not a valid equation and so Akhil is not the first one to shoot.

Similarly, assuming Bharat to be the first one to shoot gives us: $c + d = 28$ (viii)

Solving equation (ii) and equation (v), $2c - d = 18$ (ix)

Adding equation (viii) and equation (ix), $3c = 46$. Again we are not getting the integral value of c from here, so Bharat is not the first one to shoot.

Obviously, it means Chandan is the first one to shoot. Let us check that also:

If Chandan is the first one to shoot then, $e + f = 28$..(x)

Solving equation (iii) and equation (v), $2e - f = 8$... (xi)

Adding equation (x) and equation (xi), $3e = 36$, so, $e = 12$.

Similarly, to find out the second shooter, we will insert, one by one, an additional equation besides the above given 5 equations, by assuming that Akhil is the second one to shoot (and hence $a + b = 26$). If it does not satisfy the given conditions, then we will construct the additional equation by assuming Chandan to be the second shooter (and hence $c + d = 26$).

Alternative Solution—The more the number of variables, the more difficult the solution will be.

Let us reduce some variables and start directly from the ‘hypothetical equation’ itself.

Assume that the total number of hits by the first one to shoot = N, so total number of misses by him = $28 - N$.

So, total number of misses by the other two shooters = $35 - (28 - N) = N + 7$

[Total number of shots fired by all the shooters = 78 and total hits by all the shooters = 43, so total number of misses by all the shooters = 35]

So, the points scored by the first person to shoot = $2N + N + 7 = 3N + 7$

Now, if Akhil is the first one to shoot, then $3N + 7 = 60 \Rightarrow 3N = 53$

Since no integral value of N is obtained from here, so Akhil is not the first one to start.

Again, if Bharat is the second one to shoot, then $3N + 7 = 53 \Rightarrow 3N = 46$

We are not getting integral value of N, so Bharat is not the first one to shoot.

Hence, Chandan is the first one to shoot.

Let us verify that:

If Chandan is the first one to shoot, then $3N + 7 = 43 \Rightarrow 3N = 36 \Rightarrow N = 12$

Now to find the second person to shoot, assume that the total number of hits by the second shooter = M, so total number of misses by him = $26 - M$.

So, total number of misses by the other two shooters = $35 - (26 - M) = M + 9$

Or, the points scored by the second person to shoot = $2M + M + 9 = 3M + 9$

If Akhil is the second one to shoot, then $3M + 9 = 60 \Rightarrow 3M = 51 \Rightarrow M = 17$

Hence, Bharat is the second one to shoot.

18. (c)

19. (a)

20. (b)

Chapter

2

DEVELOPING THE SKILLS

LEARNING Objectives

In this chapter, you will learn:

- What constitutes Logical Reasoning?
- Different types of Logical Reasoning questions
- Skill set required to excel in Logical Reasoning
- Approach to solve the questions

CONSTITUENTS OF LOGICAL REASONING

Before we move on to solving the questions, it is very imperative that we understand the constituents of the Logical Reasoning Questions and at the same time the skill-sets required to crack them.

Logical reasoning questions are designed to measure the students' ability to understand the structure of relationships and to draw conclusions from it. Students will be asked to make deductions from a set of statements, conditions or rules that describe the relationships among various variables such as persons, places, things or events. These questions simulate the kinds of detailed analyses of relationships that management students must perform in solving problems. Additionally, they require the ability to reason clearly and deductively from a given set of rules or restrictions; all under a strict time frame.

Each logical reasoning question contains three separate parts—

- (i) Scenario
- (ii) Rules and
- (iii) Question/s

Scenario

The scenario introduces a set of variables—people, places, things or events involved in an easy to understand activity such as sitting in seats or singing songs.

Here is an example:

A postman has to deliver exactly seven letters—N, O, P, Q, R, S and T on seven days of a week; not necessarily in the same order. The seven deliveries must be made according to certain conditions.

In the above situation, there are two variable sets—the letters N, O, P, Q, R, S and T and seven different delivery positions, which would be numbered 1 through 7 for the different days of the week.

In the above situation, there are two variable sets—the letters N, O, P, Q, R, S and T and seven different delivery positions, which would be numbered 1 through 7 for the different days of the week.

Rules

The scenario is followed by a series of rules or conditions which impose specific restrictions upon the relationships among the subjects. Rules can also be seen as a set of statements that describe the relationships between the

variables. An LR set may include as few as two or as many as ten rules or may be more. Besides, these rules or conditions specify the relationship between the different variables.

Here are the rules that accompanied the above given LR set:

- (i) Letter P and Letter O have to be delivered on consecutive days.
- (ii) The postman cannot deliver letter O and letter S on consecutive days.
- (iii) Letter T has to be delivered on the fourth day of the week.
- (iv) The postman has to deliver S and N both before delivering letter Q.
- (v) It is also given that Monday is assumed to be the first day of the week.

Rules also help us in providing a proper sequence of events or arrangement of several variables involved in the question. We will discuss more about ‘Sequencing and Arrangement’ in Chapter 4 of this section.

Questions

The rules are followed by a series of questions about the relationships defined by the conditions. The questions call for a deductive analysis and a right correspondence between the scenario and the rules. This third and final part of any LR set, tests the students’ knowledge about the relationships between the variables, the structural features of the given set, and the way these relationships and features change as the conditions in the set change.

As in QA problems, one and only one response can be proven beyond any doubt to be the correct one. In CAT, the number of questions per set normally ranges from one to six, although CAT does not follow certain pattern.

All initial rules or conditions are applied to all the questions given thereof. However, sometimes a particular question might introduce something new after suspending the parent information. Hence, students are expected to consider each question separately from the other questions. Do not carry over information provided in any particular question to the other questions.

Some of the sample questions pertaining to the above LR set are as follows:

1. Which of the following lists an acceptable order of deliveries of letters?
 - (a) NQPTOSR (b) POSTRNQ
 - (c) NRSTPQQ (d) RSOTNPQ

2. Which of the following is a complete list of the days on which letter O could be delivered?
 - (a) Wednesday, Friday
 - (b) Wednesday, Friday, Sunday
 - (c) Wednesday, Thursday, Friday
 - (d) Any day of the week except Saturday
3. Which of the following cannot be true?
 - (a) Letter Q is delivered on Wednesday
 - (b) Letter Q is delivered on Friday
 - (c) Letter R is delivered on Wednesday
 - (d) Letter S is delivered on Tuesday

We will go through the solution of the questions given above after discussing the Skills set required to excel in the Logical Reasoning section.

SKILL-SET REQUIRED

We have understood and observed upto now that the LR questions test the following:

- Command of the details given,
- Formal deductive abilities,
- Understanding of how rules limit and order behavior, and
- Ability to cope up with many pieces of data simultaneously to solve the problems.

In my experience of dealing with a good number of students, most of them already have these skills, the problem lies with the fact that they probably haven’t acquired the know-how to apply these skills to their best advantage in the rarified atmosphere of a standardized time-bound skills-based test.

While discussing the various skills required, we will assume that a student has no prior background of solving these kinds of questions and owing to this; he/she is almost at a very basic level.

Skill 1—Understanding the Information

This simply means that, “Are you able to decipher the different kinds of statements given?”

Let us have a look at these statements:

- (i) Game B must be played on the day following the day on which game F is played.
- (ii) Game D must be staged on Sunday and is not to be immediately preceded by game B.

1.12 Logical Reasoning

- (iii) The population of Maharashtra is followed by the population of Bihar whereas population of Orissa is preceded by the population of Bihar.

Which of the following options is least likely to be wrong?

Obviously, the above written statements are just a part of any particular LR set, but play an important role in making a sequence of events. Besides, there can be a few questions, which by virtue of juggling with the words, can become difficult to comprehend within that time-bound test ambience. This can best be understood by looking at a few examples with their proper explanations.

Sometimes just for the sake of making a statement difficult to understand, the test makers start playing with the words, as seen in the following example:

Statement (i) – There are three cottages in a row and three friends A, B and C are living in these cottages, one person in each cottage. The cottage of A is in between the cottages of B and C.

Statement (ii) – There are three cottages in a row facing south and three friends A, B and C are living in these cottages one person in each cottage. When A, B and C are standing in front of their houses facing north, A makes a statement that cottage of one of B and C is on his right and another cottage is on his left.

Statement (iii) – There are three cottages in a row numbered 1 through 3 and three friends A, B and C are living in these cottages, one person in each cottage. A finds that his cottage number is less than the cottage number of one of his friends.

We do understand that the interpretation of all the three statements is the same i.e., the order of their cottages being—BAC or CAB.

At the same time, we should understand some of the basic statements pertaining to the questions. To answer these questions, we should focus on the nature of the right and wrong answer choices:

Question reads as...	Its meaning...
Which one of the following statements could be true?	A statement that could be true. The remaining wrong choices will be statements that cannot be definitely true. (i.e., statements that must be false)
Which one of the following statements cannot be true?	A statement that cannot be true(must be false). The remaining wrong choices will be the statements that can either be definitely true or at least could be true.
Which one of the following statements must be true?	A statement that must be true. The remaining wrong choices will be statements that either cannot be true or only could be true.
All of the following statements could be true EXCEPT.....	A statement that cannot be true. The remaining wrong choices will be statements that either could be true or are definitely true.
All of the following statements must be true EXCEPT...	A statement that either cannot be true or merely could be true. The remaining wrong choices will be statements that must be true.
Which one of the following statements could be false?	A statement that cannot be true or could be true or false. The remaining wrong choices will be the statements that must be true.
Which one of the following statements must be false?	A statement that cannot be true. The remaining wrong choices will be the statements that are either definitely true or only could be true.
Which of the following statements is least likely to be wrong?	A statement that is true. The remaining options will be false.

Skill 2—Diagramming the Information

This is the most important stage of solving any LR set. This particular skill in itself requires the students to be aware of various factors related to the scenario and the rules, such as:

- What kind of diagram viz., table or line diagram etc., is the most best suitable for the given set?
- How many variables are there in the set and out of the given variables, which of the variables are most helpful in making the diagram and representing the rules and the scenario?

Ideally, in case of two variables, the work done in creating the setup and making inferences will be sufficient to answer the question. But the problem starts surfacing when the number of variables increases to three or more. We will discuss more about the variables and the way to use them to our benefit later in this chapter.

Besides the given data in the LR set, sometimes the questions which supply a new piece of information specific to that question alone, also tend to help us in achieving a complete diagram. And this is the reason why students should do this diagramming work next to the question itself, if enough space is available. This provides you several benefits:

- By doing the work next to the problem, you increase the visual connection between your diagram and the LR set.
- If you need to come back to a question, when you return you will be able to clearly see the work done up to that point.

There are two approaches that are widely propagated and used to form a diagram. Let us look at the pros and cons related to the approaches:

Approach 1

Do the work for each question on the main diagram

This approach suggests that the work for each question should be done on the main diagram itself. In order to utilize this method, you must erase your previous work before beginning each question. However, erasing your work has a number of negative effects too: you could accidentally erase important information that applies to all the questions and more importantly, every time you erase your work you lose some of the knowledge that you created about the game.

Rather what I would suggest as a thumb rule: do not erase any work that you have done unless you have made a mistake.

Approach 2

Create a “grid” and do the work for each question in the rows within the grid

This approach requires you to create a grid near the main setup. The work for each question is then done within the rows of the grid, as follows:

Questions/Scenario or conditions	1	2	3	4	5
Q 1	A	B	C		
Q 2	B	A			C
Q 3		D	E	A	D

After going through the above discussion, we can conclude that

- Drawing the grid along with the main setup requires a large amount of space, which might not be always available in the test paper. In contrast, doing the work next to the question is space-efficient.
- In case of LR sets with less than four variables, working next to the question is always efficient, as it allows you to draw the most appropriate diagram for the given scenario.

Lastly, since the LR sets asked in the CAT are too dynamic in nature, the proper use of scratch work is an important pre-requisite.

Skill 3—Sequencing the Information to get the Answer

Uptill now, we have understood how the given variables can be arranged in a proper structure. Before moving on to the actual problem solving of two or more variables, we have now reached a stage (theoretically) where the given information is to be used to solve the LR set. The idea is to focus on what the question requires of you, before starting the solving process.

Remember some of the very basic rules:

- Always pay special attention to the sequencing aspect in every set. Many questions are answered just by thinking, “What things are left? Where can (or must) they be placed and at which position?”

1.14 Logical Reasoning

- Many a times it will happen that we don't fully grasp a LR situation. In such cases keep asking yourself questions and go through a couple of "what ifs?" to keep the LR set going. Whenever you are in a fix, ask yourself, "What if it goes here? What does that mean for the other things?" Even if you don't get any help from this, but it's still time worth spent because it helps you to understand the LR set better.
- The best way to deal with any LR set is to build it directly into a diagram from the given information. Sometimes, the students are expected to fill some of the unoccupied places on their own by assuming something. Then it becomes essential to segregate the given information in the LR set with your assumed information. You can do it by encircling the data assumed by you.
- While assuming some information on your own, always keep an eye on the options provided along with the question. Sometimes you might get a lot of help from the options as well.
- Remember that the test-maker has scattered the easy, the moderate and the difficult questions across the entire paper in no proper order. So, solve the question which you find the easiest first, and not the one which is Q 1.

MANAGING THE VARIABLES

Let me clarify at the onset, that the variables which we are talking about here are not the same as the mathematical variables. Rather, what we mean to say is that the word variable here represents all the entities, be it the name of a place, a person or the days; a book which they might have been reading or practically anything given in the LR set. Additionally, there will be some rules or conditions encompassing these variables. And as it is correctly said, "Our variables are our resources"; similarly we should use the variables given to us in our questions, in the same way.

Understandably, a LR set can have two or more variables. Let us see some examples:

Example 1: Two variable LR set

Six plays, viz., *Ram teri Ganga maili*, *Satya, Don*, *Bakri.com*, *Andha Mughal* and *Angrezo Bharat aao*, are to be staged, one on each day starting from Monday to Saturday.

In the above written statement, which can also be the opening statement of an LR set, we see that there are two sets of variables—

- (A) Six plays and
- (B) Six days as six different positions

Now according to the given conditions, we will be establishing the correspondence between these plays and the days on which they can happen.

Example 2: Three variable LR set

There are five men working in *Due North Inc.* namely A, B, C, D and E. Their respective salaries are different and they are married to five women namely F, G, H, I and J.

In this situation, there are three sets of variables—

- (A) Five men working in an organization.
- (B) Their respective salaries which are different.
- (C) Their wives, which are of course different.

Before plotting the diagram for the above set, the most important thing to remember here is the fact that we can establish direct correspondence on paper, only between two variables, and so the third variable is to be kept in the mind. Now, to choose the two variables out of the given three variables, we should keep an eye on the rules or the given conditions. The more the conditions related to a particular variable are given, the more the chances are of it being taken as one of those two variables which are to be used in the diagram on the paper.

Example 3: More than three variable LR set

Five men from five different states of India work in a factory and each of them performs a different job. Each man commutes to work using a different mode of transport and most work on different shifts. There are three shifts—1st shift, 9 A.M.–12 Noon; 2nd shift, 12 Noon–3 P.M. and 3rd shift, 3 P.M.–6 P.M. All the people working on the same shift come at the same time.

How many variables are there in the above LR set?

Let us count—

- (A) 1st variable – five men
- (B) 2nd variable – five states
- (C) 3rd variable – different job
- (D) 4th variable – mode of transport
- (E) 5th variable – work-shift

We do understand that most of the time managing fewer variables is easier than managing more variables.

From here we will start with LR sets of two variables and then move on to the LR sets of a higher number of variables.

One thing I would like to reiterate—Please don't just read this book; rather, sit with a pen/pencil and paper

and before going through the solution of any LR set, give it a try.

HOW TO APPROACH LR

In this section, we will learn the method of solving LR questions keeping in mind various do's and don'ts.

Problems in Two Variables

Directions for questions 1 to 4: Read the following passage and solve the questions based on it.

There are five boxes viz., T, U, W, X and Z, to be delivered on five consecutive days, Monday through Friday one box per day. The following conditions are to be kept in mind while formulating the delivery schedule of the boxes:

Solution

Scenario

There are two sets of variables—1st set being five boxes and 2nd set being five days Monday through Friday.

As the boxes must be delivered in these five days, so one box is to be delivered everyday.

Rules

There are two sets of rules given here:

- (A) Strict sequencing rule—These are the rules which give us the exact position of the variables.
 - (B) Loose sequencing rule—These are the rules which give us the relative positioning of one variable with respect to the other variable, without giving the exact position.

We will discuss about Sequencing in Chapter 4 of this section.

Now let us interpret the rules:

■ Box X is not delivered on Monday—This is a strict sequencing rule.

If box T is delivered on Monday, then box X must be delivered on Friday.

This is a loose sequencing rule which introduces further conditions related to the delivery of box T and box X. But we should be very clear about certain facts related to this statement:

- (i) If box T is not delivered on Monday, then box X can be delivered on any day (except Monday)
 - (ii) If box X is not delivered on Friday, then box T cannot be delivered on Monday.

If box X is delivered on Tuesday, box U is delivered on Monday.

This is again a loose sequencing rule which introduces conditions related to the delivery of box X and box U. This statement also means that if U is not delivered on Monday, then X is not delivered on Tuesday.

Box W is delivered the day following the day of the delivery of box Z.

This is also a loose sequencing rule which introduces conditions related to the delivery of box W and box Z. It simply means that Z -W will be consecutive in the same order.

For the sake of establishing the rules clearly in our mind, we should write it as follows:

This question can be used to generate a set of new questions as well. One such question could have been made by replacing “must be” with “could be”. Of course in that case, more than one option would have become true out of the given four options.

However, two variables LR set questions should be seen more as ‘Sequencing and Arrangement’ questions. We will discuss more about this in Chapter 4.

Problems in Three Variables

Directions for questions 5 to 6: Read the following passage and solve the questions based on it.

- (i) Six men—Rajesh, Dinesh, Lokesh, Nilesh, Shailesh and Himesh work in different companies, namely, P, Q, R, S, T and U, and each one wears a company-sponsored different coloured tie, i.e., Brown, Green, Pink, Yellow, Purple and Red, though not necessarily in the same order.
 - (ii) The one wearing a Brown tie works in company S and the one wearing a Green tie works in company P.
 - (iii) Himesh does not work in company R or T.
 - (iv) Rajesh wears a Pink tie and works in company Q.
 - (v) Nilesh does not work in company T and a purple colour tie is not given by the company R.
 - (vi) Shailesh works in company U and neither Nilesh nor Dinesh works in the company S.
 - (vii) Company T does not sponsor Purple or Yellow coloured ties and Lokesh works in company P.
5. Which colour tie is given by the Company R?
- (a) Cannot be determined
 - (b) Brown
 - (c) Green
 - (d) None of these
6. Which of the following “colour of tie-company person” combinations is correct?
- (a) Green-R-Nilesh
 - (b) Brown-S-Lokesh
 - (c) Red-T-Dinesh
 - (d) Yellow-R-Shailesh

Solution

Scenario

There are three variables involved in this question set: Name of the person, company and the colour of tie.

- There are six persons—Rajesh, Dinesh, Lokesh, Nilesh, Shailesh and Himesh

- There are six organizations—P, Q, R, S, T and U
- There are six coloured ties—Brown, Green, Pink, Yellow, Purple and Red.

Rules

Using the rules, we can make the following table:

Tie	Company	Name
Brown	S	Himesh
Green	P	Lokesh
Pink	Q	Rajesh
Purple	U	Shailesh
Yellow	R	Nilesh
Red	T	Dinesh

- 5.(d) The colour of the tie provided by the company R is Yellow. Hence, the answer is option (d). None of these.
- 6.(c) Obviously, the answer is option (c).

Problems in More Than Three Variables

Directions for questions 7 to 8: Read the following passage and solve the questions based on it.

Five men from five different states work in an office and each of them performs a different work. Each comes to the office using a different mode of travel and most work on different shifts (There are three shifts; the second shift starts after the first shift and ends before the third shift). All the five persons working in the same shift come at the same time.

- (i) Hari, who isn't from West Bengal (WB), does not walk to work.
- (ii) Narayan is not a GL.
- (iii) The man who works in the third shift and whose name isn't Javed doesn't use the bus.
- (iv) Simon, who isn't from UP, uses a bicycle to go to work. He isn't a technician.
- (v) The man from Karnataka isn't called Narayan and he comes to work after the assembler but before Abbas.
- (vi) The man from Bihar and the person who walks, both work on the first shift.

1.18 Logical Reasoning

- (vii) The GL comes to work before the man who uses the train.
 - (viii) Javed comes to work after the man from Gujarat but before the man who uses a scooter.
 - (ix) Narayan and the man who uses the bus work on the same shift.
 - (x) The man from UP and the tester work in the second shift.
 - (xi) The stock clerk works on the third shift.

8. Which of the following statement(s) is (are) true?

- I. The GL comes by bus and the assembler walks to work.
- II. The stock clerk comes by bus and the tester by train.
- III. The stock clerk comes by scooter and the technician by train.
- IV. The assembler comes by bicycle and the tester by train.

(a) I and III only (b) II only
(c) I only (d) None

Solution

Scenario

We have already seen that this question set is of 5 variables

- 1st variable – Five men
- 2nd variable – Five states
- 3rd variable – Different job
- 4th variable – Mode of travel
- 5th variable – Work-shift

- (A) The five persons are—Hari, Narayan, Simon, Javed and Abbas.
 - (B) The five modes of travel are—Bus, Walk, Bicycle, Train and Scooter.
 - (C) The five states are—Bihar, UP, WB, Karnataka and Gujarat.

- (D) The five works are—GL, Assembler, Tester, Technician and Stock Clerk.
 - (E) The three shifts are—1st shift, 2nd shift and 3rd shift.

Rules

There are two major bottlenecks with this problem set:

- Most of the statements given in the beginning have a negative connotation.
 - A total of eleven statements are given.

Ideally, in these types of situations where a good amount of information is given, we should first go through all the statements and then find out the statement with the maximum concrete facts.

Let us first make a table denoting all the variables:

	Shift	State	Work	Mode of Travel
Hari				
Narayan				
Simon				
Javed				
Abbas				
Statement (v)	Karnataka – 2nd shift – Neither Abbas nor Narayan			
	Assembler – 1st shift			
	Abbas – 3rd shift			
Statement (viii)	Javed – 2nd shift Gujarat – 1st shift Scooter – 3rd shift			
Statement (vi)	Bihar – 1st shift Walk – 1st shift			
Statement (x)	UP – 2nd shift Tester – 2nd shift			
Statement (iv)	Narayan – 1st shift Bus – 1st shift			

What deductions can we make from the above statements?

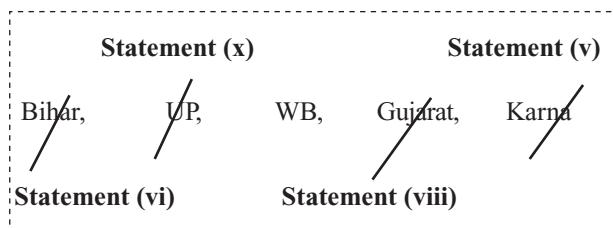
Deduction 1 – Since there are five persons and two persons each are coming in the 1st shift and 2nd

shift, so we can conclude that only one person is coming in the 3rd shift. We will do more deductions after filling up the space for the person who comes in the 3rd shift.

Abbas – 3rd shift – Scooter – Stock Clerk (Using statement xi)

However we are still not sure about the state to which Abbas belongs. Let us find it out through the process of elimination:

Possible states—Bihar, UP, WB, Gujarat, Karnataka
Possible state for Abbas—



Hence West Bengal is the only possibility for Abbas.

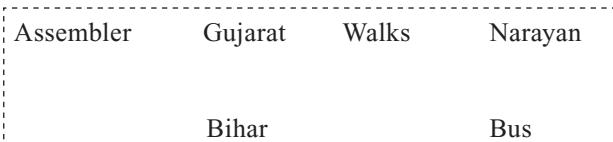
Let us fill the table with the newly acquired information:

	Shift	State	Work	Mode of Travel
Hari				
Narayan	1st	Gujarat/ Bihar		Bus/Walk
Simon				
Javed				
Abbas	3rd	WB	Stock Clerk	Scooter

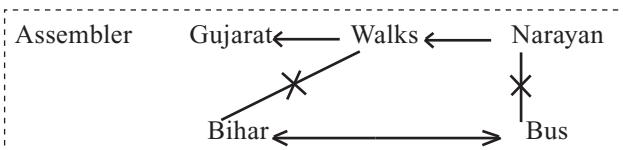
We can fill up some more blanks above with the various possibilities (as we did in the case of Narayan's state).

Now we have a good amount of information regarding the persons working in the first shift:

1st shift –



Thus, we can have the following arrangement:

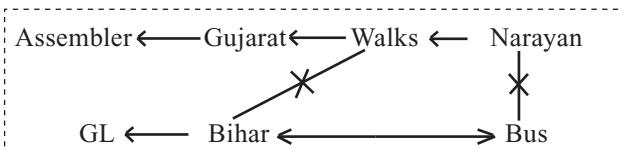


Still we are not sure if Narayan is an assembler or not? To find it out, we will go to some other unused statements. Let us use statement (vii):

Statement (vii): GL – 1st shift

Train user – 2nd shift (Because person who commutes by train cannot come in 3rd shift, as Abbas is coming in 3rd shift).

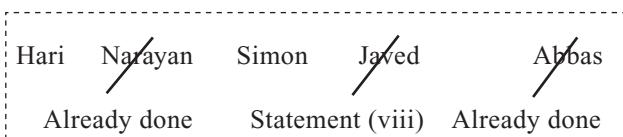
Using statement (ii), Narayan is not a GL, so he has to be an Assembler.



Let us fill up the table with the new information again:

	Shift	State	Work	Mode of Travel
Hari				
Narayan	1st	Gujarat	Assembler	Walk
Simon				
Javed				
Abbas	3rd	WB	Stock Clerk	Scooter

To find out the 2nd person working in 1st shift, now we will use the process of elimination:



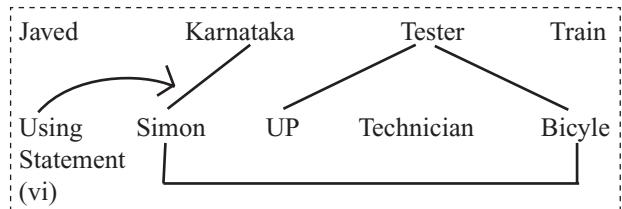
The possible options for the 2nd person is either Hari or Simon. Using statement (iv), Simon comes on a bicycle. However, the 2nd person working in the 1st shift comes by bus. So, Simon is not possible in the

1.20 Logical Reasoning

1st shift. Hence, Hari is the 2nd person coming in the first shift.

	Shift	State	Work	Mode of Travel
Hari	1st	Bihar	GL	Bus
Narayan	1st	Gujarat	Assembler	Walk
Simon				
Javed				
Abbas	3rd	WB	Stock Clerk	Scooter

Now we are left with the variables attached to only the 2nd shift. Let us write them one by one:



Hence, the final table is:

	Shift	State	Work	Mode of Travel
Hari	1st	Bihar	GL	Bus
Narayan	1st	Gujarat	Assembler	Walk
Simon	2nd	Karnataka	Tester	Bicycle
Javed	2nd	UP	Technician	Train
Abbas	3rd	WB	Stock Clerk	Scooter

PRACTICE EXERCISE 1

Directions for questions 1 to 5: Read the following passage and solve the questions based on it.

- (i) Six students P, Q, R, S, T and U are in different branches of Engineering viz., IT, Mechanical, Chemical, Electrical, Metallurgy and Electronics but not necessarily in the same order.
 - (ii) Each of them is a resident of a different city viz., Mumbai, Kolkata, Chennai, Patna, Hyderabad and Bangalore. R is the resident of Patna but he is not in chemical or electrical. T, who is in mechanical, is not a resident of Mumbai or Hyderabad. Q is from Kolkata and he is in electrical. The student from Chennai is in electronics; S is from Mumbai; P is in metallurgy.
1. Which of the following is not the correct combination of student and subject?
 - (a) P-Metallurgy (b) Q-Electrical
 - (c) U-Electronics (d) S-IT
 2. Which student is from Chennai?
 - (a) R (b) U
 - (c) S (d) T
 3. Which city does P belong to?
 - (a) Chennai
 - (b) Kolkata
 - (c) Hyderabad
 - (d) Cannot be determined
 4. Which student is from Bangalore?
 - (a) T (b) Q
 - (c) S (d) T or P
 5. Which subject is being studied by R?
 - (a) Electronics (b) Mechanical
 - (c) Metallurgy (d) None of these

Directions for questions 6 to 10: Read the following passage and solve the questions based on it.

- (i) Five friends P, Q, R, S and T travelled to five different cities, Chennai, Kolkata, Delhi, Bangalore and Hyderabad, by five different modes of transport, bus, train, airplane, car, and boat, from Mumbai.
- (ii) The person who travelled to Delhi did not travel by boat.
- (iii) R went to Bangalore by car and Q went to Kolkata by airplane.
- (iv) S travelled by boat whereas T travelled by train.

- (v) Mumbai is not connected by bus to Delhi and Chennai.
- 6. Which of the following combinations of person and mode is not correct?
 - (a) T-Airplane (b) R-Car
 - (c) S-boat (d) P-Bus
- 7. Which of the following combinations is true for S?
 - (a) Chennai-bus
 - (b) Chennai-boat
 - (c) Delhi-bus
 - (d) Cannot be determined
- 8. Which of the following combinations of place and mode is not correct?
 - (a) Chennai-boat
 - (b) Kolkata-airplane
 - (c) Hyderabad-bus
 - (d) Delhi-bus
- 9. The person travelling to Delhi went by which of the following modes?
 - (a) Bus (b) Train
 - (c) Airplane (d) Car
- 10. Who among the following travelled to Delhi?
 - (a) T
 - (b) S
 - (c) R
 - (d) Cannot be determined

Directions for questions 11 to 15: Read the following passage and solve the questions based on it.

Six persons Amar, Bijay, Chetan, Disha, Esha and Farukh took up a job with an organization in a week from Monday to Saturday. Each of them joined for different posts on different days. The posts were of—clerk, officer, technician, manager, supervisor and sales executive, though not necessarily in the same order.

Farukh joined as a manager on the first day. Bijay joined as a supervisor but neither on Wednesday nor Friday. Disha joined as a technician on Thursday. Chetan joined the firm as an officer on Wednesday. Esha joined as a clerk on Tuesday. Amar joined as a sales executive.

11. Who joined the firm on Wednesday?
 - (a) Bijay
 - (b) Chetan
 - (c) Bijay or Chetan
 - (d) Cannot be determined

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ANSWER KEYS

1. (d) 2. (b) 3. (c) 4. (a) 5. (d) 6. (a) 7. (b) 8. (d) 9. (b) 10. (a)
11. (b) 12. (d) 13. (d) 14. (b) 15. (a)

HINTS AND EXPLANATIONS

1 to 5

Student	Place	Branch
R	Patna	Chemical, Electrical (x)
T	Mumbai, Hyderabad (x)	Mechanical
Q	Kolkata	Electrical
	Chennai	Electronics
S	Mumbai	
P		Metallurgy

The following bold letters can be filled easily with the given information.

Student	Place	Branch
R	Patna	IT
T	Bangalore	Mechanical
Q	Kolkata	Electrical

Student	Place	Branch
U	Chennai	Electronics
S	Mumbai	Chemical
P	Hyderabad	Metallurgy

6 to 10

- P – Hyderabad-bus
- Q – Kolkata-airplane
- R – Bangalore-car
- S – Chennai-boat
- T – Delhi-train

11 to 15

Person	Posts	Days
Farukh	Manager	Monday
Bijay	Supervisor	Saturday
Disha	Technician	Thursday
Chetan	Officer	Wednesday
Esha	Clerk	Tuesday
Amar	Sales executive	Friday

PRACTICE EXERCISE 2

Directions for questions 1 to 2: Read the following passage and solve the questions based on it.

- Six books on different subjects, viz., History, Geography, English, Hindi, Economics and Psychology, are arranged in a pile (not necessarily in the same order). Each book belongs to different persons whose names are Debasis, Harsh, Vishwas, Ravi, Sanjay and Neeta.
 - Six books on different subjects, viz., History, Geography, English, Hindi, Economics and Psychology, are arranged in a pile (not necessarily in the same order). Each book belongs to different persons whose names are Debasis, Harsh, Vishwas, Ravi, Sanjay and Neeta.
 - English book, which is kept on the top, belongs to Debasis, Psychology book, which is kept at the bottom does not belong to Sanjay or Ravi.
 - Economics book belongs to Harsh and is kept immediately below Hindi.
 - History book is immediately above Geography and immediately below Economics. Hindi book belongs to Neeta and History book belongs to Ravi.
- Whom does the Psychology book belong to?
 - Neeta
 - Vishwas
 - Harsh
 - Cannot be determined
- Which book is fourth from the bottom?
 - History
 - Geography
 - Economics
 - Hindi

Directions for questions 3 to 6: Read the following passage and solve the questions based on it.

- Mr Sharma has five sons—A, K, S, R and N. While going for a party, they wore different coloured shirts viz., red, yellow, blue, white and green (not necessarily in the same order).
- Each one of them has different likings viz., reading, playing, traveling, singing and writing in no particular order.
- K, who has a liking for singing, does not wear a yellow shirt. S wears a red shirt and does not like reading or writing. N likes to play and does not wear a blue or yellow shirt. A has a liking for writing and R does not wear a yellow or green shirt.
- What is the colour of K's shirt?
 - White
 - Green
 - Blue
 - Data inadequate
- Who has a liking for reading?
 - R
 - A
 - K
 - Data inadequate

- Which of the following combination of son–colour of shirt-liking is correct?
 - R – blue – reading
 - N – white – playing
 - A – yellow – writing
 - N – green – playing
- For how many sons can the colour of shirt be definitely determined?
 - 1
 - 2
 - 3
 - 4

Directions for questions 7 to 10: Read the following passage and solve the questions based on it.

There were ten papers in the last year 10th standard CBSE exam. Following guidelines have been issued to schedule the examination:

- Examination board has organized the exams for ten papers viz., A, B, C, D, E, F, G, H, I and J on six days of the week with a holiday on Sunday; not having more than two papers on any of the days.
- Exam begins on Wednesday with paper F.
- D is accompanied by some other paper but not on Thursday. A and G are on the same day immediately after the holiday.
- There is only one paper on the last day and Saturday. B is immediately followed by H, which is immediately followed by I.
- C is on Saturday. H is not on the same day as J.
- Examination for which of the following pairs of papers is on Thursday?
 - HE
 - DB
 - FD
 - Data inadequate
- Examination for which of the following papers is on the next day of D?
 - B
 - C
 - I
 - H
- Examination for which of the following papers is on the last day?
 - B
 - E
 - J
 - Data inadequate
- Examination for paper F is on the same day as which of the following papers?
 - E
 - D
 - I
 - None of these

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Directions for questions 11 to 15: Read the following passage below and solve the questions based on it.

There are seven professors A, B, C, D, E, F and G teaching seven subjects History, Geography, Physics, Chemistry, Maths, Biology and English from Monday to Friday at Gaya College. Each professor teaches a different subject and not more than two subjects are taught on any one of the days.

- (i) Chemistry is taught by professor B on Tuesday.
 - (ii) Professor D teaches on Friday but neither Geography nor Physics.
 - (iii) Professor F teaches History but neither on Thursday nor on Friday.
 - (iv) Professor A teaches English on the day on which History is taught.
 - (v) Professor C teaches Maths on Monday.
 - (vi) Geography and Chemistry are taught on the same day.
 - (vii) Professor G teaches on Thursday.
11. On which of the following days is English taught?
(a) Wednesday (b) Monday
(c) Tuesday (d) Cannot be determined
12. Which of the following subjects is taught by professor G?
(a) Biology (b) Geography
(c) Physics (d) Chemistry
13. On which of the following days is Geography taught?
(a) Monday (b) Tuesday
(c) Wednesday (d) Thursday
14. Which subject is taught on Friday?
(a) Physics (b) History
(c) Geography (d) Biology
15. Which of the following pairs of professors teaches on Tuesday?
(a) B and D (b) A and B
(c) B and F (d) None of these

Directions for questions 16 to 18: Read the following passage and solve the questions based on it.

- (i) Seven friends P, Q, R, S, T, U and W have gathered at the Patna airport. However, only five of them are scheduled to go to five different places Delhi, Chennai, Lucknow, Bangalore and Kolkata.

- (ii) Five of them are executives with specializations in Administrative (Admn), Human Resource management (HRM), Marketing, Systems and Finance.
 - (iii) T is an executive and he is going to Chennai and his specialization is neither Finance nor Marketing.
 - (iv) W is a system specialist and is going to Delhi. U is an executive but is not going anywhere.
 - (v) Q is an executive with specialization in HRM but has come at the airport to see his friends only.
 - (vi) P is an executive but not from Marketing and is going to one of the destinations but not to Bangalore or Kolkata.
16. Who among the following specializes in Marketing?
(a) S (b) P
(c) U (d) Cannot be determined
17. What is the specialization of R?
(a) Finance
(b) Marketing
(c) Either Marketing or Finance
(d) None of these
18. Who is going to Bangalore?
(a) R (b) S
(c) P (d) Cannot be determined

Directions for questions 19 to 20: Read the following passage and solve the questions based on it.

- (i) Six men B, D, C, M, J and K are split in two groups of three each and are made to stand in two rows, such that a man in one row is exactly facing a man in the other row.
 - (ii) M is not at the ends of any row and is to the right of J, who is facing C. K is to the left of D, who is facing M.
19. Which of the following groups of men are in the same row?
(a) BMD (b) MJK
(c) BDC (d) None of these
20. Who is to the immediate left of B?
(a) M (b) D
(c) J (d) Data inadequate

ANSWER KEYS

1. (b) 2. (c) 3. (d) 4. (a) 5. (c) 6. (b) 7. (a) 8. (b) 9. (c) 10. (d)
 11. (a) 12. (c) 13. (b) 14. (d) 15. (d) 16. (c) 17. (d) 18. (d) 19. (d) 20. (a)

HINTS AND EXPLANATIONS**1 to 2**

1.	English	Debasis
2.	Hindi	Neeta
3.	Economics	Harsh
4.	History	Ravi
5.	Geography	Sanjay
6.	Psychology	Vishwas

3 to 6

Son	Colour of Shirt	Likes
A	yellow	writing
K	white/blue/green	singing
S	red	traveling
R	blue/white	reading
N	green/white	playing

3. white or blue or green

7 to 10

Wed	Thu	Fri	Sat	Mon	Tue
F, B	H, E	I, D	C	A, G	J

11 to 15

Seven professors are: A, B, C, D, E, F and G.

Seven subjects are: History, Geography, Physics, Chemistry, Maths, Biology and English. Subjects are

taught on Monday, Tuesday, Wednesday, Thursday and Friday.

From statements (i), (v) and (vii), we get the following:

Table 1

Person	Subject	Day
B	Chemistry	Tuesday
C	Maths	Monday
G	—	Thursday

Now, with the help of (ii), (iii), (iv) and (vi) we get the following table:

Table 2

Person	Subject	Day
B	Geography	Tuesday
	Chemistry	Tuesday
C	Maths	Monday
G	—	Thursday
D	—	Friday
F	History	—
A	English	—

From Table 2, it is obvious that E teaches Geography on Tuesday.

Now, we know that History and English are not taught on Tuesday, Monday, Thursday and Friday. Hence, History and English are taught on Wednesday.

Again from Table 2, it is obvious that D teaches either Physics or Biology. But from Ans. (ii) D does not teach Physics. Hence, D teaches Biology.

1.26 Logical Reasoning

So, using elimination techniques, G teaches Physics. Hence, the obtained information can be summarized as below:

Table 3

Person	Subject	Day
1. E	Geography	Tuesday
2. B	Chemistry	Tuesday
3. C	Maths	Monday
4. G	Physics	Tuesday
5. D	Biology	Friday
6. F	History	Wednesday
7. A	English	Wednesday

16 to 18

Using the given information, we get the following:

Person	Specialization	Destination
T	Finance, Marketing (x)	Chennai ... (i)
W	Systems	Delhi ... (ii)
U		Going nowhere ... (iii)

Person	Specialization	Destination
Q	HRM	Going nowhere ... (iv)
P	Marketing (x)	Bangalore, Kolkata... (x) ... (v)

It is given that there are five destinations. Using (i), (ii) and (v) we can definitely determine that:

P – Lucknow

Now, there are five executives.

Using (i), (ii) and (iv)

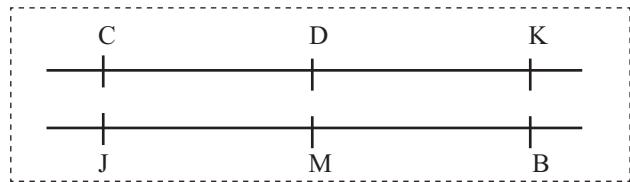
T	–	A	–	Chennai	
Now	P	–	F	–	Lucknow

Now, the only remaining field of specialization can be allotted to U.

Hence, U – M – Going nowhere

So, the remaining two friends R and S are not executives but are going either to Bangalore or to Kolkata.

19 to 20



Chapter

3

LOGICAL LINKS

LEARNING Objectives

In this chapter, you will learn:

- What is logical link?
- Different types of logical links and their meanings
- Inclusive vs exclusive meaning of logical links
- Different types of questions
- Approach to solve the questions

While discussing Logic in Chapter 1, we understood how Logic helps us in understanding and examining every proposition/statement. However, in order to construct the formal rules of inference we need to take care of some of the very common ‘words’, which we define as Logical Links. It is to be understood very clearly that these words alone cannot work as Logical Links.

These Logical Links help us in examining the reversibility of logic, too.

WHAT DO WE UNDERSTAND BY LOGICAL LINKS?

Before we move ahead, let us consider some statements which will help us in getting a clear picture of Logical Links in our mind:

- If it rains, then the farmers will be happy.
- Either my party will secure majority in the parliament or my government will resign.
- If India does not win a gold medal in chess in the Doha Asian Games, then Indians will not be happy.
- If America mobilizes or Britain protests to the UN, then China will call for a meeting of all the Asian countries.

In all the given statements, there are one or two key words playing the maximum role in deciding the direction and nature of the statement like, if the statement has a negative connotation or it brings an element of uncertainty or causes a concern or brings some conditionality.

In the first example, the combination “If – then” is working like a conditional clause. In the second example, the combination “either – or”; in the third example, the combination “If not – then” and similarly in the fourth statement, the combination “If – then” works as a Logical Link.

HOW DO WE DEFINE A LOGICAL LINK?

Statements like “I will go to watch a movie” or “She will go to a picnic” are known as simple statements. Now we can join these two simple statements in a number of ways:

- Either I will go to watch a movie or she will go to a picnic.
- If I go to watch a movie, then she will go to a picnic.
- If I go to watch a movie, only then will she go to a picnic.

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Or, if we allow a bit of change in the nature of statements then statements could be seen as follows too:

- If I go to watch a movie, then she will not go to a picnic.
- If I do not go to watch a movie, then she will go to a picnic.
- If I do not go to watch a movie, then she will not go to a picnic.
- If I do not go to watch a movie, only then will she not go to a picnic.
- If I go to watch a movie, only then will she not go to a picnic.

After we have joined the simple statements, we call these statements Compound Statements. And the words which we use to join two simple statements are known as Logical Links.

SOME STANDARD LOGICAL LINKS AND THEIR USAGES

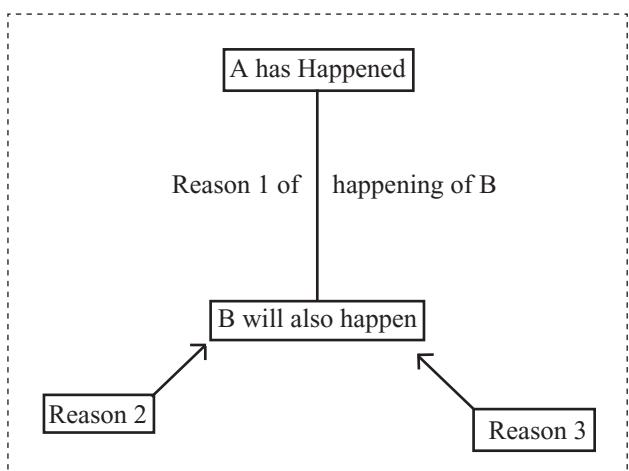
A. If – then

“If – then” is one of the most important Logical Links. Its usage includes the affirmative as well as the negative statement. Following are some of the structured applications of this logical link:

If A happens then B happens

Given – A has happened.
Conclusion – B will happen.
This is a valid conclusion.

See this through the following diagram:



Example 1

1. If the terrorists' demands are met, then lawlessness will prevail.
Given – The terrorist's demands have been met.
Conclusion – Lawlessness will prevail.

If A happens then B happens

Given – A has not happened.
Conclusion – B will not happen.
This is an invalid conclusion.

Using the diagram given above, despite A has not happened, B might happen owing to the occurrence of either reason 2 or reason 3 etc.

Example 2

2. If the terrorists' demands are met, then lawlessness will prevail.
Given – The terrorist's demands have not been met.
Conclusion – Lawlessness will not prevail.
This is an invalid conclusion.

Example 3

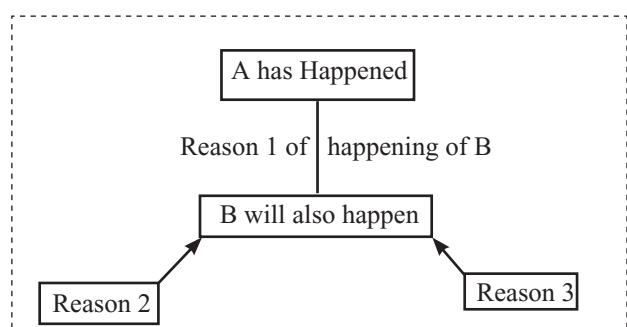
3. If you fall down from the roof, then your legs will get fractured.
Given – You have not fallen down the roof.
Conclusion – Your legs will not get fractured.

This is an invalid conclusion. What we should understand here is the fact that falling down the roof is just one of the ways by which the legs can get fractured and there can be other ways also of the legs getting fractured e.g., meeting with an accident or getting beaten up etc. And just because you have not fallen down the roof, we cannot be sure that the legs have not got fractured.

If A happens then B happens

Given – B has happened.
Conclusion – A would also have happened.
This is an invalid conclusion.

Once again go through the same diagram:



Obviously, B can happen due to reason 2 or reason 3 also and is not dependent on ‘reason 1 only’.

Example 4

- If you fall down from the roof, then your legs will get fractured.

Given – Your legs have got fractured.

Conclusion – You have fallen down the roof.

This is an invalid conclusion.

Again, going through the explanation given above, we know that falling down the roof is not the only reason for the legs getting fractured. So just because the legs have got fractured, we cannot conclude that a person has fallen down the roof.

Example 5

- If it rains, then farmers become happy.

Given – Farmers are happy.

Conclusion – It must have rained.

This is an invalid conclusion.

We do understand that farmers can have more than one reason for being happy, and having rain is just one of them. So, if farmers are happy we cannot definitely conclude that it must have rained.

If A happens then B happens

Given – B has not happened.

Conclusion – A would also not have happened.

This is a valid conclusion.

Example 6

- If you fall down from the roof, then your legs will get fractured.

Given – Your legs have not got fractured.

Conclusion – You have not fallen down from the roof.

This is a valid conclusion.

Understand this—You give a contract to a goon to make Mr A fall down from the roof tonight and as a result Mr A’s legs will automatically get fractured. But the next morning you see Mr A walking and looking perfectly all right. He can walk like this because his legs are not fractured, so the direct response will be—The goon has not done his job of making Mr A fall down from the roof. With this, a lot many accidents might not have happened with Mr A, but he must not have fallen down the roof too.

B. Only if – then

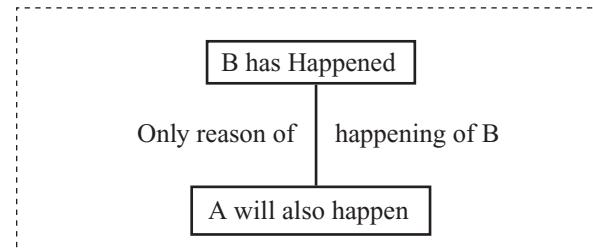
Only if A happens then B happens

Given – B has happened.

Conclusion – A would also have happened.

This is a valid conclusion.

See the diagram for this:



Example 7

- If you die, only then you go to heaven.

Given – You have gone to heaven.

Conclusion – You have died.

This is a valid conclusion.

Here, the only way in which a person can go to heaven is to die. So, if a person has gone to heaven, he must have died too.

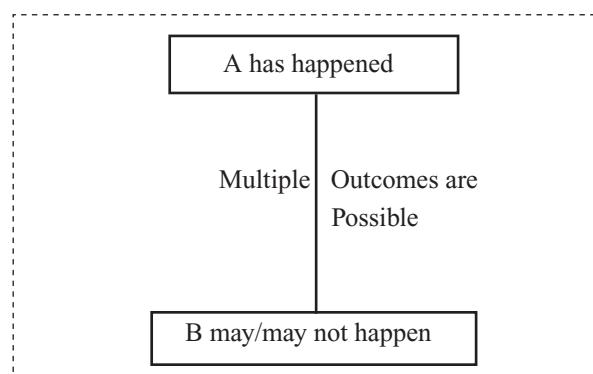
Only if A happens then B happens

Given – A has happened.

Conclusion – B will also happen.

This is an invalid conclusion.

See the diagram for this:



Example 8

- If you die only then you go to heaven.

Given – You have not died.

Conclusion – You will not go to heaven.

This is a valid conclusion.

Example 9

9. If you die only then you go to heaven.

Given – You have died.

Conclusion – You will go to heaven.

This is an invalid conclusion. However, the conclusion “You may go to heaven” is valid.

Sometimes we can even see that two compound statements have been joined with multiple Logical Links. One such statement can be:

If A happens, then B happens. If A does not happen then C happens. So what will be the impact on C if A has happened/A has not happened?

Let us understand this situation with an example:

Example 10

10. If the terrorists’ demands are met, then lawlessness will prevail. And if the terrorists’ demands are not met, then the hostages will be murdered.

Consider the statements given below:

- (i) Lawlessness has not prevailed.
- (ii) The hostages have been murdered.
- (iii) The terrorists’ demands have been met.
- (iv) The terrorists’ demands have not been met.

Which of the following options does not show a proper cause-effect relationship?

- | | |
|------------|-----------|
| (a) i-ii | (b) iv-ii |
| (c) iii-ii | (d) ii-iv |

Let us take the options one by one:

Option (a) i-ii

Since lawlessness has not prevailed (i), it means that the terrorists’ demands have not been met. And if the terrorists’ demands have not been met, then the hostages will be murdered (ii). So, this option shows a valid relationship.

Option (b) iv-ii

Since the terrorists’ demands have not been met, the hostages will be murdered. This is a direct conclusion. So, it is a valid relationship.

Option (c) iii-ii

Since the terrorists’ demands have been met, lawlessness will prevail. Now, from here we cannot deduce that the hostages will be murdered. So, it is not a valid relationship.

Option (d) ii-iv

Since the hostages have been murdered, the terrorists’ demands must not have been met. So, this is also a valid relationship.

Hence option (c) is not a valid cause-effect relationship.

B. Either – or

We use a lot many statements involving “Either– or” as a logical link in our day-to-day life too. In case of reasoning questions also, we see very similar statements with very similar interpretations. However, for a proper understanding, we should be very clear with the structure of these statements. Some of these structured statements are given here under.

There are two situations possible here:

- **Inclusive** It means ‘and/or’ where at least one term must be true or they can both be true simultaneously. This is the case of set $A \cup B$, where any member of this set (A union B) should be present in at least one of the sets.
- **Exclusive** It means one must be true and the other must be false. Both terms cannot be true and both cannot be false.

The popular English language concept of or is often ambiguous between these two meanings, but the difference is pivotal in evaluating the Logical Link questions asked in the CAT.

Understand this argument:

Either P or Q.

Not P.

Therefore, Q is valid and indifferent between both inclusive and exclusive meanings. However, only in the ‘exclusive’ meaning is the following form valid:

Either P or Q (exclusive).

P.

Therefore, not Q.

With the ‘inclusive’ meaning, we cannot draw a definitely true conclusion from the situation given above.

Remember, for the purpose of CAT we have to consider the statements in their ‘exclusive’ sense.

Either A will happen or B will happen

Given – A will happen.

Conclusion – B will not happen

This is a valid conclusion.

Either A will happen or B will happen

Given – A will not happen.

Conclusion – B will happen

This is a valid conclusion.

Either A will happen or B will happen

Given – B will happen.
Conclusion – A will not happen
This is a valid conclusion.

Either A will happen or B will happen

Given – B will not happen.
Conclusion – A will happen
This is a valid conclusion.

Understandably, in case of ‘Either A will happen or B will happen’, not happening of one part ensures the happening of the other part because one of the parts has to be true. Similarly, we should remember that happening of one part ensures ‘not happening’ of the other part.

Summarizing the above discussion,

Either A will happen or B will happen		Validity	Truth-metre
A has happened	B will not happen	Valid	Definitely True
A has not happened	B will happen	Valid	Definitely True
B has happened	A will not happen	Valid	Definitely True
B has not happened	A will happen	Valid	Definitely True

Further, it should be understood that the statement ‘Either A will happen or B will happen’ and statement ‘A will happen or B will happen’ are one and the same.

Example 11

11. Either A is 200 m from B and B is 100 m from C or A is 300 m from C.
- (i) A is 200 m from B and B is 100 m from C.
 - (ii) A is 300 m from C.
 - (iii) A is not 200 m from B and B is not 100 m from C.
 - (iv) A is not 300 m from C.
- Which of the following is an incorrect ordered relationship?
- (a) ii-iii
 - (b) i-iv
 - (c) iii-ii
 - (d) i-iii

Solution

Go through the options.

Option (a) ii-iii

A being 300 m from C ensures that A is not 200 m from B and B is not 100 m from C. So, ii-iii is a correct relationship.

Option (b) i-iv

We definitely have a true pair here as well.

Option (c) iii-ii

Since one of the two statements given in the example has to be true; and in this case one statement is given to be wrong; so, the other statement has to be true.

Hence, if A is not 200 m from B and B is not 100 m from C then the statement A is 300 m from C has to be true.

So, this is a valid conclusion.

Option (d) i-iii

Obviously, this is not true.

PRACTICE EXERCISE 1

1. I will buy the airplane only if it is the costliest and the fastest.
 - (a) I did not buy the airplane and it is neither the fastest nor the costliest.
 - (b) I bought the airplane and it is not the costliest nor is it the fastest.
 - (c) The airplane is the fastest and the costliest and I did not buy it.
 - (d) I bought the airplane and it is the fastest and the costliest.

 2. I work very hard whenever there is a need.
 - (a) I work very hard and there is a need.
 - (b) I did not work hard and there is no need.
 - (c) I did not work hard and there is no need.
 - (d) Both (b) and (c)

 3. I wear a pad every time I bat.
 - (i) I batted.
 - (ii) I didn't bat.
 - (iii) I wore a pad.
 - (iv) I didn't wear a pad.

(a) ii-iv	(b) iii-i
(c) iv-ii	(d) i-iv

 4. I get cold feet whenever I see a lion.
 - (i) I saw a lion.
 - (ii) I didn't see a lion.
 - (iii) I got cold feet.
 - (iv) I didn't get cold feet.

(a) iii-i	(b) ii-iv
(c) iv-ii	(d) ii-iii

 5. Whenever Devdas comes, Umrao Jaan sings.
 - (i) Umrao Jaan is singing.
 - (ii) Devdas has come.
 - (iii) Devdas hasn't come.
 - (iv) Umrao Jaan is not singing.

(a) iii-i	(b) ii-iv
(c) iv-ii	(d) ii-iii

 6. I can see the star only if I go to the planetarium.
 - (i) I went to the planetarium.
 - (ii) I didn't see the star.
 - (iii) I saw the star.
 - (iv) I didn't go to the planetarium.

(a) ii-iv	(b) iv-ii
(c) i-ii	(d) iii-iv

 7. I can find Chinese toys only if I go to the fair.
 - (i) I didn't find Chinese toys.
 - (ii) I found Chinese toys.
-
- (iii) I went to the fair.
 - (iv) I didn't go to the fair.

(a) iii-iv	(b) iii-ii
(c) iii-i	(d) i-iv

 8. I will befriend Som only if he returns my book.
 - (i) I befriended Som.
 - (ii) Som returned my book.
 - (iii) I won't befriend Som.
 - (iv) Som didn't return my book.

(a) ii-i	(b) ii-iii
(c) iv-iii	(d) iii-iv

 9. Only in Bengal, you can see the Bengal Tiger.
 - (i) You went to Bengal.
 - (ii) You didn't go to Bengal.
 - (iii) You saw the Bengal Tiger.
 - (iv) You didn't see the Bengal Tiger.

(a) i-iii	(b) iv-ii
(c) i-iv	(d) ii-iv

 10. You cannot clear the CAT unless you are hard working.
 - (i) You are hard working.
 - (ii) You can clear the CAT.
 - (iii) You are not hard working.
 - (iv) You cannot clear the CAT.

(a) ii-iv	(b) i-iii
(c) iii-iv	(d) i-ii

 11. Amit Kumar is either an engineer or a doctor.
 - (i) Amit Kumar is an engineer.
 - (ii) Amit Kumar is not a doctor
 - (iii) Amit Kumar is not an engineer.
 - (iv) Amit Kumar is a doctor.

(a) i-ii	(b) i-iv
(c) iv-i	(d) ii-iii

 12. Either Raghav is sick or he is stoned.
 - (i) Raghav is sick.
 - (ii) Raghav is not sick.
 - (iii) Raghav is stoned.
 - (iv) Raghav is not stoned.

(a) i-ii	(b) iv-i
(c) i-iii	(d) iii-iv

 13. When I see an RGV movie I have a bad dream.
 - (i) I saw an RGV movie.
 - (ii) I did not see an RGV movie.
 - (iii) I did not have a bad dream.
 - (iv) I had a bad dream.

ANSWER KEYS

1. (d) **2.** (c) **3.** (c) **4.** (c) **5.** (d) **6.** (b) **7.** (d) **8.** (c) **9.** (d) **10.** (c)
11. (a) **12.** (b) **13.** (a) **14.** (d) **15.** (d) **16.** (b) **17.** (c) **18.** (b) **19.** (d) **20.** (b)

HINTS AND EXPLANATIONS

- 1.** If I bought aeroplane, it must be the fastest & the costliest. If I did not buy the aeroplane it is either not the fastest or not the costliest or neither fastest nor the costliest (not necessarily neither fastest nor the costliest). Only option (d) show a feasible case of buying the aeroplane
Correct option is (d)

2. If there is need I will definitely work hard. But, if I worked hard, it does not necessarily mean that there was need. Similarly, if I did not work hard there must not been need else I must have worked hard. So, option (c) show feasible case of not working hard as there is no need
Correct option is (c)

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3. If I wear a pad every time I bat, then it also shows that if I did not wear a pad, I did not bat. So, (ii) follows (iv) logically.

Please note that wearing a pad does not mean I batted. Logic is given other way round, that If I bat, then I wear a pad.

I may wear a pad, but do not bat.

Correct option is (c)

4. If I get cold feet whenever I see a lion, then if I didn't get cold feet, I must not have seen a lion. So, (ii) follows (iv) logically

Correct option is (c)

5. Whenever Devdas comes, Umrao Jaan sings. So, if Devdas has come, Umrao Jaan must be singing. So, (ii) follows (i) logically

Correct option is (d)

6. If I can see a star only if I go to the planetarium, and then if I didn't go to the planetarium, I must not have seen a star. So, (ii) follows (iv) logically

Correct option is (b)

7. If I can find Chinese toys only if I go to the fair, then if I didn't find the Chinese toys, I didn't go to the fair. So, (iv) follows (i) logically

Correct option is (d)

8. If I will befriend Som only if he returns my book, then if he didn't return my book, I won't befriend him. So, (iii) follows (iv) logically

Correct option is (c)

9. If you can see the Bengal tiger only in Bengal, then if you didn't go to Bengal you didn't see the Bengal tiger. So, (iv) follows (ii) logically

Correct option is (d)

10. If you cannot clear the CAT unless you are hardworking, then if you are not hardworking you cannot clear the CAT. So, (iv) follows (iii) logically

Correct option is (c)

11. If Amit Kumar is either an engineer or doctor, then if he is an engineer he cannot be a doctor. So, (ii) follows (i) logically

Correct option is (a)

12. Either Raghav is sick or he is stoned. So, if he is not stoned he must be sick. So, (i) follows (iv) logically

Correct option is (b)

13. When I see a RGV movie I had a bad dream. So, if I did not have a bad dream, I did not see a RGV movie. So, (ii) follows (iii) logically

Correct option is (a)

14. Raju gets a mild flu whenever he eats an ice-cream. So, if he does not get a mild flu he has not eaten an ice-cream. So, (ii) follows (iii) logically

Correct option is (d)

15. Either SRK is angry or he shows mock anger. So, if he does not show mock anger, he is angry. Also, if he is not angry he shows mock anger. So, (i) follows (iv) logically & (ii) follows (iii) logically

Correct option is (d)

16. If whenever my mother scolds me, I either hide behind my father or complain to my grandma. Then, if I did not complain to my grandma & did not hide behind my father, my mother must not have scolded me

Correct option is (b)

17. Either the paper is big or the pencil is small. So, if paper is not big, the pencil must be small. So, (iii) follows (ii) logically

Correct option is (c)

18. Either the lion is not big or the fox is cruel. So, if lion is big, the fox is cruel. Therefore, (iii) follows (i) logically

Correct option is (b)

19. If the milk is not cold then I will not go to the school & will not have dinner. Then, if I had gone to school or I had dinner, the milk is cold

Correct option is (d)

20. Unless you catch the criminals, the crimes will not stop. So, if the criminals have not been caught, the crimes must not have stopped. Therefore, (iv) follows (iii) logically

Correct option is (b)

Chapter

4

SEQUENCING AND ARRANGEMENT

LEARNING Objectives

In this chapter, you will learn:

- Meaning of Sequencing and Arrangement
- Different types of Sequencing and Arrangement questions
- Circular Arrangement
- Approach to solve the questions

In the CAT and other major B-School exams, sequencing and arrangement questions constitute a major portion of the paper. In this chapter, we will discuss sequencing and arrangement both as a skill and as a type of question.

However, throughout this book, other than this chapter, we will be using the word sequencing and arrangement more as a skill, rather than as a type of question.

While discussing the constituents of Logical reasoning in Chapter 2—Developing the Skills, we went through the definitions and interpretations of variables and understood the mechanisms to solve the LR questions. Besides, we covered Sequencing, which is just a part of the whole gamut of solving questions, and the problems of two/three/more than three variables.

We will start from the same place where we left in Chapter 2.

WHAT IS SEQUENCING AND ARRANGEMENT?

Sequencing is the act of putting things in a specific sequence, order or a list. In our day-to-day life too, we

go through many examples of sequencing or arranging things and events such as:

While writing appointments on a calendar or a mobile,

While placing an order in a restaurant—Talumein soup, kebabs, ice cream and finally mocha,

While taking a test and deciding which section is to be attempted first, second and so on.

The only difference between sequencing in our practical life and the LR set will be the fact that the LR set given in the questions will have a prior order of variables. As a student your job will be to find out that order or sequence.

TYPES OF SEQUENCING AND ARRANGEMENT

While a good number of times the statements/conditions given in the LR set will specify the exact positioning of the entities given. However, many a times only the relative positioning of the variables will be given.

1.36 Logical Reasoning

Let us see some examples of such statements:

Context	Statement reads as
Which variables are exactly placed in the sequence?	M is fourth.
Which variables are forbidden from a specific position in the sequence?	M is not fifth.
Which variables are next to, before or immediately preceding or following one another?	M and N are consecutive. A is next to B. No variable comes between A and B. A and B are consecutively in the sequence.
Which variables cannot be next to, before or immediately preceding or following one another?	A does not immediately precede or follow B. A is not immediately before or after B. M and N are not consecutive in the sequence.
How far apart in the sequence are two particular variables?	Exactly two people come between A and B.
What is the relative position of A and B in the sequence?	A comes before B in the queue. M comes after N in the queue.

In the above given examples, we observe two types of sequencing:

Strict Sequencing and Arrangement

In these kinds of sequencing, relative positioning of the variables will be almost fixed. These are the rules which give us the exact position of the variables.

Example

Directions for questions 1 to 3: Read the following passage below and solve the questions based on it.

During the summer placements at MU, which will run for a single week in June starting from Monday through Friday; Due North Inc. will interview three applicants Omkara, Tyagi, and Keshu. Exactly five interviews will be conducted in this week long schedule with strictly one interview per day.

Further information about the schedule of the interviews is as follows:

- Each applicant is interviewed at least once.
- Omkara is interviewed twice on two consecutive days.
- Tyagi has to meet his girl friend Billo on Wednesday, therefore he cannot be interviewed on Wednesday.
- Keshu is not interviewed on Friday as he has to go to meet Dolly who is Omkara's wife.
- If Tyagi is interviewed on Monday then Keshu must be interviewed on Tuesday.

1. Which out of the following week's schedule could be true?
 - (a) The person who is interviewed on Tuesday is also interviewed on Thursday.
 - (b) The person who is interviewed on Wednesday is also interviewed on Friday.
 - (c) The person who is interviewed on Monday is also interviewed on Tuesday.
 - (d) Tyagi is interviewed on Monday and Thursday.
2. If in addition to Omkara, one more person is interviewed on two consecutive days, then which of the following could be true?
 - (a) Tyagi is interviewed on Monday and Omkara is interviewed on Wednesday.
 - (b) Tyagi is interviewed on Tuesday and Friday.
 - (c) Tyagi is interviewed on Tuesday and Omkara is interviewed on Friday.
 - (d) Keshu is interviewed on Tuesday and Omkara is interviewed on Thursday
3. If the week's interview schedule has the same applicant scheduled for Monday and Thursday then on which day must Tyagi be interviewed?
 - (a) Monday
 - (b) Tuesday
 - (c) Wednesday
 - (d) Friday

Solution

Scenario

There are three applicants—Omkara (O), Tyagi (T) and Keshu (K) and they are to be interviewed for five interviews, Monday through Friday. Looking at the given limitations of exactly one interview per day and with only three applicants for five interviews, some of the applicants must be interviewed more than once.

Rules

The interviews are conducted one per day starting on Monday through Friday. Hence sketch a weekly schedule with five spaces first.

M	T	W	T	F
—	—	—	—	—

The first condition says each applicant will be interviewed at least once. The next condition says Omkara is interviewed on two consecutive days—lets have an OO block for two consecutive days. The next two conditions tell about the days on which Tyagi and Keshu cannot be interviewed; mark this information in your diagram. The last condition says that if Tyagi is interviewed on Monday, Keshu must be interviewed on Tuesday.

T (MON) then – K (TUE)

The OO block for Omkara is the only big restricting factor present here. There is nothing that stops its placement on any particular pair of days in the schedule. But since Omkara is interviewed on exactly two days and Tyagi and Keshu are each to be interviewed at least once, you have four out of the five entities. The fifth interview will go to either P or S.

If Tyagi is interviewed on Monday, Keshu is interviewed on Tuesday, then Omkara will be interviewed either on Wednesday-Thursday or Thursday-Friday. Hence, one thing is sure that Omkara is definitely interviewed on Thursday. And if any of this does not happen, then it means that Tyagi won't be interviewed on Monday.

T (MON) then – K (TUE)

Mon	Tue	Wed	Thu	Fri
T		K	O	O
—	—	—	—	OO

1. (c)

To find out the ‘could be true’ statements, we should eliminate the options that must be false.

Option (a) does not allow to place the pair of days for Omkara anywhere, so it can't be true.

Option (b) cannot be true either: Tyagi is not interviewed on Wednesday and Keshu is not

interviewed on Friday, the only applicant who can be interviewed on both Wednesday and Friday is Omkara, but his two interviews must happen on consecutive days.

Option (d) also can't be true; if Tyagi is interviewed on Monday, we have already concluded that Omkara will be interviewed on Thursday. Only option (c) could be true.

2. (d)

According to the conditions given in the question, besides an OO block, we will have either a TT block or a KK block.

Going through the options:

Option (a) suggests that if Tyagi is on Monday, then Keshu has to be on Tuesday. But with Keshu on Tuesday and Omkara on Wednesday and Thursday, we don't have the consecutive days block left either for PP or SS, so option (a) is ruled out.

Option (b) cannot be the answer because here Tyagi is interviewed on two non-consecutive days, and that stops every body besides Omkara to go on two consecutive days.

Option (c) Omkara is on Friday, so he is interviewed on Thursday also. Since both Keshu and Omkara can't go on Wednesday (using condition 3) Keshu must be interviewed on Wednesday. Taking Tyagi on Tuesday, he must be the second person to be interviewed on two consecutive day—Monday and Tuesday. But if we put Tyagi on Monday then Keshu should be interviewed on Tuesday.

So option (c) cannot be the answer.

Option (d) is the only option left out, so this has to be the answer.

If Keshu is on Tuesday and Omkara is on Thursday, then Keshu can be on Monday and Omkara can be on Wednesday. Now Tyagi can be interviewed on Friday.

M	T	W	T	F
Keshu	Keshu	Omkara	Omkara	Tyagi

3. (d)

If the same applicant is to be scheduled for both Monday and Thursday, then it can't be Omkara, who must have the interview on two consecutive days. It can't be Tyagi too, because Tyagi on

Monday and Omkara on Thursday is not an acceptable set. So it must be Keshu. Now, Monday and Thursday are taken up by Keshu, then Omkara must be interviewed on Tuesday and Wednesday (the only consecutive days left). Hence Tyagi must be on Friday. Option (d) is correct.

Loose Sequencing and Arrangement

In this kind of sequencing, the data given will tell us the relative positioning of one variable with respect to the other variable; without giving the exact position.

Example

Directions for questions 4 to 5: Read the following passage and solve the questions based on it.

Eight parties—Forward Block, Hindustan Party, Janta Party, Lokmat, New Socialist party, Praja party, Socialist party and TDP, contested in the last general election. The number of seats won by these parties vary largely. While announcing the final results, The election commission expressed the following observation regarding the number of seats won by these parties in terms of their popularity (the more the popularity, the more is the number of seats won by the party and vice-versa).

(While doing the ranking, take the first to be being the party with the maximum seats won and the eighth to be the party with minimum seats won.)

- (i) No two parties won the same number of seats.
- (ii) The Socialist party and the Forward block are each less popular than the TDP.
- (iii) The Socialist party is more popular than the Janta party.
- (iv) The Lokmat and the New Socialist party are each less popular than the Forward block.
- (v) The Hindustan party and the Lokmat are each less popular than the Janta party.
- (vi) The Praja party is less popular than the Lokmat.
- (vi) The Praja party is not the eighth in rank.

Scenario

When planning the diagram for the sequencing first, decide if it should be drawn horizontally or vertically. To draw the diagram here, we will think of the rankings in terms of top to bottom.

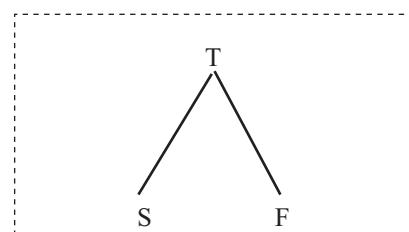
Unlike the problems done in the strict sequencing section, writing 1 to 8 or creating eight spaces will

not serve the purpose owing to the fact that no exact information regarding the positioning of variables e.g., (The Praja party is not eighth) is given.

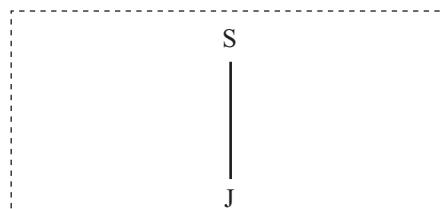
Rules

Start visualizing. Let us name each party with its first letter as in the Forward Block is F etc.

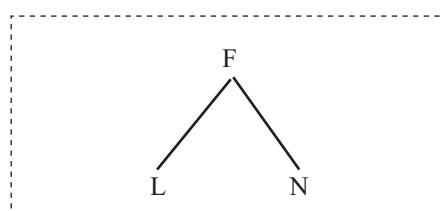
The first condition states that S and F are both less popular than T. Here we don't know anything about the space between these two entities, just the order. Draw T above both S and F by keeping in mind that nothing is said about the relationship between S and F.



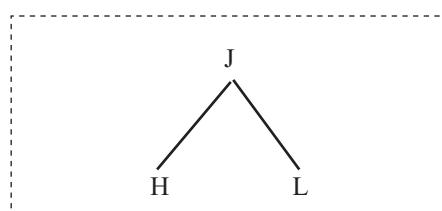
The second condition: S is more popular than J



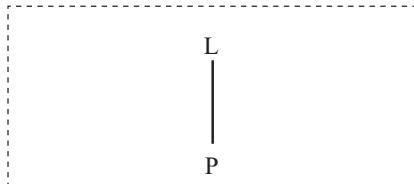
Next condition: Both L and N are less popular than F



Next condition: Both H and L are below J

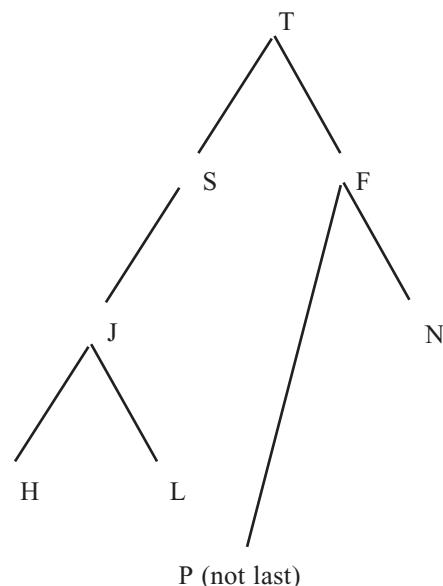


Next condition: P is less popular than L



Last condition: P is not the eighth. " $P \neq 8$ " or " P is not the last"

Let us now start joining the information. If we connect S from condition 2 to condition 1, this is exactly what we get:



After joining the rules, we have the relationship between more parties.

Which is higher, F or P? Of course F is higher, and we know we can determine the relationship between them because we can travel from one to the other in one direction.

FLAW DETECTOR—Now have a look at F and H. Can we say that F is higher than H? The answer is No. It is all because of the fact that to go from F to H, we would have to “travel” along the tree in more than one direction (first up then down, or first down then up). By doing this there is no definite relationship. F could be ranked higher than H or H could be higher than F. Which party is ranked last? Either H or N.

Lets now consider the questions.

4. Which of the following could be the order of the parties listed from winning the maximum number of seats to the minimum number of seats?

- (a) T, F, S, L, J, N, P, H
- (b) S, T, F, N, J, L, P, H
- (c) T, S, J, H, F, P, L, N
- (d) T, S, J, F, L, N, P, H

(All the parties are being denoted by their first letter).

4. (d)

To start with, this could be seen as the complete and accurate list, since all parties are taken into consideration in each answer choice.

Now, start going through the options.

Apply each condition to the given options. Option (b) violates condition (i) by making S more popular than T, therefore option (b) must be incorrect. Condition (ii) and (iii) don't help eliminate any options, but (a) violates condition (iv) by making L more popular than J, and is hence incorrect. Option (c) gives P a higher popularity than L, a violation of condition (v). We have eliminated three options. So the remaining option D has to be the correct answer.

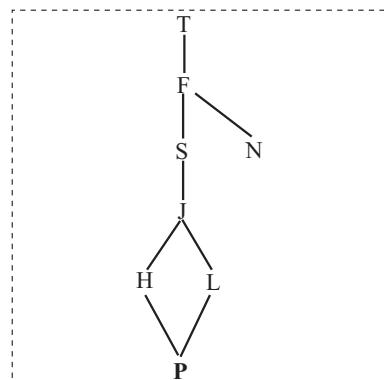
5. If the Forward block is more popular than the Socialist Party and the Hindustan party is more popular than the Praja Party, then which of the following must be true of the number of seats won by different parties in the election?

- (a) The Hindustan Party is sixth.
- (b) The Lokmat is sixth.
- (c) The Lokmat is seventh.
- (d) The New Socialist Party is eighth.

5. (d)

Let us again use the first letter of the parties as their symbol.

This “if” question places two additional conditions on the order of popularity. The first condition places F above S. The second condition places H above P. Redraw your sketch to incorporate these new conditions:



Going through the options against the backdrop of the introduction of new facts like F is assigned to position 2 and the elimination of H as a possibility for the last position (leaving only N available for that slot) in the new sketch, option (d) is correct. Since both H and L could be in the sixth position, (a) and (b) don't have to be true, although these are probably true. Also, if L is placed at the seventh position, then P would have to be in the last position. And this violates the last condition, making option (c) incorrect.

Circular Arrangement

The Circular Arrangement questions are not necessarily the questions regarding a situation where we need to make the seating arrangement around a circular table. It can be a rectangular table or even a hexagonal table. We should understand Circular Arrangement as an arrangement having a closed loop.

This can be understood with the following diagrams also:

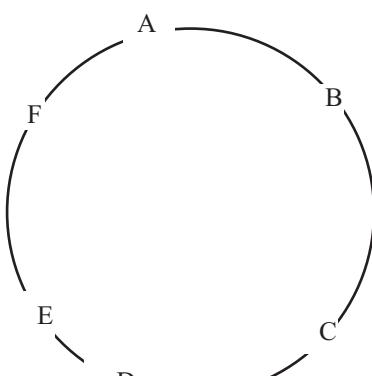


Figure 1

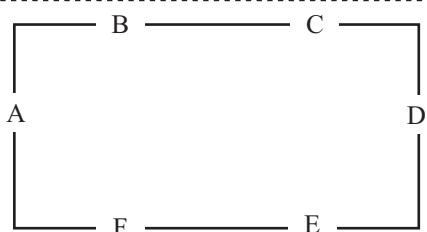


Figure 2

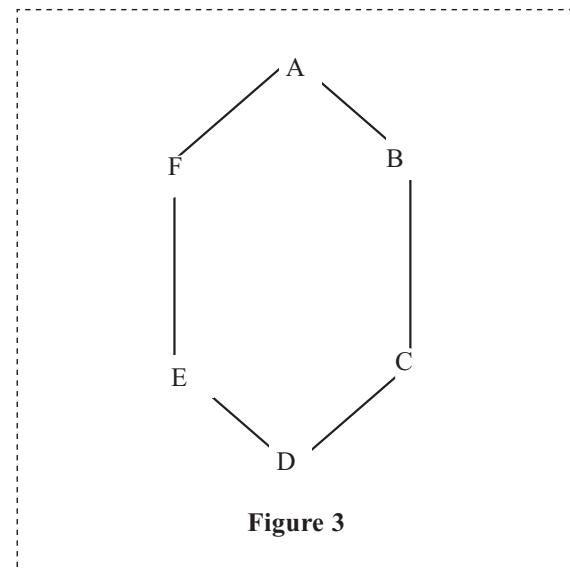


Figure 3

The above given diagrams might appear to us as three different structures/arrangements. However, there would be a minimal difference in the descriptions given for the above situations. In all the diagrams, we find the following things common:

- A is sitting opposite to D.
- B is sitting on the immediate left of A.
- E is sitting in between F and D.

Now if we go on to making the diagrams pertaining to the details given, we will be clueless about the kind of the diagram which is going to be formed.

If we form the question as—A, B, C, D, E and F are sitting around a circular table... → We would be using fig. 1.

If we form the question as—A, B, C, D, E and F are sitting around a rectangular table..... → We would be using fig. 2.

If we form the question as—A, B, C, D, E and F are sitting around a hexagonal table..... → We would be using fig. 3.

Similarly, we might be using a totally different arrangement in accordance with the given statements.

However, one thing that should be very clear in our mind is that, in any circular arrangement, whatever be the structure, the loop should be closed.

Example

Directions for questions 6 to 7: Read the following passage and solve the questions based on it.

Five leaders from undivided India—Pt Nehru (P), M.K. Gandhi (M), Rajendra Prasad (R), Subhash Chandra Bose (S) and Tyagi (T) participated during the 2nd Round Table Conference at London in 1930.

It was noted that Pt Nehru sat two seats to the left of Rajendra Prasad and M.K. Gandhi sat two seats to the right of Rajendra Prasad.

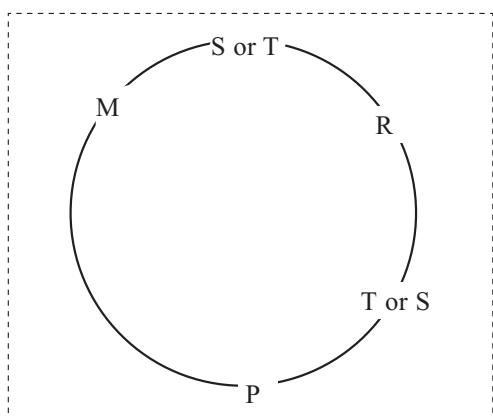
Solutions

Scenario

There are five leaders and five sitting positions.

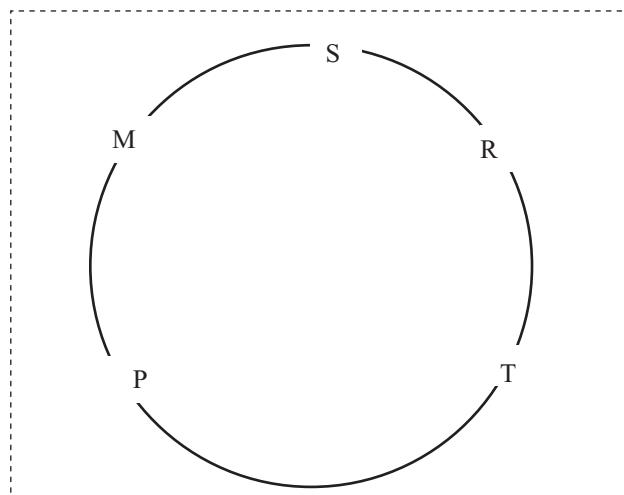
Rules

Pt Nehru sat two seats to the left of Rajendra Prasad and M.K. Gandhi sat two seats to the right of Rajendra Prasad. Let us see this with the help of a diagram:



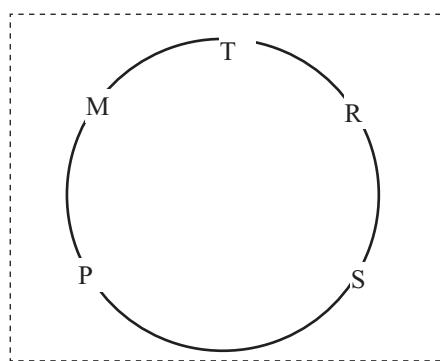
6. (a)

If Subhash Chandra Bose sat between M. K. Gandhi and Rajendra Prasad, then the arrangement would be as follows:



It is obvious from the above given diagram that Tyagi sat to the immediate right of Pt Nehru. Hence option (a) is the answer.

7. (b) If Subhash Chandra Bose did not sat next to M K Gandhi, then the seating arrangement would be as follows:



Hence, option (b) is the answer.

PRACTICE EXERCISE 1

Directions for questions 1 to 4: Read the following passage and solve the questions based on it.

Directions for questions 5 to 8: Read the passage and solve the questions based on it.

- (i) There are six different DVDs of different movies P, Q, R, S, T and U. These DVDs are kept one above the other on a shelf and belong to six different people—A, B, C, D, E and F. It is not necessary that the orders of these DVDs and persons are the same.
 - (ii) The DVD of movie Q is kept between the DVD of movie P and T and the DVD of movie S is kept between the DVD of movie P and U. The DVD of movie R is immediately above the DVD of movie T.
 - (iii) C's DVD is kept on the top. A does not have the DVDs of movies T and S. The DVD of movie P belongs to F. The DVD of movie U belongs neither to B nor to A. D's DVD is kept at the bottom

Directions for questions 9 to 13: Read the following passage and solve the questions based on it.

A, B, C, D, E, F and G are seven persons who travel to office everyday by a particular train which stops at five stations 1, 2, 3, 4 and 5 respectively after leaving its base station.

12. After how many stations does E get down?

- (a) One (b) Two
 (c) Three (d) Four

13. At which station, maximum people get down?

- (a) 2 (b) 5
 (c) 3 (d) 4

Directions for questions 14 to 17: *Read the following passage and solve the questions based on it.*

Three men (Tom, Peter and Jack) and three women (Eliza, Anne and Karen) are spending a few months at a hillside. They are to stay in a row of nine houses, which are facing north, each one living in his or her own house. There are no others staying in the same row of houses. Following are the details given regarding each of their houses:

- (i) Anne, Tom and Jack do not want to stay in any house, which is at the end of the row.
 - (ii) Eliza and Anne are unwilling to stay beside any occupied house.
 - (iii) When Karen, Peter and Jack stand facing north, Karen finds that houses of both Peter and Jack are on her left-hand side.
 - (iv) Between Anne and Jack's house there is just one vacant house.
 - (v) None of the girls occupy adjacent houses.
 - (vi) The house occupied by Tom is next to the house at the end.
 - (vii) House of P is at one of the ends.
 - (viii) Tom is beside Peter.
14. Which of the above statements can be said to be redundant?
- (a) Point (i) (b) Point (ii)
 (c) Point (iii) (d) Point (v)

15. How many of them occupy houses beside to a vacant house?

- (a) 2 (b) 3
 (c) 4 (d) 5

16. Which among these statement(s) is/are definitely true?

- I. Anne is between Eliza and Jack.
- II. At the most four persons can have occupy houses on either side of them.
- III. Tom stays beside Peter.

- (a) I
 (b) II
 (c) I and III
 (d) II and III

17. If we number all the houses from 1 through 9 and assign the house of P as number 1, then house number/s of how many people can NOT be definitely ascertained?

- (a) 0 (b) 1
 (c) 2 (d) 3

Directions for questions 18 to 20: *Read the following passage and solve the questions based on it.*

Mr Sinha has six children—Pankaj, Ravi, Santosh, Tipu, Vikash and Prakash. They all were born on 13th November, but each was born in a different year, during six consecutive years. It is also known that

- (i) Pankaj is elder to Santosh.
- (ii) Ravi is elder to both Tipu and Vikash.
- (iii) Prakash is two years older than Tipu.
- (iv) Pankaj was born either in the year 2002 or 2003.
- (v) The oldest member of the group was born in the year 2000.

18. Which of the following could be a correct list of the group, from the youngest to the oldest?

- (a) Santosh, Pankaj, Ravi, Tipu, Vikash, Prakas
 (b) Santosh, Vikash, Pankaj, Tipu, Prakash, Ravi
 (c) Santosh, Vikash, Tipu, Prakash, Pankaj, Ravi
 (d) Santosh, Vikash, Tipu, Pankaj, Prakash, Ravi

19. If Pankaj was born in 2002, then which of the following is definitely true?

- (a) Ravi was born in 2000.
 (b) Prakash was born in 2001
 (c) Santosh was born in 2003
 (d) Vikash was born in 2003

20. If Prakash is the eldest child, then which of the following is definitely true?

- (a) Ravi was born in 2001
 (b) Tipu was born in 2001
 (c) Santosh was born in 2004
 (d) Pankaj was born in 2004

ANSWER KEYS

- 1.** (c) **2.** (d) **3.** (d) **4.** (b) **5.** (a) **6.** (d) **7.** (c) **8.** (b) **9.** (c) **10.** (d)
11. (d) **12.** (d) **13.** (b) **14.** (d) **15.** (c) **16.** (c) **17.** (a) **18.** (d) **19.** (a) **20.** (a)

HINTS AND EXPLANATIONS**1 to 4**

Room	Person
A	-
B	-
C	-
D	-
E	-
F	-

From (iii) and the other given facts, two women will live in room C.

From (iii) and (iv), P will live in room E.

From (v) and (iii), S will live in room A with R (because P will live alone). From (vi) and (iii), X will live in room F.

Hence Q and T will live in room C.

Now the whole scene looks like this:

Room	Person
A	S, R
B	U/W
C	Q, T
D	W/U
E	P
F	X

5 to 8

From (ii)

P	T
Q	Q
T	P
P	U
S	S
U	P

From the last sentence of (ii), only one possibility remains

R
T
Q
P
S
U

Now, using (iii) and the above derived result:

R	C
T	E/B
Q	A
P	F
S	B/E
U	D

9 to 13

Persons traveling are: A, B, C, D, E, F and G.

Stations are base station, station 1, station 2, station 3, station 4, and station 5.

Using information (i), (iv), (v), (vi), (vii), (viii) and (x)

Station	Get on	Get down
Base station	---	× × ×
1		× × ×
2	× × ×	
3	Only G	B, D
4	A	Only E
5	× × ×	A, G, C

Using (ii) F gets down at station 2 and he got on either at the base station or at station 1.

Now, since F got down at station 2 and he had got on with C, it means that both C and F got on either at the base station or at station 1.

Again, since B and D get down at station 3, this means they too got on either at the base station or at station 1.

It is given that E got on with two other persons i.e., in a group of three persons. Obviously, E got on at the base station.

Summarizing the whole information:

Station	Get on	Get down
Base Station	E and (C, F) or (B, D)	× × ×
1	(C, F) or (B, D)	× × ×
2	× × ×	Only F
3	Only G	B, D
4	A	Only E
5	× × ×	A G C

14 to 17

The first thing that we should do is make nine houses (symbols) in a row:

Now try to find out the information that we are sure about:

- T is in either house 2 or house 8.
- A/T/J cannot be in house 1 or 9.
- Houses beside E and A have to be unoccupied.

- House numbers of P and J have to be less than the house number of K, i.e., the order should be PJK or JPK, not necessarily together.
- There are six people and 9 houses to be occupied by them.

Using point 5, 3 houses have to be vacant. It is possible only if neither E nor A are at the ends or else E is at one of the ends and the difference in the houses of E and A is more than 1.

Understand this—

If both of them are at the ends—

E	Vacant	3	4	5	6	7	Vacant	A
-	-	-	-	-	-	-	-	-

Well, this is otherwise also not possible because it violates condition (i) given in the question. In this case, only two houses are vacant.

If one of them is at the ends—

E	Vacant	3	4	5	6	7	8	9
-	-	-	-	-	-	-	-	-

If E is at 1 and A is anywhere from 4 to 8, then the total number of vacant houses = 3, but if E is at 1 and A is at 3, then only two houses will be vacant.

Now start taking the positions:

P	T	Vacant	E	Vacant	A	Vacant	J	K
-	-	-	-	-	-	-	-	-

- We have not referred to statement (v) till now, therefore it is the redundant statement.
- Obviously, four people are living beside a vacant house.

18 to 20

- This question is a typical example of the kind of questions which can be solved without actually making the whole diagram. Let us see:

Using the second statement (Ravi is elder to both Tipu and Vikash), we can eliminate option (a) Using the third statement (Prakash is two years older than Tipu), we eliminate (b) and (c). We are left with (d), which must be correct.

- This question can also be solved without using a diagram, however for the sake of discussing the solution, let us consult a diagram.

2000	2001	2002	2003	2004	2005
Prakash	Pankaj	Tipu			
Pankaj	Prakash	Tipu			

1.46 Logical Reasoning

Using statement (iii), Prakash is two years older than Tipu. Using the diagram, the only possible places which Prakash and Tipu can have are either 2003 and 2005 or 2001 and 2003.

Using statement (i), Pankaj is elder to Santosh, so the only possible place left for Santosh is 2004.

Using Statement (ii), Ravi is elder to Tipu and Vikash. Hence, the only place left for Ravi is 2000.

20. Using the diagram once again

2000	2001	2002	2003	2004	2005
------	------	------	------	------	------

Prakash	Tipu	Pankaj
---------	------	--------

Assuming Prakash to be the eldest in the group, he must have been born in 2000, that means Tipu was born in the year 2002.

Hence, we can conclude that Pankaj was born in 2003. Now using statement (ii), Ravi was elder to both Tipu and Vikash. Hence Ravi must have been born in 2001 and Vikash in either 2004 or 2005.

PRACTICE EXERCISE 2

Directions for questions 1 to 3: *Read the following passage and solve the questions based on it.*

In an obsession with the letter P, a person named all his sons starting with P.

- (i) These are the six names—Pailashanand, Pamleshanand, Punalanand, Pedaranand, Parananand, Pamalanand.
- (ii) Pailashanand is not the heaviest while Pedaranand is not the most handsome.
- (iii) The lightest of the group is the most handsome of the group.
- (iv) Pamleshanand is more handsome than Pamalanand, who is more handsome than Parananand.
- (v) Pailashanand is less handsome than Pamalanand but is heavier than Pamalanand.
- (vi) Pamleshanand is lighter than Parananand but heavier than Punalanand.
- (vii) Parananand is more handsome than Pailashanand while Pamalanand is heavier than Parananand.

1. Who is the heaviest of the group?
 - (a) Pailashanand (b) Pedaranand
 - (c) Pamleshanand (d) Pamalanand
2. What is the rank of Pamalanand in the decreasing order of weight?
 - (a) Third (b) Fourth
 - (c) Fifth (d) Second
3. Who is most handsome?
 - (a) Pamleshanand (b) Pedaranand
 - (c) Pamalanand (d) Punalanand

Directions for questions 4 to 7: *Read the following passage and solve the questions based on it.*

In the recent fashion show LFW, seven fashion designers presented their clothes to the viewers. Names of the fashion designers have been withheld due to security reasons, however to identify their clothes it has been decided that the first letter of their names will be used for their outfits. The names of the different fashion designers:

C, L, W, G, D, J, and S. Outfits made by these designers have been placed in a row in the following order:

- (i) S is placed on the immediately left of C.
- (ii) C is fourth to the left of D.
- (iii) L is between G and W.

- (iv) D, which is the third to the right of G, is at one of the ends.
- 4. How many outfits have been placed between J and G?
 - (a) 4 (b) 3
 - (c) 2 (d) 1
- 5. What is the position of C?
 - (a) Second to the left of L
 - (b) Second to the left of W
 - (c) Third to the left of G
 - (d) Between S and J
- 6. Which two outfits are at the two ends?
 - (a) S and D (b) S and W
 - (c) J and W (d) J and D
- 7. Which of the following is not true?
 - (a) S and C are consecutively placed.
 - (b) J is at one of the ends.
 - (c) There are two outfits between C and W.
 - (d) Positions of J and W are interchangeable.

Directions for questions 8 to 11: *Read the following passage and solve the questions based on it.*

- (i) A, B, C, D, E, F and G are seven members of a family standing in a row (not necessarily in the same order) facing a particular direction.
- (ii) C and B have as many members between them as G and C have between them.
- (iii) D, who is 3rd from the extreme left, is 3rd to the left of E.
- (iv) A and D are neighbours and F and C are neighbours.
- 8. Which of the following statements may be false?
 - (a) A is 3rd to the left of F
 - (c) D is 3rd to the left of E
 - (b) F is 3rd to the right of A
 - (d) B is 3rd to the left of C
- 9. Which of the following statements is true?
 - (a) C and E are neighbours
 - (b) E is to the immediate left of F
 - (c) C is to the immediate left of D
 - (d) A is to the immediate left of D
- 10. Who is at the extreme right?
 - (a) G
 - (b) B
 - (c) E
 - (d) Data inadequate

1.48 Logical Reasoning

11. Which of the following gives two pairs of neighbours?

 - (a) A, C and D, C
 - (b) A, B and E, G
 - (c) D, C and E, F
 - (d) C, F and C, E

12. In the last question, who among the following has the least chance of getting selected?

 - (a) Pankaj
 - (b) Jatin
 - (c) Robin
 - (d) Dinkar

Directions for questions 12 to 16: Read the following passage and solve the questions based on it.

Five students—Pankaj, Jatin, Robin, Dinkar and Rahul went for the Group Discussion (GD) and the (Personal Interview) (PI). The panel judged these five students and gave them rankings for the GD and the PI in a descending order. Rahul, who was ranked first in the GD, was last in the PI. Robin had the same ranking in both and was just above Rahul in the PI. In the GD, Pankaj was just above Dinkar but in the PI he was in the middle, after Jatin.

Directions for questions 17 to 20: Read the following passage and solve the questions based on it.

ANSWER KEYS

- 1.** (b) **2.** (a) **3.** (d) **4.** (c) **5.** (a) **6.** (d) **7.** (d) **8.** (d) **9.** (d) **10.** (d)
11. (c) **12.** (d) **13.** (b) **14.** (b) **15.** (d) **16.** (c) **17.** (d) **18.** (b) **19.** (c) **20.** (c)

HINTS AND EXPLANATIONS

1 to 3

In this set, we will need to make two series—one for comparing beauty and the other for comparing weights. From (iv) and (vii), we can deduce the series for comparing beauty as

Pamleshanand > Pamalanand > Parananand > Pailashanand

From (v), (vi) and (vii), we deduce the series for comparing as

Pailashanand > Pamalanand > Parananand > Pamleshanand > Punalanand.

Further, since Pailashanand is not the heaviest in the group (ii), Pedaranand has to be heavier than Pailashanand. Thus, the series for comparing weights will be Pedaranand > Pailashanand > Pamalanand > Parananand > Pamleshanand > Punalanand.

⇒ Punalanand is lightest in the group and hence, the most handsome (iii).

Therefore the series for comparing beauty will be

Punalanand > Pamleshanand > Pamalanand > Parananand > Pailashanand.

From (ii), we can say that Pedaranand is less handsome than Punalanand.

4 to 7

Using the first condition—S is on the immediate left of C, i.e., S C

Using the second condition—There are three outfits between C and D. C D

Using the third condition—

G L W or W L G

Using the fourth condition—There are 2 outfits between G and D, these should be L and W and this arrangement satisfies the second condition too.

C G L W D

Using the result from the first condition:

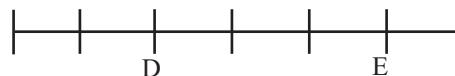
S C G L W D

As D is at one corner, J must be at the second corner as there is no empty space anywhere else. So the complete arrangement is:

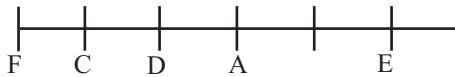
J S C G L W D

8 to 11

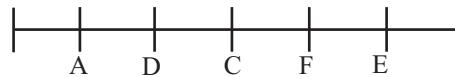
From (iii)



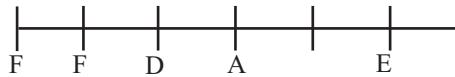
Combining (iii) and (iv), we get the following arrangements:



or



or



So, the possible arrangements are:

GADC FEB

or

BADCFEG.

8. Because position of B is not fixed.
11. As the position of B and G are not fixed, option b is not definitely true.

12 to 16

	GD	PI
Pankaj	2	3
Jatin	5	2
Robin	4	4
Dinkar	3	1
Rahul	1	5

17 to 20

Using the information given,

$$\text{GFE} \quad \dots \text{(iii),}$$

Now statements (v) and (vi) may be combined as:

$$\text{AC} - \text{--- EH} \quad \dots \text{(vii)}$$

$$\text{Or} \quad \text{CA} - \text{--- HE} \quad \dots \text{(viii)}$$

But (viii) is not possible because it violates statement (iv).

Combining (iii) and (vii), we get

$$\text{AC} - \text{GFEH} \quad \dots \text{(viii)}$$

Now, from statement (ii) and deduction (viii), we get

$$\text{ACB} - \text{GFEH} \quad \dots \text{(ix)}$$

This blank can be filled by 'D', hence the arrangement is ACBDGFEH.

- 20.** Two persons are sitting between all the four pairs, but in three of them it is clockwise and one of them is having it in anti-clockwise.

Chapter

5

SERIES

LEARNING Objectives

In this chapter, you will learn:

- Different types of series
- Methods to solve the questions
- Approach building

Questions from this topic are frequently asked in exams like XAT/SNAP/MAT etc., and Campus Recruitment Examinations.

‘Series’ questions expect students to analyse the pattern, and extrapolate on the basis of the rule or pattern identified. There are different types of rules in a series. Some of these are listed below:

The Prime Number Series

Prime numbers have only two distinct factors like 2, 3, 5, 7, 11, 13, 17.... Occurrence of these numbers does not follow any particular rule.

Examples

- (a) 3, 5, 7, 11, 13, 17, _____

Rule – Series contains a prime number series will have the next number as 19.

- (b) 5, 7, 10, 15, 22, _____

Rule – Series contains the difference between two successive numbers is 2, 3, 5, 7 and so on, which are prime numbers. Hence the next number of

the series will be 22 (the last given number) + 11 (the next prime number) = 33.

- (c) 4, 9, 25, 49, 121, _____

Rule – Series is the squares of the prime numbers. $(2)^2 = 4$, $(3)^2 = 9$ and so on. Hence the next number will be 169 which is $(13)^2$.

- (d) 1, 5, 14, 39, 88, _____

Rule – Difference between two consecutive numbers of the given series is the squares of prime numbers. Hence the next number will be $88 + 121 = 209$.

The Difference Series

In these types of series, pattern would be obtained by finding the difference between terms. Differences are categorized as 1st order difference, 2nd order difference, 3rd order difference and so on.

What is the “Order of Difference”:

Let us understand this with the help of some examples:

1st order difference is the difference between two consecutive terms of the series. If 1st order difference is constant, then general term of the series will be a linear equation.

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$$\text{1st order difference} \rightarrow \begin{array}{ccccccc} 2 & 5 & 10 & 17 & 26 & 37 \\ \downarrow 3 & \downarrow 5 & \downarrow 7 & \downarrow 9 & \downarrow 11 & \downarrow \end{array}$$

2nd order difference is the difference between the consecutive terms obtained from the 1st order difference. If 2nd order difference is constant, then general term of the series will be a quadratic equation.

$$\begin{array}{ccccccc} \text{1st order difference} & \rightarrow & 2 & 5 & 10 & 17 & 26 & 37 \\ \downarrow 3 & \downarrow 5 & \downarrow 7 & \downarrow 9 & \downarrow 11 & \downarrow & \downarrow \\ \text{2nd order difference} & \rightarrow & \downarrow 2 & \downarrow \end{array}$$

And so on, 3rd order difference will be difference between the consecutive terms obtained from the 2nd order difference. If 3rd order difference is constant, then general term of the series will be a cubic equation.

$$\begin{array}{ccccccc} \text{1st order difference} & \rightarrow & 2 & 5 & 10 & 17 & 26 & 37 \\ \downarrow 3 & \downarrow 5 & \downarrow 7 & \downarrow 9 & \downarrow 11 & \downarrow & \downarrow \\ \text{2nd order difference} & \rightarrow & \downarrow 2 & \downarrow \\ \text{3rd order difference} & \rightarrow & \downarrow 0 & \downarrow \end{array}$$

Since in the series 2, 5, 10, 17, 26, 37 – 2nd order difference is constant, hence the general term of this series is a quadratic equation. We can also conclude that if 2nd order difference is constant, then general term of the series cannot be linear equation.

Rule followed here = $(n^2 + 1)$. Hence next term = $7^2 + 1 = 50$. In general, we can find out any term of this series by putting the value of n. For example, 10th term will be $10^2 + 1 = 101$.

How to identify the general rule

For this series, 2nd order difference is constant. Hence general term will be a quadratic equation.

Let us assume that the general term for n^{th} term = $an^2 + bn + c$.

$T_1 = a + b + c$ (we obtain this by putting $n = 1$ in $an^2 + bn + c = 2$ (as given in the question) ... (1)

$T_2 = 4a + 2b + c$ (we obtain this by putting $n = 2$ in $an^2 + bn + c = 5$... (2)

$T_3 = 9a + 3b + c$ (we obtain this by putting $n = 3$ in $an^2 + bn + c = 10$... (3)

Now, we have three variables and three equations. To solve further, we would 1st eliminate one variable keeping the equations in two variable. Then, we would have two simultaneous equations in two variables

Subtract equation (1) from equation (2):

$$\begin{array}{r} 4a + 2b + c = 5 \\ - a + b + c = 2 \\ \hline 3a + b = 3 \end{array}$$

Subtract equation (1) from equation (3):

$$\begin{array}{r} 9a + 3b + c = 10 \\ - a + b + c = 2 \\ \hline 8a + 2b = 8 \end{array}$$

Now we obtain two new equations in two variables:

$$3a + b = 3 \quad \dots(4)$$

$$8a + 2b = 8 \text{ OR } 4a + b = 4 \quad \dots(5)$$

Solving (4) and (5) gives:

$$a = 1, b = 0, c = 1$$

$$\text{Hence general term } n^{\text{th}} \text{ term} = an^2 + bn + c = n^2 + 1$$

Examples:

- (a) 8, 16, 24, 32, 40, _____
In this series, the difference between two successive terms is same i.e., 8. Hence the next number in the series will be $40 + 8 = 48$.
- (b) 6, 13, 27, 55, 111, _____
In this series, the difference between two consecutive numbers is 2, 4, 6, 8... Hence the next term will be 33.
- (c) 13, 14, 18, 27, 43, _____
Difference between the two successive terms are 1, 4, 9, 16, 25, etc., which are the squares of 1, 2, 3, 4, 5... Hence the next term of the series will be $43 + 25 = 68$

The Product Series

A series is called a product series when the term is obtained by multiplying by a constant or any other number.

Examples

- (a) 3, 12, 48, 192, 768, _____
In this series, multiplying the previous term by four gets each next term. Hence the next term will be obtained by multiplying 768 by 4. The term will be 3072
- (b) 3, 6, 18, 90, 630, _____
Here the numbers are being multiplied by consecutive prime numbers i.e., 2, 3, 5, 7, 11 and so on. Hence the next number in the series will be $630 \times 11 = 6930$.

The Mixed Series

The mixed series has three types of forms involved, which can be classified as follows:

- (a) A mixed series may be formed by mixing two different series.

Example

3, 6, 24, 30, 63, 72, _____, 132

In this series, the difference between the terms of each pair formed by two consecutive terms is 3, 6, 9, 12 Hence the missing number is $132 - 12 = 120$.

- (b) A mixed series may be formed by the mixture of two series, which are placed alternately.

Example

2, 6, 10, 3, 9, 13, 4, 12, _____

In this series, the first term is multiplied by 3 to get the second term and 4 is added to the product to get the 3rd term. Hence the answer will be $12 + 4 = 16$. here a new series starts after every three terms.

The Square And Cube Series

Example

1, 4, 27, 16, 125, _____

Here the numbers in the series are formed by alternately placing the cubes of odd numbers and squares of even numbers. Hence the next term will be 36.

PRACTICE EXERCISE 1

1. 8, 12, 10, 16, 12, _____
 (a) 10 (b) 20
 (c) 30 (d) 40

2. 7, 15, 32, _____, 138, 281
 (a) 57 (b) 67
 (c) 77 (d) 87

3. 4, 6, 9, 14, _____
 (a) 16 (b) 18
 (c) 20 (d) 23

4. 36, 28, 24, 22, _____
 (a) 18 (b) 20
 (c) 21 (d) 22

5. 260, 216, 128, 108, 62, 54, _____, 27
 (a) 39 (b) 49
 (c) 29 (d) 19

6. 2, 6, 12, 20, 30, _____
 (a) 32 (b) 42
 (c) 52 (d) 62

7. 1, 5, 11, 19, 29, _____, 55
 (a) 45 (b) 39
 (c) 41 (d) 47

8. 0, 3, 8, 15, _____, 35, 48
 (a) 22 (b) 11
 (c) 24 (d) 26

9. 36, 30, 24, 18, _____
 (a) 22 (b) 12
 (c) 21 (d) 11

10. 2, 5, 9, 19, 37, _____
 (a) 47 (b) 87
 (c) 75 (d) 85

11. 6, 8, 9, 12, 14, 18, _____
 (a) 19 (b) 21
 (c) 23 (d) 25

12. 9, 15, 23, 33, 45, _____
 (a) 55 (b) 57
 (c) 59 (d) 61

13. 1, 0, 3, 2, 5, 6, _____, 12, 9, 20
 (a) 10 (b) 7
 (c) 8 (d) 12

14. 2, 0, 5, 3, _____, 8, 17
 (a) 9 (b) 10
 (c) 6 (d) 8

15. 3, 7, 13, 21, 31, _____
 (a) 43 (b) 34
 (c) 56 (d) 45

16. 6, 15, 33, 69, _____, 285
 (a) 137 (b) 141
 (c) 143 (d) 147

17. 0, 5, 22, 57, 116, _____
 (a) 216 (b) 205
 (c) 207 (d) 192

18. 1, 2, 4, 8, 16, _____
 (a) 20 (b) 24
 (c) 28 (d) 32

19. 0, 7, 26, 63, 124, _____
 (a) 195 (b) 208
 (c) 215 (d) 240

20. 1, 5, 11, 19, 29, 41, 55, _____
 (a) 68 (b) 70
 (c) 82 (d) 71

21. 123, 129, 141, _____, 159, 165
 (a) 147 (b) 148
 (c) 149 (d) 151

22. 27, 64, 125, 216, 343, _____
 (a) 416 (b) 512
 (c) 686 (d) 559

Directions for questions 23 to 27: In the following question a number series is given. In the series, a number is given followed by four options (a), (b), (c) and (d). You have to complete the series with the number given, following the sequence of the original series and answer the questions related to the series.

23. 12 30 120 460 1368
 16 (A) (B) (C) (D)

What will come in place of (D)?
 (a) 1384 (b) 2642
 (c) 2808 (d) 1988

24. 154 462 231 693 340
 276 (a) (b) (c) (d)

What will come in place of (e)?
 (a) 1746 (b) 621
 (c) 1242 (d) 1863

25.

582 574 601 537 662 446
 204 (A) (B) (C) (D) (E)

What will come in place of (D)?

26.

7 91 1001 7007 35035
 14.5 (A) (B) (C) (D)

What will come in place of (C)?

- (a) 21132.5
 (b) 14514.5
 (c) 20020.5
 (d) 13864.5

27.

85 43 44 67.5 137 345
125 (A) (B) (C) (D) (E)

What will come in place of (C)?

Directions for questions 28 to 30: Find what should come in place of question mark (?) in the following number series:

28.

12 12 18 45 180 1170 ?

20

30

23 25 53 163 657 ?
 (a) 4096 (b) 2401
 (c) 1764 (d) 2201

ANSWER KEYS

1. (b) 2. (b) 3. (d) 4. (c) 5. (c) 6. (b) 7. (c) 8. (c) 9. (b) 10. (c)
11. (b) 12. (c) 13. (b) 14. (b) 15. (a) 16. (b) 17. (b) 18. (d) 19. (c) 20. (d)
21. (a) 22. (b) 23. (c) 24. (d) 25. (a) 26. (b) 27. (d) 28. (a) 29. (c) 30. (d)

HINTS AND EXPLANATIONS

1. In this series the 1st, 3rd, 5th terms are multiplied by 2 and 4 is subtracted from the product whereas the 2nd, 4th terms are multiplied by 2 and 4 is added to the product.
 2. Each term is doubled and consecutive numbers starting from 1, 2, 3 are added to the sum to get the next term. i.e., $2 \times 32 = 64 + 3 = 67$
 3. Here the preceding term is multiplied by 2 and then 2, 3, 4 etc. are subtracted from the product.
 4. Each number is half the preceding number plus 10.
 5. The alternate numbers form two different series. The missing number belongs to the one beginning with
 6. in this subtract 4 and divide the difference by 2 to get the next number. So the missing number is $62 - 4 = 58/2 = 29$
 7. The numbers are alternately multiplied by 3 and divided by 2.
 8. The terms are got by adding even numbers starting from 4 to the preceding term.
 9. The terms are obtained by adding odd numbers from 3, 5, ... to the preceding term.
 10. The number goes down by 6 each time.
 11. Multiply each preceding number by 2, add 1 and subtract 1 alternately.

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11. Alternate terms of the given series form two series 1st 6, 9, 14, 21, and the 2nd 8, 12, 18
12. The terms of the given series are 3^2 , $4^2 - 1$, $5^2 - 2$, $6^2 - 3$, $7^2 - 4$, $8^2 - 5$
13. Alternate terms of the given series form tow different series. 1st 1, 3, 5, 7, 9 and the 2nd is 0, 2, 6, 12, 20.
14. Alternate terms of the given series form two different series. 1st 2, 5, 10, 17 ($n^2 + 1$) and the 2nd is 0, 3, 8 ($n^2 - 1$).
15. Series is: +2, +4, +6, +8, +10. Hence next term will be $+12 = 31 + 12 = 43$.
16. 1st to 4th & 6th terms are 6, 15, 33, 69, x, 285. These terms are 3×2 , 3×5 , 3×11 , 3×23 , x, 3×95
It can be observed all terms are $3 \times a_n$. Where $a_1 = 2$ & $a_n = 2a_{n-1} + 1$. So, $x = 3 \times [2(23) + 1] = 3 \times 47 = 141$
17. The 1st to 5th terms are 0, 5, 22, 57, 116. These terms are 1–1, 8–3, 27–5, 64–7, 125–9. So, these are $1^3 - 1$, $2^3 - 3$, $3^3 - 5$, $4^3 - 7$, $5^3 - 9$. So, nth term of series is $n^3 - (2n - 1)$. So, 6th term of series is $6^3 - (2 \times 6 - 1) = 216 - 11 = 205$
18. In this series each term is twice of its last term. So, the term after 16 is twice of 16 i.e. 32.
19. The nth term of series is given as $n^3 - 1$. So, the missing term (i.e. 6th term) = $6^3 - 1 = 216 - 1 = 215$.
20. The common difference between consecutive terms is increasing by 2. There is difference of 14 between 41 & 55. So, the difference between 55 & next term must be 16. So, next term is $55 + 16 = 71$
21. The common difference between consecutive terms is 6, 12, 6, 12 & so on. So, the term next to 141 is $141 + 6 = 147$
22. The general term is $T_n = (n + 2)^3$. So, the 6th term is $T_6 = (6 + 2)^3 = 8^3 = 512$
23. The given series is based on the following pattern:
 $30 = 12 \times 6 - 7 \times 6$
 $120 = 30 \times 5 - 6 \times 5$
 $460 = 120 \times 4 - 5 \times 4$
 $1368 = 460 \times 3 - 4 \times 3$
 $2730 = 1368 \times 2 - 3 \times 2$
 Similarly,
 (a) $= 16 \times 6 - 7 \times 6 = 96 - 42 = 54$
 (b) $= 54 \times 5 - 6 \times 5 = 240$
 (c) $= 240 \times 4 - 5 \times 4 = 940$
 (d) $= 940 \times 3 - 4 \times 3 = 2808$
 Hence, 2808 will come in place of d.
24. The given series is based on the following pattern:
 $154 \quad 462 \quad 231 \quad 693 \quad 346.5 \quad 1039.5$
 $\times 3 \quad \div 2 \quad \times 3 \quad \div 2 \quad \times 3$
 Similarly,
 $a \quad b \quad c \quad d \quad e$
 $276 \quad 828 \quad 414 \quad 1242 \quad 621 \quad 1863$
 $\times 3 \quad \div 2 \quad \times 3 \quad \div 2 \quad \times 3$
 Hence, 1863 will come in place of e.
25. The given series is based on the following pattern:
 $582 \quad 574 \quad 601 \quad 537 \quad 662 \quad 446$
 $-2^3 \quad +3^3 \quad -4^3 \quad +5^3 \quad -6^3$
 Similarly,
 $a \quad b \quad c \quad d$
 $204 \quad 196 \quad 223 \quad 159 \quad 284$
 $-2^3 \quad +3^3 \quad -4^3 \quad +5^3$
 Hence, 284 will come in place of d.
26. The given series is based on the following pattern:
 $7 \quad 91 \quad 1001 \quad 7007 \quad 35035$
 $\times 13 \quad \times 11 \quad \times 7 \quad \times 5$
 Similarly,
 $a \quad b \quad c$
 $14.5 \quad 188.5 \quad 2073.5 \quad 14514.5$
 $\times 13 \quad \times 11 \quad \times 7$
 Hence, 14514.5 will come in place of c.
27. The given series is based on the following pattern:
 $85 \quad 43 \quad 44 \quad 67.5 \quad 137 \quad 345$
 $\times 0.5 + 0.5 \times 1 \div 1 \times 1.5 + 1.5 \times 2 \div 2 \times 2.5 \div 2.5$
 Similarly,
 $a \quad b \quad c$
 $125 \quad 63 \quad 64 \quad 97.5$
 $\times 0.5 + 0.5 \quad \times 1 \div 1 \quad \times 1.5 \div 1.5$
 Hence, 97.5 will come in place of c.
28. The given number series is based on the following pattern:
 $12 \times 1 = 12$
 $12 \times 1.5 = 18$
 $18 \times (1 + 1.5) = 18 \times 2.5 = 45$
 $45 \times (1.5 + 2.5) = 45 \times 4 = 180$
 $180 \times (4 + 2.5) = 180 \times 6.5 = 1170$
 $\therefore ? = 1170 \times (4 + 6.5) = 12285$
 Hence, 12285 will replace the question mark.
29. The given number series is based on the following pattern:
 $467 - 444 = 23 = 23 \times 1$
 $513 - 467 = 46 = 23 \times 2$
 $582 - 513 = 69 = 23 \times 3$

$$674 - 582 = 92 = 23 \times 4$$

$$789 - 674 = 115 = 23 \times 4$$

$$\therefore ? = 789 + 23 \times 6 = 789 + 138 = 927$$

Hence, 927 will replace the question mark.

30. The given number series is based on the following pattern:

$$23 \times 1 + 2 = 25$$

$$25 \times 2 + 3 = 53$$

$$53 \times 3 + 4 = 163$$

$$163 \times 4 + 5 = 657$$

$$657 \times 5 + 6 = 3291$$

Hence, 3291 will replace the question mark.

Chapter

6

TEAM SELECTION

LEARNING Objectives

In this chapter, you will learn:

- Different types of Team Selection Questions
- Notations to mark the data
- Language Interpretation
- Methods to solve the questions

Questions belonging to this genre will provide a set of objects or people etc. and then a set of conditions. On the basis of these conditions, one is expected to make choices regarding the formation of the team. It is advisable to jot down the conditions and items to be formed into teams carefully.

In most of these set of questions, you will find that the parent data provides the basic guidelines and subsequently every question introduces one new condition.

It is imperative here to understand that while parent data is applicable to all the questions in the set, data supplied in any question is applicable to that particular question only, and not to the other questions unless specified otherwise.

Understanding the Keywords and Types of Statements

These questions will throw a gauntlet of simple but contextually confusing words at the students. Some of these words/types of statements have been listed below:

1. At least one element – It means one or more – Symbolically, we can represent this as: $1+$
2. At most one element – It means zero or one – Symbolically, we can represent this as: $0/1$
3. At most two elements – It means zero or one or two – Symbolically, we can represent this as: $0/1/2$.
4. Conditional clauses [Read chapter “Logical Links” in this book to understand these conditional clauses better]:

If A is selected, then B will also be selected.

Following inferences can be drawn:

- (a) If A is selected, B has to be selected.
- (b) There cannot be a case where A is selected but B is not selected.
- (c) It is possible that B has been selected but A may be/may not be selected.
- (d) If B has not been selected, then we can conclude that A also has not been selected.
- (e) It is not possible that B has not been selected, but A has been selected [rephrasing of inference (b) above].

In a nutshell, A alone cannot be selected though B alone can be selected.

Go through the following problem sets to understand the type of problems and techniques to solve the same. Do not look at the solution till you are convinced that you have attempted it at your best level.

Directions for questions 1 to 6: *Read the information given below and solve the questions based on it.*

Three adult women (R, S, and T), two adult men (U and V), and four children (W, X, Y, and Z) are going to a watch a movie. Though, during the online booking of the

tickets, they realized that the nine seats available for the show are in three different classes—Silver Class, Gold Class and Lounge. The layout also showed that in each class, three adjacent seats are available.

To watch the movie, they decide to have the three groups of three members each as per the following conditions:

- No adults of the same gender can be together in ONE group.
- W cannot be in R's group.
- X must be in a group with S or U or both.

PRACTICE EXERCISE 1**Team selection for exercise1 Q1 to Q6**

1. If R is the only adult in one group, the other members of her group must be
 (a) W and Y (b) X and Y
 (c) X and Z (d) Y and Z
2. R and U share a good rapport, and hence decide to be in the same group. Who can be in the second and third groups, respectively?
 (a) S, T, W; V, Y, Z (b) S, X, Y; T, W, Z
 (c) T, V, W; S, Y, Z (d) W, X, Y; S, V, Z
3. Which of the following pairs of people can be in the same group as W?
 (a) R and Y (b) S and U
 (c) S and V (d) U and V
4. Which of the following must be true?
 (a) One of the women is in a group with two children.
 (b) One of the two men is in a group with W.
 (c) R is in a group with a man.
 (d) One of the groups includes no children.
5. Any of the following pairs of people could be in a group with X EXCEPT
 (a) R and U (b) S and T
 (c) S and U (d) S and W
6. Given that T, Y, and Z form one group. Which of the following must be together in one of the other groups?
 (a) R, S, V (b) R, U, W
 (c) S, U, W (d) S, V, W

Directions for questions 7 to 10: Read the information given below and solve the questions based on it.

dueNorth presently employs three Marketing Managers (MM)—A, B and C and five faculty members—D, E, F, G and H. Company is planning to open a new office. It is planning to relocate two of the three marketing managers and three of the five faculty members to the new office. Management wants to ensure that the individuals who do not function well together should not be sent as a part of the team.

Following information was available to the HR department of dueNorth:

Marketing Managers A and C cannot be sent as a team to the new office.

C and E are excellent performers, though, they do

not share good rapport, and hence should not be sent together.

- If D is sent, then G cannot be sent, and vice versa. D and F should not be together in a team.
7. If D goes to the new office which of the following is (are) true?
 A. C cannot go B. A cannot go
 C. H must also go
 (a) A only (b) B and C only
 (c) A and C only (d) A, B and C
 8. If A is to be moved as one of the Marketing Managers, which of the following cannot be a possible working unit?
 (a) ABDEH (b) ABFGH
 (c) ABEGH (d) ABDGH
 9. If C and F are moved to the new office, how many combinations are possible?
 (a) 0 (b) 1
 (c) 2 (d) 3
 10. Who among the Marketing Managers and the faculty members is sure to find a berth in the new office?
 (a) D (b) H
 (c) G (d) B

Directions for questions 11 to 13: Read the information given below and solve the questions based on it.

Seven students at a B school who live in a dormitory are being formed into groups that consist of two or three or four members at a time. The groups may change but at any time, each person can be a part of one and only one group. The following guidelines have to be adhered to while forming the groups

- The students are Nitin, Priyanka, Rahul, Sumit, Tanay, Urmila and Vinay.
- Nitin cannot be in the same group as Sumit.
- Tanay must be in a group that includes either Sumit or Vinay but not both.
- Vinay has to be in a group that does not contain even number of members.

11. Which of the following is a possible list of three groups that can coexist?

- | | | | | |
|---|--------|--------|--------|----------|
| 1 | Nitin, | Tanay, | Rahul, | Sumit, |
| | | Vinay | | Urmila |
| | | | | Priyanka |

2	Nitin, Tanay	Vinay, Rahul, Sumit	Priyanka, Urmila
3	Nitin, Urmila	Rahul, Sumit	Vinay, Tanay, Priyanka
4	Urmila, Sumit	Vinay, Tanay	Priyanka, Nitin, Rahul

Directions for questions 14 to 15: Read the passage given below and solve the questions based on it.

Digviza and three other members of her yoga club dined out together. Each woman ordered either salad or soup to start with, and one of the three entrees (a dish served before the main course)—cabbage rolls, eggs benedict, or lasagna. Refer to the clues given below and answer the following questions:

- Every order was different. Each dish mentioned above was ordered at least once.
 - Kejri and the lady who ordered the salad both ordered lasagna as the entree.
 - Rajdev and Sonila both ordered soup as the first course.
 - Sonila did not order the eggs benedict.

- 14.** How many women ordered salad?

15. Who ordered salad and cabbage rolls?

Directions for questions 16 to 20: Read the information given below and solve the questions based on it.

K, L, M, N, P, Q, R, S, U and W are the only ten members in a department. There is a proposal to form a team from within the members of the department.

subject to the following conditions:

- A team must include exactly one among P, R, and S.
 - A team must include either M or Q, but not both.
 - If a team includes K, then it must also include L, and vice versa.
 - If a team includes one among S, U, and W, then it must also include the other two.
 - L and N cannot be members of the same team.
 - L and U cannot be members of the same team.
 - The size of a team is defined as the number of members in the team.

- 16.** Who cannot be a member of a team of size 3?

17. Who can be a member of a team of size 5?

- 18.** What would be the size of the largest possible team?

- 19.** What could be the size of a team that includes K?

- 20.** In how many ways a team can be constituted so that the team includes N?

Directions for questions 21 to 25: Read the information given below and solve the questions based on it.

There are three projects—P1, P2 and P3. A student can select either one project or two projects or all the three projects subject to the conditions given below:

Condition 1: Both P1 and P2 have to be selected.

Condition 2: Either P1 or P3, but not both, has to be selected.

Condition 3: P2 can be selected only if P3 has been selected

Condition 4: P1 can be selected only if P3 has been selected

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21. How many different selections can be made if no conditions are imposed?
(a) 5 (b) 6
(c) 7 (d) 8
(e) 4

22. How many selections can be made to meet condition 1 as given above?
(a) 1 (b) 2
(c) 3 (d) 4
(e) 0

23. How many selections can be made to meet condition 2 as given above?

24. How many selections can be made meeting the conditions 2 and 3 as given above?
(a) 0 (b) 1
(c) 2 (d) 0 or 1
(e) None of these

25. How many selections can be made meeting the conditions 1, 2 and 3 as given above?
(a) 0 (b) 1
(c) 2 (d) 3
(e) None of these

ANSWER KEYS

1. (d) 2. (c) 3. (c) 4. (a) 5. (b) 6. (d) 7. (c) 8. (d) 9. (b) 10. (d)
11. (c) 12. (a) 13. (b) 14. (a) 15. (d) 16. (a) 17. (c) 18. (d) 19. (e) 20. (e)
21. (c) 22. (b) 23. (c) 24. (e) 25. (a)

HINTS AND EXPLANATIONS

1 to 6

1. Since W cannot be in R's group, we can eliminate 1st option. X can only be in a group with S or U or both. Since R is the only adult, neither S nor U can be in the group. So, 2nd option and 3rd option can be eliminated as both contain X. 4th option is the correct answer because the only two children remaining to fill out the group with R are Y and Z.

Hence option (d) is the answer.

2. 1st option contains two women S and T in the second group. Hence 1st option is eliminated. Similarly, in the 2nd option, first group contains U and V, both men; hence 2nd can be eliminated.

Since X must be in a group with S or U, or both, the second option and 4th option can be eliminated

3rd option, consisting of groups R, U, X; T, V, W; and S, Y, Z, meets all of the restrictions and is the correct answer.

Hence option (c) is the answer.

3. S, V, and W could form a group if the other two groups were R, Y, Z, and T, U, X or R, U, X and T, Y, Z. Thus, the third option is the correct answer.

Option (a) is incorrect. W cannot be in R's group.

Option (b) is incorrect. If S and U are in the same group, X must fill the remaining seat. But option shows that W will take the seat. Therefore, it is not possible.

D is not correct. U and V are both men and cannot be in the same group.

Hence option (c) is the answer.

- #### 4. Now this is a sitter:

Option (a) is obviously correct, because there are three women and only one woman can be in ONE group, so each of the three groups must contain a woman. Further, there are more children than groups, hence at least one group must have two children. That group will include a woman along with the two children.

Option (b) is incorrect. S, W, X; R, U, Y; and T, V, Z is one of several possible sets of seating groups in which W is not in the same group as one of the two men.

Option (c) is incorrect. Using option (a) we can say that that woman can be R. Hence at best, this option is probably true, and not must be true.

Option (d) is also incorrect. Every group must include one child, because a group of three with no children would have to include two adults of the same sex, which is not possible as per the 1st condition.

Hence option (a) is the answer.

5. Option a is possible and hence not the answer. R, U, X; S, V, W; and T, Y, Z is one of several possible sets of seating groups in which R and U are in X's group.

S and T are both women and cannot be in the same group. Therefore, B is the correct answer.

Option (c) is also possible and hence cannot be the answer. S, U, X; R, Z, Y; and T, V, W is one of several possible sets of seating groups in which S and U are in X's group.

Option (d) is also incorrect. S, W, X; R, V, Y; and T, U, Z is one of several possible sets of seating groups in which S and W are in X's group.

Hence option (b) is the answer.

6. If T, Y, and Z form one group, the remaining two groups must be chosen from among R, S, U, V, W, and X.

Now, out of these, R and S are females and U and V are males.

R and S must be in different groups as well as U and V must be in different groups (hence 1st option is wrong). W must be in the group with S because W cannot be in the group with R (condition 2). X must thus be in the group with R, because both U and V are men and cannot both be in R's group. Since X must be in a group with U or S, and S is already in another group, the remaining slot with R and X must be taken by U. It means V will fill the remaining space in S's group. Hence option (d) is the answer.

7 to 10

7. D and G as well as D and F cannot work together. New office requires 3 faculty members. Therefore, E, H should go. C and E cannot function together as a team. As E has to go, C cannot go. Therefore, A and B have to be the marketing managers if D is posted to San Jose.

Hence option (c) is the answer.

8. ABDGH is not a working unit as D and G cannot work together. Hence option (d) is the answer.
9. If C and F are moved to the new office, then B should be the only other marketing manager who can go. Therefore, the managers are BC. Of the

faculty members, E cannot go. Therefore, one has to choose 3 faculty members from D, F, G, H. D cannot be sent because if he goes, then F and G cannot go. Therefore, FGH are the faculty members and B, C are the marketing managers. Only one option available. Hence option (b) is the answer.

10. B is sure to find a berth in the group. Hence option (d) is the answer.

11 to 13

11. Only in option c, all the conditions are satisfied. Vinay is in a group of 3. Tanay is in a group that has Vinay or Sumit, but not both and Nitin is not in the same group as Sumit. Hence option (c) is the answer.

12. Vinay has to be in a group that has 3 members. So, only one more member can be in that group. If Sumit is in that group, then Tanay cannot be a part of the other group as Tanay has to be in a group in which either Vinay or Sumit is there. So, Sumit has to be a part of the group that has 4 people. In which case, Nitin cannot be in the group that has 4 people and has to be a part of the group that has Vinay and Urmila. Hence option (a) is the answer.

13. Nitin cannot be in the same group as Sumit. Therefore, we need to have two more groups in addition to the one formed with the three people. So, there will be 3 groups amongst the seven students. Hence option (b) is the answer.

14 to 15

Digviza ordered the salad and lasagna.
Rajdev ordered the soup and eggs benedict.
Sonila ordered the soup and cabbage rolls.
Kejri ordered the soup and lasagna.

14. Option (a) is the answer.

15. Option (d) is the answer.

16 to 20

16. In the team of size 3, one member will be from P, R and S and one member will be from M and Q.

Now only one member has to be determined and we know that K and L will be always in team and since there is place for only 1 member, hence K and L will not be in team of 3 members. Hence, option (a) is the answer.

17. If we take K and L we cannot take N and U so the size of team will be 4 only. Now we will take S from first statement so U and W will also be there. Now as

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U so there L cannot be there and hence K will also not be there. As L is not in team so we can take N so 4 members of team are S, U, W and N and because of second statement any one of M or Q will be there and only M is given in the options
Hence, option (c) is the answer.

- 18.** Using first statement, if we take P or R, U and W cannot be in team. To get maximum members in team we should take S and from 4th statement U and W will also be in the team. Now either M or Q will be included in the team, and since U is there L can't be included in the team hence K will also not be there.

Now as L is not in the team, N can be included in the team. So team with maximum numbers of members will be S, W, U, N and any one from M and Q.

Hence maximum possible size of team of team is 5.

Alternatively,

Start with all the 10 members and keep removing the member who cannot be in the team.

K L M N P Q R S U W

Using condition 1, only one out of P, R and S can come. At the same time, S, U and W will come together. Hence we should select S out of P, R and S.

K L M N P Q R S U W

Next, since U has come, L cannot come. So we remove L.

K L M N P Q R S U W

Using point (2), only one out of M or Q can come. So eliminate M and retain Q (we could have done otherwise also).

K L M N P Q R S U W

Using point (3), if L is removed, K will also be removed.

K L M N P Q R S U W

Remaining members can be part of ONE team.

Maximum team size = 5.

Hence, option (d) is the answer.

- 19.** If we have to take K, L will always be there so U and N will not be in the team. As U is not in the team so S and W will also not be included in the team.

As anyone from P and R will always be there in team and same in the case with M and Q, so the size of team that include K will always be 4.
Hence, option (e) is the answer.

- 20.** Following are the ways in which a team can be constituted:

- (1) P, M, N
- (2) P, Q, N
- (3) R, M, N
- (4) R, Q, N
- (5) S, U, W, N, M
- (6) S, U, W, N, Q

Hence, option (e) is the answer.

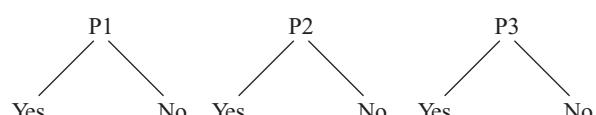
21 to 25

- 21.** If no conditions are imposed, we have following choices to select either one project or two projects and three projects [This is the part of parent statement, and conditions start afterwards]:

P1; P2; P3; P1 and P2; P1 and P3; P2 and P3; P1, P2 and P3 \Rightarrow 7 choices.

Alternatively:

For every project, we have two choices – either to select this or not to select this.



Total number of choices = $2 \times 2 \times 2 = 8$

Out of this we will remove one choice that has—
No, No, No.

Hence option (c) is the answer.

- 22.** We can use the solution to Q. 21 as our base. We will keep on eliminating the options that are not applicable:

P1; P2; P3; P1 and P2; P1 and P3; P2 and P3; P1, P2 and P3

Condition 1: Both P1 and P2 have to be selected.

Hence, only possible selections = P1 and P2; P1, P2 and P3 \Rightarrow 2 choices.

Hence option (b) is the answer.

- 23.** Exhaustive sets = P1; P2; P3; P1 and P2; P1 and P3; P2 and P3; P1, P2 and P3

Condition 2: Either P1 or P3, but not both, has to be selected.

Hence, only possible selections = P1; P3; P1 and P2; P2 and P3 \Rightarrow 4 choices.

Hence option (c) is the answer.

24. Possible selections as per condition 2 = P1; P3; P1 and P2; P2 and P3

Condition 3: P2 can be selected only if P3 has been selected \Rightarrow P3 can be selected alone, but P2 cannot be selected without the selection of P3.

Hence, only possible selections = P1; P3; P2 and P3 \Rightarrow 3 choices.

Hence option (E) is the answer.

25. Possible selections as per condition 2 and condition 3 = P1; P3; P2 and P3

Condition 1: Both P1 and P2 have to be selected.

Hence, only possible selections = None.

Hence option (a) is the answer.

PRACTICE EXERCISE 2

Directions for questions 1 to 4: *Read the information given below and solve the questions based on it.*

Hosting Filmware award ceremony is a big affair. There are lot of things to be done—anchoring, managing the filler entertainment on-stage performance, crowd management, security etc. To conduct the filler entertainment on-stage performances, name of two male actors—Abhi and Riteish—and three female actors—Rani, Shreya and Alia—have been finalized. These five actors will give a performance of a satire play named “Angrezo Bharat Aao” that has exactly eight roles.

Following conditions are to be kept in mind while allocating roles:

Roles 1, 2 and 3 must be played by male actors.

Roles 4, 5 and 6 must be played by female actors.

Roles 7 and 8 can be played by either male or female actors.

Each actor must play at least one role.

The pairs of roles below are the only pairs that do NOT require the actors playing the roles to be on stage at the same time:

Roles 1 and 2 Roles 3 and 6

Roles 3 and 7 Roles 4 and 5

Roles 4 and 8 Roles 5 and 8

Appearances in these roles are spaced far enough apart to allow time for costume changes for actors playing more than one role.

Rani and Shreya cannot play roles that require them to be on stage together at the same time.

1. Each of the following pairs of roles could be played by the same actor EXCEPT
 - (a) roles 1 and 2
 - (b) roles 3 and 6
 - (c) roles 3 and 7
 - (d) roles 4 and 8

2. If Riteish plays role 1, which of the following must be true?
 - (a) Abhi plays role 2
 - (b) Abhi plays role 7
 - (c) Shreya plays role 4
 - (d) Rani plays role 4

3. Which of the following is an acceptable assignment of roles 4, 5 and 6 respectively?
 - (a) Rani, Rani, Rani
 - (b) Rani, Alia, Rani
 - (c) Rani, Shreya, Alia
 - (d) Shreya, Alia, Rani

4. Abhi could play any of the following roles EXCEPT?
 - (a) 1
 - (b) 2
 - (c) 3
 - (d) 8

Directions for questions 5 to 8: *Read the information given below and solve the questions based on it.*

On a Sunday, five friends—ohn, Karan, Ranbir, Mithun and Onir—have gathered to play a game called Trios consisting of three rounds. In each round of the game, exactly three of these friends will play. Consider following rules regarding the participation:

No person can play in three consecutive rounds.

No person can sit out two consecutive rounds.

In any game, each of the five persons must play in exactly three rounds.

5. If John, Karan and Ranbir play in a first round, which of the following could be playing in that game's second round?
 - (a) John, Karan, Mithun
 - (b) John, Karan, Onir
 - (c) John, Ranbir, Mithun
 - (d) Karan, Mithun, Onir

6. In an individual game, Karan, Ranbir and Mithun Play in the first round and John, Ranbir and Mithun play in the third round. Then the players in the second round must be:
 - (a) John, Karan, Ranbir
 - (b) John, Karan, Mithun
 - (c) John, Karan, Onir
 - (d) Karan, Ranbir, Onir

7. In an individual game, Ranbir and Onir do not play in the first round. Which of the following must be true?
 - (a) Ranbir plays in rounds three and four
 - (b) Onir plays in rounds three and five
 - (c) Ranbir and Onir both play in round four
 - (d) Ranbir and Onir both play in round five

8. In an individual game, John, Ranbir and Mithun play in the first round, and Karan, Mithun and Onir play in the second round, which of the following must play in the fourth round?
 - (a) John
 - (b) Karan
 - (c) Ranbir
 - (d) Mithun

Directions for questions 9 to 11: *Read the information given below and solve the questions based on it.*

During the Chemistry practical examination, a naughty student removed the labels pasted on the four

bottles—that contain colorless liquids. Incharge of the lab knows that there are only six possibilities of the liquids present in the bottles—pure X liquid, pure Y liquid, pure Z liquid, or any mixture of these. No two bottles are filled with the same liquid or the same combination of any of these. The only feasible way of testing for the identity of the liquids is to use strips of Mitlus paper—that turns red, black, or yellow depending on which of certain liquids it is dipped in. The full table of colour changes when Mitlus paper is dipped inside is given below:

Liquid	Turns to the colour when Mitlus paper is dipped inside
Pure X	Black
Pure Y	Red
Pure Z	Black
X and Y	Yellow
X and Z	Yellow
Y and Z	Red
X and Y and Z	Black

9. If none of the four liquids turns the Mitlus paper yellow, each of the following must be the contents of one of the bottles EXCEPT
 - (a) Pure X
 - (b) Pure Y
 - (c) Y mixed with Z
 - (d) X, Y, and Z mixed together
10. If the liquid in the first bottle tested turns the Mitlus paper red, and if the liquid in the second bottle tested turns the paper yellow, then a mix of some of the liquid from each of the first two bottles tested will turn the Mitlus paper
 - (a) Yellow
 - (b) Either red or black
 - (c) Either red or yellow
 - (d) Either black or yellow
11. If the liquid in the first bottle tested turns the Mitlus paper red and the liquid in the second bottle tested turns it black, and if a mix of some of the liquids from each of the first two bottles tested turns it red, then which of the following must be true?
 - (a) The first bottle tested contains pure Y
 - (b) The first bottle tested contains Y mixed with Z.

- (c) The second bottle tested contains pure X.
- (d) The second bottle tested contains pure Z.

Directions for questions 12 to 15: Read the information given below and solve the questions based on it.

Fargo, Goodday and HomeTrade are three retail companies, and Q, R, S, and T are four research associates. Each associate works for at least one of the retail companies.

Q always works for Fargo and at least one of the other companies.

Some of the time Goodday employs only one of these associates, the rest of the time it employs exactly two of them.

Fargo and HomeTrade each employ exactly two of these detectives all the time.

Answer all the questions on the basis of the information given above.

12. If R works for HomeTrade only, and if S works for Goodday and HomeTrade only, then T works for
 - (a) Fargo only
 - (b) Goodday only
 - (c) HomeTrade only
 - (d) Both Fargo and Goodday
13. If Q and R both work for the same two retail companies, T must work for
 - (a) Both Fargo and Goodday
 - (b) Both Fargo and HomeTrade
 - (c) Either Fargo or Goodday but not both
 - (d) Either Goodday or HomeTrade but not both
14. If only S works for Goodday, which of the following must be true?
 - (a) R works for either Fargo or Goodday but not both
 - (b) T works for either Goodday or HomeTrade but not both
 - (c) R and T cannot work for the same company
 - (d) Q and R cannot work for the same company.
15. If G employs only one detective, which of the following must be true?
 - I. R works for two companies
 - II. T works for Goodday
 - III. S works for only one company
 - (a) I only
 - (b) II only
 - (c) III only
 - (d) I and II only

Directions for questions 16 to 19: Read the information given below and solve the questions based on it.

When I went to buy an aquarium for my home, I was given a choice of seven fish species—F, G, H, I, J, K,

and L—to be chosen from. I decided to put exactly six fishes (of same or different species) to be put in the aquarium. Though I was told by the owner of the shop that some of these fishes are quite violent towards other species of the fishes and if I put those fishes in the same aquarium tank, they will fight, and I obviously want to avoid that situation.

Consider the following restrictions

Fish of species F will fight with fish of species H, J, and K.

Fish of species I will fight with fish of species G and K.

If three or more fish of species I are in one aquarium tank, they will fight with each other.

Fish of species J will fight with fish of species I.

If a fish of species G is to be in a aquarium tank, at least one fish of species K must also be in the aquarium tank.

16. If an aquarium tank is to contain fish of exactly three different species, which of the following could be these species?

- (a) F, G and I (b) F, I and K
- (c) G, H, and I (d) H, I, and J

17. Only two species of the fishes are to be put in the aquarium tank with the condition that three fishes of species J have to be out of six fishes to be put in the aquarium tank. Other three fishes in that aquarium tank could be from which of the following species?

- (a) F (b) G
- (c) H (d) I

18. If aquarium tank is to contain fish of exactly four different species, which of the following species of the fish cannot be put?

- (a) F (b) G
- (c) H (d) J

19. Which of the following species of the fishes can be put into aquarium tank with fish of species G?

- (a) F and I (b) F and J
- (c) H and I (d) H and K

Directions for questions 20 to 25: Read the information given below and solve the questions based on it.

Members of the upper house and lower house are to be selected from exactly six qualified candidates. The six candidates are U, V, W, X, Y and Z.

Consider the following:

Each house must have exactly three members.

The two houses must have at least one member in common.

If X is selected for a house, Y must also be selected for that house.

20. If the members of the Upper House are selected first, which of the following could be those selected?

- (a) U, V and X (b) U, X and Z
- (c) V, W and X (d) V, X and Y

21. If the two houses have parallel terms of office, which of the following could be selected as the members of the Upper House and as the members of the Lower House, respectively, for one such term of office?

- (a) U, V and W; X, Y and Z
- (b) U, W and Y; V, X and Z
- (c) U, X and Y; U, X and Z
- (d) W, X and Y; X, Y and Z

22. If the members of the Upper House are V, W, and Z, and if the Lower House is to have as many members in common with the Upper House as the rules allow, the Lower House must consist of

- (a) U, V and W
- (b) V, W and Z
- (c) W, Y and Z
- (d) X, Y and Z

23. Assume that U, V and W make up the Upper House, and W, Y, and Z make up the Lower House. Which of these house members could yield his or her place on a house to X without causing any other changes?

- (a) U (b) W
- (c) Y (d) Z

24. If U and X are each selected for a house and only Z is selected for both house, which of the following must be true?

- (a) V is selected for the same house as W.
- (b) W is selected for the same house as Y.
- (c) U is selected for a different house than Y.
- (d) X is selected for a different house than Y.

25. If X and Z are both selected for the Upper House, and if U is selected for the Lower House, each of the following pairs of people could be the other two members of the Lower House EXCEPT

- (a) V and W (b) V and Z
- (c) W and Y (d) Y and Z

ANSWER KEYS

- | | | | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 1. (b) | 2. (b) | 3. (c) | 4. (d) | 5. (d) | 6. (c) | 7. (d) | 8. (d) | 9. (d) | 10. (d) |
| 11. (d) | 12. (a) | 13. (d) | 14. (c) | 15. (c) | 16. (d) | 17. (c) | 18. (a) | 19. (d) | 20. (d) |
| 21. (d) | 22. (b) | 23. (d) | 24. (c) | 25. (a) | | | | | |

HINTS AND EXPLANATIONS**1 to 4**

There are 8 roles & 5 actors such that 2 are male actors & 3 are female actors. Role 1 & 2 are not played at same time. Both are to be played by male actor. So, same male actor can play both roles. Roles 3 & 7 are not played at same time & role 3 is to be played by a male actor. So, same male actor can play both roles. Also, roles 3 & 6, 4 & 8, 5 & 8 are not to be played at same time & so these 2 (in pairs) can be played by same actors. Also, roles 4, 5 & 6 must be played by female actors & role 8 can be played by male or female. There are 3 female actors. So, 1 of female actor must play either roles 4 & 8 or 5 & 8. Other 2 plays role 6 & role 4/5 (whichever is not played by female actor who also played role 8). So, we have 5 actors playing roles as:

- a) Role 1 & 2 are played by same male actor
 - b) Roles 3 & 7 are played by same male actor
 - c) Role 4/5(any 1 of 4 & 5) & 8 played by same female actor
 - d) Role 6 played by a female actor
 - e) Role 4/5 (any 1 of 4 & 5) played by a female actor
- Role 1 & 2 are not played at same time. Both are to be played by male actor. So, same male actor can play both roles. Role 3 & 7 are not played at same time. Role 3 is to be played by male actor. Role 7 can be played by either male or female actor. So, if a male play Role 7, then same male actor can play both roles. Role 4 & 8 are not played at same time. Role 4 is to be played by female actor. Role 8 can be played by either male or female actor. So, if a female play Role 8, then same female actor can play both roles. So, option (a), (c) & (d) are not correct. Role 3 & 6 are not played at same time. But, Role 3 must be played by male actor while Role 6 must be played by female actor. So, Roles 3 & 6 cannot be played by the same actor. Correct option is (b)
 - From general solution we know 1 of the male actor is playing roles 1 & 2. The other male actor is playing roles 3 & 7. As Ritesh is playing role 1, so he is also playing role 2. Every actor must play at least 1 role.

So, Abhi must play roles 3 & 7. So, Abhi plays role 7. Correct option is (b)

- From general solution we know that roles 4, 5 & 6 are played by different female actors. So, options (a) & (b) are incorrect. Further we know that roles 4 & 6 are played together. It is also given that Rani & Shreya cannot play roles which require them to be together on stage. So, any 1 of them is neither playing role 4 nor 6. But in option (d), Shreya & Rani are playing roles 4 & 6 respectively, so this option is also incorrect. The given arrangement in option (c) is feasible as Shreya is playing role 5 (i.e. neither 4 nor 6). Correct option is (c)
- From general solution we know that role 8 is played by a female actor. Abhi is male actor, so he cannot play role 8. He can play any of roles 1, 2 & 3 (also 7), but cannot play role 8. Correct option is (d)

5 to 8

- None of the players can sit out 2 consecutive rounds. In options (a) & (c), Onir will sit out 2 consecutive rounds. So, these are incorrect options. In option (b), Mithun will sit out 2 consecutive rounds. So, it is incorrect option. Only option (d) is feasible. Correct option is (d)
 - None of the players can sit out 2 consecutive rounds. So, the 2 players John & Onir, who were not in 1st round, must play in 2nd round. Only option (c) shows both John & Onir in 2nd round. Correct option is (c)
 - If Ranbir & Onir did not play in 1st round, then the players who played in 1st round must be- John, Karan & Mithun. In 2nd round we must have- Ranbir, Onir & John/Karan/Mithun (i.e. any 1 from John, Karan & Mithun). If we assume 3rd person to be John (we can take any 1 of these 3 as we must focus on Ranbir & Onir & not of these 3). So, we can assume in 2nd round we have- Ranbir, Onir & John
- To check option (a): Option (a) is incorrect as according to it, Ranbir played 3 consecutive rounds.

To check option (b): If we assume Onir played in round 3, then he cannot play in round 4 (as he cannot play in 3 consecutive rounds). But, he will play in round 5 (as cannot sit out 2 consecutive rounds). But, it is not necessary that he must play in round 3, as we can repeat any 1 from Ranbir, Onir & John (who played in round 2). So, we cannot say he must have played in round 3 & 5 (we can say that he could have played in round 3 & 5). So, option (b) is not correct

To check option (c): If we assume Ranbir & Onir played in round 4, then none of them played in round 3 (as then they would have played in 3 consecutive rounds 2, 3 & 4). But we can repeat any 1 from Ranbir, Onir & John (who played in round 2). So, option (c) is not correct. (Actually it cannot be said that it must be true, however, it can be true like option (b))

To check option (d): There may be 2 cases:

1. Neither Ranbir nor Onir is repeated in round 3 (after playing round 2). Then both of them must be repeated in round 4. Now only 1 of them can be repeated in round 5. So, any 1 of them can appear in 3 rounds. But, the other can appear in only 2 rounds. But, every player must appear in 3 rounds in game of 5 rounds. So, it is not possible
2. One of them (Ranbir or Onir) is repeated in 3rd round. Let this be Onir. Then Onir cannot be repeated in 4th round (as he will be in 3 rounds consecutively which is not possible). Now, the other one i.e Ranbir must play in 4th round (as no player can sit out in 2 consecutive rounds). Now Onir must play in round 5 (as no player can sit out in 2 consecutive rounds). Ranbir must also play in round 5 (as every player must appear in 3 rounds in game of 5 rounds). So, Onir plays in 2nd, 3rd & 5th round. Ranbir plays in 2nd, 4th & 5th round.

So, it is concluded that both Ranbir & Onir must play in round 5. So, option (d) is correct answer

8. Mithun played in both 1st & 2nd round. So, he cannot play in 3rd round (as he will be in 3 rounds consecutively which is not possible). Now, he must play in 4th round as no player can sit out in 2 consecutive rounds. Therefore, Mithun must play in the 4th round. Correct option is (d)

9 to 11

10. The liquid from 1st bottle turns Mitlus paper red, so it has either Pure Y or Y & Z. The liquid from 2nd bottle

turns Mitlus paper yellow, so it has either Pure X & Y or X & Z. If we mix liquids from both the bottles, we get 3 possibilities-

- a) X & Y – it will turn the Mitlus paper Yellow
- b) X & Z – it will turn the Mitlus paper Yellow
- c) X & Y & Z- it will turn the Mitlus paper Black

So, if we mix the liquids from both the bottles, the liquid will turn the Mitlus paper either black or yellow. Correct option is (d)

11. The 1st bottle is either Pure Y or Y & Z as it turns the Mitlus paper red. The 2nd bottle is either Pure Z or X & Y & Z as it turns the Mitlus paper black. The mix from both bottles turns the Mitlus paper red, so the mix must be either Y or Y & Z. From these, it can be concluded that the mix is Y & Z. So, 1st bottle is either only Y or Y & Z. The 2nd bottle must be only Z (it cannot be X & Y & Z). Option (d) is correct

12 to 15

12. R works for HomeTrade only. S works for Goodday & HomeTrade only. We know HomeTrade employs exactly 2 employees. So, HomeTrade has employed R & S. We also know that Q works for Fargo & at least 1 of the other company. So, Q must be working for Goodday too (but not for HomeTrade as it has exactly 2 research associates). Goodday employs either 1 or 2 research associates. So, Goodday has employed 2 research associates S & Q. T can work for Fargo only (other 2 companies are already having 2 research associates with them). Correct option is (a)
13. Q always works for Fargo & at least 1 of the other companies. It is also given that Q & R both work for the same 2 retail companies. So, 1 of these companies must be Fargo & other is either Goodday or HomeTrade. Fargo 7 HomeTrade employs exactly 2 people & Goodday can employ 1 or 2 people. So, in this case Goodday must employ 2 people. We also know each person must work in at least 1 company. So, both S & T are working in exactly 1 company & they are working in Goodday & HomeTrade such that exactly 1 of them is working in HomeTrade & other person is working in Goodday. So, for T we can conclude that he/she is working in either Goodday or HomeTrade but not in both. Correct option is (d)
14. Only S works for Goodday. So, Goodday has employed only 1 person (S). Now, both Fargo & HomeTrade employs exactly 2 people each. Q always works for Fargo & at least 1 of the other companies. So, Q is working for both Fargo & HomeTrade. We also know

each person must work in at least 1 company. So, both R & T are working in exactly 1 company & they are working in Fargo & HomeTrade such that exactly 1 of them is working in HomeTrade & other person is working in Fargo. So, we can conclude that R & T cannot work for the same company. Correct option is (c)

15. We are given that Goodday employs only 1 detective. We also know that both Fargo & HomeTrade employs exactly 2 people each. Q always works for Fargo & at least 1 of the other companies. So, Q is working for both Fargo & HomeTrade. We also know each person must work in at least 1 company. So, each one of R, S & T are working in exactly 1 company. But, we do not know who is working for which company. So, only III is correct. Correct option is (c)

16 to 19

16. In option (a) & (c) there is no fish of species K while there is fish of species G. So, both (a) & (c) are incorrect options. We cannot keep fish of species K with F (fish of species F fights with fish of species K). So, option (b) is incorrect. In option (d) no condition is violated. Correct option is (d)
17. Fish of species I cannot be kept with fish of species J. So, option (d) is incorrect. If we keep G, then K must also be kept, so option (b) is incorrect. Fish of species F will fight with fish of species J. So, option (a) is incorrect. We can keep 3 fishes of species H with 3 fishes of species J. Correct option is (c)
18. If we keep fish of the species F, then we cannot keep fish of species H, J or K. So, the 4 species will be F, G, I & L. Fish of species I & G cannot be kept together & we must also keep fish of species K with fish of species G. So, we can conclude that, if we keep fish of species F, we cannot keep 4 different species. Correct option is (a)
19. If there is fish of species G, we must also have fish of species K. So, options (a), (b) & (c) are incorrect options as K is not present in these options. Correct option is (d)

20 to 25

20. If X is selected for a House, Y must also be selected for that house. But in options (a), (b) & (c) X is selected but Y is not selected. So, these are incorrect options. Correct option is (d)
21. The 2 House must have at least 1 member in common, so option (a) is incorrect. If X is selected for a house, Y must also be selected for that House. But in options (b) & (c) Y is not selected for the House for which X is selected. So, these are incorrect options. Correct option is (d)
22. If we want to have as many members in common in both Houses as possible, then we should have all 3 common members in both Houses. So, members of Lower House are V, W & Z. Correct option is (b)
23. None of the members of Upper House can yield his or her place to X, as we must also have Y with X. So, there will be at least 2 changes needed (in next change Y will be added to Upper House). W from Lower House cannot yield his or her place to X, as he or she is only member between both Houses. Y from Lower House cannot yield his or her place to X, as he or she must also be present with X in same house. Only Z can be replaced by X. Correct option is (d)
24. Only common member for both Houses is Z. U & X are each selected for a house. So, we can conclude that one of the houses must have X, Y & Z as its 3 members (as it already has X & Z, we must keep Y with X). The other house has U & Z as its 2 members. The 3rd member may be W or V. So, we can say that U must be selected for a different house than Y. Correct option is (c)
25. If X & Z are selected for Upper House, then the 3 members of Upper House are X, Y & Z (as Y also be selected for the house for which X is selected). One of the members of Lower House is U. If we choose V & W as 2 other members, and then there cannot be any common member in both houses. But, we must have at least 1 common member in both houses. So, V & W cannot be selected. Correct option is (a)

Chapter

7

BLOOD RELATION

LEARNING Objectives

In this chapter, you will learn:

- Relations across the generations
- Approaching a question from back-end
- Mapping of generations to eliminate the options

Introduction to the Topic

This chapter is quite important for MBA exams like SNAP, MAT, CMAT etc., and Campus Recruitment Examinations.

Following kind of questions are expected in Family Tree questions:

- i. Find out the relationship of one person with other person.
- ii. Relationship will be provided and the sex of the person will be asked to determine.
- iii. Find out the total number of males or females in the family.

The only skill set required to solve these kinds of questions is a very simple thing—Do we have the ability to translate the given situation in the question into our real life? The more easily, we do this, the easier will be to solve the questions related to ‘family tree’.

To remember easily the relations may be divided into two sides as given below:

Paternal Side Relations

Father's father = Grandfather

Father's mother = Grandmother

Father's brother = Uncle

Father's sister = Aunt

Children of uncle = Cousin

Wife of uncle = Aunt

Son/daughter of aunt = Cousin

Husband of aunt = Uncle

Maternal Side Relations

Mother's father = Maternal grandfather

Mother's mother = Maternal grandmother

Mother's brother = Maternal uncle

Mother's sister = Aunt

Son/daughter of maternal uncle = Cousin

Wife of maternal uncle = Maternal aunt

Generation Chart

Generation 1	Grandfather, Grandmother (Both Paternal and Maternal)
Generation 2	Father, Mother, Father in Law, Mother in Law, Uncle, Aunt (Both Paternal and Maternal),
Generation 3	YOU, Brother, Sister, Cousins, Brother in Law, Sister in Law
Generation 4	Son, Daughter, Niece, Nephew
Generation 5	Grandson, Granddaughter

How to Approach a Question

While attempting a blood relation question, keep following thumb rules in mind:

- Ideally, these questions should be approached from the back end.
- Do a generation check—Keep a tab on level of generation—if the answer is in same generation as that of the subject or in a generation above one level or lower than the subject? This may not get you the answer always, but will help you in eliminating the options.

Example 1

If X is the brother of the son of Y's son, how is X related to Y?

Solution

Son of Y's Son – Grandson of Y

Next Step – Brother of the son of Y's son = Brother of (Grandson of Y) = Grandson of Y

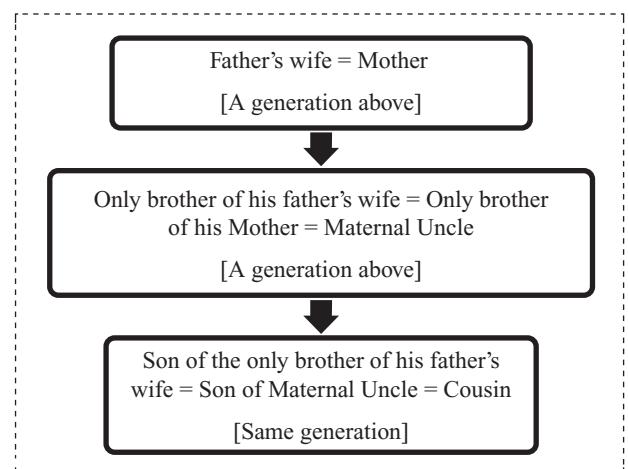
Example 2

Amit introduces Rahul as the son of the only brother of his father's wife. How is Rahul related to Amit?

- Cousin
- Son
- Uncle
- Son-in-law

Solution

In general, in these kinds of questions, we should start from the back-end.



Hence Cousin is the answer.

Hence option (a) is the answer.

Alternatively, we can eliminate few options by using the generation check.

Father's wife – A generation above (since father is a generation above, and father's wife will be in the same generation as that of father).

Only brother of his father's wife = Only brother + a generation above = A generation above

Son of the only brother of his father's wife = Son of + A generation above = Same generation

Hence answer should be in the same generation.

Now let us check the options:

- Cousin – same generation
- Son – One generation lower
- Uncle – One generation above
- Son-in-law – One generation lower

Hence option (a) cousin is the answer.

Example 3

A + B means A is the mother of B

A – B means A is the brother B

A @ B means A is the father of B and

A × B means A is the sister of B,

Which of the following shows that P is the maternal uncle of Q?

- Q – N + M × P
- P + S × N – Q
- P – M + N × Q
- Q – S @ P

Solution

At first, do some mental mapping regarding how we want to achieve the asked. We have to obtain P is the maternal uncle of Q \Rightarrow P is the brother of mother of Q (this is the simplest way we can arrive at the required). Now we will see the options one by one.

- Q – N + M × P
Q – N means Q is the brother of N.
N + M means that N is the mother of M.
Using above two statements, we can say that Q is the maternal uncle of M. Now to show that P is the maternal uncle of Q, next relation should be M is the brother/sister of Q.
M × P = M is the sister of P
So, the final relation that comes out is – Q is the maternal uncle of M and M is the sister of P,

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hence Q is the maternal uncle of P. (This is exactly opposite of what we wanted to achieve).

- (b) $P + S \times N - Q$

$P + S \times N = P$ is the mother of S and S is the sister of N $\Rightarrow P$ is the mother of N

$N - Q = N$ is the brother of B $\Rightarrow P$ is the mother of B. Hence not true.

- (c) $P - M + N \times Q$

$P - M + N = P$ is the brother of M and M is the mother of N $\Rightarrow P$ is the maternal uncle of N

Next, $N \times Q = N$ is the sister of Q

We already know that P is the maternal uncle of N and N is the sister of Q $\Rightarrow P$ is the maternal uncle of Q. Hence option (c) is the answer.

- (d) $Q - S @ P$

$Q - S @ P = Q$ is the brother of S and S is the father of B $\Rightarrow Q$ is the uncle of B.

Example 4

$A + B$ means A is the sister of B

$A - B$ means A is the brother of B

$A \times B$ means A is the daughter of B.

Which of the following options show that E is the maternal uncle of D?

- (a) $D + F - E$
- (b) $D - F \times E$
- (c) $D \times F + E$
- (d) None of these

Solution

Going through the options:

(a) $D + F - E = D$ is the sister of F and F is the brother of E \Rightarrow This remains in the same generation (as in D and E are in the same generation), so we certainly know that “maternal uncle (which is one generation above)” relation cannot be established here. Hence option (a) cannot be the answer.

(b) $D - F \times E = D$ is the brother of F and F is the daughter of B $\Rightarrow D$ is the son of B

(c) $D \times F + E = D$ is the daughter of F and F is the sister of E $\Rightarrow E$ can be maternal uncle or maternal aunt of D depending upon if E is a male or a female. F is the sister of E indicates the gender of F (Female) only and does not tell anything about the gender of E. Hence option (d) None of these is the answer.

Example 5

Introducing a boy, a girl said, “He is the son of the daughter of the father of my uncle.” How is the boy related to the girl?

- | | |
|------------|----------------|
| (a) Cousin | (b) Nephew |
| (c) Uncle | (d) Son-in-law |

Solution

Father of the boy’s uncle \Rightarrow the grandfather of the boy and daughter of the grandfather \Rightarrow

Aunt \Rightarrow Son of aunt = Cousin

PRACTICE EXERCISE 1

1. A girl introduced a boy as the son of the daughter of the father of her maternal uncle. The boy is girl's:
(a) Son (b) Uncle
(c) Son-in-law (d) cannot be determined

2. Pointing out to a photograph, a man tells his friend 'She is the daughter of the only son of my father's wife'. How is the girl in the photograph related to the man?
(a) Daughter (b) Cousin
(c) Mother (d) Sister

3. X introduces Y saying, "He is the husband of the granddaughter of the father of my father. How is Y related to X?
(a) Brother (b) Son
(c) Brother-in-law (d) Son-in-law

4. Showing on to the man on the stage, Ritika said he is the brother of the daughter of the wife of my husband. How is the man on the stage related to Ritika?
(a) Son (b) Husband
(c) Cousin (d) Nephew

(c) cannot be determined
(d) none of these

8. Which one is the colour preference of A?
(a) Red (b) Yellow
(c) Red or yellow (d) cannot be determined

Directions for questions 9 to 12: Read the passage below and solve the questions based on it.

(i) In a family of six members A, B, C, D, E and F each one plays one game out of the six games snooker, Carom, Table Tennis, badminton, Bridge and Cricket.
(ii) Two are married couple.
(iii) B who plays carom, is daughter in law of E.
(iv) A is the father of D, the Table Tennis player, and is father of C, who plays cricket.
(v) F is the brother of (c)
(vi) Snooker is not played by a female member.
(vii) E's husband plays Badminton.

9. Who among them plays bridge?

Directions for questions 5 to 8: *Read the passage below and solve the questions based on it.*

There is family of six persons A, B, C, D, E and F. Following information pertains to the members of this family:

Directions for questions 9 to 12: Read the passage below and solve the questions based on it.

- (i) In a family of six members A, B, C, D, E and F each one plays one game out of the six games snooker, Carom, Table Tennis, badminton, Bridge and Cricket.
 - (ii) Two are married couple.
 - (iii) B who plays carom, is daughter in law of E.
 - (iv) A is the father of D, the Table Tennis player, and D is father of C, who plays cricket.
 - (v) F is the brother of (c)
 - (vi) Snooker is not played by a female member.
 - (vii) E's husband plays Badminton.

10. How is F related to A?
(a) Granddaughter (b) Grandson
(c) Son (d) Daughter

Directions for question 13 to 15: Read the information given below and solve the questions based on it.

M, N, O and P are all distinct individuals. Following points give the details of their relationship:

- points give the details of their relationship.

 - I. M is the daughter of N.
 - II. N is the son of O.
 - III. O is the father of P.

13. Which of the following statements is true?

 - (a) O is the uncle of M.
 - (b) P and N are brothers.
 - (c) M is the daughter of P.
 - (d) If B is the daughter of N, then M and B are sisters.

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ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (d) | 2. (a) | 3. (c) | 4. (a) | 5. (a) | 6. (c) | 7. (a) | 8. (b) | 9. (a) | 10. (b) |
| 11. (a) | 12. (d) | 13. (d) | 14. (a) | 15. (d) | 16. (a) | 17. (d) | 18. (c) | 19. (b) | 20. (d) |
| 21. (d) | 22. (d) | 23. (b) | 24. (b) | 25. (d) | | | | | |

HINTS AND EXPLANATIONS**1 to 4**

1. The girl's maternal uncle and the boy's mother are siblings because they have the same father. Hence the boy is either the brother of the girl if the boy's mother and the girl's mother is the same, or the boy is the cousin of the girl if there is/are any more sibling/s of the boy's mother other than the maternal uncle of the girl. Thus, the correct option is cannot be determined.
Correct option is (d)

2. The man is himself the only son of his parents and the girl who he is pointing to in the photograph is his daughter.
Correct option is (a)

3. The father of X's father is his grandfather. Moreover, X and the granddaughter mentioned in the question are siblings. Hence her husband i.e. Y is the brother-in-law of X.
Correct option is (c)

4. "The wife of my husband" refers to Ritika, hence her daughter's brother will be her son. Thus the man on the stage is the son of Ritika.
Correct option is (a)

5 to 8

According to the sixth condition F is of third generation as he/she has a grandmother A. B is the brother of F and is of the same generation. Now there are three people left viz. E, D and C out of which one is of the first while two are of the second generation.

From the fourth condition we can say that C is of second generation as she is the daughter in law of E who is in turn is the husband of A. The person left is D who automatically is the husband of C.

B likes blue colour. C likes black so the lady who likes yellow is A and his husband E likes green. F doesn't like red so D is the person who likes red and F likes white.

5. From the above information the married couple is CD.
Correct option is (a)

6. The male members are E, D, B and F(as a female cannot like white but F likes white hence he is male).
Correct option is (c)
7. F likes white hence is not a female, thus will be the brother of B.
Correct option is (a)
8. According to the above solution the colour preference of A is yellow.
Correct option is (b)

9 to 12

In this question there are three generations. A is from the first generation and has a son D who in turn is the father of C. C is from the third generation who has a brother F. Now from the third statement it is clear that E is from the first generation and is the wife of A as there are two married couples. B is the daughter in law of E and D is the son of A, so B is the wife of D.

B plays carom, D plays table tennis, C plays cricket, A plays badminton. Now from the sixth statement it can be inferred that as a female does not play snooker hence it will be played by F and the remaining game i.e bridge will be played by E.

9. E plays bridge.
Correct option is (a)
10. As A is the father of D and F is the son of D hence F is the grandson of A.
Correct option is (b)
11. The husband of B is D.
Correct option is (a)
12. As the gender of C is not known, hence the number of male members cannot be determined.
Correct option is (d)

13 to 15

13. As from the three statements it is clear that O is the grandfather of M and is the father of P and N. So, the first option is wrong.

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The gender of P is not known so we can't say that P and N are brothers. Thus the second option is also invalid.

As M is the niece of P hence cannot be the daughter of P, so third option is also incorrect.

Now if B is the daughter of N, then N will have two children M and B, both of which are females, thus will be sisters. Hence the fourth option is correct.

Correct option is (d)

14. The first option is contradictory as P is either the uncle or aunt of M, not the father of M. The rest options can be correct if there is some additional information, but the first option is completely contradictory.

Correct option is (a)

15. If B is the son of N and has a brother D, then M is the sister of D and O is the grandfather of D. Hence the first and the third statements are correct.

Correct option is (d)

16 to 18

C is the wife of B, B has a son F and a daughter A as A is the granddaughter of G. G is the mother of B. As D is the father in law of C, hence D is the husband of G. D is the father of B and E.

Also, E is a professor, D is a lawyer (G's husband is a lawyer), G is a housewife, A is an engineer, C is a doctor.

16. From the above information B is the father of F, and the husband of C. Hence, F is the son of C.

Correct option is (a)

17. B is the brother of E.

Correct option is (d)

18. D is the lawyer.

Correct option is (c)

19 to 20

We are given 4 names. We cannot determine the gender of a person by name only. Prakash lives with his (or her) parents. So, at least 2 people are older than him (or her). Qureshi lives with 3 persons younger to him (or her). We also know Shabdeshi lives with his mother & is older than at least 2 people living with him. So, his gender is Male & his mother must be Qureshi. Now, Rajesh lives with his (or her) son & is not older than Shabdeshi. So, she must be female & wife of Shabdeshi & mother of Prakash. So, we get in order of age (1 is eldest):

1. Qureshi (female) – Mother of Shabdeshi
2. Shabdeshi (male) – Son of Qureshi, Husband of Rajesh & Father of Prakash
3. Rajesh (female) – wife of Shabdeshi & mother of Prakash
4. Prakash (male or female) – son or daughter of Shabdeshi & Rajesh

19. There are total 4 persons in the house
Correct option is (b)

20. Qureshi is Prakash's grandmother
Correct option is (d)

21. According to the first option M is the father of P, Q and N.

The second expression states that N is the brother of P, who is the father of Q, who is the sister of M. Hence N is the maternal uncle of M.

From the third option it can be seen that N is the sister of P, who is the mother of Q, who is the sister of M. Thus, N is the maternal aunt of M.

None of the above option shows that M is the maternal uncle of N.

Correct option is (d)

22. According to the expression P is the mother of Q, who is the father of R, who is the brother of T, who is the daughter of N. P is the mother of Q and K is the wife of Q, hence P is the mother-in-law of K. Hence the answer is none of these.

Correct option is (d)

23. According to the second expression K is the brother of Y, who is the father of I. Hence K is the uncle of I. Also I is the sister of Z, thus it can be said that I is the niece of K.

Correct option is (b)

24. The only child of Mohit's father is Mohit himself and the girl is his daughter. Hence Mohit's wife will be the mother of the girl.

Correct option is (b)

25. From the first expression P is the maternal aunt of M, who is the father of N. Thus, P is the grandmother of N.

The second option says that P is the husband of Q and Q is the father of M, which is not possible because if P and Q is a couple then both of them cannot be males.

Third expression states that P is the mother of Q and Q is the father of N, hence P is the grandmother of N, not vice versa.

Hence none of the given options is correct.

Correct option is (d)

Chapter

8

DIRECTIONS DECISION MAKING

LEARNING Objectives

In this chapter, you will learn:

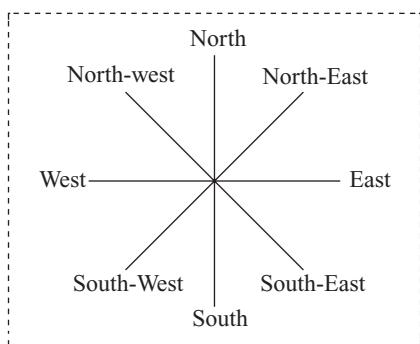
- Deciding the direction—pre movement and post movement
- Drawing the diagram
- Methods to solve the questions

Direction questions test student's ability to process the information based upon directions swiftly and make decisions on the basis of it. Further, mapping of the whole schema to things as per the conditions required and terms used like clockwise/anti-clockwise/southeast etc.

To solve these questions, student should have a clear idea of the directions and be able to draw the diagram as per the information given in the question.

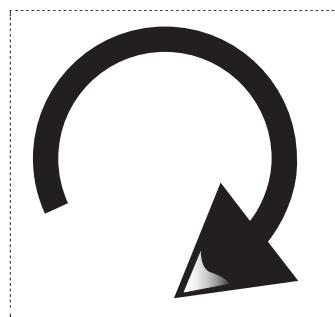
Pictorial Presentation of Directions/ Movements on a Map

(a) Directions



If question mentions North East, it means it is equally inclined with North and East (exactly at 45°).

(b) Clockwise movement



(c) Anti-clockwise movement

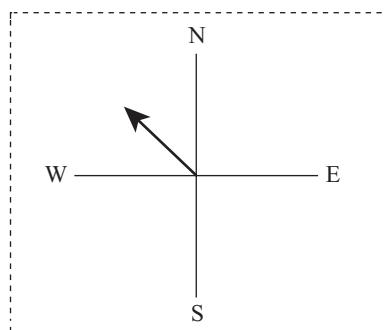


We will now learn how to draw the diagrams and arrive at final conclusion.

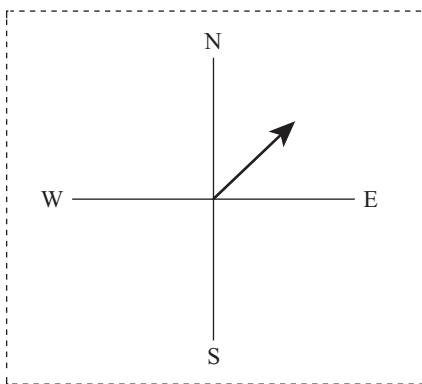
Example

Solution

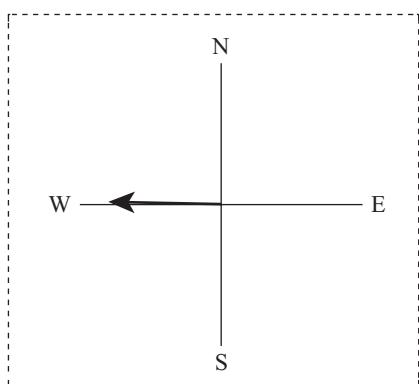
Step 1: A man is facing north-west.



Step 2: He turns 90° in the clockwise direction.



Step 3: And then 135° in the anti-clockwise direction.



As obvious from the diagram, he is now facing West. Hence option (b) is the answer.

Example

2. Goki is looking for his wife Vartika. He went 90 metres in the east before turning to his right. He went 20 metres before turning to his right again. He walked 30 metres further to look for Vartika at his uncle's place, but was told that Vartika has already left. Disappointed he went 100 metres to his north before meeting Vartika. How far did Goki meet his wife from starting point?

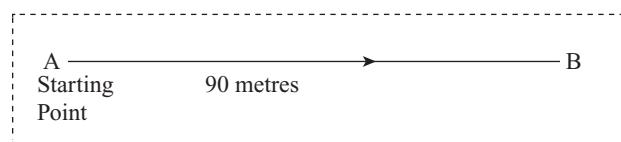
(a) 80 metres
(b) 100 metres
(c) 140 metres
(d) 260 metres

Solution

Let us see the diagram:

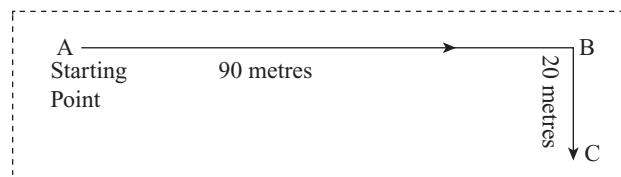
Step 1:

Goki moves 90 m eastwards to B.



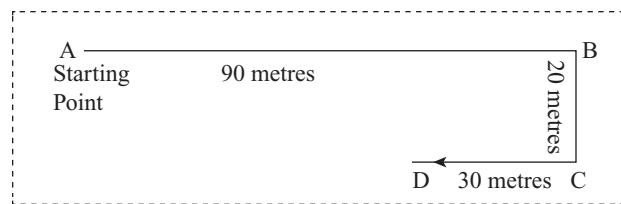
Step 2:

He, then, turns right and moves 20 m to C. At this point we are facing towards B. So right would be downwards.



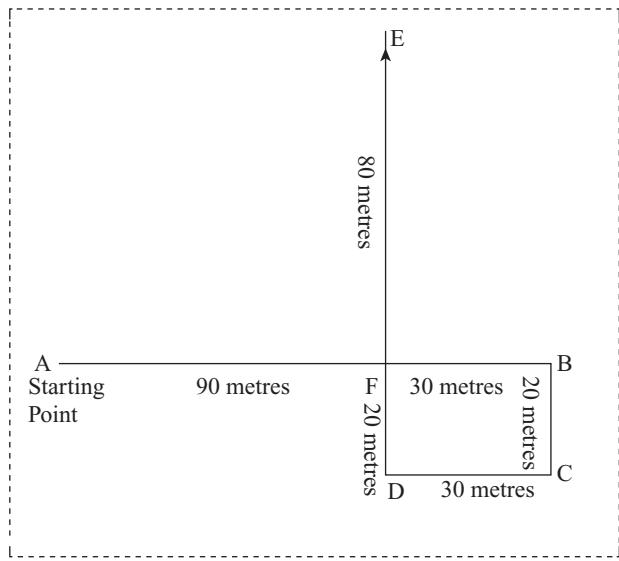
Step 3:

He again turns right and moves 30 m up to D.



Step 4:

Finally, he turns right and moves 100 m up to E.



Clearly, $AB = 90$ m, $BF = CD = 30$ m. So, $AF = AB - BF = 60$ m. Also $DE = 100$ m, $DF = BC = 20$ m.

So, $EF = DE - DF = 80$ m.

So, Goki found Vartika at a distance $= AE = \sqrt{AF^2 + FE^2} = 100$ m.

Hence option B is the answer.

Example

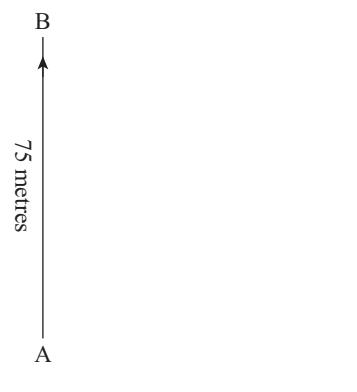
3. Neha Kavi moved a distance of 75 metres towards the north. She then turned to her left and walked for 25 metres, turned left again and walked 80 metres. Finally, she turned to the right at an angle of 45° . In which direction was she moving finally?
- North-east
 - North-west
 - South
 - South-west

Solution

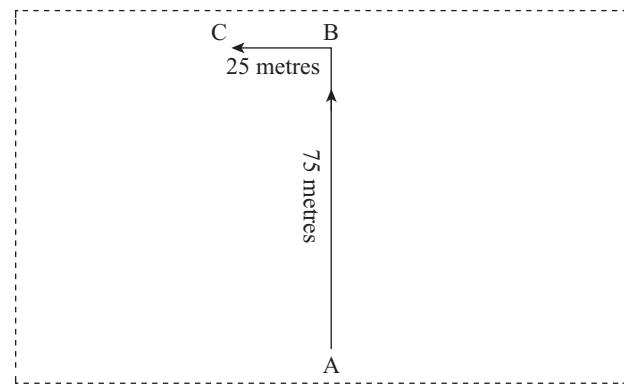
Let us see the diagram:

Step 1:

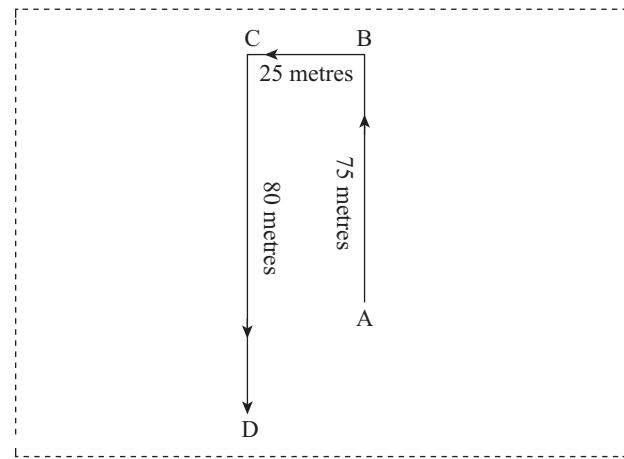
Neha Kavi moved a distance of 75 metres towards north to reach point B.

**Step 2:**

She turned left and walked 25 m to reach point C.

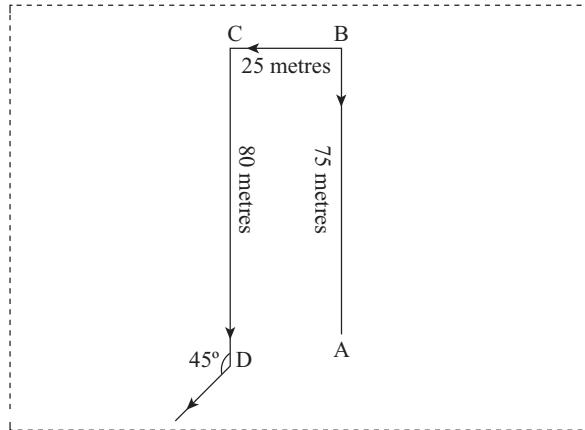
**Step 3:**

She then turned left again and moved 80 m to D.



Step 4:

Turning to the right at an angle of 45° .



It can be seen through the diagram that she is finally moving in the South-west direction.

Hence option (d) is the answer.

Example

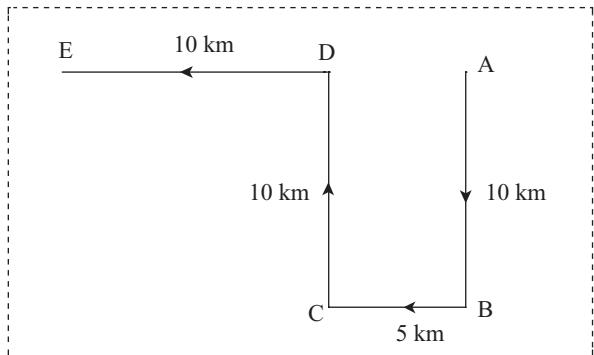
4. One day, Dileep left his home and walked 10 km southwards, turned right and walked 5 km, turned right and walked 10 km, walked left and then walked 10 km. How many kilometres will he have to walk to reach his home straight?
- 10 km
 - 15 km
 - 20 km
 - 25 km

Solution

Now we will draw the whole situation in one unified diagram.

Dileep starts from his home at A, walks 10 km southwards till B, turns right and moves 5 km till C, turns right again and walks 10 km till D and finally turns left and walks 10 km till E.

It can be seen that his distance from initial position $A = AE = AD + DE = BC + DE = (5 + 10) \text{ km} = 15 \text{ km}$. Hence option (b) is the answer.

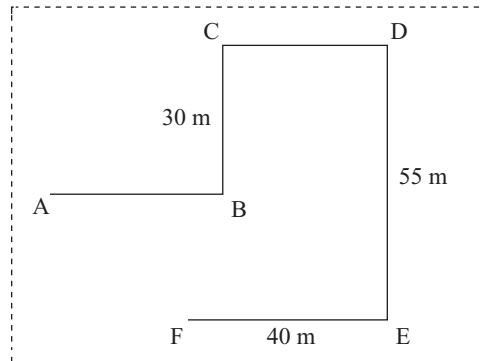


Example

5. Tanay is standing facing north. Turning to his right, he walks 25 metres. He then turns to his left and walks 30 metres. He, further, walks 25 metres to his right. He then walks to his right again and walks 55 metres. Finally, he turns to the right and walks 40 metres. In which direction is he now from his starting point?

- South-west
- South
- North-west
- South-east

Solution



Tanay moves towards right from north direction. Therefore, he walks 25 m towards east to B, turns left, and moves 30 m to C, turns right and goes 25 m to D.

At D, he turns to right towards south and walks 55 m to E.

Next, he again turns to right and walks 40 m to F, which is his final position.

F is to the south-east of A. Therefore, he is to the south-east from his starting point.

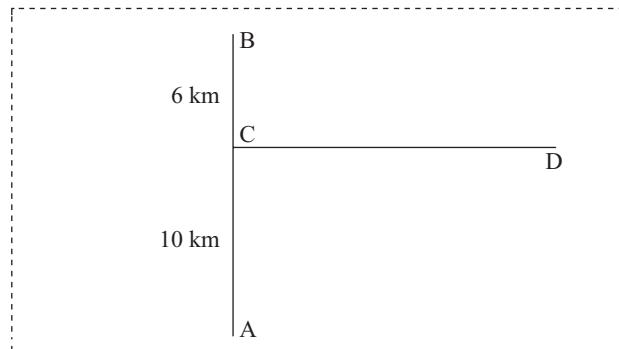
Hence option (d) is the answer.

Example

6. Kaveri walks 10 km towards North. From there she walks 6 km towards South. Then, she walks 3 km towards East. How far and in which direction is she with reference to her starting point?

Solution

Let us first draw the diagram:



Clearly, Kaveri moves from A 10 km northwards to reach point B, then moves 6 km southwards to reach point C, turns towards East and walks 3 km to reach point D.

Then, $AC = (AB - BC) = (10 - 6) = 4 \text{ km}$ and $CD = 3 \text{ km}$.

So, Kaveri's distance from starting point A = AD = $\sqrt{AC^2 + CD^2} = \sqrt{4^2 + 3^2} = 5 \text{ km}$.

Also, D is to the North-east of A.

Hence, option (d) is the answer.

Example

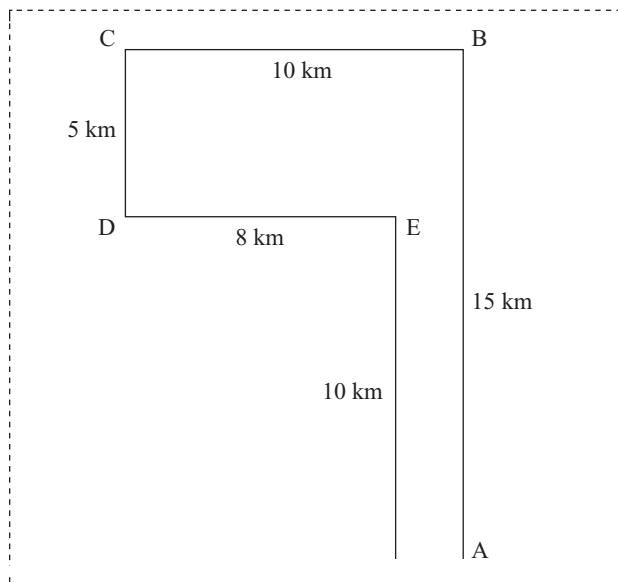
7. Gyan Prakash left for his college in his car. He drove 15 km towards north and then 10 km towards

west. He then turned to the south and covered 5 km. Further, he turned to the east and moved 8 km. Finally, he turned right and drove 10 km. how far and in which direction is he from his starting point?

- (a) 2 km West (b) 5 km East
(c) 3 km North (d) 6 km South

Solution

Let us see the diagram:



Gyan Prakash drove 15 km from A to B northwards and then 10 km from B to C towards west.

He then moves 5 km southwards from C to D and 8 km eastwards up to E.

Finally, he turned right and moved 10 km up to F.

So we can conclude that A and F lie in the same straight line and F lies to the west of A.

Hence Gyan Prakash's distance from the starting point A = AT = $(BC - DE) = (10 - 8) \text{ km} = 2 \text{ km}$.

Hence option (a) is the answer.

PRACTICE EXERCISE 1

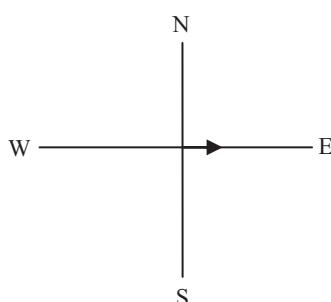
- he walked 10 m. In which direction is he from his house?
- East
 - North
 - South
 - West
- 15.** I am facing South now. I take two right turns walking, walk 20 m and 10 m respectively. Then I turn left and walk 10 m and then turning right walk 20 m. Then I turn right again and walk 60 m. In which direction am I from the starting point?
- North
 - North-west
 - east
 - North-east
- 16.** Arun walks 10 metres in front and 10 metres to his right. Then every time turning to his left, he walks 5 m, 15 m and 15 m respectively. How far is he from his starting point?
- 5 m
 - 10 m
 - 15 m
 - 20 m
- 17.** A man walks 1 mile towards East and then he turns to South and walks 5 miles. After that, he turns to East and walks 2 miles further. Finally, he turns to his North and walks 9 miles. How far is he from his starting point (in miles)?
- 2
 - 3
 - 4
 - 5
- 18.** Laxman went 15 km to the west from his house, then turned left and walked 20 km. He then turned East and walked 25 km and finally turning left covered 20 kms. How far was he from his house?
- 5 km
 - 10 km
 - 40 km
 - 80 km
- 19.** Ramesh goes 50 m to the South of his house. Then he turns left and goes another 20 m. Then, turning to the North, he goes 30 m and then starts walking to his house. In which direction is he walking now?
- North-west
 - North
 - South-east
 - East
- 20.** Door of Chumu's house faces the East. From the backside of his house, he walks 50 metres straight, then turns to the right and walks 50 metres again. Finally, he turns towards left and stops after walking 25 metres. Now, Chumu is in which direction from the starting point?
- South-east
 - North-east
 - South-west
 - North-west
- 21.** There was a 4-direction pole situated at a crossroad—with arrows pointing towards four directions East, West, South and North. Due to an accident that damaged the pole, east pointer is now towards South. Unfortunately, a man who wanted to go actually northwards took the help of this direction pole and started moving towards north as per the pole. Which direction is this man actually moving towards?
- West
 - North
 - South
 - East
- 22.** In the above question, if the north direction pointer starts showing south direction, then how many direction pointers are still showing the right direction?
- 0
 - 1
 - 2
 - 3

ANSWER KEYS

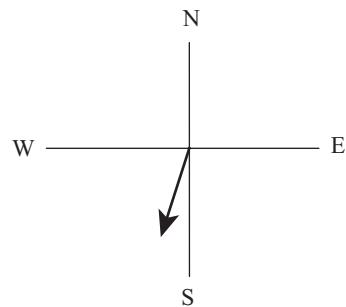
- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (b) | 2. (a) | 3. (d) | 4. (a) | 5. (a) | 6. (b) | 7. (d) | 8. (c) | 9. (c) | 10. (b) |
| 11. (a) | 12. (d) | 13. (d) | 14. (b) | 15. (d) | 16. (a) | 17. (d) | 18. (b) | 19. (a) | 20. (d) |
| 21. (d) | 22. (a) | | | | | | | | |

HINTS AND EXPLANATIONS

- 1.** Step 1: facing east

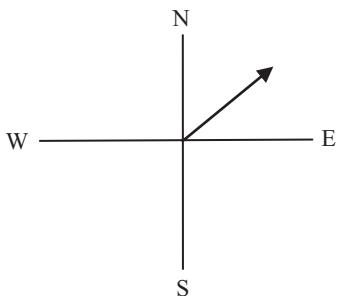


- Step 2: turns 100° in clockwise direction.



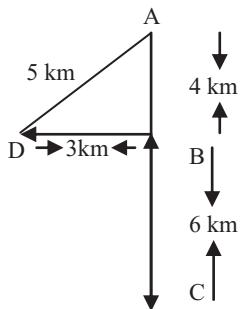
1.86 Logical Reasoning

Step 3: then turns 145° in anticlockwise direction.



As can be seen from the diagram, I am facing North-East direction. Hence option (b) is the right answer.

2.

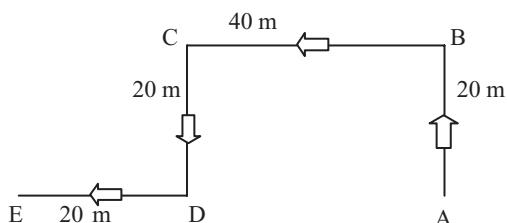


$$AD^2 = AB^2 + BD^2 = 3^2 + 4^2$$

Or, $AD = 5 \text{ km}$

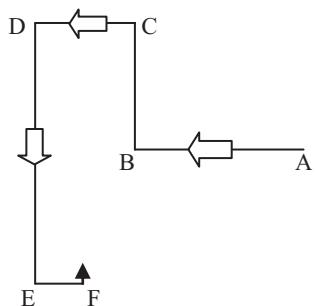
Thus, Amit is 5 km in north-west direction with reference to his starting point.

3.



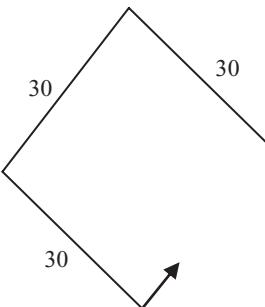
Thus, Mudit is 60m away from starting point.

4.



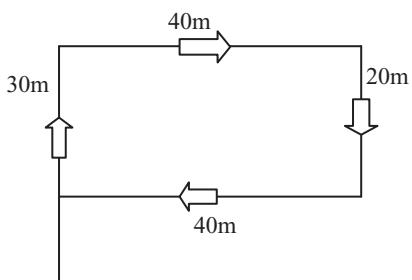
Thus, Rajat is walking in north direction.

5.



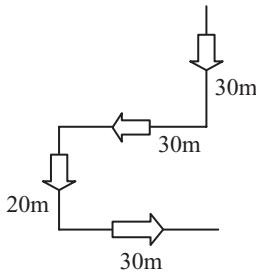
Thus, Priyanka is moving in north-east direction.

6.



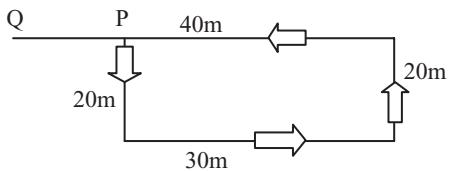
Thus, Surendra is 10m away from starting point.

7.



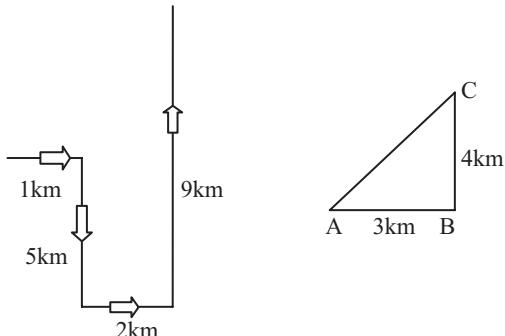
Thus, Vineet is 50 m away from starting point.

8.



Thus, Q is 10m in west direction.

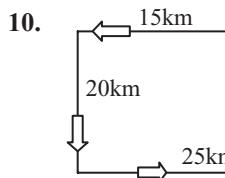
9.



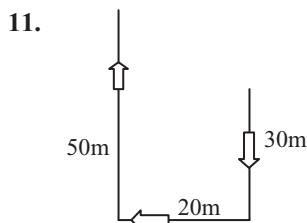
$$AC^2 = AB^2 + BC^2 = 3^2 + 4^2$$

Or, $AC = 5 \text{ km}$.

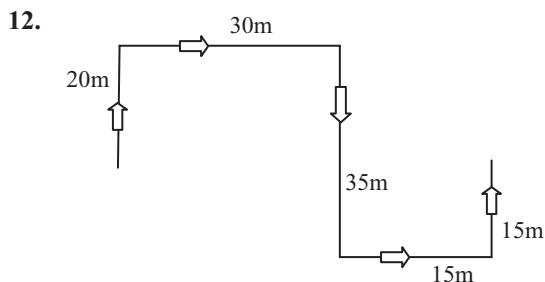
Thus, Vijendra is 5km away from starting point.



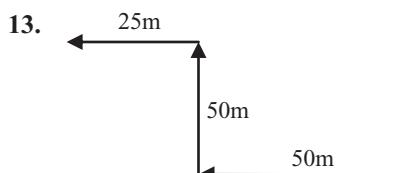
Thus, Munu is 10km away from her home.



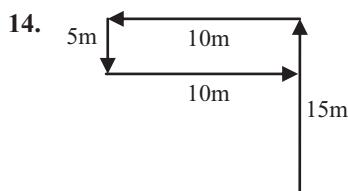
Thus, Ruchi is walking in north-west direction.



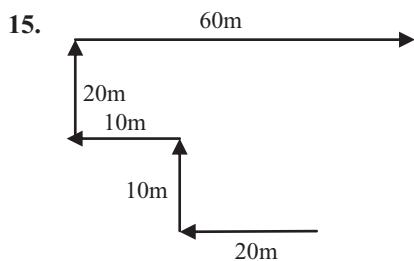
Thus, Maulik is 45m towards east from starting point.



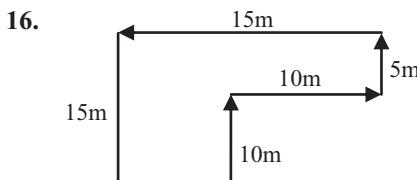
Thus, Anjali is in south-west direction from starting point.



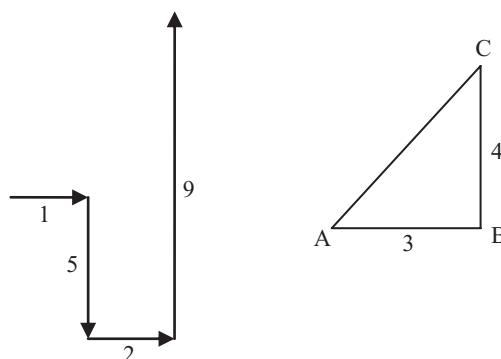
Thus, Vikash is in North direction from his house.



Thus, I am in North-East direction from starting point.

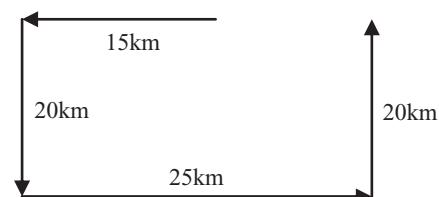


Thus, Arun is 5m from the starting point.

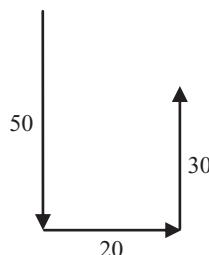


$$AC^2 = AB^2 + BC^2 = 3^2 + 4^2 \\ \text{Or, } AC = 5 \text{ miles.}$$

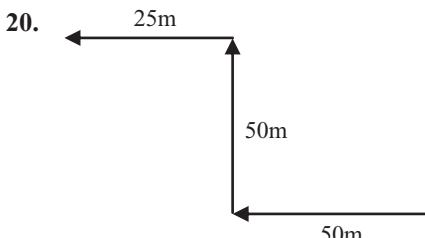
Thus, the man is 5 miles from the starting point.



Thus, Laxman is 10km away from his house.



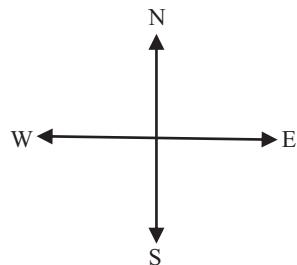
Thus, to reach his house, Ramesh is walking in North-West direction.



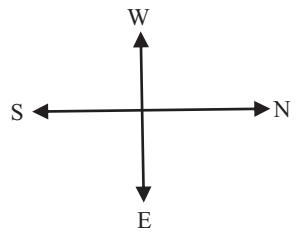
1.88 Logical Reasoning _____

Thus, Chumu is in North-West direction from starting point.

21. Originally,

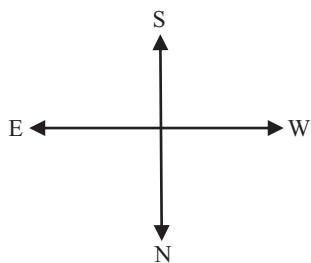


After Accident the position of pointers



Thus, the man is actually moving in East direction.

22. After accident, the position of pointers,



Thus, none of the pointer is showing the right direction after accident.

Chapter

9

SYLLOGISM

LEARNING Objectives

In this chapter, you will learn:

- Different Types of statements
- Interpretations and conclusions of those statements
- Conclusions derived through joining the statements
- Methods to solve the questions

In Syllogism, we study the given statements in order to substantiate the derived conclusions.

The evidence provided to substantiate the conclusions are known as premises and that which is drawn on the basis of the premises is a conclusion. Thus Syllogism can be understood to be a piece of reasoning providing ‘relational arrangement’ between premises and conclusions.

Let us first understand the various terms involved:

Statement 1: Some of the Indians are men.

Statement 2: All men have the potential to be good.

Conclusion: Some Indians have the potential to be good.

In the above given statements, statement 1 and statement 2 are premises and conclusion is to be verified on the basis of the premises given. It is also to be noted that:

- Propositions and statements are not the same thing.
- While finding out the conclusion, we should not be concerned with the vocabulary of the terms involved in the statements. Rather, we should treat them in isolation, without taking their literal meaning into account. To understand it better, if it is given that ‘All boys are good’, we cannot derive any relationship

between boys and bad (opposite of good), unless some association between bad and good is given in the original question.

Types of Statements and the ways to Represent them

Famous European philosopher Aristotle and other classical logicians divided the categorical statements into four types:

Universally Affirmative Statement

Whenever we say that “All girls are good”, we are simply accepting the relationship between the two entities ‘girls’ and ‘good’ in such a way that anything or anybody who is a girl, has to be good. We may assume that there is such a thing called girls. But the meaning of the above premise does not depend upon the assumption that girls exist.

These kinds of statements are known as Universally Affirmative Statements because they give the impression of the statement being universally true.

Like all the girls present anywhere can be anything else, but simultaneously have to be good also. And there cannot be any exception to this rule.

Examples—

All goats are animals.

All actresses are beautiful.

All prime numbers are natural numbers.

Universally affirmative statements can be also rephrased using the word ‘only’.

‘All goats are animals’ can be written as – only animals are goats.

Or, ‘All actresses are beautiful’ can be written as – only the beautiful are actresses.

Or, ‘All prime numbers are natural numbers’ can be written as – only natural numbers are prime numbers.

Universally Negative Statement

Whenever we say that, “No man is perfect”, we are simply accepting the relationship between two entities ‘man’ and ‘perfect’ in such a way that anything or anybody who is a man cannot be perfect. We may assume that there is such a thing called a man. But the meaning of the above premise does not depend upon the assumption that man exists.

These kinds of statements are known as Universally Negative Statements because they give the impression of the statement being universally true. Like all the men present anywhere might not be anything else too, but simultaneously they cannot be perfect also. And there cannot be any exception to this rule.

Examples –

No Indian is a coward.

No prime number is a fraction.

No dream is unachievable.

Particular Affirmative Statement

Whenever we say that, “Some movies are boring”, we are simply accepting the relationship between two entities ‘movies’ and ‘boring’ in such a way that some of the movies have to be boring. It also means that all the movies cannot be not-boring. We may assume that there is such a thing called ‘movies’. But the meaning of the above premise does not depend upon the assumption that movies exist.

These kinds of statements are known as Particular Affirmative Statements because they give the impression of the statement being true in some particular cases and not in all the cases. Hence, it falls short of being a universal fact or a universally affirmative statement.

Example—

Some dogs are rich.

Some people are happy.

Some bosses are stupid.

Particular Negative Statement

Whenever we say that, “Some numbers are not integers”, we are simply accepting the relationship between two entities ‘numbers’ and ‘integers’ in such a way that some of the numbers have to be non-integers. We may assume that there is such a thing called ‘numbers’. But the meaning of the above premise does not depend upon the assumption that numbers exist.

These kinds of statements are known as Particular Negative Statements because they give the impression of the statement being true in some particular cases and not in all the cases.

Example—

Some scorpions are not honest.

Some managers are not effective.

Some relationships are not manageable.

Representing the Statements and Standard Deductions

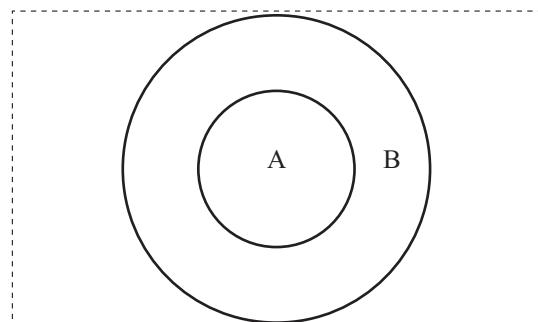
Normally, the statements given above construct a major part of any question in a syllogism. To represent these, we can either apply the subject-predicate form or the Venn-diagram method. We will see both these methods one by one:

Universally Affirmative Statement

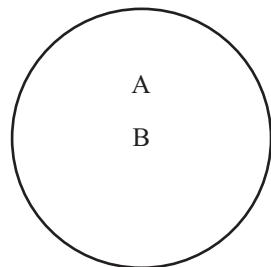
Consider the example—All A are B.

Subject-predicate form: These types of statements are known as ‘A-type’ statements.

Venn-Diagram form: In the Venn-diagram form, we can represent A-type statements in the following ways:



In the above form, A is included inside B. And obviously set B is bigger than set A.



In the above form, set A and set B are of the same size.

Following are the deductions which can be made from the above given statement:

- Some A are B.
- Some B are A.

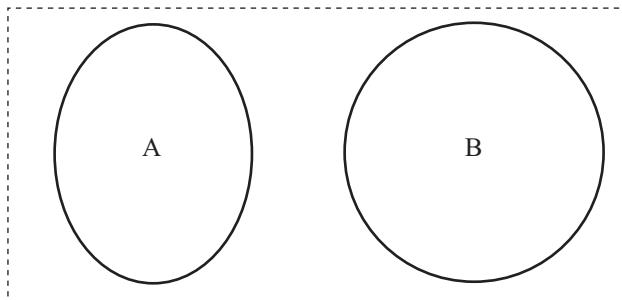
The given deductions are definitely true, however, we can derive some more ‘probably true’ deductions from the above statement. For example—‘Some B are not A’ is probably a true statement. And similarly ‘some A are not B’ is a definitely false statement.

Universally Negative Statement

Consider the example—No A are B.

Subject-predicate form: These types of statements are known as ‘E-type’ statements.

Venn-Diagram form:



Following are the deductions which can be made from the above given statement:

- No B are A.
- Some A are not B.
- Some B are not A.

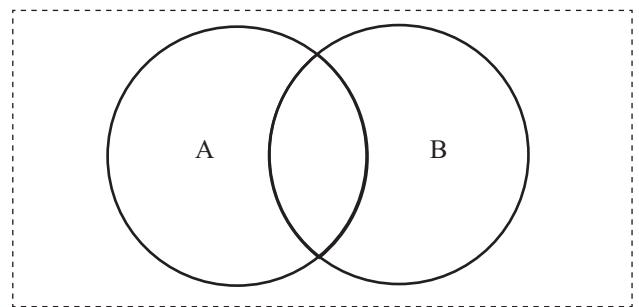
The above given deductions are definitely true.

Particular Affirmative Statement

Consider the example—Some A are B.

Subject-Predicate form: These types of statements are known as ‘I-type’ statements.

Venn-Diagram form:



Following are the deductions which can be made from the above given statement:

- Some B are A.

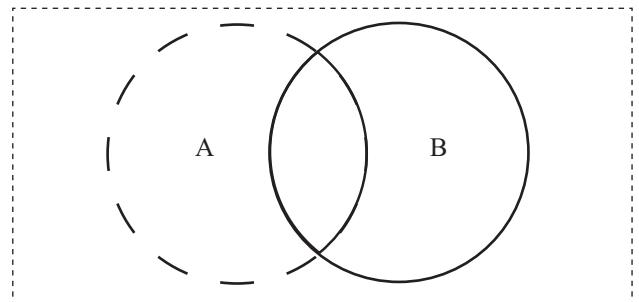
The above given deduction is definitely true, however we can derive some more ‘probably true’ deductions from the above statement. E.g., ‘Some B are not A’ is probably a true statement.

Particular Negative Statement

Consider the example—Some A are not B.

Subject-Predicate form: These types of statements are known as ‘O-type’ statements.

Venn-Diagram form:



The following are the deductions which can be made from the above given statement:

- All A are not B.

However, we cannot make any deduction of A, E, I or O format from this statement.

1.92 Logical Reasoning

Summarizing the whole discussion till now, we can have the following conclusions drawn:

	Affirmative	Negative
Universal	All (A)	No (E)
Particular	Some or Many (I)	Some not or Many not (O)

We can see the summary of all the standard deductions in a table format also:

	Given statement	Deduction	Truth-metre	Summary
All A are B	Some A are B	Definitely True	'All' can give only 'Some' as definitely true statement.	
	Some B are A	Definitely True		
	Some B are not A	Probably True		
	Some A are not B	Definitely False		
Some A are B	Some B are A	Definitely True	'Some' can give only 'some' as definitely true statement.	
	Some B are not A	Probably True		
	Some A are not B	Probably True		
Some A are not B	No 'Definitely True' deduction possible			
	Some B are not A	Probably True		
No A are B	No B are A	Definitely True	'No' can give only 'No' or 'Some + Not' as definitely true statement.	
	Some A are not B	Definitely True		
	Some B are not A	Definitely True		

Remember that

- No positive statement can give rise to any negative definitely true conclusion.

- No negative statement can give rise to any positive definitely true conclusion.

Besides the standard AEIO statements, there are a few more statements which are used in Syllogism:

Given statement	Deduction	Truth-meter	Summary
Only A are B	All B are A	Definitely True	All the conclusions related to the Some format will be true.
	Some A are B	Definitely True	
	Some B are A	Definitely True	
All A is not B	Some A are not B	Definitely True	
	Some B are not A	Probably True	

Deductions of two or more than two statements of AEIO type together:

First Statement type	Second Statement type	Possible 'definitely true' conclusions	Not possible
All	Some	Some	No/Some Not
	All	All/Some	No/Some not
	No	Some not/No	Some All
Some	Some not	No conclusion is possible	
	All	Some	All/Some not/No
	Some	No such conclusion possible	
No	No	Some not	All/No/ Some
	Some not	No conclusion is possible	
	Some not	No conclusion is possible	

	First Statement type	Second Statement type	Possible 'definitely true' conclusions	Not possible conclusions
No	All	No/Some not	All/Some	
	Some	Some not	All/No/ Some	
	No	No/Some not	All Some	
	Some not	No conclusion is possible		

	First Statement type	Second Statement type	Possible 'definitely true' conclusions	Not possible conclusions
Some not	All			
	Some		No conclusion is possible	
	Some not			
	No			

PRACTICE EXERCISE 1

Directions for questions 1 to 20: In each question given below are given three statements followed by four conclusions numbered (I), (II), (III), and (IV). You have to take the given statements to be true even if they seem to be at variance with commonly known facts and judge the conclusions on the basis of it. Choose the options based on the conclusions chosen.

1. Statements: (i) All boys are pens.
 (ii) Some toys are pens.
 (iii) All pots are toys.

Conclusion: I. All pens are pots.
 II. Some boys are toys.
 III. Some pots are boys.
 IV. Only pots are toys.

- (a) Only I, II and IV follow
 (b) Only II, III and IV follow
 (c) Only II and III follow
 (d) None of these

2. Statement: (i) Some books are intelligent.
 (ii) No intelligent is wise.
 (iii) Some wise are wind.

Conclusions: I. Some books are not wind.
 II. Some books are not wise.
 III. Some wind is not intelligent.
 IV. Some wise are not books.

- (a) Only I and either II or IV follow
 (b) Only III follows
 (c) Only II and III follow
 (d) Only II, III and IV follow

3. Statements: (i) Some goats are cats.
 (ii) Some pens are boxes.
 (iii) Some cats are animals.

Conclusions: I. Some goats are pens.
 II. Some goats are animals
 III. Some pens are animals.
 IV. Some animals are either goats or pens.

- (a) None follows
 (b) Only IV follows
 (c) Only I and II follow
 (d) Only I, II and III follow

4. Statements: (i) All proverbs are sentences.
 (ii) No men are proverbs.
 (iii) Some women are sentences.

Conclusions: I. Some sentences are women.
 II. No proverbs are men.

- III. Some proverbs are men.
 IV. No proverbs are women.

- (a) Only I follows
 (b) Only II and either III or IV follow
 (c) Only II follows
 (d) None of these

5. Statements: (i) Some cars are jeeps.
 (ii) All bikes are cycles.
 (iii) Some jeeps are not bikes.
- Conclusions: I. Some jeeps are not cycles.
 II. Some cycles are not bikes.
 III. Some jeeps are cars.
 IV. No cycles are jeeps.

- (a) Only III follows
 (b) Only III and IV follow
 (c) Only I and IV follow
 (d) Only I and III follow

6. Statements: (i) All khiladis are spectators.
 (ii) Some spectators are theatres.
 (iii) Some theatres are movies.
- Conclusions: I. Some movies are spectators.
 II. Some khiladis are movies.
 III. Some theatres are khiladis.
 IV. All spectators are khiladis.

- (a) Only II follows
 (b) None follows
 (c) Only II and IV follow
 (d) Only I and III follow

7. Statements: (i) Some buckets are salts.
 (ii) All salts are ipods.
 (iii) Some ipods are woods.
- Conclusions: I. Some woods are salt.
 II. Some buckets are woods.
 III. Some ipods are buckets
 IV. Some woods are buckets

- (a) None follows (b) Only II follows
 (c) Only III follows (d) Only IV follows

8. Statements: (i) Some channels are mobiles.
 (ii) Some mobiles are computers.
 (iii) Some computers are stations.
- Conclusions: I. Some stations are channels.
 II. Some mobiles are stations.
 III. Some computers are channels.
 IV. All channels are stations.

- (a) None follows
 (b) Only I and II follow
 (c) Only I, II and III follow
 (d) Only II and III follow

- 9.** Statements: (i) All leaves are dim.
 (ii) No dim is brush.
 (iii) All tops are brushes.
 Conclusions: I. Some tops are leaves
 II. Some dim is top.
 III. Some dim is leaf.
 IV. Some tops are brushes.
 (a) All follow
 (b) Only I and II follow
 (c) Only II and III follow
 (d) Only III and IV follow
- 10.** Statements: (i) All noodles are threads.
 (ii) All threads are boxes.
 (iii) All trees are boxes.
 Conclusions: I. No noodle is a tree.
 II. Some trees are threads.
 III. Some boxes are noodles
 IV. Some trees are noodles.
 (a) Only either I or IV follows.
 (b) Only either I or IV and II follow.
 (c) Only III follows
 (d) Only either I or IV and III follow.
- 11.** Statements: (i) Some mountains are rivers.
 (ii) Some rivers are deserts.
 (iii) All deserts are roads.
 Conclusions: I. Some roads are rivers.
 II. Some roads are mountains.
 III. Some deserts are mountains.
 (a) None follows
 (b) Only I follows
 (c) Only II and III follow
 (d) Only I and II follow
- 12.** Statements: (i) Some cars are flowers.
 (ii) All flowers are plants.
 (iii) Some plants are leaves
 Conclusions: I. Some plants are cars.
 II. Some leaves are flowers.
 III. No car is a leaf.
 (a) None follows (b) Only I follows
 (c) Only II follows (d) Only I and III follow
- 13.** Statements: (i) All homes are mountains.
 (ii) All glasses are mountains.
 (iii) Some mountains are windows.
 Conclusions: I. Some windows are glasses.
 II. Some homes are windows.
 III. Some mountains are glasses.
 (a) Only I follows
 (b) Only II follows
 (c) Only III follows
 (d) None follows
- 14.** Statements: (i) Some homes are tables.
 (ii) Some tables are gardens.
 (iii) All lanterns are gardens
 Conclusions: I. Some lanterns are tables.
 II. Some gardens are homes.
 III. Some lanterns are homes.
 (a) None follows
 (b) Only I follows
 (c) Only II follows
 (d) Only III follows
- 15.** Statements: (i) All ships are buses.
 (ii) No room is a bus.
 (iii) All boats are rooms.
 Conclusions: I. No boat is a ship.
 II. No bus is a boat.
 III. No ship is a room
 (a) Only I and II follow
 (b) Only II and III follow
 (c) Only I and III follow
 (d) All follow
- 16.** Statements: (i) All books are copies.
 (ii) All copies are pencils
 (iii) No pencils are erasers.
 Conclusions: I. No erasers are books.
 II. No copies are erasers.
 III. Some pencils are copies.
 IV. All books are pencils.
 (a) Only I, II and III follow
 (b) Only II, III and IV follow
 (c) Only I, III and IV follow
 (d) All follow
- 17.** Statements: (i) All coats are shirts.
 (ii) Some shirts are caps.
 (iii) No caps are trousers.
 Conclusions: I. Some coats are caps.
 II. Some trousers are not shirts.
 III. No coats are trousers.
 IV. Some caps are shirts.
 (a) Only IV follows
 (b) Only I and IV follow
 (c) Only I, II and IV follow
 (d) None of these
- 18.** Statements: (i) No toys are bats.
 (ii) Some bats are boxes
 (iii) All boxes are pots.
 Conclusions: I. Some bats are not toys.
 II. Some toys are not boxes.
 III. Some pots are bats.
 IV. Some pots are not toys.

1.96 Logical Reasoning

- (a) Only I and III follow
(b) Only I, III and IV follow
(c) Only I, II and III follow
(d) None of these
- 19.** Statement: (i) No slates are pencils.
(ii) All pencils are dusters.
(iii) No pencils are chalks.
Conclusions: I. Some dusters are slates.
II. No dusters are slates
III. No slates are chalks.
IV. Some slates are chalks.
(a) Only I and III follow
(b) Only either I or II and III follow
(c) Only I and either III or IV follow
(d) None of these
- 20.** Statement: (i) Some phones are radios.
(ii) Some radios are recorders.
(iii) Some recorders are not televisions.
Conclusions: I. Some phones are recorders .
II. Some phones are not radio.
III. All phones are radios.
IV. Some radios are not televisions.
(a) Only IV follows
(b) Only I and IV follow
(c) Only I, II and IV follow
(d) None of these
- Directions for questions 21 to 27:** Solve the following questions.
- 21.** Statements: (i) All cars are trucks.
(ii) No truck is a mare.
(iii) All mares are animals.
Conclusions: I. No car is a mare.
II. Some animals are mares.
III. Some trucks are cars.
IV. Some cars are mares.
(a) Only either I or IV and II follow
(b) Only either I or II and both III and IV follow
(c) Only either I or IV and both II and III follow
(d) Only I, II and III
- 22.** Statements: (i) Some drums are vehicles.
(ii) Some vehicles are machines.
(iii) Some machines are mechanics
Conclusions: I. Some mechanics are machines.
II. Some vehicles are drums.
III. Some machines are drums.
IV. Some mechanics are vehicles.
(a) Only I and II follow
(b) Only III and IV follow
- (c) Only I and IV follow
(d) None follows
- 23.** Statements: (i) Some opels are televisions.
(ii) Some televisions are bulbs.
(iii) All lanterns are bulbs.
Conclusions: I. Some opels are lanterns.
II. Some opels are bulbs.
III. No lantern is opel.
IV. All bulbs are lanterns.
(a) IV follows
(b) Only II and III follow
(c) Only either II or III follows
(d) Only either I or III follows
- 24.** Statements: (i) All cats are lions.
(ii) Some lions are mice.
(iii) All mice are giraffes.
Conclusions: I. Some mice are cats.
II. Some giraffes are lions.
III. Some giraffes are cats.
IV. All giraffes are mice.
(a) Only I and II follow
(b) Only I and III follow
(c) Only II or III follows
(d) None of these
- 25.** Statements: (i) Some apples are bees.
(ii) No bee is a papaya.
(iii) All papayas are boys.
Conclusions: I. Some apples are boys.
II. Some boys are papayas.
III. Some boys are apples.
IV. Some bees are apples.
(a) None follows
(b) Only II and IV follow
(c) Only II and III follow
(d) None of these
- 26.** Statements: (i) Some tables are apartments.
(ii) All apartments are cars.
(iii) Some cars are trucks.
Conclusions: I. Some tables are trucks.
II. Some tables are cars.
III. Some cars are apartments.
IV. No truck is a table.
(a) Only II and III follow
(b) Either only I or II, III and IV follow
(c) Either only I or IV, and II and III follow
(d) All follow
- 27.** Statements: (i) All tables are phones.
(ii) Some phones are gadgets.
(iii) All gadgets are tables.

Conclusions: I. Some gadgets are phones.
 II. Some gadgets are tables.
 III. Some gadgets are not tables.
 IV. Some tables are phones.

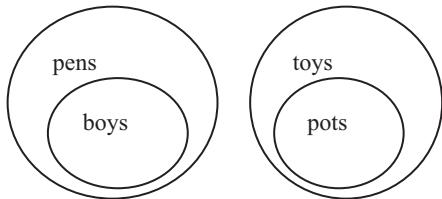
- (a) Only I and II follow
- (b) Only I and III follow
- (c) Either II or IV follow
- (d) None of these

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (d) | 2. (c) | 3. (a) | 4. (d) | 5. (a) | 6. (b) | 7. (c) | 8. (a) | 9. (d) | 10. (d) |
| 11. (b) | 12. (b) | 13. (c) | 14. (a) | 15. (d) | 16. (d) | 17. (a) | 18. (b) | 19. (d) | 20. (d) |
| 21. (d) | 22. (d) | 23. (d) | 24. (d) | 25. (b) | 26. (c) | 27. (a) | | | |

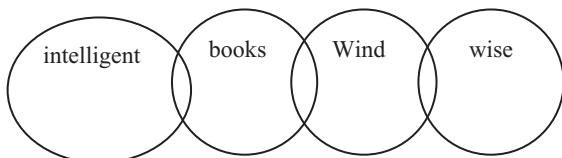
HINTS AND EXPLANATIONS

1.



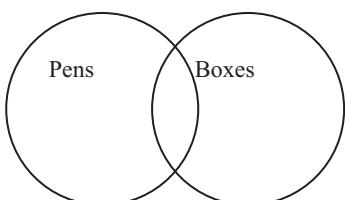
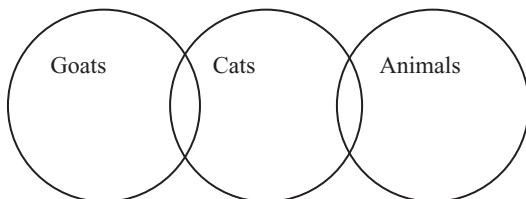
Therefore, from the above venn diagram, we can see that none of the conclusion follows.

2.



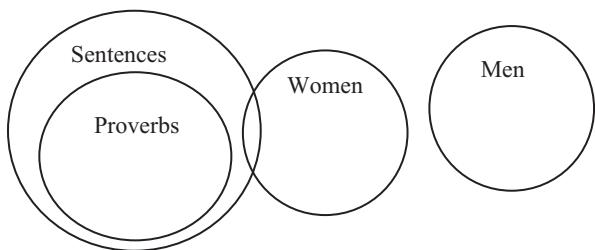
Therefore, from the above venn diagram, we can see that only II and III follows.

3.



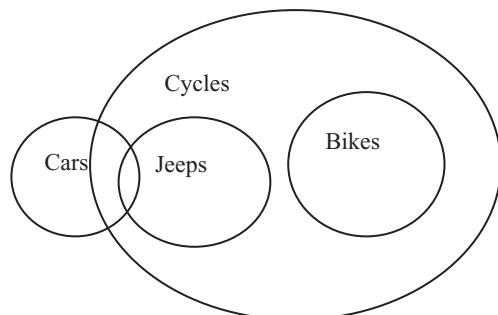
Therefore, from the above venn diagram, we can see that none of the conclusion follows.

4.

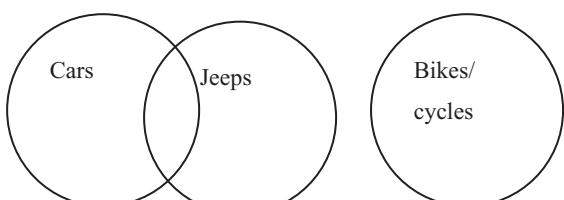


Therefore, from the above venn diagram, we can see that none of the conclusion follows.

5.

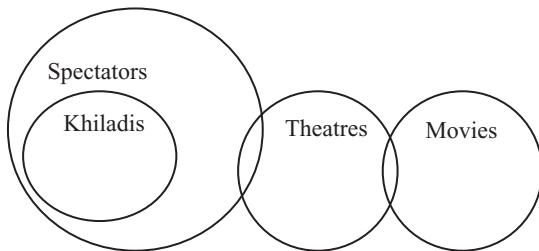


Or,

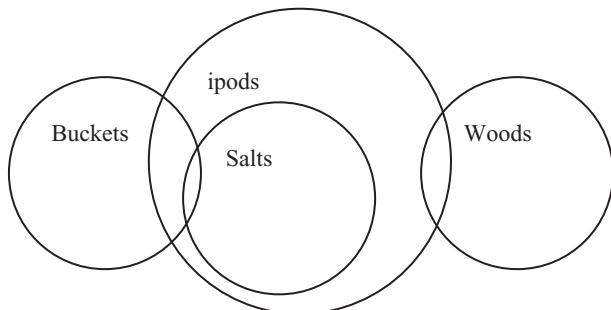


1.98 Logical Reasoning _____

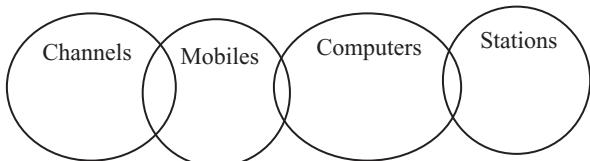
Therefore, from the above venn diagrams we can see that only conclusion III follows.

6.

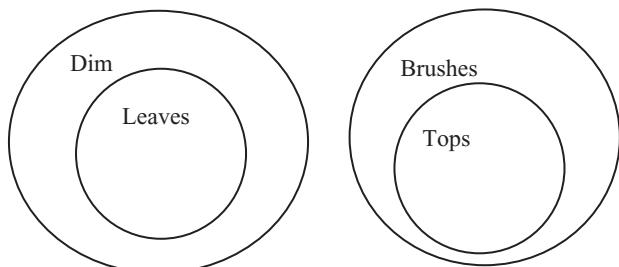
Therefore, from the above venn diagram we can see that none of the conclusion follows.

7.

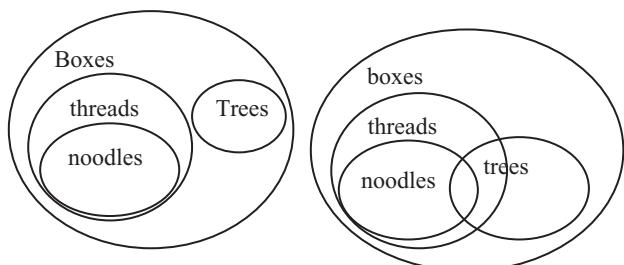
Therefore, we see that only conclusion III follows.

8.

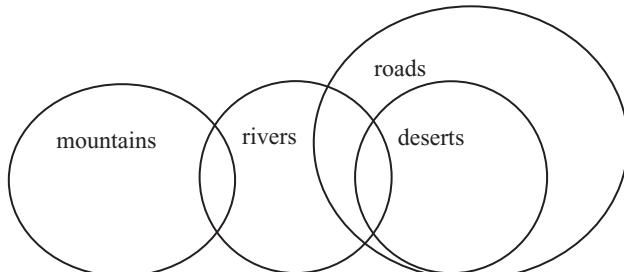
Therefore, from the above venn diagram we can see that none of the conclusion follows.

9.

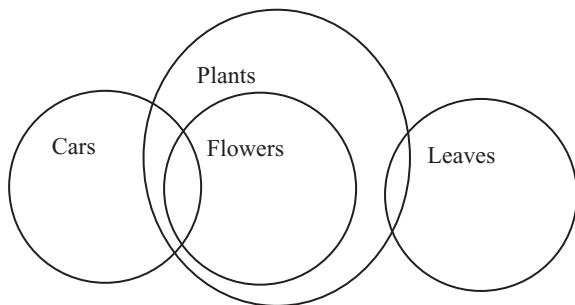
Therefore, from the above venn diagram, we can see that only conclusions III and IV follows.

10.

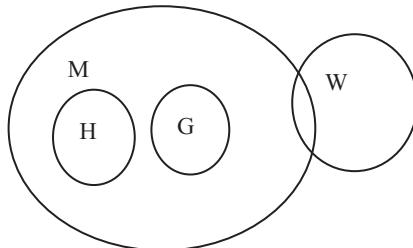
Therefore, from the above venn diagrams, we see that either conclusion I or conclusions III and IV follows.

11.

Therefore, from the above venn diagram, we see that only conclusion I follows.

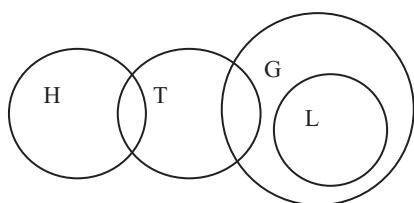
12.

Therefore, from the above venn diagram, we see that only conclusion I follows.

13.

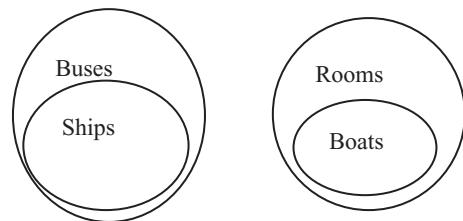
Therefore, from the above venn diagram, we see that only conclusion III follows.

14.



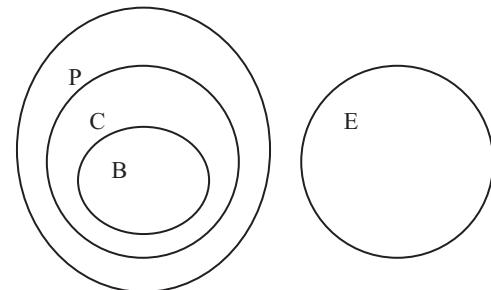
Therefore, from the above venn diagram, we see that none of the conclusion follows.

15.



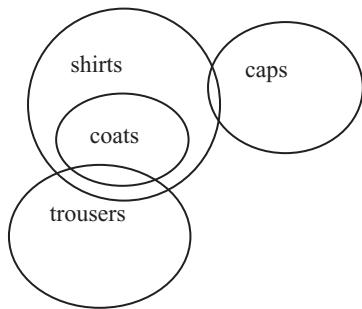
Therefore, from the above venn diagram, we see that all the conclusions follow.

16.



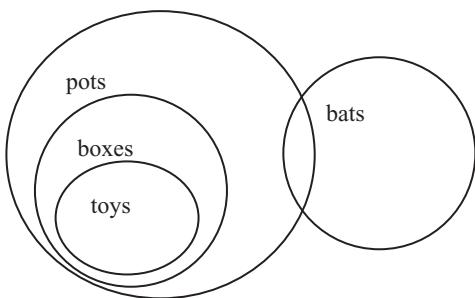
Therefore, from the above venn diagram, we see that all the conclusions follow.

17.



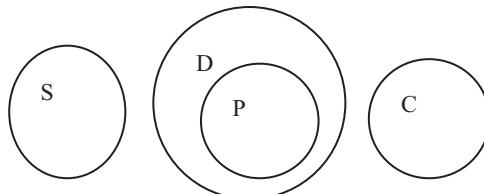
Therefore, from the above venn diagram, we see that only conclusion IV follows.

18.



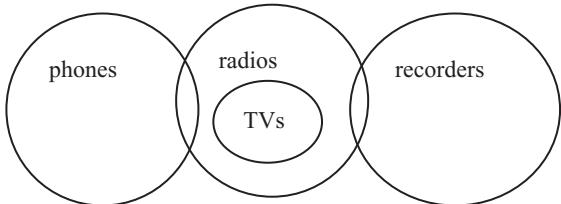
Therefore, from the above venn diagram, we see that only conclusions I, III and IV follow.

19.



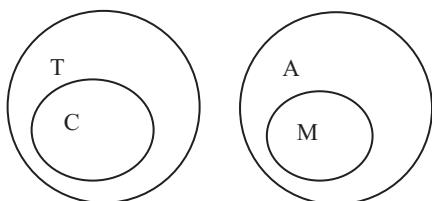
Therefore, from the above venn diagram, we see that none of the conclusions follow.

20.



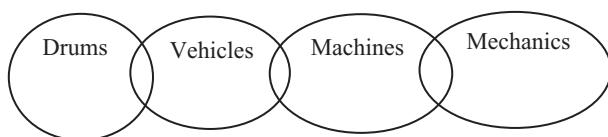
Therefore, from the above venn diagram, we see that none of the conclusions follow.

21.



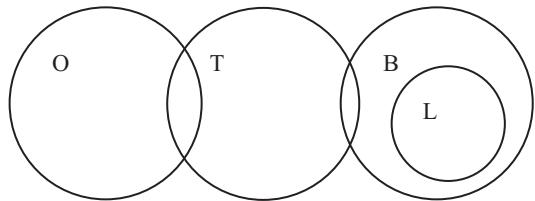
Therefore, from the above venn diagram, we see that none of the conclusions follow.

22.

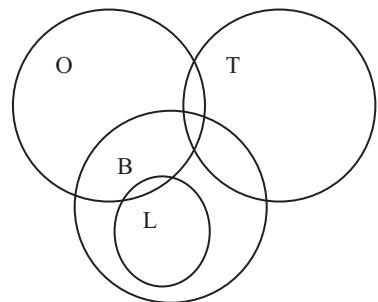


1.100 Logical Reasoning _____

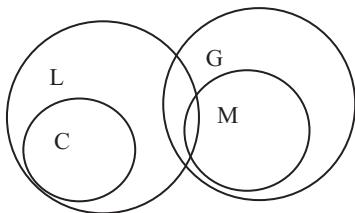
Therefore, from the above venn diagram, we see that none of the conclusions follow.

23.

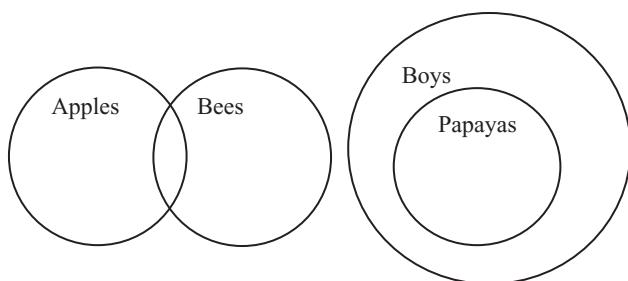
Or,



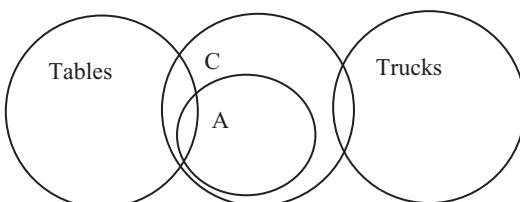
Therefore, from the above venn diagram, we see that either conclusion I or III follows.

24.

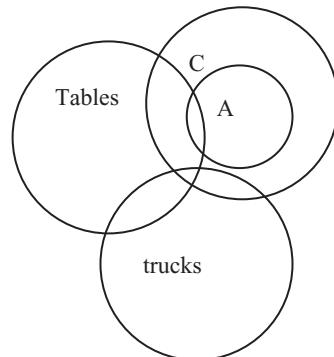
Therefore, from the above venn diagram, we see that none of the conclusions follow.

25.

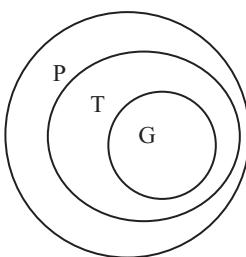
Therefore, from the above venn diagram, we see that only conclusion II and IV follows.

26.

Or,



Therefore, from the above venn diagram, we see that either conclusion I or IV, and II and III follows.

27.

Therefore, from the above venn diagram, we see that only conclusion I and II follows.

Chapter

10

INPUT–OUTPUT

LEARNING Objectives

In this chapter, you will learn:

- Different types of questions
- Mapping the pattern
- Methods to solve the questions

Input–Output questions test the student's ability to understand the pattern given in the input and subsequent steps, and extrapolate that to answer the questions.

Generally, there are three types of Input–Output questions:

- (a) Based upon reasoning – In these questions, the words or the numbers are arranged as per some fixed order or reasoning. For example, elements may be arranged in steps as per alphabetical order in case of letters or it may be an ascending or descending order in case of numbers or steps may be given in the order of sum of digits of the number.
- (b) Based upon simple replacement algorithm – In these questions, elements given in the input are shifted according to a fixed pattern.
- (c) Based upon arithmetic operation – Typically, in these questions, input will be some number given and subsequent steps are obtained by performing different arithmetic operations on the numbers given in the input.

Structure of the Question

Every question will start with an Input – either numeric or words or a combination – followed by

Steps. Understand this with the help of following example:

1. An electronic device when fed with numbers rearranges them in a particular order following certain rules. Following is the data fed (input) and Steps obtained:

Input:	18, 12, 27, 11, 14, 25
Step I:	27, 18, 12, 11, 14, 25
Step II:	27, 25, 18, 12, 11, 14
Step III:	27, 25, 18, 14, 12, 11
Step III:	is the last step for the given data (input).

How to Approach Problems

On the basis of the steps given, we are required to decide if it is based upon reasoning or based upon simple replacement algorithm.

For understanding the logic of arrangement you are advised to follow some steps:

Step I: Look at the last step and try to find out if there is a pattern or reasoning in the occurrence of the elements. If yes, it is reasoning based problem and if no, it is simple replacement algorithm.

Step 2 gives all the elements arranged in the descending order. Hence this is the last step. Hence option (b) is the answer.

5. If step IV is as given, then which of the following was the input?

Step IV: 92, 86, 71, 69, 15, 19, 06, 63, 58

- (a) 86, 92, 69, 71, 15, 19, 06, 63, 58
- (b) 15, 86, 19, 92, 06, 69, 63, 58, 71
- (c) 15, 19, 06, 63, 58, 86, 92, 69, 71
- (d) Cannot be determined

Solution

We cannot go back to previous step or to the input as we do not know which element came from which place. Hence option (d) cannot be determined is the answer.

Directions for questions 6 to 10: Read the instruction given below and solve the questions based on it.

A word arrangement machine, when given an input line of words, rearrange them following a particular rule. Following presents the input and steps generated as per this rule:

- | | |
|------------|---------------------------------------|
| Input: | Go for to though by easy to access at |
| Step I: | Access go for to though by easy to at |
| Step II: | Access at go for to though by easy to |
| Step III: | Access at by go for to though easy to |
| Step IV: | Access at by go for to though easy to |
| Step V: | Access at by easy for go to though to |
| Step VI: | Access at by easy for go to though to |
| Step VII: | Access at by easy for go though to to |
| Step VIII: | Access at by easy for go though to to |

(Step VIII is the last step for this input.) As per the rules followed in the above steps, find out in the given questions the appropriate step for the given input.

Explanation

A quick glance at the last step gives us an idea that words have been arranged alphabetically 1st and if the 1st letter is same, then 2nd letter decides the order of occurrence.

This sequencing is also known as sequencing based upon dictionary usage.

6. Input: Story for around on was he at”.

Which of the following will be Step IV for the given input?

- (a) Around at for he on was story
- (b) Around at for he on story was
- (c) Around at for he story on was
- (d) Around at he for story on was

Solution

Step 1 = Around Story for on was he at

Step 2 = Around at Story for on was he

Step 3 = Around at for Story on was he

Step 4 = Around at for he Story on was

Hence option (c) is the answer.

7. Input: “Every ant peer to an for”. Which of the following steps would be the last step for this input?

- (a) II
- (b) III
- (c) IV
- (d) V

Solution

Step 1 = an every ant peer to for

Step 2 = an ant every peer to for

Step 3 = an ant every for peer to

This is the last step for this input as all the words are alphabetically arranged now. Hence option (b) is the answer.

8. Step II of an input is as follows: “Do and pet to on that”.

Which of the following would definitely be the input?

- (a) Do on pet to and that
- (b) Do pet to and that on
- (c) Do and pet to on that
- (d) Cannot be determined

Solution

We cannot go back to input from any step in any question set that is based upon some reasoning. Hence answer is option (d) cannot be determined.

PRACTICE EXERCISE 1

Directions for questions 1 to 5: *Read the information given below and answer the questions that follow.*

A word arrangement machine when given an input line of words, rearranges them following a particular rule in each step. The following is an illustration of input and the steps of rearrangement.

Input:	Thus a the there would soon may good
Step I:	Good thus a the there would soon may
Step II:	Good may thus a the there would soon
Step III:	Good may soon thus a the there would
Step IV:	Good may soon would thus a the there
Step V:	Good may soon would there thus a the
Step VI:	Good may soon would there the thus a.
Step VII:	Good may soon would there the a thus

(And step VII is the last step for this input). As per the rules followed in the above steps, find out in the given questions the appropriate step for this input.

1. Input: “Britain legal but for and law see other”. Which of the following steps will be the last of the above input?
 - (a) VI
 - (b) VII
 - (c) VIII
 - (d) None of these
2. Input: “Apart from about the baby suffers”, which of the following steps would be “suffers baby the apart from about”?
 - (a) II
 - (b) III
 - (c) IV
 - (d) V
3. Input: “No one know true can join kept”. Which of the following is 2nd step?
 - (a) Kept no one know true can join
 - (b) Kept no join know true can one
 - (c) Kept join no one know true can
 - (d) Kept join can no one know true
4. The step III is “one of the charms claimed that baby”. Then which of the following would definitely be the input?
 - (a) Charms claimed that baby one of the
 - (b) Charms that claimed baby one of the
 - (c) Charms that claimed one baby of the
 - (d) None of these
5. Input: “The commence of surgery some critics”. Which will be the last step of the above input?
 - (a) III
 - (b) IV
 - (c) V
 - (d) VI

Directions for questions 6 to 10: *Read the information given below and answer the question that follows.*

A number arrangement machine, when given a particular input rearranges it following a particular rule. Following is the illustration of the input and the steps of arrangement.

Input:	17, 19, 23, 7, 32, 26, 13
Step I:	24, 26, 30, 14, 39, 33, 20
Step II:	196, 256, 400, 16, 841, 529, 100
Step III:	55, 61, 73, 25, 100, 82, 43
Step IV:	256, 324, 484, 36, 961, 625, 144
Step V:	26, 28, 32, 16, 41, 35, 22

6. The third step of a given input is 52, 58, 70, 19, 103, 85, 49. What will be step IV of the input?
 - (a) 289, 361, 529, 25, 1027, 784, 196
 - (b) 225, 289, 441, 16, 1024, 676, 196
 - (c) 256, 324, 529, 25, 1027, 787, 196
 - (d) 289, 361, 529, 1089, 729, 225
7. What would be step III for the input – 11, 12, 16, 21, 31, 24, 18?
 - (a) 36, 39, 51, 65, 95, 74, 56
 - (b) 36, 39, 51, 66, 96, 75, 57
 - (c) 37, 40, 52, 67, 97, 46, 58
 - (d) 38, 41, 53, 69, 98, 77, 59
8. Step IV of a given input is 25, 81, 100, 324, 441, 729, 256. What will be the given input?
 - (a) 6, 10, 12, 19, 22, 28, 17
 - (b) 5, 9, 11, 18, 21, 27, 16
 - (c) 4, 8, 10, 17, 20, 26, 15
 - (d) None of these
9. In how many steps would the following arrangements be yielded by the given input?
Input: 6, 10, 12, 19, 22, 28, 17
Arrangement: 22, 34, 40, 61, 70, 88, 55
 - (a) 2
 - (b) 5
 - (c) 4
 - (d) 3
10. What will be the fifth step of the input – 5, 9, 11, 18, 21, 27, 16?
 - (a) 13, 17, 20, 26, 27, 34, 25
 - (b) 14, 18, 20, 27, 30, 36, 25
 - (c) 15, 19, 21, 26, 29, 36, 25
 - (d) 14, 18, 20, 27, 30, 36, 24

Directions for questions 11 to 15: *Read the information given below and answer the question that follows.*

Admission ticket for an exhibition bears a password which is changed after every clock hour based on set of words chosen for each day. The following is an

illustration of the code and steps of rearrangement for subsequent clock hours.

First Batch – 9am to 10am : is not ready cloth simple harmony burning

Second Batch – 10 am to 11am : ready not is cloth burning harmony simple

Third Batch – 11am to 12 noon : Cloth is not ready simple harmony burning

Fourth Batch – 12 noon to 1 pm : Not is cloth ready burning harmony simple

Fifth Batch – 1 pm to 2 pm : ready cloth is not simple harmony burning and so on.

11. If the password for the first batch was – “rate go long top we let have”, then which batch will have the password, “go rate top long have let we”?
 - (a) Second
 - (b) Third
 - (c) Fourth
 - (d) Fifth
12. Day’s first password – “camel road no toys say me not.” What will be the password for 4th batch, i.e., 12 to 1 pm?
 - (a) Road camel toy no not me say
 - (b) No road camel toy not me say
 - (c) toy no road camel not me say
 - (d) toy camel road no say me not
13. If the second batch of the day has the password – “came along net or else key lot”, then what would be the password for batch 4 (i.e., 12 noon to 1 pm)?
 - (a) net or came along else key lot
 - (b) came or net along lot key else
 - (c) or net along came lot key else
 - (d) along net or came else key lot
14. If the password for 11am to 12 noon was- “soap shy miss pen yet the she”, then what was the password for the first batch?
 - (a) Pen miss shy soap she the yet
 - (b) shy miss pen soap yet the she
 - (c) Soap pen miss shy she the yet
 - (d) None of these
15. If the password for 6th batch i.e., 2 pm to 3 pm is – “are trap cut he but say lap”, then what will be the password for 2nd batch i.e., 10–11am?
 - (a) cut trap are he lap say but
 - (b) cut he trap are lap say but
 - (c) cut he are trap but say lap
 - (d) are he trap lap say but cut

Directions for questions 16 to 19: Read the information given below and answer the questions that follow.

A number arrangement machine, when given a particular input, rearranges it following a particular rule. Illustrations of the input and the steps of arrangement is given below.

Input: 245, 316, 436, 519, 868, 710, 689
 Step 1: 710, 316, 436, 519, 868, 245, 689
 Step 2: 710, 316, 245, 519, 868, 436, 689
 Step 3: 710, 316, 245, 436, 868, 519, 689
 Step 4: 710, 316, 245, 436, 519, 868, 689

Step 4 is the last step for the given input

16. If the input is given as—655, 436, 764, 799, 977, 572, 333, which of the following step will be —333, 436, 572, 655, 977, 764, 799?
 - (a) Step Third
 - (b) Step Second
 - (c) Step Fourth
 - (d) None of these
17. How many steps will be required to get the final output from the following input?
 Input: 544, 653, 325, 688, 461, 231, 857
 - (a) 6
 - (b) 5
 - (c) 4
 - (d) None of these
18. Step third for an input is—432, 433, 542, 666, 734, 355, 574. What will be the first step for the input?
 - (a) 666, 542, 432, 734, 433, 574, 355
 - (b) 542, 666, 734, 432, 433, 574, 355
 - (c) 355, 574, 433, 432, 734, 666, 542
 - (d) Cannot be determined
19. What will be the third step for the following input?
 Input: 653, 963, 754, 345, 364, 861, 541
 - (a) 541, 345, 754, 963, 364, 816, 653
 - (b) 541, 345, 364, 653, 963, 754, 861
 - (c) 541, 345, 364, 963, 754, 861, 653
 - (d) 541, 345, 364, 653, 861, 754, 963

Directions for the questions 20 to 22: Answer the questions based on the following information.

A word arrangement machine, when given a particular input, rearranges it following a particular rule.

Following is the illustration of the input and the steps of arrangement:

Input: She was interested in doing art film
 Step 1: art she was interested in doing film
 Step 2: art was she interested in doing film
 Step 3: art was in she interested doing film
 Step 4: art was in film she interested doing
 Step 5: art was in film doing she interested

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Step 5 is the last step of the given input. Now study the logic and rules followed in the above steps and find out appropriate step for the question given below for the given input.

- 20.** Which of the following will be the last step for the input given below?

Input: he is going out to search air

- (a) out is air to going search he
- (b) out is air to search going he
- (c) search he out is air to going
- (d) None of the above

ANSWER KEYS

- 1.** (b) **2.** (b) **3.** (c) **4.** (d) **5.** (c) **6.** (b) **7.** (c) **8.** (d) **9.** (d) **10.** (b)
11. (c) **12.** (a) **13.** (d) **14.** (b) **15.** (c) **16.** (a) **17.** (b) **18.** (d) **19.** (c) **20.** (b)
21. (d) **22.** (d)

HINTS AND EXPLANATIONS

1. Input: Britain legal but for and law see others
Step I: others Britain legal but for and law see
Step II: others see Britain legal but for and law
Step III: others see law Britain legal but for and
Step IV: others see law and Britain legal but for
Step V: others see law and for Britain legal but
Step VI: others see law and for but Britain legal
Step VII: others see law and for but legal Britain.
Thus, step VII will be the last step.
Hence, option (b) is the answer.

2. Input: apart from about the baby suffers
Step I: suffers apart from about the baby
Step II: suffers baby apart from about the
Step III: suffers baby the apart from about
Hence, option (b) is the answer.

3. Input: no one know true can join kept
Step I: kept no one know true can join
Step II: kept join no one know true can
Hence, option (c) is the answer.

4. We cannot go back to previous step or to the input as we do not know which element came from which place. Hence, option (d) is the answer.

5. Input: the commerce of surgery some critics
Step I: critics the commerce of surgery some
Step II: critics some the commerce of surgery
Step III: critics some surgery the commerce of
Step IV: critics some surgery of the commerce
Step V: critics some surgery of commerce the

6. Step III: 52, 58, 70, 19, 103, 85, 49
Step IV: 225, 289, 441, 16, 1024, 676, 196
Hence, option (b) is the answer.

7. Input: 11, 12, 16, 21, 31, 24, 18
Step I: 18, 19, 23, 28, 38, 31, 25
Step II: 64, 81, 169, 324, 784, 441, 225
Step III: 37, 40, 52, 67, 97, 46, 58
Hence, option (c) is the answer.

8. We cannot go back to previous step or to the input as we do not know which element came from which place. Hence, option (d) is the answer.

9. Input: 6, 10, 12, 19, 22, 28, 17
Step I: 13, 17, 19, 26, 29, 35, 24
Step II: 9, 49, 81, 256, 361, 625, 196
Step III: 22, 34, 40, 61, 70, 88, 55
Hence, option (d) is the answer.

10. Input: 5, 9, 11, 18, 21, 27, 16
Step I: 12, 16, 18, 25, 28, 34, 23
Step II: 4, 36, 64, 225, 324, 576, 169
Step III: 19, 31, 37, 58, 67, 85, 52
Step IV: 16, 64, 100, 289, 400, 676, 225
Step V: 14, 18, 20, 27, 30, 36, 25
Hence, option (b) is the answer.

11. 1st batch: rate go long top we let have
2nd batch: long go rate top have let we

3rd batch: top rate go long we let have
 4th batch: go rate top long have let we
 Hence, option (c) is the answer.

12. 1st batch: camel road no toy say me not
 2nd batch: no road camel toy not me say
 3rd batch: toy camel road no say me not
 4th batch: road camel toy no not me say
 Hence, option (a) is the answer.
13. 2nd batch: came along net or else key lot
 3rd batch: or net along came lot key else
 4th batch: along net or came else key lot.
 Hence, option (d) is the answer.
14. 3rd batch: soap shy miss pen yet the she
 2nd batch: pen miss shy soap she the yet
 1st batch: shy miss pen soap yet the she
 Hence, option (b) is the answer.
15. 6th batch: are trap cut he but say lap
 5th batch: cut trap are he lap say but
 4th batch: he are trap cut but say lap
 3rd batch: trap are he cut lap say but
 2nd batch: cut he are trap but say lap
 Hence, option (c) is the answer.
16. Input: 655, 436, 764, 799, 977, 572, 333
 Step I: 572, 436, 764, 799, 977, 655, 333
 Step II: 572, 436, 655, 799, 977, 764, 333
 Step III: 572, 436, 655, 764, 977, 799, 333
 Step IV: 572, 436, 655, 764, 799, 977, 333
 Hence, option (d) is the answer.
17. Input: 544, 653, 325, 688, 461, 231, 857
 Step I: 231, 653, 325, 688, 461, 544, 857
 Step II: 231, 653, 544, 688, 461, 325, 857

Step III: 231, 653, 544, 325, 461, 688, 857
 Step IV: 231, 653, 544, 325, 688, 461, 857

18. We cannot go back to previous step or to the input as we do not know which element came from which place. Hence, option (d) is the answer.
19. Input: 653, 963, 754, 345, 364, 861, 541
 Step I: 861, 963, 754, 345, 364, 653, 541
 Step II: 861, 963, 653, 345, 364, 754, 541
 Step III: 861, 963, 653, 754, 364, 345, 541
 20 to 22: In the example shown we can observe that the output has the last letters arranged in reverse alphabetical order. So, the word at 1st place is one whose last word is at highest position in alphabetical series as compared to last letter off other words in the given Input
20. The Input is: ‘he is going out to search air’
 As per the logic, the output must be the- ‘out is air to search going he’. Correct option is (b)
21. If step 2 is ‘not is the casino considering legal action’.
 Step 3: ‘not is casino the considering legal action’
 Step 4: ‘not is casino action the considering legal’
 Step 5: ‘not is casino action legal the considering’
 Correct option is (d)
22. If Input is: ‘father needs to check on the boy’
 Step 1: ‘boy father needs to check on the’
 Step 2: ‘boy needs father to check on the’
 Step 3: ‘boy needs father to on check the’
 Step 3: will be the output
 Correct option is (d)

Chapter 11 CUBES

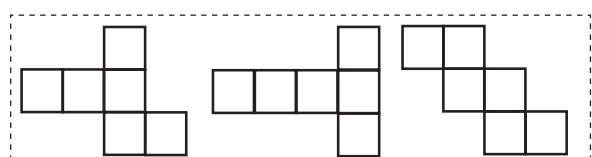
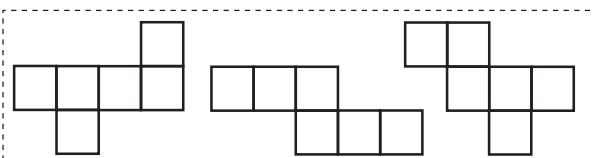
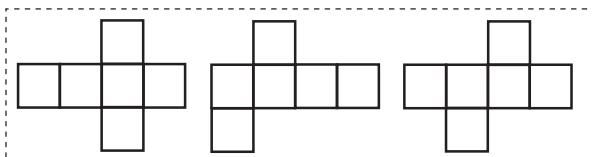
LEARNING Objectives

In this chapter, you will learn:

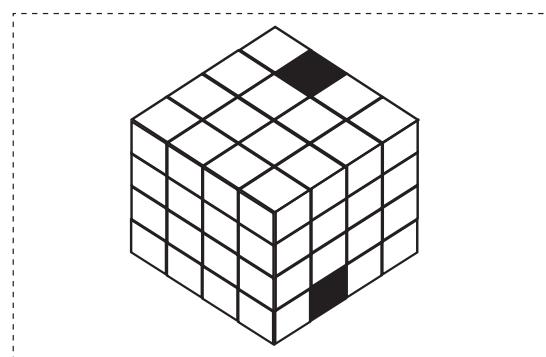
- Definitions of Edges, Faces and Corners
- Generation of new cubes through cutting the cube along different axis
- Questions based upon painting of the cubes
- Methods to solve the questions

A cube is a three-dimensional structure with the following features:

It has six faces, eight corners and twelve edges. Cube is composed of six square faces that meet each other at right angles. Let us see how the six different faces of a cube can be represented:



And finally the cube appears like:



Generally, the questions asked from Cubes in LR pertains to finding out the number of cubelets being formed from the original cube by cutting it into several pieces. However, sometimes we might be asked to find out the total number of cuts provided with the total cubelets being formed by cutting the original cube.

Cutting the Cubes

Before moving on to solve questions, we should be clear with the basics that what happens when we cut a cube:

- One cut divides the cube into two parts.
- Second cut will divide the cube in either a total of 3 parts or 4 parts, depending upon the axis of cut.
- Third cut will divide the cube in either a maximum of 8 parts or a minimum of 4 parts.

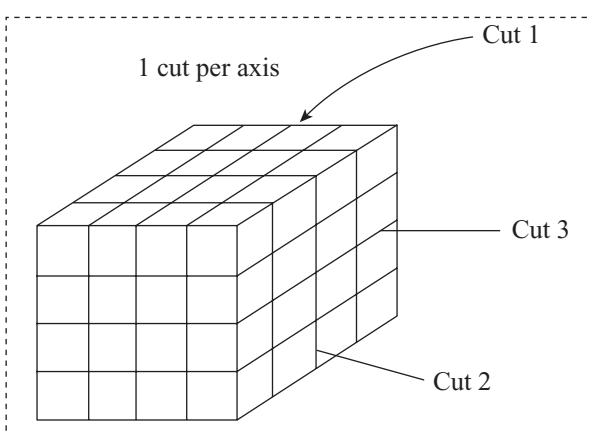
Example 1

A carpenter had a large wooden cube with side length 4 inches. He wanted to cut it into 64 smaller cubes with side length 1 inch. What is the least number of cuts required if (i) he can rearrange the pieces before each cut, (ii) the rearrangement of the pieces before/after making the cut is not allowed?

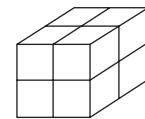
Solution

Let us understand the difference between the two questions first: (i) In first question, we are allowed to move the cube one over the other or we can stack the pieces of cube side by side or on top of each other, whereas (ii) in second question, we have to assume as if the cube is fixed on the horizontal surface and what we can do at best it to make cuts, along any of its surfaces.

- When rearrangement is allowed, the minimum is found by cutting each edge as nearly in half as possible, putting the pieces together and cutting as nearly in half again until we obtain a solid with a unit dimension. We would start here with making a cut midway on all the axis.



And this is what we will obtain now:



Now restack the solids into the $4 \times 4 \times 4$ solid and repeat the procedure. After completing the three sides, we will have $1 \times 1 \times 1$ cubes. Therefore, the sum of the cuts is the answer, which is six.

- When rearrangement is not allowed:

We know that making n cuts along one axis divides the cube in $(n + 1)$ parts. To obtain 64 cubelets by making minimum number of cuts, we should be making the cuts along all the axis.

Assume we have made n, m, p cuts along three axes.

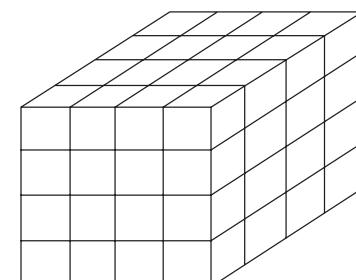
$$\text{So, number of cubelets formed} = (n + 1)(m + 1) \\ (p + 1) = 64$$

$$\begin{aligned} \text{To minimize the number of cuts, } (n + 1) &= (m + 1) \\ &= (p + 1) = 4 \end{aligned}$$

So, $n = m = p = 3$, hence a total of 9 cuts.

Alternatively, to make the number of cuts minimum, cuts should be made symmetrical.

Look at this figure:



It is having 64 cubelets of size $1 \times 1 \times 1$, and total number of cuts made = 9

Painting the cubes and then Cutting the Cubes

If we paint a cube of the dimension $n \times n \times n$ by any one colour, and then we cut it to have n^3 symmetric cubelets, then following is the number of cubelets with colour on different faces of it.

- Cubelets with only one face painted = $6(n-2)^2$
- Cubelets with two faces painted = $12(n-2)$

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- iii. Cubelets with three faces painted = 8
- iv. Cubelets with no face painted = $(n-2)^3$

So, if you add all the four types of cubelets given above (Cubelets with only one face painted + Cubelets with two faces painted + Cubelets with three faces painted + Cubelets with no face painted), it will be equal to total number of cubelets.

Formula wise:

$$6(n-2)^2 + 12(n-2) + 8 + (n-2)^3 = n^3$$

Examples

Directions for questions 2 to 5: Read the passage following and solve the questions based on it.

64 symmetrical small cubes are put together to form a big cube. This cube is now coloured on all its surfaces by green colour.

- 2. How many of the smaller cubes have none of its faces coloured?

Solution

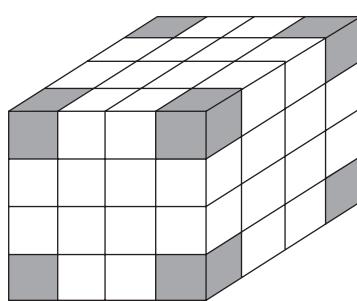
From the given $4 \times 4 \times 4$ cube, if we remove one layer from the top making it $2 \times 2 \times 2$ cube, it will not be coloured.

Hence 8 small cubes will not be coloured on any of its surfaces.

- 3. How many of the smaller cubes have exactly three faces coloured?

Solution

Look at the three faces coloured small cubes in the figure:



All the corner cubes (blackened) will be having exactly three faces coloured.

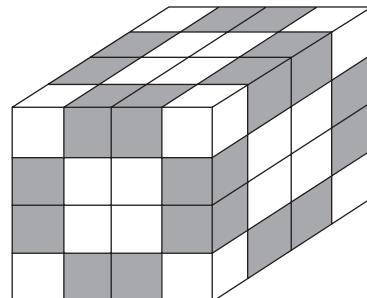
These are 8 in numbers.

Remember, for any $n \times n \times n$ dimension ($n \geq 2$), number of cubes having exactly three faces coloured = 8

- 4. How many of the smaller cubes have exactly two faces coloured?

Solution

Look at the two faces coloured small cubes in the figure:

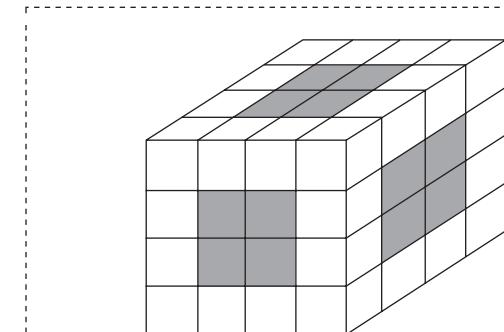


We can see that along every edge, there are two cubes painted with two colours.

So, total number of small cubes painted on exactly two of its faces = $2 \times 12 = 24$

- 5. How many of the smaller cubes have exactly one face coloured?

Solution



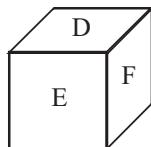
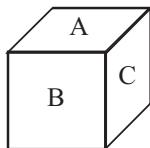
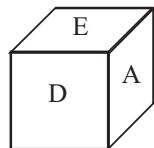
It can be seen from the above figure that total number of cubes coloured on only one of its faces = $4 \times 6 = 24$

Alternatively, total number of small cubes = Total no. of cubes painted on (one face + two faces + three faces + no face).

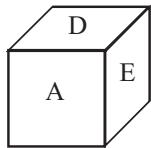
So, total number of cubes painted on only one of its faces = $64 - 8 - 8 - 24 = 24$

Example 6

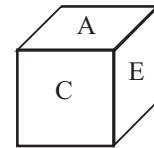
Directions for question 6: In this question, three views of a cube are given. If the same cube is rotated in a particular way, it will give rise to different views. Four such views are given in the options. However, out of the four options given, one of the options does not confirm to the original cube. Mark that option as your answer. (The letters used are only to mark the different faces of the cube.)



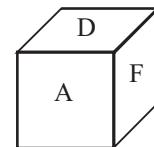
(a)



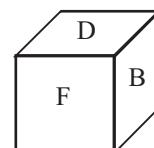
(b)



(c)



(d)

*Solution*

From the given figure, it can be inferred that the four faces adjacent to face A are—B, C, D and E. Hence face 'F' cannot be adjacent to face 'A'.

Hence option c is wrong.

PRACTICE EXERCISE 1

Directions for questions 1 to 4: *Read the passage below and solve the questions based on it.*

A large cube is dipped into a tub filled with colour. Now the cube is taken out and it was observed that all its sides are painted. This large cube is now cut into 125 small but identical cubes.

Directions for questions 5 to 9: Read the passage below and solve the questions based on it.

There is cube in which one pair of opposite faces is painted red; another pair of opposite faces is painted blue and the third pair of opposite faces is painted pink. This cube is now cut into 216 smaller but identical cubes.

Directions for questions 10 to 14: Read the passage below and solve the questions based on it.

There is cube in which one pair of adjacent faces is painted black; the second pair of adjacent faces is painted blue and third pair of adjacent faces is painted green. This cube is now cut into 216 smaller and identical cubes.

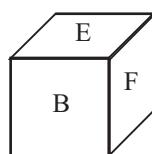
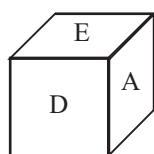
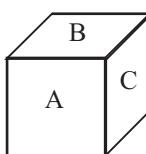
Directions for questions 15 to 18: Read the passage below and solve the questions based on it.

A large cube is painted on all its six faces. Now it is cut into a certain number of smaller identical cubes. It was found that among the smaller cubes, there were eight cubes which don't have any face painted.

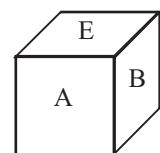
Directions for questions 19 to 25: Read the passage below and solve the questions based on it.

Three different faces of a cube are coloured in three different colours—black, green and blue. This cube is now cut into 216 smaller but identical cubes.

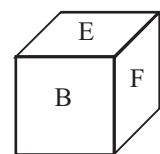
26. In this question, three views of a cube are given. If the same cube is rotated in a particular way, it will give rise to different views. Four such views are given in the options. However, out of the four options given, one of the options does not confirm to the original cube. Mark that option as your answer. (The letters used are only to mark the different faces of the cube.)



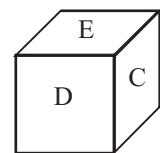
(a)



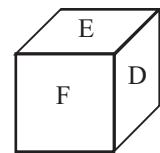
(b)



(c)



(d)



ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (a) | 2. (b) | 3. (c) | 4. (b) | 5. (b) | 6. (c) | 7. (a) | 8. (d) | 9. (a) | 10. (b) |
| 11. (d) | 12. (c) | 13. (c) | 14. (d) | 15. (c) | 16. (b) | 17. (d) | 18. (b) | 19. (a) | 20. (d) |
| 21. (d) | 22. (d) | 23. (c) | 24. (d) | 25. (b) | 26. (c) | | | | |

HINTS AND EXPLANATIONS**1 to 4**

There are 125 small identical cubes. So, $n^3 = 125$. Therefore $n = 5$.

1. The number of small cube with no painted face = $(n - 2)^3 = (5 - 2)^3 = 3^3 = 27$.
2. The number of small cube with exactly 1 painted face = $6(n - 2)^2 = 6(5 - 2)^2 = 6(9) = 54$.
3. The number of small cube with exactly 2 painted faces = $12(n - 2) = 12(5 - 2) = 12(3) = 36$.
4. The number of small cube with exactly 3 painted faces = 8.

5 to 9

There are 216 smaller identical cubes. So, $n^3 = 216$. Therefore $n = 6$. Now, the original cube has 2 opposite faces painted Red, Blue & Pink.

5. There are 2 faces which are painted red, so all the small cubes which are formed on these 2 opposite faces will have red colour at 1 of their faces. On each face there are $n^2 = 6^2 = 36$ small cubes. So, there must be total $2 \times 36 = 72$ small cubes with red colour in 1 of its face. There are total 216 small cubes. Therefore, the small cubes with no red colour at all = $216 - 72 = 144$.
6. The small cubes with at least 2 different colours on their faces = the small cubes with 2 coloured faces + small cubes with 3 coloured faces = $12(n - 2) + 8 = 12(6 - 2) + 8 = 56$.
7. The number of small cube with no painted face = $(n - 2)^3 = (6 - 2)^3 = 64$.
8. The small cubes with only red & pink on their faces = the small cubes with 1 face painted red & 1 (other) face painted pink = the small cubes with exactly 2 coloured faces with 1 face coloured as pink & other red + small cubes with 3 coloured faces (1 is coloured red, other is pink & 3rd face is blue).

The small cubes with exactly 2 coloured faces with red & pink colours are those cubes which are

formed on 2 edges which are common to red & pink faces. There are such $2(n - 2)$ cubes.

So, the small cubes with only red & pink on their faces = $2(n - 2) + 8 = 16$.

9. The small cubes with only pink or only blue colour on their face = Small cubes with only pink colour + small cube with only blue colour.

There are 2 opposite faces which are coloured blue & 2 opposite faces are coloured pink. The cubes with only 1 coloured face on each face are $(n - 2)^2$. We have 4 such faces (2 which are coloured pink & 2 are blue coloured). So, there are total $4(n - 2)^2$ such faces.

Required number of small cubes = $4(n - 2)^2 = 4(6 - 2)^2 = 64$.

10 to 14

There are 216 smaller identical cubes. So, $n^3 = 216$. Therefore $n = 6$. Now, the original cube has 3 pairs of 2 adjacent faces painted Black, Blue & Green.

10. There are 2 adjacent faces which are painted black, so all the small cubes which are formed on these 2 adjacent faces will have black colour at 1 face or 2 faces (which are formed on edge where these adjacent black faces intersect). On each face there are $n^2 = 6^2 = 36$ small cubes. So, there must be total $2 \times 36 = 72$ small cubes with black colour in 1 face or 2 faces. But, 6 cubes (which are having 2 black coloured faces are counted twice). So, there are such $72 - 6 = 66$ small cubes. There are total 216 small cubes. Therefore, the small cubes with no black colour at all = $216 - 66 = 150$.
11. The small cubes with at least 2 different colours on their faces = the small cubes with 2 coloured faces + small cubes with 3 coloured faces - small cubes which have exactly 2 coloured faces & both have same colour = $12(n - 2) + 8 - 3(n - 2) = 12(6 - 2) + 8 - 3(6 - 2) = 44$.

12. The small cubes with 1 face painted black = All cube with at least 1 face coloured black- all cubes with 2 black coloured faces (as the cubes which have 2 black coloured faces are those which are formed on the edge where the adjacent black faces intersect, so we need to remove them from all possible cubes with black colour irrespective of fact whether or not it has any other coloured face).

There are 2 faces (which are adjacent) which are coloured black, so the cubes which are formed on any of these faces are n^2 . But from these n^2 cubes there are n cubes which have both faces coloured black. So, there are total cubes with exactly 1 black coloured face = $2(n^2 - n) = 2(6^2 - 6) = 60$.

13. The small cubes with both black & green colours on their faces = Cubes with exactly 2 coloured faces which are black & green + cubes with 3 coloured faces (each face is black, blue & green coloured).

Each face intersects with 3 other faces. The 1st face must be of same colour, as adjacent faces are of same colour. The other 2 faces touching each face must be of other 2 colours. The 8 cubes which are formed at corner of original big cube must be cubes with 3 coloured face with 3 different colours. There will be 2 edges where black & green coloured faces will intersect, these cubes will have exactly 2 colours which are black & green.

So, required number of cubes = $2(n - 2) + 8 = 2(6 - 2) + 8 = 16$.

14. The small cubes with only green or only blue colour on their face = Small cubes with only green colour + small cube with only blue colour.

There are 2 adjacent faces which are coloured blue & 2 adjacent faces are coloured pink. The cubes with only 1 coloured face on each face are $(n - 2)^2$. We have 4 such faces (2 which are coloured green & 2 are blue coloured). So, there are total $4(n - 2)^2$ such faces. Further there are $n - 2$ cubes which have exactly 2 faces coloured such that both have green colour. Similarly there are $n - 2$ cubes with exactly 2 coloured faces such that both faces are of blue colour. We know that 2 adjacent faces have same colour, so the cubes formed at common edge will have both faces of same colour, but we removed 2 as there 2 are formed at corner which has 3 coloured faces, so these will have 3 coloured faces with 3rd face coloured with other colour. From these 4 cubes 1 cube has 2 faces coloured blue & 3rd face coloured green & 1 cube has 2 faces coloured green & 3rd face is coloured blue.

$$\text{Required number of small cubes} = 4(n - 2)^2 + 2(n - 2) + 2 = 4(6 - 2)^2 + 2(6 - 2) + 2 = 74$$

15 to 18

A large cube which was painted on all 6 faces is cut into certain number of identical smaller cubes. There are 8 smaller cubes which don't have any face painted. Let there are n^3 total number of smaller cubes.

15. The number of smaller cube is n^3 . The number of cubes with no face painted = $(n - 2)^3 = 8$.
So, $n - 2 = 4$ & hence $n = 4$. So, total number of smaller cubes = $4^3 = 64$.
16. The number of small cube with exactly 1 painted face = $6(n - 2)^2 = 6(4 - 2)^2 = 24$.
17. The number of small cube with exactly 2 painted faces = $12(n - 2) = 12(4 - 2) = 24$.
18. The number of small cube with exactly 3 painted faces = 8.

19 to 25

There are 216 smaller identical cubes. So, $n^3 = 216$. Therefore $n = 6$. Now, the original cube has 3 different faces painted with different colours viz. black, green & Blue.

19. We can choose the 3 different coloured faces in such a way that no 3 intersect at any corner. So, it is possible to have no 3 face coloured for the smaller cubes. So, the required least value is 0.
20. We can choose 3 coloured faces in 2 different ways. 1st is such a way in which these 3 coloured faces won't intersect at any corner. In 2nd way all 3 coloured faces may intersect at a corner. We won't get the same answer by both ways. So, as it can have 2 possible answers, it cannot be determined.
21. We can get the least number of small cubes with just 1 coloured face if we choose 3 coloured faces such that all 3 coloured faces intersect at a corner as then we get more number of cubes with 2 coloured faces. There are total $n^2 = 6^2 = 36$ faces on each face. But, among them we need to remove 1 on 2 sides as those cubes are having 2 coloured faces. So, for each face we will have $(n - 1)^2$ cubes with exactly 1 coloured face. So, there are total $3(n - 1)^2$ cubes required number of cubes. So, required number of cubes = $3(n - 1)^2 = 3(6 - 1)^2 = 75$.
22. We can get the largest number of small cubes with just 1 coloured face if we choose 3 coloured faces

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such that all 3 coloured faces do not intersect at a corner as then we get minimum number of cubes with 2 coloured faces.

There are total $n^2 = 6^2 = 36$ faces on each face. There are total 3 such faces. But, among them we need to remove the cubes which are formed on 2 edges where 2 faces intersect (there are 2 such faces). There will be $2n$ cubes on each edge (n for each of 2 faces which intersected on the edge).

Thus, required number of cubes = $3(n^2) - 2(2n) = 3(6^2) - 4(6) = 84$.

23. We need to assume the 3 coloured faces do not intersect at a corner & the black coloured face is adjacent to both green coloured face & blue coloured face (but blue & green coloured faces are not adjacent to each other). So, the smaller cubes formed at the 2 edges where black coloured face meet other coloured face will have 2 coloured faces & so these cubes must be removed. We get total n^2 small cubes

in each face. So, the required number of cubes = $n^2 - 2n = 6^2 - 2(6) = 24$.

24. We need to assume the 3 coloured faces do not intersect at a corner & the green & blue coloured faces are adjacent to each other. So, the smaller cubes formed at the edge where these faces intersect will have exactly 2 coloured faces with 1 face coloured green & other coloured blue. In each edge 6 small cubes are formed. So, required number of cubes is 6.
25. The number of smaller cubes with no coloured face must be $(n - 1)^3$ as we need to subtract 1 due to each face. So, required number of cubes = $(n - 1)^3 = (6 - 1)^3 = 125$. Only option (b) includes 125.
26. This can be solved by visual inspection. By observing the given figures we can conclude that E & C must be opposite faces. In option (c), E & C are shown as adjacent faces. So it does not confirm to the original cube.

Chapter

12

BOOLEAN LOGIC

LEARNING Objectives

In this chapter, you will learn:

- What is Boolean Logic?
- Solving questions through decision tree analysis
- Approach to solve the questions

Boolean logic is a form of algebra in which all values are reduced to either true or false. It was developed by English mathematician George Boole in the mid-19th century. Its rules govern logical functions (true/false) and are the foundation of all electronic circuits in the computer. As add, subtract, multiply and divide are the primary operations of arithmetic, AND, OR and NOT are the primary operations of Boolean logic. Boolean logic is turned into logic gates on the chip, and the logic gates make up logic circuits that perform functions such as how to add two numbers together.

However, we would be concerned here with the logical application of Boolean logic in True/False situations only. Boolean logic is, sometimes, also referred as Binary Logic.

Let us see a Boolean Logic situation:

On a fictional island, all inhabitants are either knights, who always tell the truth, or knaves, who always lie. The question set involves a stranger to the island who meets small groups of inhabitants there. Usually, the aim is for the visitor to conclude the inhabitants' type from their statements, but some questions of this type ask for other facts to be deduced. The question may also be to determine a Yes/No question which the visitor can ask in order to discover what he needs to know.

Basic Question Type

There are three inhabitants referred as A, B and C. The visitor asks A what type he is, but does not hear A's answer. B then says "A said that he is a knave" and C says "Don't believe B: he is lying!"

To solve the puzzle, understand that no inhabitant can say that he is a knave. Reason for his can be given as—if somebody is a Knight, then he speaks truth always and of course he cannot say that 'I am knave.' Similarly, if somebody is a knave, then he speaks false always. Now, if somebody speaks false only, he cannot say that I always speak false as this amounts to contradiction.

Coming back to the original question, hence B's statement must be untrue, so he is a knave, and C's statement must be true, so he is a knight. Since B is a knave, he will always lie. Therefore B was lying when he said that A said he was a knave. Therefore A must have said he was a Knight.

More Examples

A large number of elementary Boolean Logic questions can be solved by using the simple logic or elementary

Boolean Algebra (or, logic truth tables). To increase the familiarity with Boolean logic and its simplification process, let us see some more basic questions.

Jain and Baid are residents of the island of knights and knaves.

Question 1

Jain says: We are both knaves.

Who is who?

Solution

This is what Jain is saying in a more extended form:

“Jain is a knave and Baid is a knave.”

If Jain was a knight, he would not be able to say that he was a knave since he would be lying. Therefore the statement “Jain is a knave” must be true.

Since knaves lie, and one statement is true, hence to make the statement given by Jain false, the other statement must be false. Therefore the statement “Baid is a knave” must be false which leads to the conclusion that Baid is a knight.

The solution is that Jain is a knave and Baid is a knight.

Alternatively, we can use Boolean algebra to find out who's who as follows:

Let J be true if Jain is a knight and let B be true if Baid is a knight. Now, either Jain is a knight and what he said was true, or Jain is not a knight and what he said was false. Translating that into Boolean algebra, we get:

Therefore Jain is a knave and Baid is a knight. Although we can do this question without using Boolean algebra very easily.

Here is one of the most famous Boolean Logic questions:

Question 2

A prince visits an island inhabited by Knights and Knaves. Knights always tell the truth, and knaves always lie.

The prince comes to a fork in the road. He needs to know which road leads to the jungle so as to rescue the princess. (Although the prince doesn't know it, the south road leads to the jungle and the north road leads to the monster.)

Standing at this fork in the road is a knight and a knave, but the prince can't tell who is who. What question should he ask to find the road to the jungle so that he can save the princess?

Solution

Simply asking which road leads to the jungle won't help. The answer won't tell us who is lying and who is telling the truth. However, we really only need to talk to *one* of them. The trick is to ask a question where the response will be the same from both of them: a question that incorporates how a knight or a knave *not* answering would respond to the same question.

For example, what if we say to one of them, “If I asked a member of the type you *don't* belong to which road I should take to get to the jungle, what would he say?”

1. If we ask a truth-teller, the response will be: “He would say to take the north road.” The road to the castle is the south road so the liar will tell us to take the north road, and the truth teller will faithfully report this to us.
2. If we ask a liar, the response will be: “He would say to take the north road.” The road to the jungle is the south road and the truth teller will tell us to take the south road, but the liar will *not* report this faithfully to us - he will say the opposite.

In both cases we'll get the same response. We should do the opposite of what we have been told because, regardless of whether we are speaking to a liar or a truth teller, our question will always produce the wrong answer to which road we should take.

Variations in Problems

In some variants, inhabitants may also be alternators, who alternate between lying and telling the truth, or normal person, who can say whatever they want (as we can see in the case of Knight/Knave/Spy puzzles). A further complication can be brought by bringing the situation where the inhabitants may answer yes/no questions in their own language, and the visitor knows that “bal” and “da” mean “yes” and “no” but does not know which is which. So, this question will now lead to two Y-junctions.

Knights always tell the truth.

Knaves always lie.

Spies can either lie or tell the truth.

Normally, we encounter a group of three people, A, B and C and one of them is a Knight, one of them is a Knave and the left one is a spy, but we don't know who is which. However, they all know the identity of each other.

Example

A says: I am a knight.
 B says: That is true.
 C says: I am the spy.

Solution

We can understand that neither B nor C can be the knight. (B is saying that somebody else is knight and C says that he is a spy). Hence A is a knight. What B is saying is true so he cannot be the knave. Hence he is a spy. So, C is knave.

A says: B is the spy.
 B says: No, C is the spy.
 C says: No, B is definitely the spy.

Solution: B cannot be the spy, as in that case both a knave and a knight would be accusing him of being the spy. And if B is not the spy, then in that case neither A

nor C can be the knights since they would not be telling the truth. Hence B is a knight, as a result A and C are knave and spy respectively.

There can be only six possibilities of Knights, knaves and spy that we can have for any particular set:

Knight Knave Spy, or, Knight Spy Knave, Knave Spy Knight, Spy Knight Knave, Knave Knight Spy, Spy Knave Knight.

Any statement made by any person in a question can be classified into various possibilities. For example – the statement that ‘I am a knave’ cannot be said made by i. Knight, ii. Knave. Hence anybody making this statement has to be a spy. Similarly, the statement ‘I am a spy’ cannot be made by a knight. Hence anybody making this statement has to be either a knave or a spy.

However, there can be some useless statements too like ‘I am a knight’. It can be seen that this statement can be made by anybody—a knight or a knave or a spy.

PRACTICE EXERCISE 1

Directions for questions 1 to 5: *Read the following paragraph and answer the questions that follow:*

There are two types of people living in what is land—X type and Y type. The X type of inhabitants always speak the truth and the Y type of inhabitants always lie.

1. Munu says, "I always lie". Which type of an inhabitant is she?
 - (a) X
 - (b) Y
 - (c) Either X or Y
 - (d) given statement is infeasible
2. Chunmun says, "According to Munu, I always speak the truth." Which of the following is a correct conclusion?
 - (a) Chunmun has to be of type X
 - (b) Chunmun has to be of type Y
 - (c) Munu has to be of type X
 - (d) Munu has to be of type Y
3. Bhasker says, "Sharma and I are of the same type." Which of the following is a correct conclusion?
 - (a) Bhasker and Sharma are necessarily of the same type.
 - (b) Sharma has to be of type X.
 - (c) Bhasker and Sharma cannot be of the same type.
 - (d) The given statement is infeasible
4. Rahul says "Pallavi and I are of different types." Which of the following is a correct conclusion?
 - (a) Rahul and Pallavi are of type Y and type X respectively.
 - (b) Rahul and Pallavi cannot be of the same type.
 - (c) Pallavi has to be of Type Y.
 - (d) None of these
5. Booker says, "At least one person among Shane and I always lie." What types are Booker and Shane respectively?
 - (a) Y, X
 - (b) Y, Y
 - (c) X, Y
 - (d) It is not possible to deduce

Directions for questions 6 to 8: *Read the passage below and solve the questions based on it.*

On the Island of who went where, there are only two kinds of people. Type NO are those who, when they ask a question, must always get a 'No' for an answer

and type Yes are those who must always get a Yes for an answer to every question they ask.

6. Victor and Trish are married. Victor asks you: "Are both of us of the type No?" You can conclude that
 - (a) It is impossible for him to have asked such a question
 - (b) Victor is a No
 - (c) Trish is a No
 - (d) His type cannot be identified
7. Jay, Ajay and Vijay all approach you. Jay asks, "Are at least two of us of the type No?" You can infer that
 - (a) Jay is a No
 - (b) Jay is a Yes
 - (c) None of them is No
 - (d) Cannot be determined.
8. Abhay, Lokesh and Rituraj approach you. Abhay asks, "Is it true that neither Lokesh nor Rituraj can be yes?" you can infer that
 - (a) Both Lokesh and Rituraj are Nos.
 - (b) Abhay is a No
 - (c) Abhay is a yes
 - (d) None of the above

Directions for questions 9 to 11: *Read the information given below and solve the questions based on it.*

There are four members in a family—Kitto, Litto, Mitto and Nitto. Among these four persons, there is one couple, their son and their daughter. When asked about their relationships, the following were their replies:

Kitto – Nitto is my husband. Mitto is my daughter.
Litto – Kitto is my mother. Mitto is my son.

Mitto – Kitto and Litto are of the same gender.
Litto is my sister.

Nitto – Litto is of the same gender as I. Mitto is my son.

If was known that only one of them always speaks the truth.

9. Among them, if there are two persons who always lie then who always speaks truth?
 - (a) Kitto
 - (b) Mitto
 - (c) Nitto
 - (d) cannot be determined
10. Among the four, who cannot be the truth teller?

(a) Litto	(b) Mitto
(c) Nitto	(d) cannot be determined

Directions for questions 12 to 16: Read the information given below and solve the questions based on it.

There are three friends—A, R and U—in a group. Out of these three friends, one always speaks truth, one always lies and another one alternates between truth and lies. Exactly one of them is the owner of facebook.com, the other one is the owner of orkut.com and the third one is the owner of terrificmail.com, in no particular order.

In a recent interview, each of them was asked—
Which website do you own? Following is their reply
pertaining to the above given question:

A – I own facebook.com. U owns orkut.com.
U – I own facebook.com. R owns terrificmail.com
R – A owns orkut.com. U owns facebook.com.

Directions for questions 18 to 20: *Read the passage below and solve the questions based on it.*

Nobody has ever imagined that the level of politics in India will stoop so low that people will become indifferent and totally uninterested in Indian Politics. And as a result, they will forget even the name of their Prime Minister. And even the situation of the parliamentarians was no better. To hide the fact that they are unaware of the name of their Prime Minister, whenever they are asked the name of Prime Minister, they make two statements - one of which is true and the other one is false (If you cannot convince, then confuse them). Following is the recorded transcript of the interview of three parliamentarians:

Rakhi – The Prime Minister(PM) claims that he is the PM. I am the PM.

Sameera – I am the PM. Rakhi is the PM.

Mallika – I am the PM. Sameera knows who is the

18. Using the statements of whom of the three, can we determine the PM?

 - (a) Sameera's + Rakhi's
 - (b) Sameera's + Mallika's
 - (c) Mallika's + Rakhi's
 - (d) Cannot be determined

19. Who is the PM?

 - (a) Sameera
 - (b) Mallika
 - (c) Rakhi
 - (d) None of these three

20. Whose first statement is false?

 - (a) Sameera
 - (b) Mallika
 - (c) Rakhi
 - (d) None of these three

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (d) | 2. (c) | 3. (b) | 4. (c) | 5. (c) | 6. (b) | 7. (d) | 8. (d) | 9. (c) | 10. (a) |
| 11. (a) | 12. (b) | 13. (b) | 14. (b) | 15. (a) | 16. (c) | 17. (d) | 18. (a) | 19. (a) | 20. (b) |

HINTS AND EXPLANATIONS**1 to 5**

1. Munu cannot be X type person, as then her given statement would contradict it. If she is type Y person, then her statement is true which will prove that she is not type Y person. So, the given statement is infeasible
2. We are given what Munu said about Chunmun. So, we should analyse it according to Chunmun being type X or type Y person. If Chunmun is type X person, then the statement given by Chunmun must be correct & so Munu is also type X person. If Chunmun is type Y person then the statement given by Chunmun must be wrong, so it means then Munu must have said that Chunmun lies which again shows that Munu is type X person. So, in either case Munu must be type X person. So, we can conclude that Munu has to be of type X
3. We do not know whether Bhaskar is saying truth or he is lying. If we assume that Bhaskar is type X person, then he must be true & it proves that Sharma is also type X person. If Bhaskar is type Y person, then the statement must be false & so Bhaskar & Sharma must be of different type. So, in that case, Sharma must be type X person. So, in either case, Sharma is type X person. So, we can conclude that Sharma has to be of type X
4. We do not know whether Rahul is saying truth or he is lying. If we assume that Rahul is type X person, then he must be true & it proves that Pallavi is type Y person. If Rahul is type Y person, then the statement must be false & so Rahul & Pallavi must be of same type. So, in that case, Pallavi must be type Y person. So, in either case, Pallavi is type Y person. So, we can conclude that Pallavi has to be of type Y
5. We do not know whether Booker is saying truth or he is lying. If we assume that Booker is type X person, then he must be true & it proves that Shane is type Y person, as only Shane could lie among Booker & Shane. If Booker is type Y person, then the statement must be infeasible as the statement must be true but it

cannot go along the fact that Booker is type Y person. So, only possibility is that Booker is type X & Shane is type Y person

6 to 8

6. We do not know that whether Victor is type Yes or type No person. If we assume him to be type Yes person, then the answer must be no (as at least he won't be type No person then) but if answer No is given, he will become type No person. So, he must not be type Yes person. If he is type No person then the answer he receive must be no & it is possible in Trish is type Yes person (Victor still being type No person). So, we can conclude that Victor must be type No & Trish must be type Yes person
7. We do not know that whether Jay is type Yes or type No person. If we assume Jay to be type Yes person, then the answer may be yes (if he is type Yes person, then Ajay & Vijay may be type No person) or no (if either Ajay or Vijay or both are type Yes person). So, it is feasible as it can give Yes as answer if Jay is also yes person.
If we assume Jay to be type No person, then the answer may be yes (if Ajay or Vijay or both are type No person) or no (if both Ajay & Vijay are type Yes person). So, it is feasible as it can give No as answer if Jay is also No person. So, we cannot conclude whether Jay is Yes type person or No type person. So, it cannot be determined
8. We do not know that whether Abhay is type Yes or type No person. If we assume Abhay to be type Yes person, then the answer will be yes ,then Lokesh & Rituraj are type No person. If we assume Abhay to be type No person, then the answer will be no, then at least one among Lokesh & Rituraj is type Yes person (there will be 3 possibilities- Lokesh is type Yes & Ritiraj is type No, Lokesh is type No & Rituraj is type Yes or both are type Yes). So, we

cannot conclude anything about Abhay, Lokesh & Rituraj. So, it cannot be determined

9 to 11

We know there are 4 people- Kitto, Litto, Mitto & Nitto. Among these people there is a couple, their son & their daughter. We also know only 1 of them always speak truth (i.e. both the statements must be true only for 1 person)

If we check the statements by Litto, it is clear that at least 1 of his/her statement must be false as there are 2 generation & not 3 generations of this family.

If we assume both the statement of Kitto is correct. Then, Nitto & Kitto are husband-wife. Mitto & Litto are their daughter & son respectively.

If we assume both the statement of Mitto is correct. Then, Nitto & Kitto are husband-wife. Litto & Mitto are their daughter & son respectively.

If we assume both the statement of Nitto is correct. Then, Kitto & Nitto are husband-wife. Litto & Mitto are their daughter & son respectively.

9. We are given that 2 person always lie. We cannot choose any 2 from Kitto, Mitto & Nitto to be those 2 who always lie (say both Kitto & Mitto always lie or both Kitto & Nitto always lie or both Nitto & Mitto always lie). As then the 3rd person cannot be the truth teller (whose both statements will be correct) & we also know that 1 from these 3 must be the truth teller as Litto cannot be the truth teller.

So, 1 person who always speak lie is Litto. Other person is 1 from Kitto, Mitto & Nitto. The truth teller is 1 from Kitto, Mitto & Nitto. One of the people who always lie is Litto, so both statements by him/her must be false. So, neither Mitto is his/her son nor his/her mother is Kitto. We can conclude that Litto & Mitto are siblings & their parents are Nitto & Kitto. So, if Kitto is not mother he must be the father. So, Kitto is the husband & his wife is Nitto

Among Kitto, Mitto & Nitto only Nitto said that Kitto & Nitto are husband wife. So, only Nitto can be the truth teller. Option (c) is correct

10. It is observed in general solution of 9-11, that at least 1 statement of Litto must be false. So, Litto cannot be the truth teller. Option (a) is correct
11. We are given that 2 persons always alternate between truth & lie, so 1 of the statement must be true & other must be false. Litto cannot be the truth teller, but he/she may be the person who alternate between truth & lie. The truth teller is still 1 among the

Kitto, Mitto & Nitto. So, we can assume any one from these 3 to be the truth teller & check if we can find 2 people such that both are having 1 statement correct & one statement false. If we assume both the statement of Kitto is correct. Then, Nitto & Kitto are husband-wife. Mitto & Litto are their daughter & son respectively. Litto's 1st statement is correct but 2nd is false. Mitto's both statements are false. Nitto's 1st statement is correct & 2nd is false. So, we can conclude that Kitto must be the truth teller. Correct option is (a)

Note: students must check it by assuming Mitto & Nitto as truth teller too. It must not give exactly 2 persons who always alternate between truth & lie.

12 to 16

We know there are 3 friends- A, R & U. Among these friends, one is truth teller (always speak truth, so both statements by that person must be correct), one always lie (so both statements by that person must be false) & one always alternate between truth & lie (so this person's one statement must be correct & one statement must be false). Exactly one of them is owner of facebook.com, other one is owner of orkut.com & 3rd one is owner of terrificmail.com.

Case 1: If we assume that A is truth teller, then A is owner of facebook.com, U is owner of orkut.com & R is owner of terrificmail.com.

Further, 1st statement by U is false & the 2nd statement is correct. Similarly, both statements of R are false.

So, A is truth teller, R always lie & U alternate between truth & lie.

Case 2: If we assume that U is truth teller, then U is owner of facebook.com, A is owner of orkut.com & R is owner of terrificmail.com.

Further, both statements of R are correct. Similarly, both statements of A are false.

So, both U & R are truth tellers & A always lie.

Case 3: If we assume that R is truth teller, then U is owner of facebook.com, A is owner of orkut.com & R is owner of terrificmail.com.

Further, both statements of U are correct. Similarly, both statements of A are false.

So, both U & R are truth tellers & A always lie.

We are given exactly 1 is truth teller (always speak truth), one always lie & 3rd one alternate between truth & lie.

So, only case 1 is feasible. Therefore A is truth teller, R always lie & U alternate between truth & lie.

1.124 Logical Reasoning

- 12. R is a liar
- 13. R is the owner of terrificmail.com
- 14. The website orkut.com is owned by U
- 15. A is a truth teller
- 16. U is an alternator
- 17. If we check I, Knave will not say he is Knave & so B or C must not be Knave. Further any 1 of them is spy. If A is Knave then B or C cannot be Knight too as Knight must say he is Knight. So, this does not give valid assignment of Knight, Knave & Spy

If we check II, Knave will not say he is Knave & so B must not be Knave & he cannot be Knight too, so he is spy. Knight must say he is Knight. So, A is spy. Now, C cannot be Knave. So, this does not give valid assignment of Knight, Knave & Spy

If we check III, if A is Knight then there cannot be any Knave (as both B & C are also correct). If A is Knave, then there cannot be any Knight (as both B & C will be wrong). If A is spy then there is no Knave (as both B & C are correct). So, this does not give valid assignment of Knight, Knave & Spy.

So, all 3 sets end up in a paradox. Correct option is (d)

18 to 20

We are given 3 parliamentarians Rakhi, Sameera & Mallika. They all are alternators (each of them gave 2 statements, out of which 1 is correct & other is false).

If we check all 3 of them claimed to be PM. So, it means PM must have claimed that he/she is PM. So, Rakhi's 1st statement is correct. So, 2nd statement must be false & so Rakhi is not PM. Now, Sameera's 2nd statement is false (as Rakhi is not PM). So, Sameera's 1st statement is correct. So, Sameera is PM. Mallika's 1st statement is false & 2nd statement is correct

- 18. Sameera's + Rakhi's statements are sufficient to decide that Sameera is PM. (we have to start with 1st statement of Rakhi as shown above)
- 19. Sameera is the PM
- 20. Mallika's 1st statement is false

PART 1

LOGICAL REASONING

SECTION 2

PRACTISING LOGICAL REASONING

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Chapter

13

FOUNDATION EXERCISES

PRACTICE EXERCISE 1

Directions for questions 1 to 3: Read the following passage and solve the questions based on it.

Ten coins are distributed among four people P, Q, R and S such that one of them gets one coin, another gets two coins, the third gets three coins and the fourth gets four coins. It is known that Q gets more coins than P, and S gets fewer coins than R.

1. If the number of coins distributed to Q is twice the number distributed to P, then which one of the following is necessarily true?
 - (a) R gets an even number of coins
 - (b) R gets an odd number of coins
 - (c) S gets an even number of coins
 - (d) S gets an odd number of coins
2. If R gets at least two more coins than S, then which one of the following is necessarily true?
 - (a) Q gets at least two more coins than P.
 - (b) Q gets more coins than S
 - (c) P gets more coins than S
 - (d) P and Q together get at least five coins
3. If Q gets fewer coins than R, then which one of the following is not necessarily true?
 - (a) P and Q together get at least four coins than P
 - (b) Q and S together get at least four coins
 - (c) R and S together get at least five coins
 - (d) P and R together get at least five coins

Directions for questions 4 to 7: Read the following passage and solve the questions based on it.

To make the non-technical background new joiners understand the process of manufacturing colour TVs better, LG has hired the services of Due North Inc. consultants. Due North is a consultancy firm which provides technical training of all the household equipment to the non-tech background new joiners at LG. To facilitate the training process, it has been decided that there will be six groups of new joiners namely A, B, C, D, E and F and each of the groups is scheduled at least once a week. All the groups will start their training on the same day and will also end their training on the same day.

Following points are to be taken into consideration while making the training schedule:

- (i) Sunday is a holiday.
- (ii) B group is scheduled all days except Friday and Saturday.
- (iii) C group meets four days in succession.
- (iv) F group meets only from Monday to Thursday.
- (v) E group is scheduled everyday, but not on Thursday and Saturday.
- (vi) A group is scheduled on alternate days.
- (vii) C group does not meet on Monday and Tuesday only.
- (viii) A and D groups never meet on the same days.
- (ix) D group is scheduled only once a week on either Wednesday or Friday.

Directions for questions 8 to 11: Read the following passage below and solve the questions based on it.

There are five identical looking boxes containing different objects in each of them and every box has a label indicating its contents. The following is the correct description of the contents and the label of each box:

Contents	Label
Two Pins	PP
Two Balls	BB
Two Clips	CC
One Pin and one Clip	PC
One Ball and one Clip	BC

Somebody has mischievously interchanged these labels in such a way that no box carries the label describing its contents correctly.

8. The first box which was opened contained the label PP and the second box opened contained the label PC. It is also known that out of the four items in the two boxes, one item was definitely a ball. Then which of the following has to be true?

 - (a) Other three items will not contain two balls
 - (b) Other three items will not contain any clip

- (c) Other three items will contain at least one clip
(d) None of these

9. Box PP contained two clips, box CC contained two pins and the box BB contained one ball. Then which of the following will definitely be false?

(a) The box BC contains one pin and one clip
(b) The box BB contains one ball and one clip
(c) The box BC contains two balls
(d) The box PC contains two balls

10. If the first box containing the label BC was opened and it was found that one item is a ball, then which of the following is definitely true?

(a) The other item may be either a ball or a clip
(b) The other box with the BB label contains one ball and one clip
(c) The other item will not be a ball
(d) The other item will also be a ball

11. If the information is available that the box PC does not contain either any pin or any clip, box PP does not contain any pin and box CC contains one clip and one ball. Which of the following will definitely be true if only one of the remaining boxes is opened?

(a) The box will have one pin and one clip
(b) The box will have at least one clip
(c) The box will have at least one pin
(d) None of these

Directions for questions 12 to 16: Read the following passage and solve the questions based on it.

There are various rides available at the annual *Lucknow Mahotsav*. One of the rides that is available is the roller coaster ride, comprising five cars, numbered 1 through 5 from the front to back. Each car can accommodate up to two riders, seated side by side. Six persons—T, G, L, M, P and J, are taking the ride simultaneously. The following information is available regarding their seating pattern:

Directions for questions 17 to 20: Read the following passage and solve the questions based on it.

'Vaastu-shastra' says that the dining table should not be rectangular, rather it should be hexagonal, as it helps in reducing the conflict. Accordingly, Mr Verma bought a hexagonal dining table for his six office employees A, B, C, D, E and F.

One day while taking lunch they were sitting along the sides of the hexagonal table. The following information is given regarding their seating postions:

- (i) F, who is sitting exactly opposite A, is to the immediate right of B.

(ii) D is between A and B and is exactly opposite C.

17. A is sitting between which of the following pairs of persons?

(a) D and E (b) B and E
 (c) B and C (d) E and C

Directions for questions 21 to 23: Read the following passage and solve the questions based on it.

There are nine judges—G, H, I, K, L, M, N and O, who have to appear on a series of three benches. Each bench will consist of three judges and each judge will appear in exactly one bench. The benches must be arranged according to the following conditions:

- (i) I and N must be on the same bench.
 - (ii) K and L must be on the same bench.
 - (iii) O and J cannot be on the same bench.
 - (iv) M must appear on the second bench.
 - (v) Either J or M or both must appear on the bench with H.

21. Which of the following judges could appear on a bench together?

 - (a) G L O
 - (b) G J M
 - (c) K I M
 - (d) N I J

22. Which of the following cannot be true?

 - (a) I appears on the second bench
 - (b) H appears on the third bench
 - (c) O appears on the third bench
 - (d) J appears on the first bench, and H appears on the third

23. The third bench could consist of all of the following except

 - (a) K, L, O
 - (b) K, I, J
 - (c) G, H, J
 - (d) G, I, N

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (d) | 2. (b) | 3. (a) | 4. (b) | 5. (a) | 6. (d) | 7. (c) | 8. (d). | 9. (c). | 10. (d) |
| 11. (c) | 12. (d) | 13. (b) | 14. (a) | 15. (d) | 16. (d) | 17. (a) | 18. (b) | 19. (c) | 20. (a) |
| 21. (d) | 22. (d) | 23. (b) | | | | | | | |

HINTS AND EXPLANATIONS**1 to 3**

1. It is given that Q > P and R > S.

Q	P	R	S
4	2	3	1
2	1	4	3

The distribution of coins can be of two types; in both the cases, S gets an odd number.

2. The possible arrangements are:

R	S	Q	P
3	1	4	2
4	1	3	2
4	2	3	1

3.	R	S	Q	P
	4	2	3	1
	4	1	3	2
	4	3	2	1

Looking at the possible distribution of coins, we find that option (a) is not always true.

4 to 7

Using the statements given above, we have the following diagram for the training schedule:

Group	Mon	Tue	Wed	Thu	Fri	Sat
A	X	✓	X	✓	X	✓
B	✓	✓	✓	✓	X	X
C	X	X	✓	✓	✓	✓
D	X	X		X		X
E	✓	✓	✓	X	✓	X
F	3	3	✓	✓	X	X

Here, group D meets either on Wednesday or on Friday.

8 to 11

8. Content combinations PP in 1st box and PC in the 2nd box are eliminated as no label indicates the contents of the boxes correctly. Now if one of the four items is a ball then one of the combinations is either BC or BB.

Option (a) is wrong when the combinations are BC and BB.

Option (b) is wrong when the combinations are (i) BC along with PC or CC, (ii) BB along with CC, PC or BC.

Option (c) is wrong because the combination in box PP is BB and in box PC is PP.

Option (d) is obviously the answer.

9. Label PP – CC

Label CC – PP

Label PP – BC

Now if the box with the label BC has contents BB, then the box with the label PC will have the contents PC and this is not allowed. Hence option (c) is definitely wrong.

10. The box containing the label BC has one ball and one clip. After the interchange, it will not contain the same combination. Now, there are only two boxes which have the ball as one of the items, so the other item will also be a ball.

11. The box with the label PC contains two balls; the box with the label PP contains two clips and the box with the label CC contains one ball and one clip. The remaining two boxes contain two pins and one pin and one clip. Hence if only one of the remaining boxes is opened, it will have at least one pin.

12 to 16

12. G is either in 3rd or 4th car. So, option (b) is not possible. L is sharing a car. So, (a) is not correct. M is not sharing a car. So (c) is not correct.

Correct option is (d)

13. Let us take two possible scenarios:

Scenario 1: L, G and T would occupy the second, third and fourth cars, respectively. But this arrangement would not accommodate M, seated alone, immediately behind an empty car. Hence this scenario is eliminated.

Scenario 2: Given the additional information, L must occupy the third car while T occupies the fifth car. Accordingly, M must occupy the second car and the first car must be empty.

However, P may occupy either the third or the fourth car. Thus, statement (b) is not necessarily true.

14. Total number of persons = 6

Total number of seats = 10

Number of vacant seats = 4. Out of these 4 seats, 3 seats are vacant because of M. So, only one out of remaining people can sit alone.

15. If P is in 2nd car, then we have 2 possibilities:

G is in 3rd or 4th car. If G is in 4th car, we cannot accommodate M in any car. So, G must be in 3rd car. T is not sharing car with G. So, there are 3 possibilities for 3rd car, which are:

- (1) G alone
- (2) G & J
- (3) G & P

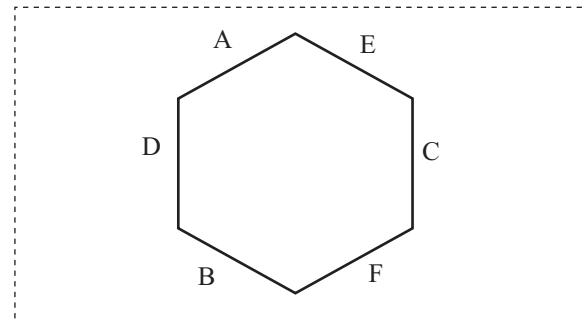
Correct option is (d)

16. Again, consider two basic scenarios.

In Scenario 1: G is in the 3rd car, Given that J and the 7th person occupy the first car, M must occupy the fifth car alone.

Scenario 2: G is in the 4th car. It is given than J and the 7th person occupy the 1st car, M must occupy the 3rd car (while the 2nd car is empty). Since T cannot share a car with G, T must occupy the 5th car. Again T cannot share a car with P, hence P must share the 4th car with G.

Accordingly, L should share the 5th car with T.

17 to 20

18. The rest are sitting adjacent to each other

21 to 23

21. Eliminating the options. I must appear with N so, we can eliminate option (c). Also K must appear with L so, we can eliminate option (a). Finally, J or M must be with H, so we can eliminate option (b).

Hence option (d) is the answer.

22. The last condition requires that either J or M or both appear with H. M is on bench two. If J is assigned to bench one and H to bench three, then neither J nor M appears with H.

23. I cannot be assigned to a bench without N so, option (b) violates one of the initial conditions.

PRACTICE EXERCISE 2

Directions for questions 1 to 4: Read the following passage and solve the questions based on it.

Under a special arrangement at FBI, telephone numbers of the employees are to be coded in the following way:

Digit	7	3	5	0	2	1	6	4	9	8
Code	N	H	L	T	F	D	R	Q	G	P

Following conditions are to be maintained:

- (i) If the first digit is even and the last digit is odd, then they are to be coded as \$ and @ respectively.
- (ii) If the first digit is odd and the last digit is even, then they are to be coded as # and γ respectively.
- (iii) If 0 is preceded as well as followed by an odd digit, then 0 is to be coded as *.
- (iv) If 0 is preceded as well as followed by an even digit, then 0 is to be coded as ↑.
- (v) Zero (0) is considered neither even nor odd.

1. What is the code for 1375490?
 - (a) DHNLQGT
 - (b) #HNLQGE
 - (c) DHNLQG*
 - (d) γHNLQG#
2. Which of the following numbers will be coded as \$ Q R L * H @?
 - (a) 8456037
 - (b) 8465032
 - (c) 6475031
 - (d) cannot be determined
3. Which of the following numbers will be coded like— Q L P ↑ R N T?
 - (a) 4570680
 - (b) 4780650
 - (c) 6580470
 - (d) None of these
4. What will be the code for 36250084?
 - (a) #RFL**Gγ
 - (b) #RFLG**γ
 - (c) #RF**LG*
 - (d) none of these

Directions for questions 5 to 7: Read the following passage and solve the questions based on it.

“Lets be God” is an organization imparting training to people to touch the different dimensions of life and be like God. It was planning to organize series of eight lectures A, B, C, D, E, F, G and H (not necessarily in the same order) for three subjects ‘Purpose of God’, ‘Alignment of Purpose’ and ‘Touching Lives’ on three successive days.

For the sake of convenience, these three subjects are coded as X, Y and Z respectively. Subject X was to

be covered first in three lecturers followed by Z and then subject Y in two lectures.

- (i) Lectures A, C and D have to be on separate days.
 - (ii) Lectures B and F have to be kept on separate days. Lecture B cannot be clubbed with A or G or D.
 - (iii) Lectures G and H should happen on one day.
 - (iv) Only one lecture will happen everyday.
5. Which of the following pairs of lectures can go along with lecture A on subject X?
 - (a) B, C
 - (b) G, H
 - (c) D, E
 - (d) data inadequate
 6. Which combination of lecturers was arranged on the second day of the series?
 - (a) C, G, H
 - (b) B, D, E
 - (c) C, A, G
 - (d) data inadequate
 7. Which of the following lectures were for subject Y?
 - (a) D, F
 - (b) G, H
 - (c) B, C
 - (d) data inadequate

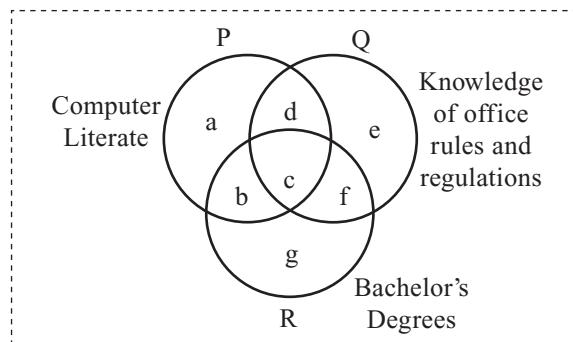
Directions for questions 8 to 12: Read the following passage and solve the questions based on it.

Pankaj, Qureshi, Rajesh and Sudhir live together in a house.

- (i) Pankaj lives with his (or her) parents.
 - (ii) Qureshi lives with at least three persons younger than him (or her).
 - (iii) Sudhir lives with his mother, and is older than at least two persons living with him.
 - (iv) Rajesh lives with his (or her) son and is not older than Sudhir.
8. The total number of persons in that house is ____.
 - (a) 3
 - (b) 4
 - (c) 5
 - (d) 6
 9. Qureshi is Pankaj’s ____.
 - (a) father
 - (b) mother
 - (c) son
 - (d) grandmother
 10. Sudhir is Pankaj’s ____.
 - (a) brother
 - (b) father
 - (c) mother
 - (d) sister
 11. Rajesh is Qureshi’s ____.
 - (a) daughter
 - (b) son
 - (c) grandson
 - (d) daughter-in-law
 12. Rajesh is Sudhir’s ____.
 - (a) wife
 - (b) husband
 - (c) son
 - (d) daughter

Directions for questions 13 to 17: Read the following passage and solve the questions based on it.

The figure given below consists of three intersecting circles which represent the applicants for the post of PA who are computer literate; who have knowledge of office rules and regulations; and who have a bachelor's degree.



Directions for questions 18 to 22: Read the following passage and solve the questions based on it.

Mr Manoj is a medical representative and he is supposed to visit six doctors—M, N, P, Q, R and S, exactly once

every week. To visit the doctors, Mr Manoj has set up a schedule to visit each of the six doctors during the course of one week according to the following conditions:

ANSWER KEYS

- | | | | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 1. (a) | 2. (d) | 3. (d) | 4. (d) | 5. (b) | 6. (d) | 7. (d) | 8. (b) | 9. (b) | 10. (d) |
| 11. (d) | 12. (a) | 13. (c) | 14. (a) | 15. (d) | 16. (b) | 17. (d) | 18. (a) | 19. (a) | 20. (d) |
| 21. (d) | 22. (a) | 23. (d) | 24. (c) | | | | | | |

HINTS AND EXPLANATIONS**1 to 4**

- 1.** 1 3 7 5 4 9 0
 D H N L Q G T

2. From (i) \$ and @ can be replaced by the combination of 2,4,6,8 and 1,3,5,7,9 respectively.

3. Using (iv)

Q	L	P	↑	R	N	T
4	5	8	0	6	7	0

4. Obviously, the answer is (d) None of these

5. There are 3 possibilities:

Day 1: X	AGH	AGH	AEF
Day 2: Z	CBE	DEF	DGH
Day 3: Y	DF	CB	CB

6. There are multiple possibilities, so data is inadequate to give answer.

7. There are multiple possibilities, so data is inadequate to give answer.

8 to 12

The given information can be analysed as follows:

Qureshi	— Mother of Sudhir(ii) and (iii)
Sudhir	— Son of Qureshi(ii) and (iii)
Rajesh	— Wife of Sudhir(iv)
Pankaj	— Son of Rajesh and Sudhir(i)

13 to 17

13–16. These can be solved by directly observing the figure.

17. The provided figure do not give any numerical data. So, we cannot solve the given question.

18 to 22

18. He visits Dr M before Dr N and Dr N before Dr Q. Hence, he must visit Dr M before Dr Q.

19. Out of the six doctors if Dr S is first, Dr P is third and the order Dr M, Dr N, Dr Q and Dr M, Dr R is followed. Hence, Dr M must be visited second.

20. Since Dr P is at the third place and order Dr M, Dr N, Dr Q and Dr M, Dr R is to be followed, so, immediately after Dr P he can visit any doctor except Dr M and which may occupy first or second place because Dr Q, Dr R and Dr N cannot precede him/her.

21. The order is M, N, P, S, Q, R.

22. According to the given conditions, Dr P must be in third place and the order Dr M, Dr N, Dr Q must not be violated.

23 and 24 D has 2 sons A & B. E is wife of A. C & F are daughter and son of E & A.

23. A is E's husband.

24. E is the mother of F and C.

PRACTICE EXERCISE 3

Directions for questions 1 to 4: Read the following passage and solve the questions based on it.

Five friends—Umesh, Vishnu, Xinhua, Yogesh and Zeta collected pebbles on the sea shore. They collected a total of 100 pebbles.

None of them collected less than 10 pebbles each. No two among them collected the same number of pebbles. Following information is given regarding the number of pebbles with each one of them:

Directions for questions 5 to 9: Read the following passage and solve the questions based on it.

Each of the alphabets given below represents a digit (from 1–9). No digit is represented by more than one alphabet and vice versa.

$$\begin{array}{r}
 & & A & B & C & D \\
 + & C & A & B & E & B \\
 \hline
 & B & F & D & F & C
 \end{array}$$

Directions for questions 10 to 13: Read the following passage and solve the questions based on it.

Directions for questions 14 to 17: Read the following passage and solve the questions based on it.

There are six students—A, B, C, D, E and F, participating in an evaluation test for Language and Science.

- (i) A's total marks in language were just above C and in Science just above F.
- (ii) B was just above C in Science but scored less than D in Language.
- (iii) F got more marks than D and E in science, but didn't perform as well as D in Language.
- (iv) No one scored in between C and D in Language and C and A in Science.

14. Who got the highest marks in Science?

- (a) A
- (b) B
- (c) C
- (d) Cannot be determined

15. Which of the following students has scored the least in Science?

- (a) only D
- (b) only E
- (c) either D or E
- (d) A

16. Who scored just below D in Language?

- (a) B
- (b) F
- (c) C
- (d) Cannot be determined

17. Which of the given statements is not necessary to answer the questions?

- (a) ii
- (b) iii
- (c) iv
- (d) All are necessary

Directions for questions 18 to 22: Read the following passage and solve the questions based on it.

In the annual performance appraisal, all employees were placed in three categories—average, good and excellent. To execute the appraisal plan more effectively, a software called ‘Appraise Well’ is being used. But somehow the computer got infected with a virus and some information was lost.

While trying to recover the data, only the following could be recovered:

	Average	Good	Excellent	Total
Male				12
Female				36
Total				33

- (i) An employee can be placed in only one category.
- (ii) Half the employees are either excellent or good.
- (iii) 40% of the employees were females.
- (iv) One-third of the males were average.

18. How many employees are both females and excellent?

- (a) 2
- (b) 4
- (c) 8
- (d) 0

19. What proportion of the good employees are males?

- (a) 0.4
- (b) 0.5
- (c) 0.6
- (d) None of these

20. What proportion of the good employees are females?

- (a) 0.4
- (b) 0.5
- (c) 0.6
- (d) 0.27

21. What proportion of the females are good employees?

- (a) 0.4
- (b) 0.5
- (c) 0.6
- (d) None of these

22. How many employees are neither excellent nor males?

- (a) 36
- (b) 12
- (c) 24
- (d) 0

Directions for questions 23 to 25: Read the following passage and solve the questions based on it.

A quiz has three rounds of two questions each. However, the scoring scheme is different in all the three rounds as per the following:

In the first round, each correct answer carries 20 points and each incorrect answer carries a penalty of 10 points. If both the questions in the 1st round are answered correctly a bonus of 10 points is awarded.

In the second round, each correct and incorrect answer gets the same points as in the first round. However, an additional penalty of 10 points is awarded if both the questions are answered incorrectly.

In the third round, each right answer fetches 40 points and an incorrect one fetches a penalty of 20 points.

23. In how many ways can a score of 40 be achieved?

- (a) 0
- (b) 1
- (c) 2
- (d) 3

24. If only two answers are incorrect in the whole quiz, what is the minimum possible score that a contestant can achieve?

- (a) 20
- (b) 30
- (c) 40
- (d) None of these

25. If only two answers are incorrect in the whole quiz, what is the maximum possible score that a contestant can achieve?

- (a) 100
- (b) 130
- (c) 120
- (d) None of these

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (b) | 2. (b) | 3. (a) | 4. (b) | 5. (c) | 6. (a) | 7. (a) | 8. (b) | 9. (b) | 10. (c) |
| 11. (d) | 12. (a) | 13. (c) | 14. (b) | 15. (c) | 16. (d) | 17. (d) | 18. (d) | 19. (d) | 20. (d) |
| 21. (d) | 22. (a) | 23. (c) | 24. (d) | 25. (a) | | | | | |

HINTS AND EXPLANATIONS**1 to 4**

$$\begin{array}{ll} U - \text{Umesh} & V - \text{Vishnu} \\ X - \text{Xinhua} & Y - \text{Yogesh} \\ Z - \text{Zeta} & \end{array}$$

We have

$$U + V + X + Y + Z = 100$$

and each one of $U, V, W, X, Z \geq 10$

$$U = V + X \text{ and } 3Y = 4Z$$

Now,

$$X = 8 + 3 = 11 \text{ or } X = 27 + 3 = 30 \text{ and}$$

$$U = 16, 25, 36, 49 \text{ and}$$

$$V = 16, 25, 27, 36$$

Observing the values of U, V and X , we can easily get that

$$X(11) + V(25) = U(36)$$

$$\text{So, } X = 11, V = 25 \text{ and } U = 36$$

$$\text{Now, } Y + Z = 100 - (U + V + X)$$

$$= 100 - (11 + 36 + 25) = 28.$$

now put $Y = 4/3 Z$ in the above equation to get

$$Z = 12 \text{ and then } Y = 16.$$

5 to 9

$$\begin{array}{r} & A & B & C & D \\ + & C & A & B & E & B \\ \hline B & F & D & F & C \end{array}$$

Start with the last column. We can infer that there has to be a carry over in the previous column so that $C + 1 = B$, or $B - C = 1$

From the first column, $D + B = C$ or $D + B = C + 10$; $D + B = B - 1$ or $D + B = B + 9$. Hence, D is equal to either -1 or 9 . Since -1 is not possible, so $D = 9$. Now there is a carry over to the next column i.e., $C + E + 1 = F$ or $C + E + 1 = F + 10$.

Moreover, $B + B = D$ is not possible as $B + B = 2B$ which is always an even number. Thus, $B + B + 1 = D$ or $B + B + 1 = D + 10 = 19$ i.e., $B = 4$ or $B = 9$. But B cannot be equal to 9 as $D = 9$. Hence, $B = 4$,

$$C = B - 1, \text{ so, } C = 3$$

$$A + A = F + 10 \text{ and } C + E + 1 = F + 10.$$

$$\begin{array}{ccc} A & F & E \\ 6 & 2 & 8 \end{array}$$

possible

$$\begin{array}{ccc} 7 & 4 & \\ & & \end{array}$$

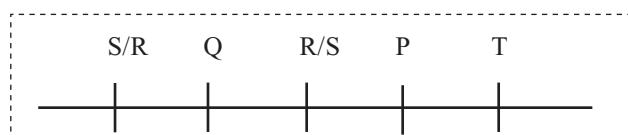
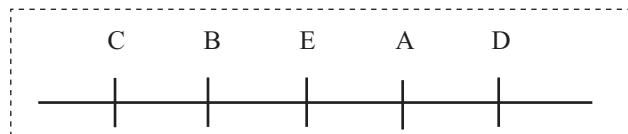
not possible as $B = 4$

$$\begin{array}{ccc} 8 & 6 & 12 \\ & & \end{array}$$

not possible

Finally,

$$\begin{array}{ccccccc} \hline A & B & C & D & E & F \\ \hline 6 & 4 & 3 & 9 & 8 & 2 \end{array}$$

10 to 13**14 to 17**

Order in Language: EACDFB or EACDBF or ACDBFE or ACDBEF or ACDEBF or ACDEFB or ACDFEB or ACDFBE

Order in Science: BCAFDE or BCAFED

- 17.** To answer the question, all four statements (i), (ii), (iii) & (iv) are needed.

1.138 Logical Reasoning

18 to 22

	Average	Good	Excellent	Total
Male	18	24	12	54
Female	27	9	0	36
Total	45	33	12	90

24. For minimum possible score with only 2 incorrect answer, the last 2 answers must be incorrect & first 4 answers must be correct. So, required sequence is TTTTFF $\rightarrow 50 + 40 - 40 = 50$.
Correct option is (d).
25. Maximum score can be obtained through TTFFFT sequence = 100 points or FFTTTT = $-20 + 40 + 80 = 100$ points.

PRACTICE EXERCISE 4

Directions for questions 1 to 3: *Read the following passage and solve the questions based on it.*

A, B, C, D and E are five cities out of which two are hill stations and the rest are in the plains. Two cities, which are in the plains, are ports. Four cities out of five are state capitals and two are industrial cities. The population of two cities is less than 5 lacs. The population of one city is 20 lacs and the more than 50 lacs of. Two cities are situated on the same latitudes and other two are on same longitude and the other two are on the same longitude. Latitudes and longitudes of both ports are different and out of these one is an industrial town. The population of both the industrial cities is more than 50 lacs. The longitude of one hill station and one of the industrial cities is the same. The latitudes and longitudes of the other hill station and the other port are different. One industrial town is neither a hill station nor a port. None of the hill stations is an industrial town. The hill station has the same longitude as the port, is a capital. B is a hill station while the longitudes of A and E are the same. E is a port. The latitudes of D and C are the same and the population of D is 20 lacs. Both the ports are capitals and one of them is an industrial town.

1. Which of the following two cities have a population less than 5 lacs?
 - (a) B and C
 - (b) A and B
 - (c) A and D
 - (d) D and B
2. Which of the following cities is not a capital?
 - (a) A
 - (b) C
 - (c) B
 - (d) E
3. Which one of the following cities is a hill station as well as a capital?
 - (a) A
 - (b) B
 - (c) C
 - (d) D

Directions for questions 4 to 5: *Read the following passage and solve the questions based on it.*

To smoothen the procedure of grievances reprisal, a team of five members is being constituted by the top management. As per the procedures established, it has to provide representation to both the workers and the middle management. The team must have two representatives of the middle management, two representatives of the workers and one representative of the top management.

As per the availability of persons, we know that

- (i) The middle management's representatives must be chosen from X, Y and Z.

- (ii) The workers' representatives must be chosen from A, B and C.
 - (iii) The top management's representative must be chosen from either J or K.
- Owing to some geographical constraints, we know that
- (iv) A cannot serve with C.
 - (v) Z cannot serve together with A.
 - (vi) Y cannot serve unless K is also in the team.
4. Which of the following persons must be chosen?
 - (a) J
 - (b) X
 - (c) Y
 - (d) B
 5. If A and B are chosen to be the workers representatives, then which of the following statement(s) is/are true?
 - I. K is chosen
 - II. Both X and Y are chosen to represent middle managers
 - III. J is chosen
 - (a) I only
 - (b) II only
 - (c) III only
 - (d) Both I and II
- Directions for questions 6 to 9:** *Read the following passage and solve the questions based on it.*
- There are five islands A, B, C, D and E in Nicobar. Two of these have post offices, three have schools and three are accessible by bridge. Two have a population of more than 5000 each, two have a population between 2000 and 5000 each, and one has a population of less than 2000. Two of these islands have electricity in addition to certain other facilities such as a school and accessibility by bridge. The island with a population of less than 2000 has a school but does not have a post office nor is it accessible by bridge; while each of the islands with a population of more than 5000 has a school. Of the two islands having a population between 2000 and 5000, only one has a post office and is accessible by bridge. Island A is accessible by bridge. Island B has a population of more than 5000, island D has a school and is accessible by bridge but does not have a post office, while island E has a school but is not accessible by bridge.
6. Which island has a school and a post office?
 - (a) A
 - (b) B
 - (c) C
 - (d) D
 7. Which island does not have any of the facilities available to other islands?
 - (a) A
 - (b) B
 - (c) C
 - (d) D

Directions for questions 10 to 13: Read the following passage and solve the questions based on it.

P, Q, R, S, T and U are six lecturers in a college each teaching a different subject Mathematics, Physics, Sociology, Biology, Geography and History not necessarily in the same order. There are only four female lecturers. Following is the information regarding who teaches what:

Directions for questions 15 to 19: Read the following passage and solve the questions based on it.

Directions for questions 20 to 24: Read the following passage and solve the questions based on it.

There are seven students—A, B, C, D, E, F and G – in a batch at Prep-Well Coaching institute. All these students sit on three benches 1st, 2nd and 3rd in such way that:

- (i) There are at least two students sitting on each bench.
 - (ii) There is at least one girl on each bench.
 - (iii) C, a girl student, does not sit with A, E and D.

ANSWER KEYS

1. (b) 2. (c) 3. (a) 4. (d) 5. (d) 6. (b) 7. (c) 8. (c) 9. (a) 10. (d)
11. (a) 12. (c) 13. (b) 14. (d) 15. (d) 16. (b) 17. (a) 18. (d) 19. (d) 20. (d)
21. (b) 22. (d) 23. (c) 24. (c)

HINTS AND EXPLANATIONS

4 to 5

The possible groups are XYABK, XYBCK, XZBCJ and YZBCK.

4. B must be chosen.
 5. A and B are chosen, then Z cannot be in the team. So, X and Y will be in the team and therefore so will K. Both I and II only are true.

6 to 9

Villages	Post office	School	Accessibility By bridge	Electricity	Population		
					>5000	2000 to 5000	<2000
A	✓		✓			✓	
B	✓	✓	✓	✓	✓		
C						✓	
D		✓	✓	✓	✓		
E		✓					✓
Total		3	3	2	2	2	1

10 to 14

Lecturer	Sex	Subject	Relative Age
Q	F	History	4/5
R	M	Biology	1
T	M	Mathematics	3
S	F	Sociology	6
P	F	Physics	2
U	F	Geography	5/4

The smaller the number, the lesser the age.

15 to 19

Student	Subject	Author
R	Physics	Gupta
M	Chemistry	Edgar
N	Maths	Khanna
V	English	Harish
S	Biology	D'souza

1.142 Logical Reasoning**20 to 24**

It is given that A and G sit on the 1st and the 3rd bench respectively.

Now, since F is a boy who sits with only B, B has to be a female. F and B sit on the 2nd bench .

On the basis of the above information, we can summarize the details as follows:

1st Bench	A	—
2nd Bench	F(+)	B(−)
3rd Bench	G	—

(+) Indicates male; (−) indicates female

Now, since C (a girl) does not sit with A, E and D, it means that C sits on the 3rd bench (on the 2nd bench only two students sit). This by eliminating, E and D sit on the 1st bench.

Now, using the statement, “A sits with his best friend”, hence A is a male. Again, E is a male as he is the brother of C. Eliminating the choices, D is a female but the sex of G is not known.

PRACTICE EXERCISE 5

Directions for questions 1 to 4: *Read the following passage and solve the questions based on it.*

In a state, there are seven cities—A, B, C, D, E, F and G. The following cities have a two way connection between them: D and F, E and H, A and B, B and C, G and E, C and E and G and F. There is a one-way connection from F to B. (Two way connection means people can move in both the Directions whereas in a one way connection, people can move only in one way.)

1. If the connection between E and C is cut, then which route is not possible?
 - (a) B to E
 - (b) A to G
 - (c) F to B
 - (d) D to G
2. If a person wishes to travel from D to E, then what is the minimum number of cities that he needs to cross enroute?
 - (a) 2
 - (b) 4
 - (c) 3
 - (d) 5
3. If a person wants to go to city F from city A, how many cities will he be required to cross (excluding A and F)?
 - (a) 2
 - (b) 4
 - (c) 3
 - (d) 5
4. In the above question, which of the following will minimize the number of cities?
 - (a) make F – B a two way connection
 - (b) connect F – C with a two way connection
 - (c) connect A – D with a one way connection from D to A
 - (d) connect C – G with a two-way connection

Directions for questions 5 to 7: *Read the following passage and solve the questions based on it.*

There are two groups namely Left and Right. Persons A, B, C and D are in the Left group and E, F and G are in the Right group. A committee is to be formed of 3 persons, at least one from each group. B and C will never be together. If G is there in the committee then E will also be there. F and C will be always together. The co-ordinator has to be from the minority group.

5. Which one of them cannot be a valid committee?
 - (a) BDE
 - (b) FGB
 - (c) AGC
 - (d) EFG
6. Which one of them cannot be a coordinator?
 - (a) F
 - (b) B
 - (c) G
 - (d) D

7. Which one is a false statement?
 - (a) FBA is a possible group
 - (b) FCD is a possible group
 - (c) FCE is a possible group
 - (d) GEA is a possible group

Directions for questions 8 to 12: *Read the following passage and solve the questions based on it.*

P, Q, R, S, T, V and W are seven friends who left for seven different places—Delhi, Chennai, Hyderabad, Bangalore, Kolkata, Chandigarh and Patna—each one on a different day of the week. R left for Patna on Monday. On the last day of the week one person left for Bangalore. T left the next day after P, who left for Chandigarh and a day previous to W's departure. S left for Kolkata on Friday. Q did not leave for either Hyderabad or Bangalore and W left for Delhi.

It is also given that the week starts on Sunday and ends on Saturday.

8. On which day of the week did Q leave?
 - (a) Sunday
 - (b) Saturday
 - (c) Wednesday
 - (d) Cannot be determined
9. Who left for Bangalore?
 - (a) T
 - (b) P
 - (c) V
 - (d) Cannot be determined
10. On which day of the week did T leave?
 - (a) Tuesday
 - (b) Thursday
 - (c) Sunday
 - (d) Wednesday
11. Which of the following combinations of person-place is not correct?
 - (a) R—Patna
 - (b) P—Chandigarh
 - (c) T—Hyderabad
 - (d) All are correct
12. Who left on Tuesday?
 - (a) P
 - (b) W
 - (c) Q
 - (d) V

Directions for questions 13 to 16: *Read the following passage and solve the questions based on it.*

Manoj is a medical representative (M R) with Nicholas Piramal. He has to meet seven doctors M, N, O, P, Q, R and S on a particular day between 9 a.m. and 4 p.m. Following details are available regarding his schedule:

- (i) He takes 30 minutes with each doctor and keeps a gap of 25 minutes between two appointments for travel and preparation except after the 5th visit, when

Directions for questions 17 to 21: Read the following passage and solve the questions based on it.

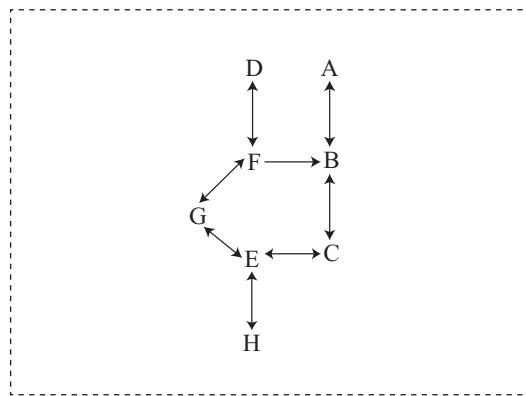
B, C, D, F, G, H and J are seven students studying in three colleges P, Q and R. Among them are three boys and four girls. There is at least one boy and one girl in each college. Three of them are in the Commerce discipline and two each in Arts and Science. B and her sister G are in the Science discipline but in different colleges. F studies Arts in college Q and he does not study with either J or C. D is not in the Commerce discipline and he studies in college R, only with B. All the three from the Commerce discipline do not study in the same college. H studies in the same college with her friend G.

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (a) | 2. (a) | 3. (b) | 4. (a) | 5. (a) | 6. (c) | 7. (a) | 8. (b) | 9. (c) | 10. (d) |
| 11. (d) | 12. (a) | 13. (b) | 14. (d) | 15. (a) | 16. (d) | 17. (a) | 18. (b) | 19. (a) | 20. (c) |
| 21. (d) | 22. (c) | 23. (c) | 24. (c) | 25. (a) | | | | | |

HINTS AND EXPLANATIONS**1 to 4**

Let us first make the network of connections:



1. Obviously, B – E is not possible.
2. The path with the minimum possible cities in between will be D – F – G – E.
3. The route will be A – B – C – E – F – G
4. Making F – B a two way connection will give us the route A – B – F. In this case, only one city will need to be crossed.

5 to 7

5. Option (b) & (c) are not possible as there is G but not E. Option (d) is not possible as all members are from right group. Option (a) is a valid committee.
6. If G is there in committee, E will be also there. So, there are 2 members from the right group. So, coordinator must be from the left group.
7. As F & C must be together, so only F is not possible. So, FBA is not a possible group.

8 to 12

Let us prepare the scenario first:

Seven friends are P, Q, R, S, T, V and W. Seven destinations: Delhi, Chennai, Hyderabad, Bangalore, Kolkata, Chandigarh and Patna.

Let us proceed with the following concrete information:

R-Patna – Monday; Bangalore – Saturday

P-Chandigarh; S-Kolkata – Friday, W-Delhi

With the help of the above information we get the following table:

Table 1

No.	Person	Destination	Day
1.	R	Patna	Monday
2.		Bangalore	Saturday
3.	P	Chandigarh	
4.	S	Kolkata	Friday
5.	W	Delhi	

Using the indirect information—Since Q did not leave for either Hyderabad or Bangalore, the above table helps us conclude that Q left for Chennai.

Now, T left the next day of P's departure and a day previous to W's departure. Using the above table, P and W did not depart on Monday, Saturday or Friday. T did not depart on Monday or Friday.

Now P can't depart on Sunday or Thursday because T did not depart on Monday or Friday respectively. P can't depart on Wednesday because he did not depart on Friday. So, by elimination, P left for Chandigarh on Tuesday.

Let us tabulate the information received till now:

Table 2			
No.	Person	Designation	Day
1.	R	Patna	Monday
2.		Bangalore	Saturday
3.	P	Chandigarh	Tuesday
4.	S	Kolkata	Friday
5.	W	Delhi	Thursday
No.	Person	Designation	Day
6.		Hyderabad	
7.	Q	Chennai	

Finally, since T left for his destination on Wednesday, it is obvious that T's destination is Hyderabad.

Hence, V is going to Bangalore and Q left for Chennai. The person left for Bangalore, left on the left day of week. So, V and Q left on Sunday & Saturday respectively.

So, the final table will look like:

Table 3			
No.	Person	Designation	Day
1.	R	Patna	Monday
2.	V	Bangalore	Sunday
3.	P	Chandigarh	Tuesday
4.	S	Kolkata	Friday
5.	W	Delhi	Thursday
6.	T	Hyderabad	Wednesday
7.	Q	Chennai	Saturday

13 to 16

Order	Doctor	Duration of meeting	Gap (in minutes)
1.	O	9 a.m. – 9.30 a.m.	25
2.	S	9.55 a.m. – 10.25 a.m.	25
3.	R	10.50 a.m. – 11.20 p.m.	25
4.	M	11.45 a.m. – 12.15 p.m.	25
5.	Q	12.40 p.m. – 1.10 p.m.	50
6.	P/N	2 p.m. – 2.30 p.m.	25
7.	N/P	2.55 p.m. – 3.25 p.m.	-

17 to 21

Let us first find out the scenario – There are three colleges, three disciplines and seven students. Further, we know that three of them are in the Commerce discipline and two each in Arts and Science.

We have been given that B and G are in Science, F in Arts and D is not in Commerce. This implies that D is in Arts. By elimination, the remaining (C, J and H) are in Commerce.

Thus we get the following table:

Table 1

Discipline	Students
Science	B and G
Arts	F and D
Commerce	C, J and H

Now, let us proceed to make a table which correctly matches the colleges and the students/discipline.

It is given that D (a male student) studies in college R only with B. This implies that only two students study in college R and B is a female. (Note that there are at least one boy and one girl in each college).

Further, it is known that B's sister G, and H (a female student) study in the same college. Now, this

college can't be P because in that case there will be only a single student (among the given students) in college Q. Hence, H and G study in college Q.

Still we do not know about the sex of J and C. Hence, the above information can be tabulated as follows:

Table 2

College	Students
P	J and C
Q	F (male), H (female) and G(female)
R	D (male) and B (female)

- 18.** If B & C are interchanged, C must be female as B is male. J must be a boy as B is female & there must be

1 boy & 1 girl in each college. So, C, G, H & B are girls.

- 21.** D & F are males. Any 1 from J & C is a male & other is female. So, the 3 boys cannot be identified.
- 22.** 'Father of the brother of my father' is also the father of my father and hence is my (woman's) grandfather.
- 23.** For page 1 to 9, there are 9 digits. From 10 to 99 there are 180 digits from 100 to 999 there are 2700 digits. As, $1890 = 9 + 180 + 1701$. So, the number of pages must be between 100 & 999. As, $1701/3 = 567$. Now, counting from 100, the 567th member is 666. So, there are 666 pages in book.

24 to 25

Order of novel reading is as follows:

B – C – E – A – D.

PRACTICE EXERCISE 6

Directions for questions 1 to 4: Read the passage given below and solve the questions based on it.

Five persons—Yamini, Nitika, Monica, Rehana and Pragya are students of five different areas Medical, Engineering, Architecture, Arts and Management in no particular order. Each of them plays a different musical instrument from Sitar, Tabla, Sarod, Guitar and Violin, not given respectively.

Monica, a medical student, does not play Sarod or Sitar or Guitar.

Pragya is neither a student of Engineering nor of Management.

Rehana, who plays tabla, is an Arts student.

Neither Pragya nor Yaminji plays Sarod.

Directions for questions 5 to 10: Read the passage given below and solve the questions based on it.

During their stint at IIM Shillong, ten students have opted for various electives named from A to F. In these electives, students are given the points on a scale of 1 to 5 points. Points obtained by the students can be integral points only.

It is also known that not all the electives are taken by all the students and not all the students are taking at least an elective.

The range of scores indicates the maximum and minimum scores in that elective by the students who have chosen that elective. However, if the range of the scores is 1–4, then at least one of students must have got 1 point and at least one student must have got 4 points in that elective.

The number of elective takers out of the 10 students is given in the last column.

Elective	Range of scores of all the elective takers (Minimum and maximum scored)	Average score of the elective takers	Number of elective takers
A	1–4	3.5	6
B	2–4	3	3
C	1–5	4	7
D	1–2	4/3	3
E	2–5	4	4
F	3–5	11/3	6

having all those students who have opted elective A and elective B and the scores of each of these electives have been taken into consideration while finding the average of elective H. If none of the students of elective A and elective B are common, then what will be the average score of elective H?

- (a) 10/3
(b) 3
(c) 3.5
(d) None of these
(e) Cannot be determined

Directions for questions 11 to 13: Read the passage given below and solve the questions based on it.

There are six movies—A, B, C, D, E and F—to be showed in a film festival. B, C and E are art movies and others are commercial movies. Only F and D are Hindi movies and the remaining movies are English movies. Movies A, C and D are made by Jagmohan Mundhra and movies B, E and F are made by Steven Spielberg.

11. Which English movie is a commercial movie?

 - (a) A
 - (b) B
 - (c) C
 - (d) D
 - (e) None of these

12. Which Hindi movie is made by Jagmohan Mundhra?

 - (a) A
 - (b) B
 - (c) C
 - (d) D
 - (e) None of these

13. Which of the English movies is/are art movies made by Steven Spielberg?

 - (a) B
 - (b) B and C
 - (c) C
 - (d) B and E
 - (e) None of these

Directions for questions 14 to 18: Read the passage given below and solve the questions based on it.

Bus route no. 761 has exactly six stops on its route. Any bus plying on this route starts from the initial position, then stops first at stop one and then at stops two, three, four, five, and six respectively. After the bus reaches stop six, the bus turns and returns to its initial position and repeats the cycle. Buses are not allowed to carry people on its return journey.

Following are the six stops—L, M, N, O, P, and Q in no particular order. Further, following observations have been made regarding the stops on this route:

Observation 1 – P is the third stop.

Observation 2 – M is the sixth stop.

Observation 3 – The stop Q is the stop immediately after O.

Observation 4 – N is the stop immediately before L.

Directions for questions 19 to 20: Read the passage given below and solve the questions based on it.

During the Indian film festival at Goa, movies from five countries—Austria, Bhutan, China, Denmark, and England are to be shown. Movies from these countries have to follow a particular order as given follows:

Movie from Austria must be shown before the movie from China.

Movie from England should be the fifth movie to be shown.

Movie from Bhutan must be shown before the movie from Denmark.

19. Which of the following is the correct order for showing all the movies?

- (a) Austria, China, Bhutan, Denmark, England
- (b) Austria, China, Denmark, England, Bhutan

- (c) Bhutan, Denmark, China, Austria, England
- (d) Bhutan, Denmark, England, Austria, China
- (e) England, Bhutan, China, Austria, Denmark

20. Movies from Denmark and England are shown at the farthest gap possible. Which among the following would be true?

- (a) Movie from Austria is shown earlier than Movie from Bhutan.
- (b) Movie from England is shown earlier than Movie from China.
- (c) Movie from Denmark is shown earlier than Movie from Austria.
- (d) Movie from England is shown earlier than Movie from Bhutan.
- (e) Movie from China is shown earlier than Movie from Denmark.

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (b) | 2. (d) | 3. (d) | 4. (c) | 5. (e) | 6. (c) | 7. (e) | 8. (e) | 9. (a) | 10. (e) |
| 11. (a) | 12. (d) | 13. (d) | 14. (b) | 15. (b) | 16. (a) | 17. (b) | 18. (d) | 19. (a) | 20. (c) |

HINTS AND EXPLANATIONS

1 to 4

We can arrange the 5 students in following table with each column shows names; Area & musical instruments respectively.

Name	Area	Musical Instrument
Monica	Medical	Violin
Pragya	Architecture	
Rehana	Arts	Tabla
Yamini		
Nikita		Sarod

1. Nikita plays sarod.
2. It may be engineering or architecture or management.
3. Either Pragya or Yamini plays sitar.

4. We can find the exact discipline & musical instrument for only 2 students Monica & Rehana.

5 to 10

5. We cannot find a definitive answer to this question because the solution give rise to multiple overlapping.
6. Looking at the elective D, total number of points scored = 4 points and the number of students = 3. Since the range of the points obtained is 1–2, hence the maximum 2 points can be obtained by only one student and remaining two students are getting one mark each. In A & C too any 1 student may get 1 mark. But we may assume they are same as 2 who get 1 mark in D.
7. Same as that of Q5. Hence, cannot be determined.

8. To find the minimum number of students with more than 3 points, we should try to accommodate as much students as possible at 3 points each. And after we have accommodated enough students at 3 points each, remaining students will be accommodated at more than 3 points.

In case of elective A, maximum number of students who can get 3 points = 3. Hence, remaining 3 students are getting a total of 12 points. And in no way these 3 students are getting 3 points or less than 3 points to satisfy the conditions given.

In case of elective C, the minimum number of students that can be accommodated at 3 points each = 3. Hence, total points = 9. Now remaining 19 points are to be accommodated among 4 students and none of these five students can get 3 points or less than 3 points [Otherwise then 16 points will be required to be accommodated among 3 students and in that case at least one student will get more than 5 points and that is a contradiction].

We can further see that each of these students will get more than 3 points now to satisfy the given conditions.

Hence, minimum number of the students who have scored more than 3 points in at least one elective = 4.

9. Total points obtained by the students of elective A = 21

Total points obtained by the students of elective B = 9

Total points obtained by the students of elective A + B = 30

Total number of students = 9

Hence, average = 30/9

10. In this question, at least one student is going to be overlapped. And without knowing the score of this student (or other overlapped students if any), we cannot find the average score of the elective N.

Hence cannot be determined.

11 to 13

Jagmohan Mundra

1. A – English – Commercial
2. C – English – Arts
3. D – Hindi – Commercial

Steven Spielberg

1. B – English – Arts
2. E – English – Arts
3. F – Hindi – Commercial

14 to 18

Following is the structure of the stops on this route:

N	L	P	O	Q	M
Step 1	Step 2	Step 3	Step 4	Step 5	Step 6

or

O	Q	P	N	L	M
Step 1	Step 2	Step 3	Step 4	Step 5	Step 6

Now all the questions can be answered.

18. NLPOQM
NLPQOM
OQPNLM
QOPNLM

These are 4 possibilities for fixing the stops & routes by relaxing third observation.

19 to 20

19. We can eliminate options (b), (d) & (e) as movie from England must be last to be played. Option (c) can be eliminated as movie from China can be shown after movie from Austria.

So, correct Option is (a).

20. The movie from England must be shown at last. So, movie from Denmark must be shown as early as possible. But it can be shown after movie from Bhutan. So, the first & second movies must be from Bhutan & Denmark. Movies from Austria & China are shown at third & fourth place.

PRACTICE EXERCISE 7

Directions for questions 1 to 3: *Read the passage given below and solve the questions based on it.*

Six sides of a cube are painted by six different colours—Black, blue, brown, green, red and white—one colour on one side. Following observations are made regarding the sides and the colour on it:

1. The side coloured red is opposite the side coloured black.
 2. The green side is between the red side and the black side.
 3. The blue side is adjacent to the white side.
 4. The brown side is adjacent to the blue side.
 5. The red side is the bottom face.
1. The four colours adjacent to the green side are
 - (a) Black, blue, brown, red
 - (b) Black, blue, brown, white
 - (c) Black, blue, red, white
 - (d) Black, white, brown, red
 2. Which of the following can be deduced using the observation 1 and observation 5?
 - (a) Black is on the top
 - (b) Brown is on the top
 - (c) Blue is on the top
 - (d) Brown is opposite to black.
 3. If the red side is exchanged for the green side and the blue is swapped for black, then which of the following is false?
 - (a) Red side is opposite to black side.
 - (b) White side is adjacent to the brown side.
 - (c) Green side is opposite to the blue side.
 - (d) White side is adjacent to the blue side.

Directions for questions 4 to 8: *Read the passage given below and solve the questions based on it.*

In the latest *Rajshri* films *Hum aapke hain saath saath*, there are six generations in a family however total members in this family is 5. Names of the members of this family are Atul, Binod, Charu, Deepak and Faisal.

Following observations have been made regarding them:

1. Charu is the only unmarried child whose grand parents have passed away.
2. Deepak, a widow, is the daughter of Faisal who is a widower.
3. None of the family members is an adopted son or an adopted daughter.

4. One generation has at most one family member.
5. Every couple has only one child and the first generation did not have any siblings.
4. If Atul is the grandson of Binod, then which member is in the second last generation?
 - (a) a male
 - (b) Atul
 - (c) Either (a) or (b)
 - (d) Both (a) and (b)
5. If Binod is the eldest member in the family, then how is Deepak related to Atul?
 - (a) Grandmother
 - (b) Grandfather
 - (c) Either (a) or (b)
 - (d) None of these
6. If Binod is the eldest member in the family, then how is Atul related to Charu?
 - (a) Father
 - (b) Mother
 - (c) Uncle
 - (d) Cannot be determined
7. If Atul is Charu's father and Binod's grandson, then how many possible combinations of the family exist?
 - (a) 1
 - (b) 2
 - (c) 3
 - (d) 4
8. If grandfather of Charu were alive, he would have definitely belonged to which generation?
 - (a) 4th last
 - (b) 3rd
 - (c) 2nd last
 - (d) 3rd last

Directions for questions 9 to 12: *Read the passage given below and solve the questions based on it.*

There are six classes to be held everyday by six different teachers—A, B, C, D, E, and F in a school. Three of these classes will take place in the morning session before the lunch break whereas the other three classes will be held in the afternoon session after the lunch break.

The scheme of the classes should follow the following restrictions

Class by B should be immediately before the class by C and their presentations cannot be separated by the lunch break.

Class by D must be either the first or the last class.

9. If class by C is the fifth class of the day, then class by B is theclass of the day.
 - (a) first
 - (b) second
 - (c) third
 - (d) fourth

Directions for questions 13 to 20: Read the passage given below and solve the questions based on it.

There are three projects—P1, P2 and P3. A student can select either one project or two projects or all the three projects subject to the conditions given below:

Condition 1: Both P1 and P2 have to be selected.

Condition 2: Either P1 or P3, but not both, has to be selected.

Condition 3: P2 can be selected only if P3 has been selected.

Condition 4: P1 is selected only if P3 is selected.

Directions for questions 21 to 26: Read the passage given below and solve the questions based on it.

Five universities—A, B, C, L and K participated in the last year inter-university athlete event. Each of the universities were represented by three members. According to the rules, the race-track maker gets wild card entry making the total number of athletes participating in the race equal to 16. The rank obtained by the individual will be the points obtained. And similarly the points obtained by an individual university will be equal to the sum of the ranks of the member athletes of the team. Lower the points, better the team and the best team wins the trophy.

The five universities tied for the trophy, their sum being equal, however no two athletes tied for the same position. In order to determine the order in which the universities will hold the trophy (they agreed to hold it for 73 days each), they multiplied the athletes positions together in each university. The university with the smallest product – K – will hold the trophy first and so on the university with the largest product – A – will hold the cup last. Unfortunately, universities B and C were still tied and had to be separated by a toss of coin.

It was also found that the no two athletes of a university finish at the consecutive positions. Had the race-track maker did not come in between two athletes of university B, university B would have achieved this feat of two athletes being at consecutive positions.

ANSWER KEYS

- 1.** (d) **2.** (a) **3.** (b) **4.** (d) **5.** (a) **6.** (d) **7.** (a) **8.** (d) **9.** (d) **10.** (c)
11. (d) **12.** (c) **13.** (c) **14.** (b) **15.** (c) **16.** (a) **17.** (a) **18.** (b) **19.** (d) **20.** (a)
21. (b) **22.** (b) **23.** (b) **24.** (c) **25.** (d) **26.** (e)

HINTS AND EXPLANATIONS

1 to 3

- As green side is between red & black sides so, 2 of the 4 adjoining sides of green side must be of red & black colours. As, blue side is adjacent to both brown & white side. So, it must be opposite to green side. So, the 4 colours adjacent to green side are black, white, brown & red.
 - As red colour is on bottom face & it is opposite to black coloured face. So, the top face must be of black colour.
 - From 1st & 2nd answer, we know red & black colour are on opposite sides. Similarly green & blue colour are on opposite faces. So, brown & white must also be colour on opposite faces. So, brown & white cannot be the adjacent sides.

4 to 8

We get the following information using the statements given:

Statement 1:

1st Generation

2nd Generation

3rd Generation

4th Generation

xx

5th Generation

6th Generation

Charu

Statement 2:

Faisal (Male)

Deepak (Female)

Faisal and Deepak will be in consecutive generations.

4. If Atul is the grandson of Binod, then the only possibility for this family is:

1st Generation	Faisal
2nd Generation	Deepak
3rd Generation	Binod
4th Generation	XX
5th Generation	Atul
6th Generation	Charu

Hence, Atul is in the second last generation. Since Atul is the grandson, so Atul is a male.

5. If Binod is the eldest member in the family, then following is the arrangement of the people in this family:

1st Generation	Binod
2nd Generation	Faisal
3rd Generation	Deepak (F)
4th Generation	XX
5th Generation	Atul
6th Generation	Charu

Hence, Deepak is grandmother of Atul.

6. Using the arrangement given in Q 5, we can see that Atul can be mother or father of Charu. Hence, cannot be determined.
7. 1. Faisal (Male)
2. Deepak (Female)
3. Binod
4. X
5. Atul (Male)
6. Charu
So, there is just 1 combination of family which is possible.
8. Grandfather of Charu must have been in the fourth generation = 3rd last generation.
9. If C is fifth then B must be fourth as it is just before C.
10. B cannot be 3rd as then C must be 4th & both C & D will be separated by lunch break which is not possible.
11. D must be 1st as he cannot be last as per statement of question. So, there are 2 possibilities. D, F, __, B, C, __ or D, F, __, __, B, C.
12. D must be 1st, B & C can be 2nd & 3rd. So, A must be 4th.

13 to 20

13. Total number of selections = $2^3 = 8$
Total selections possible = $8 - 1 = 7$
14. (P1, P2), (P1, P2, P3)
15. P1, P3, (P1, P2), (P2, P3)
16. P1, P3, (P1, P3), (P2, P3), (P1, P2, P3),

17. P2, P3, (P1, P3), (P2, P3), (P1, P2, P3)
18. (P1, P2)
19. P1, P3, (P3, P2)
20. None of the selections can be done.

21 to 26

Sum of ranks of all the 16 players = 136.

Sum of the ranks of all the universities is same, hence, their sum should be divisible by 5. So, their sum should be either 135, or 130, or 125 or 120. In turn, the rank of the race-track maker will be either 1, or 6, or 11 or 16 respectively.

Since race-track maker comes in between the two athletes of university B, hence rank cannot be 1 or 16.

Case 1 – If the rank of race-track maker = 6

Hence, the sum of the ranks obtained of all the universities = 130, and so the sum of ranks of all the athletes of each of the universities = 26.

Since the race track maker comes in between two athletes of university B, hence the ranks obtained by two of the athletes of university B are 5 and 7. Hence the rank of the third athlete of university B = $26 - (5 + 7) = 14$

Now the product of ranks of all the athletes of university B = Product of ranks of all the athletes of university C.

Product of ranks of university B contains 72 inter alia, and no other exponent of 7 is possible in the whole series of 1 to 16 for university C.

Hence, we can conclude that rank of race-track maker cannot be 6.

Now the only possible rank of race-track maker = 11.

Case 2 – If the rank of race-track maker = 11

Hence, the sum of the ranks obtained of all the universities = 125, and so the sum of ranks of all the athletes of each of the universities = 25.

Since the race track maker comes in between two athletes of university B, hence, the ranks obtained by two of the athletes of university B are 10 and 12. Hence the rank of the third athlete of university B = $25 - (10 + 12) = 3$

Hence the ranks of athletes of university B = 3, 10, 12

Now the product of ranks of all the athletes of university B = Product of ranks of all the athletes of university C.

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Hence, the ranks of athletes of university C = 4, 6, 15

We can observe that the product and sum of the ranks of athletes of university B and C are same.

From the remaining ranks now, for the smallest product of the ranks of athletes such that their sum is equal to 25, the ranks should be 1, 8, 16 (University K).

Similarly, for the maximum product of the ranks of the athletes for the university A, ranks should be 13, 7, 5.

Hence the ranks for the athletes of the university L = 2, 9, 14.

A	B	C	L	K
13 7 5	3 12 10	4 6 15	2 9 14	1 8 16

Chapter

14

MODERATE EXERCISES

PRACTICE EXERCISE 1

Direction for questions 1 to 4: Go through the information given below and solve the questions based on it.

Captain of a cricket team has to allot five middle batting positions to five batsmen. The average runs scored by each batsman at these positions are as follows:

Batting Positions					
Batsman	I	II	III	IV	V
P	40	40	35	25	50
Q	42	30	16	25	27
R	50	48	40	60	50
S	20	19	20	18	25
T	58	60	59	55	53

As per the rules, a batsman can come to bat only at one position. Objective is to maximize the total number of runs scored.

3. How many different batting order are possible so that the five batsmen score the maximum?

 - (a) 1
 - (b) 2
 - (c) More than 1 but finite
 - (d) Infinite

4. To satisfy the maximum possible runs scored by them together, what is the runs scored by Q?

 - (a) 20
 - (b) 25
 - (c) 19
 - (d) 18

Directions for questions 5 to 9: Read the following passage and solve the questions based on it.

Amit, Bharat, Chandan, Dinesh, Eeshwar and Ferguson are cousins. None of them are of the same age, but all of them have birthdays on the same date. The youngest of them is 17 years old and Eeshwar, who is the eldest, is 22 years old. Ferguson is somewhere between Bharat and Dinesh in age. Amit is elder to Bharat and Chandan is older than Dinesh.

5. Which of the following is not possible?

 - (a) Dinesh is 20 years old
 - (b) Ferguson is 18 years old
 - (c) Ferguson is 19 years old
 - (d) Ferguson is 20 years old

6. If Bharat is 17 years old, then which of the following could be the ages of Dinesh and Chandan respectively?
 (a) 18 and 19 (b) 19 and 21
 (c) 18 and 20 (d) 18 and 21
7. If two of the cousins are between Chandan and Ferguson in age, then which of the following must be true?
 (a) Amit is between Ferguson and Dinesh in age
 (b) Bharat is 17 years old
 (c) Bharat is younger than Dinesh
 (d) Ferguson is 18 years old
8. If Amit is one year elder to Chandan, the number of logically possible orders of all six cousins by increasing age is
 (a) 2 (b) 3
 (c) 4 (d) 5
9. If Chandan is 19 years old, which of the following must be true?
 (a) Amit is 20 years old and Dinesh is 21 years old
 (b) Bharat is 18 years old and Amit is 20 years old
 (c) Bharat is 20 years old and Amit is 21 years old
 (d) Dinesh is 17 years old and Bharat is 21 years old

Directions for questions 10 to 11: Read the following passage and solve the questions based on it.

There are five rooms in my house in Patna—a hall, kitchen, study room, bedroom and dining room. There is one light in each room. The following clever arrangements are planned in the house:

- (i) Whenever the kitchen light is ‘on’, the study room light is ‘off’.
 - (ii) Whenever the dining room light is ‘on’, the kitchen light is also ‘on’.
 - (iii) Whenever the study room light is ‘on’, the hall light has to be ‘on’.
10. Which one of the following combinations cannot be ‘on’ at the same time?
 (a) dining room and kitchen
 (b) hall and bedroom
 (c) dining room and study room
 (d) kitchen and hall
11. How many lights, at the most, can be ‘on’ simultaneously?
 (a) 5 (b) 4
 (c) 3 (d) 2

Directions for questions 12 to 15: Read the following passage and solve the questions based on it.

Guru Nanak Institute of Management will organize six once-a-month lecture series for young entrepreneurs as per the following schedule, with no dates conflicting for any two different programmes:

- (i) Marketing – August through January
 - (ii) Entrepreneurship – April through October
 - (iii) Law – January through September
 - (iv) Finance – March through June
 - (v) Accounts – October through April
 - (vi) HR – October through December
12. During which month are the fewest lectures scheduled?
 (a) January (b) February
 (c) June (d) September
13. What is the maximum number of lectures that can be attended in a single month?
 (a) 7 (b) 6
 (c) 5 (d) 4
14. How many months of the year must a student attend to hear all the lectures on Marketing, Entrepreneurship and Finance?
 (a) 11 (b) 10
 (c) 9 (d) 8
15. How many different lectures can be attended during the months of January, February and March?
 (a) 11 (b) 10
 (c) 8 (d) 6

Directions for questions 16 to 19: Read the following passage and solve the questions based on it.

Two ants start climbing a slippery wall together, from the bottom of the wall. Ant A climbs at the rate of 3 inches per minute. Ant B climbs at the rate of 4 inches per minute. However, owing to the fact that the wall is slippery, ant A slips back 1 inch for every 2 inches climbed and ant B slips back 1.5 inches for every 2 inches climbed. Besides this, ant A takes a rest of 1 minute after every 2 minutes and ant B takes a rest of 1 minute after every 3 minutes. (Assume that both ant A and ant B slip continuously while climbing.)

16. At what height on the wall do the two ants meet each other?
 (a) never (b) 3 inches
 (c) 5 inches (d) 12 inches
17. If the widest gap achieved between the two ants, within the first 10 minutes, is N inches, then find the value of N?

Directions for questions 20 to 22: Read the following passage and solve the questions based on it.

KK, an aspiring entrepreneur wanted to set up a pen drive manufacturing unit. Since technology was changing very fast, he wanted to carefully gauge the demand and the likely profits before investing. Market survey indicated that he would be able to sell 1 lac units before customers shifted to different gadgets. KK realized that he had to incur two kinds of costs – fixed costs (the costs which do not change, irrespective of numbers of units of pen drives produced) and variable costs (= variable cost per unit multiplied by number of units). KK expected fixed cost to be ₹40 lacs and variable cost to be ₹100 per unit. He expected each pen drive to be sold at ₹200.

ANSWER KEYS

- 1.** (b) **2.** (d) **3.** (a) **4.** (a) **5.** (d) **6.** (b) **7.** (d) **8.** (a) **9.** (c) **10.** (c)
11. (b) **12.** (b) **13.** (d) **14.** (a) **15.** (c) **16.** (b) **17.** (b) **18.** (d) **19.** (d) **20.** (a)
21. (d) **22.** (d)

HINTS AND EXPLANATIONS

1 to 4

Following scheduling can be done:

Maximum runs

Batsman	Position	Runs
P	V	50
Q	I	42
R	IV	60
S	III	20
T	II	60
Total		232

1. Maximum possible runs scored = 232.
Hence option (b) is the answer.
 2. P will play at position V.
Hence option (d) is the answer.
 3. There is only one scheduling possible for maximum runs to be scored.
Hence option (a) is the answer.
 4. S will score 20 runs.
Hence option (a) is the answer.

5 to 9

The given information can be sequenced as:

Eeshwar is the eldest;
 Amit > Bharat;
 Chandan > Dinesh and
 Dinesh < Ferguson < Bharat or
 Bharat < Ferguson < Dinesh

Now, the following possible arrangement can be attained:

22	21	20	19	18	17
(1) Eeshwar	Amit	Bharat	Ferguson	Chandan	Dinesh
(2) Eeshwar	Amit	Bharat	Chandan	Ferguson	Dinesh
(3) Eeshwar	Amit	Chandan	Bharat	Ferguson	Dinesh
(4) Eeshwar	Chandan	Amit	Bharat	Ferguson	Dinesh
(5) Eeshwar	Chandan	Dinesh	Ferguson	Amit	Bharat
(6) Eeshwar	Chandan	Dinesh	Amit	Ferguson	Bharat
(7) Eeshwar	Chandan	Amit	Dinesh	Ferguson	Bharat
(8) Eeshwar	Amit	Chandan	Dinesh	Ferguson	Bharat

5. From the above arrangement, we see that Dinesh can be 20 years of age [(5), (6)], Ferguson can be 18 years old [(2), (3), (4)] and Ferguson can also be 19 years old [(1), (5)]. However, Ferguson can never be 20 years old.
 6. If Bharat is 17 years old, the possible arrangements are (5), (6), (7) and (8).
- From the options, we can see that the only possible answer is (b).
7. There are two cousins between Chandan and Ferguson in age reference [(4); (6) and (7).] In all the cases, we have Ferguson's age as 18 years.
 8. Amit is one year older than Chandan in only two arrangements. [(3) and (8)].
 9. If Chandan is 19 years old, the only possible arrangement is (2) Clearly, Amit is 21 years old and Bharat is 20 years old.

10 and 11

10. Let us go through the various options to

Option (a): The dinning room and kitchen lights can certainly be 'on' at the same time [reference (ii)].

Option (b)

There is nothing given in the data to indicate that the hall and bedroom lights cannot be 'on' at the same time.

Option (c)

Whenever the dining room light is 'on', the kitchen light is 'on' [reference (ii)] and whenever the latter is 'on', the study room is 'off' [reference (i)]. Hence, the dining room and the study room lights cannot be 'on' at the same time. Hence, the answer is (c).

Regarding option (d), note that the hall and kitchen lights can be 'on' at the same time. When the kitchen light is 'on', the study room light is 'off' [reference (i)]. Whenever the study room light is 'on' the hall light is also 'on' [reference (iii)]. But this does not mean that the hall light is 'off' when the study room light is 'off'. That would be true, only if statement (iii) says, "The hall light is 'on' only if the study room light is 'on'", but that is not so. Hence there is no restriction on the hall light being 'on' when the kitchen light is 'on'.

11. The bedroom, kitchen, dining room and the hall lights can all be 'on' simultaneously. Hence, the maximum number of lights that can be on simultaneously is 4.

12 to 15

Following diagram can be made:

	Marketing	Ent	Law	Finance	Acc	HR
Jan						
Feb						
Mar						
Apr						
May						
June						
July						
Aug						

Sep					
Oct					
Nov					
Dec					

Now all the questions can be answered.

15. The number of different lectures which can be attended in January, February & March are 3, 2 & 3 respectively. So, total 8 different lectures can be attended.

16 to 19

- 16, 17 & 19. As per the question the following data is available to us:

Ant A climbs 3 inches per minute; ant B climbs 4 inches per minute; ant A slips back 1 inch for every 2 inches climbed; ant B slips back 1.5 inches for every 2 inches climbed.

Ant A takes a rest break of 1 minute after every 2 minutes.

Ant B takes a rest break of 1 minute after every 3 minutes.

After min			
1	2	3	4
5	6	7	8
9	10	11	12

Ant A			
2"	3"	3"	5"
6"	6"	8"	9"
9"	11"	12"	12"

Ant B			
1"	2"	3"	4"
5"	6"	7"	8"
9"	10"	11"	12"

18. If ant B do not take rest, we will get the following table:

After minutes			
1	2	3	4
5	6	7	8
9	10	11	12

Ant A			
2"	3"	3"	5"
6"	6"	8"	9"
9"	11"	12"	12"

Ant B			
1"	2"	3"	4"
5"	6"	7"	8"
9"	10"	11"	12"

20 to 22

20. Expected profit margin (known as contribution) per unit = ₹200 – ₹100 = ₹100

Hence break even sales units

$$= \frac{\text{Fixed Cost}}{\text{Profit margin per unit}}$$

$$\frac{\text{₹}40 \text{ lacs}}{\text{₹}40 \text{ lacs}} - 40,000 \text{ units}$$

Hence net sales = $40,000 \times 200 = \text{₹}80 \text{ lacs}$

21. Original profit = Total sales – Total cost (fixed cost + variable cost) = $(\text{₹}200 \times 1 \text{ lac}) - (40 \text{ lacs} + \text{₹}100 \times 1 \text{ lac}) = \text{₹}60 \text{ lacs}$

Now, new variable cost = ₹110 / unit, and everything else remains same.

So new profit = $(\text{₹}200 \times 1 \text{ lac}) - (40 \text{ lacs} + \text{₹}110 \times 1 \text{ lac}) = \text{₹}50 \text{ lacs}$

So, percentage decrease in profit

$$= \frac{\text{₹}10 \text{ lacs}}{\text{₹}60 \text{ lacs}} \times 100 = 16.67$$

22. Original profit = ₹60 lacs (see above question)
Interest payment = ₹2 lacs
Profit after interest = ₹58 lacs
Profit after interest after tax = ₹58 lacs – 30% of ₹58 lacs = ₹40.6 lacs
In the new case, there is 20% growth in sales.

So, new profit = $(₹200 \times 1.2 \text{ lac}) - (40 \text{ lacs} + ₹100 \times 1.2 \text{ lac}) = ₹80 \text{ lacs}$
Profit after interest payment = ₹78 lacs
Profit after interest after tax = ₹78 lacs – 30% of ₹78 lacs = ₹54.6 lacs
Percentage increase in earning = $\frac{54.6 - 40.6}{40.6} \times 100 = 34.5\%$ increase

PRACTICE EXERCISE 2

Directions for questions 1 to 2: Read the following statement and solve the questions based on them.

- (i) Seema is Raju's grandmother
 - (ii) Ganesh is Raju's father
 - (iii) Arun is Seema's sister
 - (iv) Pratibha is Ganesh's wife
 - (v) Arun is not Ganesh's aunt
1. What is Seema's daughter Devaki to Raju?
 - (a) mother
 - (b) paternal aunt
 - (c) maternal aunt
 - (d) father's aunt
 2. Pratibha is Arun's
 - (a) sister
 - (b) sister-in-law
 - (c) maternal uncle
 - (d) niece

Directions for questions 3 to 7: Read the following passage and solve the questions based on it.

There are six persons in a family, viz., A, B, C, D, E and F—three males and three females, not necessarily in the same order. Out of these, there are two married couples and two persons who are unmarried. Each one of them likes a different newspaper, viz. Times, Express, Hindustan Times, Financial Times, Bharat Times and Business Standard.

E, who likes the Express, is A's mother-in-law and A is C's wife. D is F's father and he does not like the Times or the Business Standard. B likes the Bharat Times and is F's sister, who likes the Hindustan Times. C does not read the Business Standard.

3. Who among the following likes the Times?
 - (a) C
 - (b) D
 - (c) A
 - (d) Cannot be determined
4. How is F related to E?
 - (a) Daughter
 - (b) Brother
 - (c) Son
 - (d) None of these
5. Which of the following is one of the married couples?
 - (a) D-B
 - (b) D-E
 - (c) B-F
 - (d) E-F
6. Which of the following newspapers is read by A?
 - (a) Times
 - (b) Bharat Times
 - (c) Business Standard
 - (d) Data Inadequate
7. How many sons does E have?
 - (a) four
 - (b) three
 - (c) two
 - (d) one

Directions for questions 8 to 11: Read the following passage and solve the questions based on it.

- (i) There are five types of cards, viz., A, B, C, D and E, and three cards of each type. These are to be kept in envelopes of three colours—violet, yellow and black and there are five envelopes of each colour.
 - (ii) B, D and E type cards are to be kept in the violet envelopes. A, B and C type cards are to be kept in the yellow envelopes; and C, D and E type cards are to be kept in the black envelopes.
 - (iii) Two cards each of B and D type are to be kept in the violet envelopes.
8. How many E type cards are kept in the black envelopes?
 - (a) nil
 - (b) one
 - (c) two
 - (d) three
 9. Which of the following combinations of regarding the type of cards and the number of cards is definitely correct with respect to the yellow coloured envelopes?
 - (a) A-2, B-1, C-2
 - (b) B-1, C-2, D-2
 - (c) A-2, E-1, D-2
 - (d) None of these
 10. Which of the following combinations regarding the type of cards, the number of cards and the colour of envelopes is definitely correct?
 - (a) C-2, D-1, E-2, black
 - (b) C-1, D-2, E-2, black
 - (c) B-2, D-2, A-1, violet
 - (d) None of these
 11. Which of the following combinations regarding the colour of envelopes and the number of cards is definitely correct with respect to the E type cards?
 - (a) Violet – 2, black – 1
 - (b) Violet – 1, yellow – 2
 - (c) Violet – 2, yellow – 1
 - (d) None of these

Directions for questions 12 to 15: Read the following passage and solve the questions based on it.

- (i) There are six picture cards—A, B, C, D, E and F, each bearing the picture of a king, a priest, a queen, a palace, a joker and a prince. These are printed in six different coloured inks—blue, red,

green, grey, yellow and black—and are arranged from left to right (not necessarily in the same order and colour).

Directions for questions 16 to 18: Read the following passage and solve the questions based on it.

To smoothen the process of issuing of passports, MEA has devised a ‘Single office–Three windows’ system. Under this system, the windows are named W1, W2 and W3. To ease the pressure upon the employees, the windows operate at different time slots on different days.

- (i) W1 is open between 10 a.m. and 2 p.m. on Monday, Wednesday and Thursday and between 2.30 p.m. and 4.30 p.m. on Tuesday, Friday and Saturday.
 - (ii) W2 is open between 9 a.m. and 12 noon on Tuesday, Thursday and Friday and between 1 p.m. and 3 p.m. on Monday, Wednesday and Saturday.
 - (iii) W3 is open between 8 a.m. and 11 a.m. on Monday, Tuesday, Thursday and Friday and between 1 p.m. and 3 p.m. on Monday, Wednesday and Saturday.

16. On which of the following days are all the three windows simultaneously open any time before noon?

(a) Saturday (b) Thursday
(c) Wednesday (d) Monday

17. On which day not more than one window is open simultaneously at any given time?

(a) Tuesday (b) Wednesday
(c) Friday (d) Saturday

18. On which day's afternoon slots are W1 and W2 open simultaneously for some time?

(a) Friday (b) Thursday
(c) Monday (d) Tuesday

Directions for questions 19 to 23: Read the following passage and solve the questions based on it.

- (a) Violet
 (b) Blue
 (c) Either blue or red
 (d) Either blue or violet
- 22.** If cube B is kept to your left with the green coloured surface facing you and cube A kept to your right with the blue surface facing you; then which of the following pairs of colours of cube A and cube B will be facing each other?
 (a) Yellow-black
 (b) Yellow-white
- (c) Black-violet
 (d) Data inadequate
- 23.** If cube B is kept behind cube A in such a way that the brown coloured surface of cube B is facing the yellow coloured face of cube A then which colour of cube B will be to your right?
 (a) Blue
 (b) Black
 (c) Brown
 (d) Data inadequate

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (c) | 2. (d) | 3. (a) | 4. (c) | 5. (b) | 6. (c) | 7. (c) | 8. (c) | 9. (d) | 10. (a) |
| 11. (d) | 12. (a) | 13. (b) | 14. (d) | 15. (a) | 16. (b) | 17. (c) | 18. (c) | 19. (d) | 20. (a) |
| 21. (c) | 22. (d) | 23. (d) | | | | | | | |

HINTS AND EXPLANATIONS**1 and 2**

Seema is the mother of either Raju's father (Ganesh) or his mother (Pratibha). As Arun is Seema's sister, she is the maternal aunt of either Ganesh or Pratibha.

- 1.** To solve the first question of the set; as Arun is not Ganesh's aunt, Seema is not Ganesh's mother (if she were, Arun would have been Ganesh's aunt).

Therefore, she is Pratibha's mother.

So, Seema's daughter, Devaki, is Pratibha's sister. Devaki is Raju's maternal aunt.

- 2.** It is given that Arun is not Ganesh's aunt. So, she is Pratibha's aunt. This means that Pratibha is Arun's niece, and so the answer to the second question is (d).

3 to 7

The following table and family tree can be easily made:

Person	Newspaper	Sex
E	Express	Female
A	Business Standard	Female

C	Times	Male
D	Financial Times	Male
B	Bharat Times	Female
F	Hindustan Times	Male

Relation $(-)E \leftrightarrow D(+)$
 |
 $(-)B - (+)F - (+)C \leftrightarrow A(-)$

8 to 11

From statement (ii) we can see that out of the fifteen cards, nine cards can be kept easily.

Table 1

Violet Envelope	Yellow Envelope	Black Envelope
B	A	C
D	B	D
E	C	E

From (iii) and using the above table, we get

Table 2

Violet Envelope	Yellow Envelope	Black Envelope
B(2)	A	C
D(2)	B(1)	D(1)
E(1)	C	E(2)

Digits given in the brackets show the number of cards. From statement (i), it is clear that each coloured envelope contains five cards. So, there are two C-type cards in the black envelope. Therefore, the remaining one C-type card is in the yellow envelope. So, all the three A-type cards are in the yellow envelope.

12 to 15

Starting with the definite information in statements (iii) and (iv) we get the following table (say Table I);

Table 1

Card	Colour	Picture	Position
A	black	queen	6
B		prince	
C	grey	king	2
D			
E			
F			

The cards have been assigned the positions 1 to 6 from left to right.

Using the information given in the other statements:

Palace – blue – D (x)(i)

Prince – D, E (x) (ii)

Priest – green, yellow (x) (iii)

B – 2 or 4

From (i), (ii), (iii) and Table I, we get

Prince – red (v)

From (ii), (v) and Table I, we get

Prince – red - F (vi)

Using (i), (vi) and Table I, we get

Palace – blue – E (vii)

Using (iv), (vi), (vii) and Table I, and then filling up the remaining information, we get the following table:

Table 2

Card	Colour	Picture	Position
A	black	queen	6
B	green/yellow	prince	
C	grey	king	2
D	yellow/green	joker	
E	blue	palace	
F	red	priest	

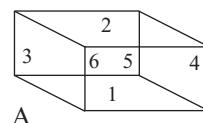
- 12 The vacant positions are 1, 3, 4 and 5. The given conditions require that the three consecutive cards – 3, 4 and 5 – be assigned to these. So, the joker will be at the number 1 position from the left.

16 to 18

	Mon	Tue	Wed	Thu	Fri	Sat
W1	10 a.m. – 2 p.m.	2.30 p.m. –4.30 pm	10 a.m. –2 p.m.	10 a.m. –2 p.m.	2.30 p.m. –4.30 p.m.	
W2	1 p.m. – 3 p.m.	9 a.m. – 12 noon	1 p.m. – 3 p.m.	9 a.m. – 12 noon	9 am – 12 noon	1 p.m. – 3 p.m.
W3	8 a.m. – 11 a.m.	8 a.m. – 11 a.m.	12 noon –2 p.m.	8 a.m. – 11 a.m.	12 noon –2 p.m.	12 noon –2 p.m.

19 to 23

We need to visualize it.

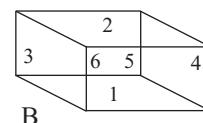


1 = Bottom face

2 = Top face

5 = Front face

6 = Back face



1 = Bottom face

2 = Top face

5 = Front face

6 = Back face

19. As per figure we need to find colour of face 3 of cube B. For cube B, face 1 is of blue colour & face 2 must also be of blue colour. Colour of face 5 & 6 must be black & white respectively. So, the colour of face 3 which is facing cube A must be either brown or green.

20. As for cube B, the face opposite to black colour face must be of white colour. So, white coloured side will face the sky.
21. As the colour of the face of cube A which is facing sky is yellow. So, the face facing us can be either of red or blue colour.
22. In this case multiple possible combinations of colour of the faces of cubes A & B facing each other are possible. So, data is inadequate.
23. The colour of face of cube B facing us may be blue or black or white. So, data is inadequate.

PRACTICE EXERCISE 3

Directions for questions 1 to 4: *Read the following passage and solve the questions based on it.*

Six people—P, Q, R, S, T and U are X's husband, sister, son, daughter, mother and aunt, though not necessarily in that order. They satisfy the following conditions:

- (i) R and S are either both males or both females.
 - (ii) Either P or Q, or both are male.
 - (iii) Either T or U, or both are female.

Directions for questions 5 to 9: Read the following passage and solve the questions based on it.

A business school with six professors, viz., L, M, N, O, P and Q, has decided to implement a new scheme of course management. Each professor has to coordinate one course and support another course. This semester, O's support course is Finance, while three other professors are its coordinator's. P and Q have Marketing as one of their subjects. Q coordinates Operations, which is a support course for both N and P. Finance and IT are L's subjects. Both L and O have the same subjects . Strategy is a support course for only one of the professors.

8. Who all are coordinating the Finance course?
(a) L, M and N (b) M, N and O
(c) N and O (d) L and N

9. Which course has only one coordinator and only one support professor?
(a) Marketing (b) Operations
(c) Finance (d) Strategy

Directions for questions 10 to 12: Read the following passage and solve the questions based on it.

During the Independence day celebrations at A R Academy last year, six different items, viz., drama, singing, mimicry, speech, story-telling and dance, were performed by six children viz., Abha, Binita, Sophiya, Devika, Esha and Ferguson, not necessarily in the same order. The programme began with the song which was not sung by Binita and ended with the dance item. Sophiya performed the mimicry item immediately after the speech. Esha performed the drama just before the dance sequence. Devika or Ferguson were not available for the last performance. The speech was not given by Abha and an interval of 30 minutes was given immediately after the mimicry item with three more items remaining to be performed. Devika performed immediately after the interval.

10. Which item was performed by Ferguson?
(a) Drama (b) Song
(c) Speech (d) Cannot be determined

11. Who performed the dance item?
(a) Abha (b) Binita
(c) Ferguson (d) Cannot be determined

12. Who was the first performer?
(a) Abha (b) Binita
(c) Ferguson (d) Cannot be determined

Directions for questions 13 to 15: Read the following passage and solve the questions based on it.

Next year in the Auto-Expo at Pragati Maidan, six cars, namely Uno, Verna, Wind, X-tra, Yale and Zen, are to be displayed. There will be six display stalls numbered 1, 2, 3, 4, 5 and 6 from the left to the right in such a way that only one car is showcased in each stall. However, the car Uno cannot be placed adjacent to the Verna and the Car Wind must be showcased to the left of X-tra. The Zen cannot be displayed in stall number 6.

Note: The direction (left or right) should be determined with respect to the observer/shopper.

Directions for questions 18 to 21: Read the following passage and solve the questions based on it.

- (i) The length, breadth and height of a rectangular piece of wood are 4 cm, 3 cm and 5 cm respectively.
 - (ii) Opposite sides of the $5 \text{ cm} \times 4 \text{ cm}$ piece are coloured red.
 - (iii) Opposite sides of the $4 \text{ cm} \times 3 \text{ cm}$ piece are coloured blue.
 - (iv) Rest of the sides of size $5 \text{ cm} \times 3 \text{ cm}$ are coloured green on both sides.
 - (v) Now the rectangular piece is cut in such a way so that cubes of size $1 \text{ cm} \times 1 \text{ cm} \times 1 \text{ cm}$ can be made.

Directions for questions 22 to 26: Read the following passage and solve the questions based on it.

Out of a stock of five essences, viz., L, M, N, O and P, two or more essences are used by a manufacturer in making all the perfumes. He has learned that for a blend of essences to be agreeable, they should comply with all the rules listed below.

- (i) A perfume containing the essence L should also contain the essence N and the quantity of N should be twice as that of L.
 - (ii) A perfume containing the essence M must also have the essence O as one of its components and they should both be in equal proportions.
 - (iii) No perfume should contain the essence N as well as the essence O.
 - (iv) The essence O and P the essence should not be used together.
 - (v) A perfume containing the essence P should contain it in such a proportion that the total amount of the essence P present should be greater than the total amount of the other essence or essences used.

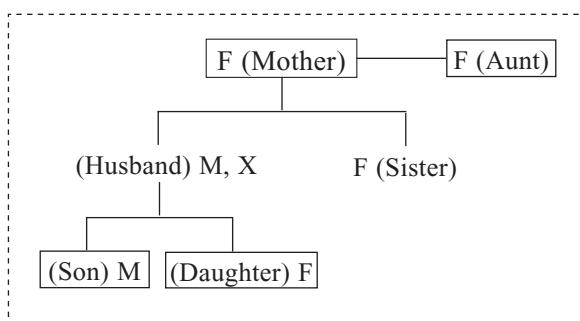
ANSWER KEYS

- 1.** (c) **2.** (d) **3.** (d) **4.** (b) **5.** (d) **6.** (b) **7.** (c) **8.** (a) **9.** (a) **10.** (d)
11. (d) **12.** (d) **13.** (d) **14.** (b) **15.** (c) **16.** (d) **17.** (b) **18.** (a) **19.** (d) **20.** (b)
21. (d) **22.** (d) **23.** (a) **24.** (d) **25.** (a) **26.** (b)

HINTS AND EXPLANATIONS

1 to 4

Let us first make a diagram from the given facts:



Two (husband and son) of X's six relatives are males and four are females. Since R is of the same sex as S, so both must be females, otherwise neither P nor Q could be males. The family relationship can be drawn around X like:

F = female and M = male

1. Since both R and S must both be females, so, S cannot be X's son.

However, P, Q, T and U each could be X's son because any of them might be male.

2. The only son among the six relatives is X's son. If U were T's son, then U would also be X's son. Accordingly, T would be X's husband. However, T and U cannot both be males. Thus statement (d) is false.

3. If Q is U's daughter, then Q and U must either be X's daughter and husband respectively or X's sister and mother respectively. If P is X's sister, P and Q would both be females, which is impossible so option (a) must be false. Since none of the six relatives could be U's niece, so option (b) must be false. T and S would have to be X's son and sister respectively. Accordingly, U and Q would have to be X's husband and daughter but T and U cannot both be males. So, option (c) must be false. Option (d) could be true because U would be X's mother, S would be U's sister and Q would be X's sister.

4. If P is T's sister, then P and T must either be X's daughter and son respectively or X's mother and aunt

(in either order). But P, T and U cannot all three be females, so U cannot be X's daughter.

5 to 9

- O Supports Finance
- Q Coordinates Operations
- N Supports Operations
- P Supports Operations

Professor	Coordinator	Support
L		
M		
N		Operations
O		Finance
P		Operations
Q	Operations	

P and Q have Marketing as one of their subjects

Professor	Coordinator	Support
L		
M		
N		Operations
O		Finance
P		Operations
Q	Operations	

P and Q have marketing as one of their subjects

Professor	Coordinator	Support
L		
M		
N		Operations
O	IT	Finance
P	Marketing	Operations
Q	Operations	Marketing

3 people coordinate Finance and

Professor	Coordinator	Support
L	Finance	
M	Finance	
N	Finance	Operations
O	IT	Finance
P	Marketing	Operations
Q	Operations	Marketing

IT is L's subject
Strategy is supported by one of the professors.

Professor	Coordinator	Support
L	Finance	IT
M	Finance	Strategy
N	Finance	Operations
O	IT	Finance
P	Marketing	Operations
Q	Operations	Marketing

10 to 12

For the sake of convenience, let us take the first letter of the names of all the children.

Table 1

Item	Order	Performer	
Song	1	B(x)	... (i)
Dance	6		... (ii)
Mimicry	x = 3	S	... (iii)
Speech	(x-1) = 2	A(x)	... (iv)
Drama	5	E	... (v)

(order can be determined with the help of Table II)

Table 2

6	D/F (x)	...(vi)
4	D	...(vii)

' $x = 3$ ' is known by the second last line of the given information.

Table 3

Story telling	4	D
Drama	5	E
Mimicry	3	S
Speech	2	B/F
Song	1	A/F
Dance	6	A/B

13 to 15

13. In any arrangement the Wind must be to the left of X-tra so, the X-tra cannot be placed in stall number 1.
14. If the X-tra is placed in stall number 3, then the Wind has to be immediately to the left of X-tra. So the Wind must be placed in stall number 2.
15. If the Uno is placed in stall number 5, neither the Wind nor the X-tra can be placed in stall number 6 as they must be placed next to each other. Also the Verna cannot be placed adjacent to the Uno. Hence, only the Yale can be placed in stall number 6.

16 to 17

Tie	Company	Name
brown	S	Himesh
green	P	Lokesh
pink	Q	Rajesh
purple	U	Shailesh

yellow	R	Nilesh
red	T	Dinesh

18 to 21

18. 8 cubes will have 3 colored faces.
19. No surface coloured = $(l - 2)(b - 2)(h - 2) = 3 \times 1 \times 2 = 6$
20. There are three cubes on each red – green interface (barring corner cubes) So, $4 \times 3 = 12$ cubes.
21. Single coloured cube = $2(l - 2)(b - 2) + 2(l - 2)(h - 2) + 2(b - 2)(h - 2) = 22$

22 to 26

22. Using condition (i) if we have L, then we must also have N in double quantity. So, option (a), (b) & (c) are eliminated.
23. Using condition (ii), option (b), (c) & (d) are not possible as O is not there, but M is present.
24. P must be more than all other essences combined. We have 2 part of N & 1 part of P. So, 2 part of P must be added.
25. If we use L, we must also use N. Similarly if we use M, we must also use O. But N & O cannot be used together. So, L & M cannot be used together.
26. We have 1 part of L & 1 part of N, while there must be 2 part of N if 1 part of L is used. So, 1 part of L should be removed. Similarly we have M, but no O. So, M should also be removed. So, we need to remove 2 essence from option (a). So, option (a) is eliminated.

In option (c), P is less than other essences, so it should be removed. But, L should also be removed as N is not present. So, option (c) is also eliminated.

In option (d), we have to remove N & P both, so it is also eliminated.

In option (b), we need to remove only O. So, (b) is correct option.

PRACTICE EXERCISE 4

Directions for questions 1 to 4: *Read the following passage and solve the questions based on it.*

A total of six teams participated in the PHL held at Chennai last year. The schedule of the tournament was such that each team had to play against every other team six times. Points were awarded for wins (W), losses (L) and draws (D). The following table gives the details of the various teams:

	Sikkim	Goa	Gujarat	Bihar	MP	Chandigarh
W	13	7	12	X	10	9
L	15	18	15	Y	16	15
D	2	5	3	Z	4	6

Directions for questions 5 to 9: Read the following passage and solve the questions based on it.

P, Q, R, S, T, U and V are sitting in a circle facing the centre. Following are the details of their order of sitting:

- (i) S, who is second to the right hand side of R, is not to the immediate right of V.
 - (ii) U is not between V and T.
 - (iii) P is between R and O.

5. Which of the following statement is wrong?

 - (i) T is to the immediate left of R.
 - (ii) Q is to the immediate left of U.
 - (iii) U, S and T are in a sequence, one after the other.
 - (a) only I
 - (b) only II
 - (c) only III
 - (d) I and II

6. Which of the following are the two pairs of adjacent members?

 - (a) VS and TR
 - (b) SU and PQ
 - (c) PR and TQ
 - (d) None of these

7. What is the position of T?

 - (a) To the immediate left of R
 - (b) Second to the left of P
 - (c) Fourth to the left of U
 - (d) None of these

8. Which of the following statement is correct?

 - (i) V is third to the left of R
 - (ii) U is between S and V
 - (iii) Q is to the immediate left of P
 - (a) only I
 - (b) only II
 - (c) only III
 - (d) II and III

9. If Q and R interchange places so as to be like T and V, then which of the following is true?

 - (a) S is third to the right of R
 - (b) T is second to the left of R
 - (c) Q is fourth to the right of T
 - (d) None of these

Directions for questions 10 and 11: Read the following passage and solve the questions based on it.

- (i) Five boys are standing in a line facing the wall. Each boy is either wearing red, green, yellow, white or blue dress.

(ii) The boy dressed in yellow is not standing at any end of the line.

(iii) The boy dressed in red is not standing at any end of the line.

10. What colour dress is the boy in the middle wearing?

(a) Green

(b) Blue

(c) Red

(d) Cannot be determined

Directions for question 12 to 17: Read the following passage and solve the questions based on it.

There are five specializations—Marketing, Finance, Production, Personnel and Systems—available at the IIM. It is necessary for all students to take up a combination of at least two of the above specializations.

Based on common preferences, pre-set combinations called modules are offered, which are coded S001, S002, S003, S004 and S005. Each of these modules has two specializations, so that every specialization is assigned to two modules. Further, to allow for uncommon preferences a student is allowed to take up more than one combination in such a way that the specialization common to the two modules is dropped.

However, a student can specialize in more than two subjects by manipulating the combination of modules.

Additional information is as follows:

S001 has not been assigned to Production. S003 has not been assigned to Marketing. S004 has not been assigned to Finance. By choosing S001 and S003, one may specialize in Marketing and Systems. By choosing S001 and S002 one may specialize in Marketing, Production, Finance and Personnel. By choosing S001 and S004 one may specialize in Finance and Personnel.

12. What specializations are possible by choosing S001, S002 and S003?

 - (a) Marketing, Finance and Personnel
 - (b) Marketing, Production and Personnel
 - (c) Finance, Personnel and Production
 - (d) Marketing, Production, Personnel and Systems

13. Which of the following number of modules give the minimum number of specializations?

 - (a) S003 and S004
 - (b) S002 and S004
 - (c) S002 and S003
 - (d) S004 and S005

14. What is the maximum number of modules that a student can take to specialize in at least two areas?

 - (a) 2
 - (b) 3
 - (c) 4
 - (d) 5

Directions for questions 18 to 22: Read the following passage and solve the questions based on it.

For a motorist, there are three ways of going from city A to city C by a 20 km long, toll highway the toll for which is ₹25 per entry; a 10 km long tunnel between the two cities, the toll for which is ₹40 per entry; and a two-lane, toll-free highway which goes 30 km east to city B and then 20 km north-west to city C.

The running cost of the motorist = ₹1/km.

18. Which of the following is the costliest way of going from city A to city C?

 - (a) tunnel
 - (b) toll highway
 - (c) toll-free highway
 - (d) tunnel or toll-free highway

19. To connect the cities better, a master plan has been devised. According to this plan, a new toll-highway is to be built from the mid point of the highway connecting cities A and B to city C. The toll for this new highway is ₹30 per entry. Which of the following is the cheapest route between city A to city C?

 - (a) tunnel
 - (b) toll highway
 - (c) toll-free highway
 - (d) new proposed highway

20. Due to CNG, the cost of the motorist has reduced to ₹0.5/km. Which of the following is the cheapest way to go from city A to city C?

 - (a) tunnel
 - (b) toll highway
 - (c) toll-free highway
 - (d) tunnel or toll-free highway

21. If we combine the data of question 2 and question 3, then which of the following is the cheapest way to go to city C from city A?
- tunnel
 - toll highway
 - toll-free highway
 - new proposed highway
22. According to a new system, motorists are supposed to pay a bribe at the starting of their journey. This bribe has to be a one-time bribe only and no other bribe is to be paid during the earlier journey. What should be the bribe amount at the toll highway such that the total expenses on the toll highway become equal to the total expenses on the toll-free highway?
- ₹5
 - ₹10
 - ₹15
 - None of these

Directions for questions 23 to 25: Read the following passage and solve the questions based on it.

Two out of Anil, Balraj and Chandan are fighting each other. The given statements are

- The shorter one out of Anil and Balraj is the older of the two fighters.
 - The younger one out of Balraj and Chandan is the shorter of the two fighters.
 - The taller one out of Anil and Chandan is the younger of the two fighters.
23. Who is not fighting?
- Anil
 - Balraj
 - Chandan
 - Data inconsistent
24. Who is the tallest?
- Anil
 - Balraj
 - Chandan
 - Data inconsistent
25. Who is the youngest?
- Anil
 - Balraj
 - Chandan
 - Data inconsistent

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (b) | 2. (b) | 3. (b) | 4. (d) | 5. (d) | 6. (d) | 7. (d) | 8. (c) | 9. (d) | 10. (d) |
| 11. (d) | 12. (d) | 13. (b) | 14. (c) | 15. (b) | 16. (c) | 17. (a) | 18. (d) | 19. (b) | 20. (c) |
| 21. (c) | 22. (a) | 23. (c) | 24. (a) | 25. (a) | | | | | |

HINTS AND EXPLANATIONS

1 to 4

1. Total number of matches = $15 \times 6 = 90$

Number of matches played by each team = 30. The score table given in the question considers a total of 180 matches.

Let total number of wins = x , so total loss = x

So, total number of draws on the score table

$$D = 180 - 2x$$

$$D = 2(90 - x)$$

We can conclude that the number of matches drawn must be a multiple of 2 i.e., an even number and we know that the total number of matches for each team should be = 30

$$\text{Or, } 51 + P = 79 + Q$$

$$\text{Or, } P - Q = 28$$

We know that

$$P + Q \leq 30 \quad \text{and}$$

$$P + Q + R = 30.$$

From the given equations, we can find the following possibilities:

P = 29	Q = 1	R = 0
P = 28	Q = 0	R = 2

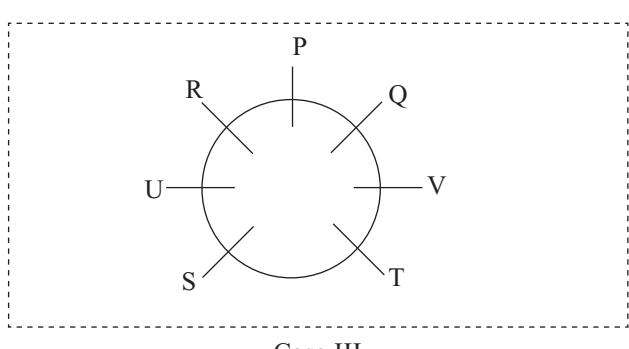
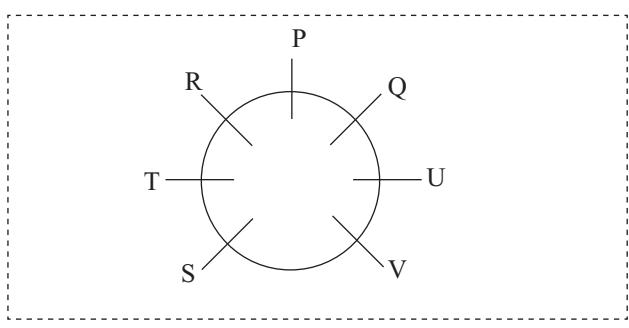
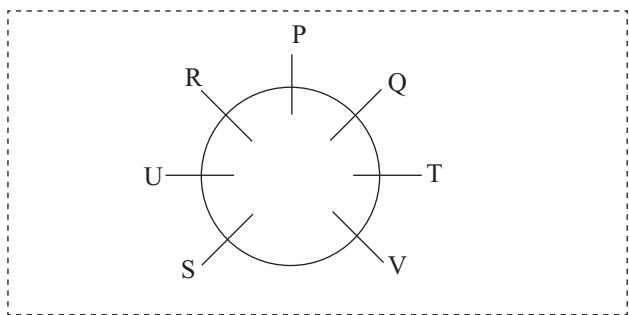
Therefore 2 W, L and D combinations were possible for the Bihar team.

- 2 The lowest score possible was
for Goa = -9

The highest score possible was
for Bihar = 144 (See question 1)
So, the maximum possible
difference = 153

3. Bihar is maximum possible wins and losses were 29 and 1 respectively. It means Bihar has won all six matches against any 4 teams but it could win only 5 matches. Since Gujarat didn't lose any of its 6 matches against the other teams, it is definitely not the team which lost all its matches against Bihar. Hence, it must be the team which won the match against Bihar. Therefore, Bihar lost the match against Gujarat.
4. Since the scoring pattern for the wins (w), losses (l) and draws (d) of the match was not given, therefore it cannot be determined as to which team won the PHL.

5 to 9



5. We cannot say that statement (iii) is wrong because case III (as shown above) makes the statement true. While case I and case II make the statement wrong.

Since we are not certain about the positions of U, V and T, therefore, only statement (i) and (ii) are wrong.

6. There are 3 possible cases & none of the given pairs are possible in all 3 cases.
7. Position of T is not fixed & it changes in the given possible diagrams.
8. Position of V & U are not fixed. But position of Q & P are fixed & Q is immediate left of P. So, only (iii) is correct.
9. We can check in all 3 possible cases that options (a), (b) & (c) are not correct.

10 to 11

1	2	3	4	5
X Red				X Red
X Yellow				X Yellow

10. The colour of dress of boy in middle cannot be determined.
11. This cannot be determined.

12 to 17

Module S001 does not have Production and module S003 does not have Marketing. But their combination gives us Marketing and Systems. Hence, 5 module S001 must have Marketing. Since modules S001 and S002 have four different specializations, there must be no common specialization and module S002 will not have Marketing but will have Production. Module S003 will have Systems included because it is not a part of module S001. So, S001 will have Finance or Personnel and it will be common to module S003.

Now, since the S001 and S004 module combination does not have Marketing as a specialization, it means that they both have Marketing as common. Since they have Finance and Personnel common, therefore module S001 has Finance and module S004 has Personnel. Thus, module S002 also has Personnel and module S003 must also have Finance. This leaves module S005 with Production and Systems.

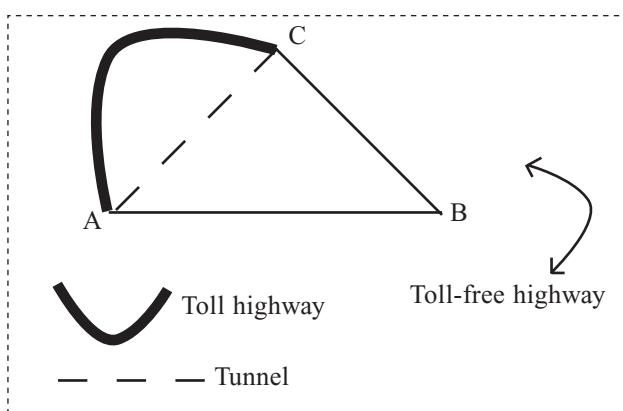
12. The combination of S001, S002 & S003 will give Marketing, Production, personnel & System. Finance is common in S001 & S003 & so it is dropped.
13. In option (b), there are 3 subjects as Personnel is common & so cancelled. All other options give 4 subjects.
14. If a student takes all the modules, then there will be no available subject as all subjects are common in 2 modules. If a student takes 4 modules (by leaving any 1 of 5 modules) then at least 2 areas will be covered

as the 2 areas covered in the module which was not taken. So, the maximum number of modules that a student can take to specialize in 2 areas is 4.

15. If a student takes 1 module only, there will be 2 areas of specialization. If a student takes 2 modules, there will be 4 (if no subject is common) or 2 (if 1 subject is common) areas of specialization. If a student takes 3 modules, there can be 4 or 2 areas of specialization depending on 1 or 2 common subjects. So, in any case 3 areas of specialization is not possible.
16. S002 & S004
17. S001 & S003.

18 to 22

Let us first see the arrangement of cities:



18. Total cost through the toll highway
= ₹20 + ₹25 = ₹45

$$\text{Total cost through tunnel} \\ = ₹10 + ₹40 = ₹50$$

Total cost through the toll-free highway = ₹50
Therefore the costliest way of going from city A to city C is by the tunnel or the toll-free highway.

19. By using the data in the above answer we can see that the cheapest route between city A to city C is through the toll highway.

20. Total cost through the toll highway
= ₹10 + ₹25 = ₹35

$$\text{Total cost through the tunnel} \\ = ₹5 + ₹40 = ₹45$$

$$\text{Total cost through the toll-free highway} \\ = ₹25$$

Therefore the cheapest way to go from city A to city C using the CNG fuel option is through the toll-free highway.

21. By using the data in the above answer we can see that the cheapest way to go to city C from city A is through the toll-free highway.

22. Using the data from the solution of question 1, the difference = ₹5. Hence if ₹5 is the bribe amount, then the costs will be equal.

23 to 25

Using statement (i), Chandan is not the older fighter. From statement (iii): Balraj is not the younger fighter. So, either:

Case 1. Anil is the older fighter and Chandan is the younger fighter.

Case 2. Balraj is the older fighter and Anil is the younger fighter.

Case 3. Balraj is the older fighter and Chandan is the younger fighter.

From statement (iii):

Chandan is the taller fighter for case 1 and Chandan is taller than Anil for case 3.

From statement (i):

Balraj is the shorter fighter for case 2 and Balraj is shorter than Anil for case 3.

From statement (i) and (iii):

Chandan is taller than Balraj for Case 3.

Summarizing the whole discussion we get the following:

	Older fighter	Younger fighter	Taller fighter	Shorter fighter
Case 1	Anil	Chandan	Chandan	Anil
Case 2	Balraj	Anil	Anil	Balraj
Case 3	Balraj	Chandan	Chandan	Balraj

From statement (ii):

Anil is not the shorter fighter; so case 1 is eliminated.

From statement (ii):

Balraj cannot be both older and shorter than Chandan, so case 3 is eliminated. Then case 2 is the correct one and Chandan is not fighting.

Then, from statement (ii): Balraj is younger than Chandan (so Chandan is the eldest out of the three and Anil is the youngest) and, from statement (iii): Anil is taller than Chandan (so Anil is the tallest out of the three).

PRACTICE EXERCISE 5**Directions for questions 1 to 4:** *Read the following passage and solve the questions based on it.*

A chess tournament is taking place at the college club and the players on all the four tables are engaged in their fourth game against their respective opponents. The players with the white pieces are: Sharukh, Sanjay, Saif and Shakti. The players with the black pieces are: Salman, Sunny, Sunil and Sohail. The scores are 3:0, 2.5:0.5, 2:1 and 1.5:1.5 (Note: Tied games result in a score of 0.5 for each player).

- The player using the white pieces at table 4 is Shakti; however, the current score at the table is not 2:1.
- Saif is playing at the table on the right hand side of Sohail, who has lost all his games until now.
- Sunil, who is not in the lead against his opponent, has not been in a tied game.
- Salman is leading his match after his last three games.
- Sanjay is playing against Sunny.

(One win gets point for the winner whereas a player gets no point for losing the game).

- What table is Sohail playing at, and what is the score at that table?
 (a) table 1:2.5–1.5 (b) table 2:3–0
 (c) table 2:2.5–1.5 (d) table 3:2–1
- Which player has the highest score?
 (a) Salman (b) Saif
 (c) Sunny (d) Sunil
- Which player had the black pieces alongwith and the lowest score?
 (a) Salman (b) Sunny
 (c) Sunil (d) Sohail
- Who is the winning player at table 4?
 (a) Salman (b) Shakti
 (c) Sharukh (d) Sanjay

Directions for questions 5 and 6: *Read the following passage and solve the questions based on it.*

If the sum of the rows, columns and the diagonals are equal in the following table, then:

y	x	y – 2
y – 1	y + 1	—
—	—	—

- If $x = 10$, then what is the value of y?
 (a) 5 (b) 10
 (c) 6 (d) 15
- If the sum of any of the rows, columns or diagonals is 21, then what is the value of x?
 (a) 5 (b) 11
 (c) 15 (d) Cannot be determined

Directions for questions 7 and 8: *Read the following passage and solve the questions based on it.*

In a multiplex, nine shops are connected by corridors. Anyone visiting these shops must begin at the reception which is a part of shop number 1. From there, the other shops may be visited via the different corridors connecting them. The details of the corridors connecting the various shops are as under:

- Corridors connect the reception to shops number 2, 3 and 6.
- A corridor connects the reception to shop number 2 and then to shop number 4.
- Corridors connect the shops number 2 and 3 to shop number 7.
- Shop number 6 is connected to shops number 1, 5 and 9.
- Shop number 7 is connected to shop number 9.
- Shops number 7 and 9 are connected to shop number 8.
- Without visiting any shop more than once, what is the maximum number of shops that a person can visit?
 (a) 5 (b) 6
 (c) 7 (d) 8
- If a visitor wants to travel to shops number 4 and 5, which one of the following options must be False?
 (a) The visitor will go to every shop except shop 3.
 (b) The visitor will go to shop 2 only once.
 (c) The visitor will not visit any shop more than once.
 (d) The visitor will visit at least six different shops.

Directions for questions 9 to 11: *Read the following passage and solve the questions based on it.*

(Any additional information provided with a particular question pertains to that individual question only.)

The placement office of a management school has to schedule seven companies viz., P, Q, R, S, T, U and V for the placement week (the week starts on a Sunday) but not necessarily in that order. This group of seven companies is divided into three categories, viz., finance, manufacturing and sales. There are three companies in the final category and two each in one manufacturing and sales categories. The placement schedule is such that the same category companies have to be scheduled consecutively. It has also been decided that:

- (i) Company S, which is a manufacturing company, cannot be scheduled on the sixth day of the week.
 - (ii) Companies Q and U are scheduled consecutively but not necessarily in that order.
 - (iii) Company T can be scheduled on any day of the week except on a Saturday.
 - (iv) Company R, which is in the same category as the companies Q and U, has to be scheduled on the third day of the week.
9. If P is scheduled on Wednesday, which one of the following options has to be True?
- (a) U has to be scheduled on Thursday
 - (b) V has to be scheduled either on Friday or on Saturday
 - (c) T has to be scheduled on either Thursday or Friday
 - (d) S is always scheduled before Q
10. If S is scheduled on Monday, which one of the following options is definitely False?
- (a) P and T are sales companies
 - (b) The maximum number of days in between the schedules of T and U is three
 - (c) R is always scheduled before Q
 - (d) There are three schedules for P being slotted on a Sunday
11. If T is a sales company and S is scheduled for Saturday, then which of the following schedules are possible?
- | | |
|-------------------|--------------------|
| Schedule I | U-Q-R-T-P-V-S |
| Schedule II | P-T-R-U-Q-V-S |
| Schedule III | T-V-R-Q-U-P-S |
| Schedule IV | Q-U-R-P-V-T-S |
| (a) I, III and IV | (b) II, III and IV |
| (c) I, II and IV | (d) I, II and III |

Directions for question 12: Read the following passage and solve the questions based on it.

There are five boxes—T, U, W, X and Z—that are to be delivered on five consecutive days, Monday through

Friday, one box per day. The following conditions are to be kept in mind while formulating the delivery schedule of the boxes:

- (i) Box X is not to be delivered on Monday
 - (ii) If box T is delivered on Monday, then box X must be delivered on Friday
 - (iii) If box X is delivered on Tuesday, box U is delivered on Monday
 - (iv) Box W is delivered the next day following the delivery of box Z
12. If box W is delivered on Friday, which of the following must be false?
- (a) Box Z is delivered on Thursday
 - (b) Box X is delivered on Wednesday
 - (c) Box T is delivered on Tuesday
 - (d) Box U is delivered on Tuesday

Directions for questions 13 to 17: Read the following passage and solve the questions based on it.

Tetraicosa is a game which is played by rolling six dices simultaneously. While playing the game—

If rolling six dices were rolled, then the following was observed:

- (i) Three of the dices showed the same number. The rest showed different numbers.
 - (ii) Only one dice showed 6.
 - (iii) Not more than three dice showed 4 or more.
13. Find the minimum possible total of numbers on the faces of all the six dice if three dice show the same number 2.
- | | |
|--------|-------------------|
| (a) 14 | (b) 21 |
| (c) 18 | (d) None of these |
14. Find the maximum total if four of the dice show less than 4.
- | | |
|--------|-------------------|
| (a) 29 | (b) 32 |
| (c) 22 | (d) None of these |
15. If the third observation is waived, then what would be the maximum total if three dice were faulty and had only 5 on all the faces?
- | | |
|--------|-------------------|
| (a) 31 | (b) 28 |
| (c) 34 | (d) None of these |
16. If only one dice shows 1, what is the maximum number of dice with numbers greater than 4?
- | | |
|-------|-------|
| (a) 3 | (b) 1 |
| (c) 2 | (d) 4 |
17. What is the maximum number that can be on the faces of the three dices which show the same number?
- | | |
|-------|-------|
| (a) 2 | (b) 4 |
| (c) 3 | (d) 5 |

Directions for questions 18 to 21: Read the following passage and solve the questions based on it.

Seven persons A, B, C, D, E, F and G contested in a game show that had a total prize money of ₹14 lakhs. Every contestant won some prize money and the highest prize money was ₹3.5 lakhs. No two contestants won the same amount of prize money. For every person the difference with the next highest and the next lowest contestant was the same.

- (i) E won ₹2 lakhs.
 - (ii) B won more money than A.
 - (iii) The difference in prize money between B and A was the least.
 - (iv) The difference in prize money between D and F was not the least.
 - (v) There was at least one person whose prize money was between that of E and G.
18. Which of the following is a proper list of persons in an increasing order of prize money won?
- G, C, F, B, E, D, A
 - D, F, C, E, A, B, G
 - F, C, D, E, A, B, G
 - A, B, G, C, F, E, D
19. If D won more than E, and B and G together won ₹3.5 lakhs, which of the following must be true?
- D won ₹3.5 lakhs
 - A won ₹1.5 lakhs
 - B won ₹1.5 lakhs
 - C won ₹50,000
20. If the difference in prize money between A and C is the least; which of the following pairs must not have won prize money that differs by the minimal amount?
- B and E
 - C and G
 - D and G
 - A and E

21. If the total money won by A and D is equal to that of G and the difference between E and D is at least 1 lakh, then which of the following must be True?

- A and B together won ₹3 lakhs
- B and F together won ₹3.5 lakhs
- C and E together won ₹3 lakhs
- B and C together won ₹3.5 lakhs

Directions for questions 22 to 25: Read the following passage and solve the questions based on it.

Abhishek, Bhushan, Chandan, Dayal, Eklavya and Franklin are friends married to Rekha, Stuti, Urmila, Varsha, Trupti and Wanda, not necessarily in the same order.

Following facts are also given:

- (i) Rekha and Stuti are Abhishek's sisters
- (ii) Neither Rekha nor Trupti is Chandan's wife
- (iii) Wanda is Eklavya's wife and Varsha is Bhushan's wife
- (iv) Dayal is not married to Rekha, Stuti or Trupti.

22. Who is Abhishek's wife?

- | | |
|------------|--------------------------|
| (a) Rekha | (b) Urmila |
| (c) Trupti | (d) Cannot be determined |

23. Who is Rekha's husband?

- | | |
|-------------|--------------|
| (a) Chandan | (b) Franklin |
| (c) Bhushan | (d) Dayal |

24. Who is Dayal married to?

- | | |
|------------|------------|
| (a) Urmila | (b) Varsha |
| (c) Trupti | (d) Rekha |

25. Who is Stuti married to?

- | | |
|--------------|-------------|
| (a) Abhishek | (b) Dayal |
| (c) Franklin | (d) Chandan |

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (b) | 2. (a) | 3. (d) | 4. (a) | 5. (a) | 6. (b) | 7. (d) | 8. (c) | 9. (c) | 10. (d) |
| 11. (d) | 12. (d) | 13. (c) | 14. (d) | 15. (a) | 16. (c) | 17. (c) | 18. (c) | 19. (a) | 20. (d) |
| 21. (d) | 22. (c) | 23. (b) | 24. (a) | 25. (d) | | | | | |

HINTS AND EXPLANATIONS

1 to 4

- Condition (ii) says Sohail lost all 3 games, hence his score should be 0–3.
- The highest score could be that of Shahrukh or Salman. However, Salman is at the winning table 4, hence option (a) is the correct answer.
- As the sum of rows, columns and diagonals are equal, we can fill in the blanks in terms of “x and y” as below:

y	x	y - 2
y - 1	$y + 1$	$x - 2$
$x - 1$	$y - 3$	$y + 2$

$$\text{Further } (y + x + y - 2) = y - 2 + x - 2 + y + 2$$

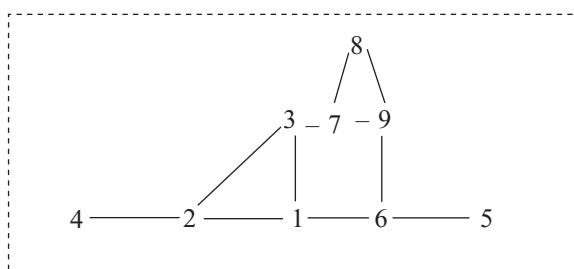
$$\text{Hence } x = y + 5$$

$$\text{So, if } x = 10; y = 5$$

- From Q. 5; we have one equation $x = y + 5$ and as sum of a row (= sum of column = sum of diagonal) is given 21; then $x + 2y = 23$. Solving these two equations we get, $y = 6$ and $x = 11$.

7 to 8

The diagram of the given arrangement can be shown as follows:



- By observing the diagram we can say that the maximum number of shops a person can visit without visiting any shop more than once is 8. Hence, the answer is option (d).
- By observing the diagram we can say that option (c) must be false, which is the correct answer.

9 to 11

The information that we have from the question is:
Q, U and R are finance companies

Now the 1st day is Sunday and the 7th day would be Saturday

S is a manufacturing company

R is scheduled on 3rd day of the week

S can't be scheduled on 6th day of the week

T can be scheduled on any day of the week except on a Saturday.

- If P is scheduled on Wednesday and R is on the third day of the week then the possible arrangements are

1(Sun)	2(Mon)	3	4	5	6	7(Sat)
Q/U	U/Q	R	P	S	T	V

or,

1(Sun)	2(Mon)	3	4	5	6	7(Sat)
Q/U	U/Q	R	P	T/V	V/T	S

Now look at the answer options. The condition which has to be true is that T has to be scheduled on either Thursday or Friday.

Hence the answer is option (c).

- If S is scheduled on Monday then possible arrangements are:

1(Sun)	2(Mon)	3	4	5	6(xS)	7(Sat)(xT)
P/V	S	R	Q/U	U/Q	T	V/P
T	S	R	O/U	U/O	P/V	V/P

Now look at the answer options to be definitely false.

(a) P and T can be sales companies when V and S are manufacturing companies and Q and U and are finance companies. So it is not false.

(b) Maximum number of days between the schedules of T and U is 3. This is also possible when U is on the 5th day and T is on the 1st day. So this case is not definitely false

- (c) R is always scheduled before Q is definitely true as the arrangement can be either RUQ or RQU.
- (d) This statement is false as only two cases are possible. The possible arrangements are:

1(Sun)	2	3	4	5	6(xS)	7(Sat)	(xT)
P	S	R	O/U	U/O	T	V	

i.e., 2 only.

11. Look at schedule IV. Since T is a sales company and S is a manufacturing company they cannot be together as the same category companies have to be scheduled consecutively. So except for schedule IV all the combinations are possible.
Hence, the answer is option (d).

12. Let us see the diagram:

Monday	Tuesday	Wednesday	Thursday	Friday
Z			W	

Now, there are three days and three boxes to be delivered.

Both X and T cannot be delivered on Monday [(condition (i) and condition (ii) given in the question)]. So, U has to be delivered on Monday. Let us see the diagram now:

Monday	Tuesday	Wednesday	Thursday	Friday
U			Z	W

Box T and box X can interchangeably be delivered on either Tuesday or Wednesday.

Go through the options now.

Answer is option (d).

13 to 17

Based on observation (i) and (ii), we can say that the three dice with the same number either show 1 or 2 or 3.

13. $2 + 2 + 2 + 6 + 5 + 4 = 21$
14. $3 + 3 + 3 + 6 + 2 + 5 = 22$
15. $5 + 5 + 5 + 6 + 5 + 5 = 31$
16. 2 because one dice shows 6, one shows 1 and three are ≤ 3 . Hence, only one more can be > 4 .
17. One dice should show 6. But there cannot be more than three dice showing 4 or more than 4. The maximum number that the three dice can show is 3.

18 to 21

The amount 14 lac is distributed in 7 people with 3.5 lac as highest & same consecutive differences. So, the amounts must be 0.5, 1, 1.5, 2, 2.5, 3 & 3.5 respectively.

18. Note that all the options except (c) violate some condition or the other.
19. If $B + G = 3.5$ lakh, then only possibility for G is ₹0.5 lakh & $B = ₹3.0$ lakh. Also, $A = ₹2.5$ lakh. As D won more than E & E get ₹2.0 lakh. So, D can have only 1 possible value that is ₹3.5 lakh.
20. As per given condition we must be having C-A-B in immediate increasing order (difference between C & A is minimum & we know that difference between A & B is minimum & B get more than A). So, difference between A & E must be at least ₹1 lakh. So, correct option must be (d).
21. We know A & B have minimum difference & $B > A$. So, A & B have 4 possible values of 0.5 lakh & 1 lakh; 1 lakh & 1.5 lakh; 2.5 lakh & 3 lakh & 3 lakh & 3.5 lakh as $E = ₹2$ lakh is already known. Further $A + D = G$ & minimum difference between E & D is ₹1 lakh. Using this we get only 1 possibility where, A, B, F, E, C, D & G have ₹0.5 lakh, ₹1 lakh, ₹1.5 lakh, ₹2.0 lakh, ₹2.5 lakh, ₹3.0 lakh & ₹3.5 lakh respectively. Correct option is (d)

22 to 25

By using the given information we can find the couples as: Abhisek-Tripti; Bhushan-Varsha; Chandan-Stuti; Dayal-Urmila; Eklavya-Wanda & Franklin-Rekha.

Chapter

15

ADVANCED EXERCISES

PRACTICE EXERCISE 1

Directions for questions 1 to 4: Read the following passage and solve the questions based on it.

The Hotel Leela in Goa has two wings, the East wing and the West wing. Some East wing rooms, but not all, have an ocean view. All the West wing rooms have a harbor view. The charges for all the rooms are the same, except:

- (i) There is an extra charge for all harbour view rooms on or above the third floor.
- (ii) There is an extra charge for all ocean view rooms, except those without a balcony.
- (iii) Some harbour view rooms on the first two floors and some East wing rooms without an ocean view have kitchen facilities, for which there is an extra charge.
- (iv) Only the ocean view and the harbour view rooms have balconies.

1. A guest can avoid an extra charge by requesting:
 - (a) a West wing room on one of the first two floors
 - (b) a West wing room on the fourth floor without a balcony
 - (c) an East wing room without an ocean view
 - (d) an East wing room without a balcony
2. Which of the following must be true if all the conditions are as stated?
 - (a) all rooms above the third floor involve an extra charge

- (b) no room without an ocean or a harbour view or kitchen facilities involves an extra charge.
- (c) there is no extra charge for any East wing room without an ocean view
- (d) there is no extra charge for any room without kitchen facilities.

3. Which of the following must be false if all the conditions are applied?
 - (a) some ocean view rooms do not involve an extra charge
 - (b) all rooms with kitchen facilities involve an extra charge
 - (c) some West wing rooms above the second floor do not involve an extra charge
 - (d) some harbour view rooms do not involve an extra charge
4. Which of the following cannot be determined on the basis of the information given?
 - I. whether there are any rooms without a balcony for which an extra charge is imposed
 - II. whether any room without a kitchen or a view involves an extra charge
 - III. whether two extra charges are imposed for any room
 - (a) I only
 - (b) II only
 - (c) I and III only
 - (d) II and III only

Directions for questions 5 to 6: Read the following passage and solve the questions based on it.

Eight sets A, B, C, D, E, F, G and H are such that

- (i) A is a superset of B, but a subset of C
- (ii) B is a subset of D, but a superset of E
- (iii) F is a subset of A, but a superset of B
- (iv) G is a superset of D, but a subset of F
- (v) H is a subset of B

$N(A)$, $N(B)$, $N(C)$, $N(D)$, $N(E)$, $N(F)$, $N(G)$ and $N(H)$ are the number of elements in the sets A, B, C, D, E, F, G and H respectively.

5. Which one of the following could be false, but not necessarily false?
 - (a) E is a subset of D
 - (b) E is a subset of C
 - (c) E is a subset of A
 - (d) E is a subset of H
6. If P is a new set and it is a superset of A and $N(P)$ is the number of elements in P; then which of the following must be true?
 - (a) $N(G)$ is smaller than only four numbers
 - (b) $N(C)$ is the greatest
 - (c) $N(B)$ is the smallest
 - (d) $N(P)$ is the greatest

Directions for questions 7 to 13: Read the following passage and solve the questions based on it.

The only people to attend a conference were four ship captains and their first assistants. The captains were L, M, N and O; the first assistants were A, D and G. Each person in turn delivered a report as follows:

- (i) Each of the first assistants delivered his report exactly after his or her captain.
- (ii) The first captain to speak was M, and captain N spoke after him.
7. Among the following which is not an appropriate order of the reports delivered?
 - (a) M, A, N, G, O, L, D
 - (b) M, D, N, G, L, O, A
 - (c) M, N, A, L, D, O, G
 - (d) M, N, G, D, O, L, A
8. In case L speaks after A and A is the third first assistant to speak, then among the following statements which would be untrue?
 - (a) O spoke immediately after G
 - (b) the order of the first four speakers was M, G, N and D
 - (c) O's first assistant was present
 - (d) A was the fourth speaker after M

9. Among the following statements which statement must be true?

- (a) in case the second speaker was a captain, the seventh speaker was a first assistant
- (b) in case the second speaker was a first assistant, the seventh speaker was a captain
- (c) in case the third speaker was a first assistant, the seventh speaker was a captain
- (d) in case the third speaker was a captain, the seventh speaker was a first assistant.

10. In case A spoke immediately after L and immediately before O; and O was not the last speaker then L spoke:

- | | |
|---------|---------|
| (a) 2nd | (b) 3rd |
| (c) 4th | (d) 5th |

11. In case G is M's first assistant, D could be the person who spoke immediately

- | | |
|--------------|--------------|
| (a) before T | (b) before L |
| (c) before V | (d) after T |

12. A is the third first assistant to speak and L is the captain whose first assistant was not present. Which among the following statements must be true?

- (a) A spoke sometime before L
- (b) D spoke sometime before O
- (c) L spoke sometime before O
- (d) O spoke sometime before L

13. Among the following statements, which would make M, D, N, G, L, O and A the only possible sequence of speakers?

- (a) D is M's first assistant; G is N's first assistant and A is O's first assistant
- (b) D is M's first assistant; G is N's first assistant and A was the second person to speak after L
- (c) the order of the first four speakers was M, D, N and G
- (d) the order of the last three speakers was L, O and A

Directions for questions 14 to 17: Read the following passage and solve the questions based on it.

An employee has been assigned the task of allotting offices to six of the staff members. The offices are numbered from 1 to 6. The offices are arranged in a row and a 6-foot high divider separates them from each other. Hence, voices, sounds and cigarette smoke flow easily from one office to the other.

Ms Robert needs to use the telephone quite often throughout the day. Mr Mike and Mr Brown need adjacent offices as they need to consult each other often while working. Ms Hardy is a senior employee and has

to be allotted the office number 5 which has the biggest window.

Mr Donald requires silence in the offices next to his. Mr Tim, Mr Mike and Mr Donald are all smokers. Ms Hardy is allergic to tobacco smoke and consequently the offices next to her are to be occupied by non-smokers.

Unless specifically stated, all the employees maintain an atmosphere of silence during the office hours.

14. Who would be the ideal candidate to occupy the office farthest from Mr Brown?

- (a) Ms Hardy
- (b) Mr Mike
- (c) Mr Tim
- (d) Mr Donald

15. The three employees who are smokers should be seated in which offices?

- (a) 1, 2 and 4
- (b) 2, 3 and 6
- (c) 1, 2 and 6
- (d) 1, 2 and 3

16. Which would be the ideal office for Mr Mike?

- (a) 2 (b) 6
- (c) 1 (d) 3

17. In the event of what occurrence, within the period of one month since the assignment of the offices, would a request for a change in office be put forth by one or more employees?

- (a) Mr Donald quitting smoking
- (b) the installation of a noisy machine by Ms Hardy in her office
- (c) Ms Robert needing silence in the office(s) next to her own
- (d) Mr Tim taking over the duties formerly taken care of by Ms Robert.

Directions for questions 18 to 23: *Read the following passage and solve the questions based on it.*

Nine individuals—Z, Y, X, W, V, U, T, S and R are the only candidates who can serve on three committees—A, B and C: and each candidate can serve on only one of the committees. The following conditions are given

- (i) Committee A should consist of exactly one member more than committee B.
- (ii) It is possible that there are no members of committee C
- (iii) Z, Y and X cannot serve on committee A
- (iv) W, V and U cannot serve on committee B
- (v) T, S and R cannot serve on committee C

18. In case T and Z are the individuals serving on committee B, how many of the nine individuals should serve on committee C?

- (a) 3 (b) 4
- (c) 5 (d) 6

19. Out of the nine individuals, the largest number that can serve together on committee C is

- (a) 9 (b) 8
- (c) 7 (d) 6

20. In case R is the only individual serving on committee B, which among the following should serve on committee A?

- (a) W and S (b) V and U
- (c) V and T (d) T and S

21. In case any of the nine individuals serve on committee C, then which among the following should be the candidate to serve on committee A?

- (a) Z (b) Y
- (c) W (d) T

22. In case T, S and X are the only individuals serving on committee B, the total members of committee C would be:

- (a) Z and Y (b) Z and W
- (c) Y and V (d) Y and U

23. Among the following combinations, which could constitute the membership of committee C?

- (a) Y and T (b) X and U
- (c) Y, X and W (d) W, V and U

Directions for question 24 and 25: *Read the following passage and solve the questions based on it.*

24. A TV programme coordinator is planning a schedule which has 8 slots numbered A to H. The programme must consist of the following: One video of Yannie, two ads, one video of Ricky Martin and four videos of Jennifer Lopez, but not necessarily in the same order. Each of these must be shown only once during the program according to the following conditions:

- (i) Two ads cannot be shown continuously.
- (ii) The programme must begin with either an ad or a video of Yannie and must end with either an ad or a video of Yannie. If the video of Yannie is aired in slot D and if exactly two out of the four videos of Jennifer Lopez are played consecutively then the Ricky Martin video must be aired in which slot number

- | | |
|-------|-------|
| (a) E | (b) F |
| (c) D | (d) B |

25. The CEO of a company must appoint a committee of 5 persons from different fields to serve as committee members. He must select two MBAs from A, B and C and three Engineers from D, E, F, G and H.

- (i) Both B and H, cannot be appointed in the committee.

- (ii) Both G and F, cannot be appointed in the committee.

- (iii) Both E and H, cannot be appointed in the committee.

If C is not selected in the committee then any of the following could be in the committee except

- | | |
|-------|-------|
| (a) D | (b) H |
| (c) E | (d) G |

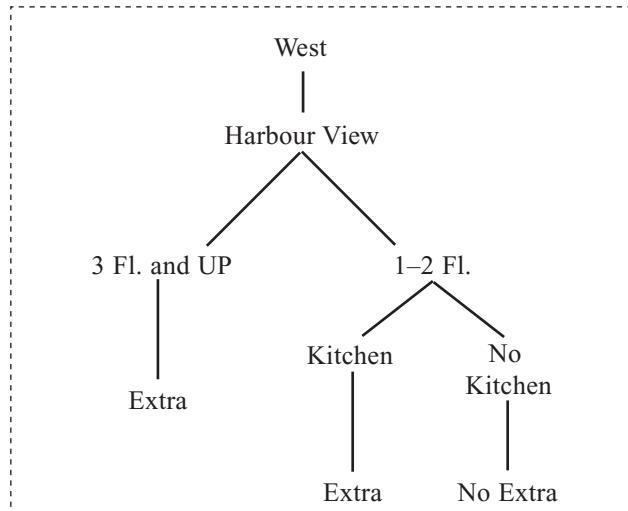
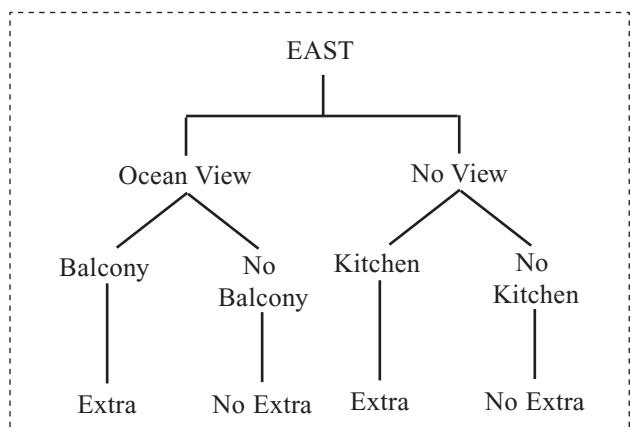
ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (d) | 2. (b) | 3. (c) | 4. (a) | 5. (d) | 6. (d) | 7. (d) | 8. (d) | 9. (a) | 10. (c) |
| 11. (b) | 12. (d) | 13. (a) | 14. (d) | 15. (d) | 16. (d) | 17. (b) | 18. (b) | 19. (d) | 20. (d) |
| 21. (c) | 22. (a) | 23. (b) | 24. (b) | 25. (b) | | | | | |

HINTS AND EXPLANATIONS

1 to 4

Let us have a schematic presentation of the given conditions:



- 1.** Simply read the information from the diagram. Some rooms described in options (a) and (c) have

kitchen facilities; the rooms described in option (b) all involve an extra charge. Therefore only option (d) will not have an extra charge.

2. The only extra charges are for an ocean view with a balcony, a harbor view, The third floor and up and the rooms with kitchen facilities, no matter where. But some ocean view rooms without a balcony and some no-view, no-kitchen East wing rooms may be above the third floor. Therefore options (a), (b) and (d) are all false.
3. The statement of option (c) directly contradicts the first extra-charge condition. The other choices are all definitely true.
4. We don't know whether any West wing rooms above the second floor or with kitchen facilities have balconies (I). But we do know that the East wing rooms without a view or a kitchen have no extra charge attached (II) and that all kitchen facilities are in rooms not otherwise subject to an extra charge (III). Therefore statement (I) is the correct answer.

5 and 6

5. Given $B < A < C, E < B < D < G < F$
 $B < F < A$
 $H < B$

From this information,

$$\begin{aligned} H &< B < F < A < C & \dots (1) \\ (< Q, Z) \quad (A < P) \end{aligned}$$

$$\text{and } E < B < D < G < F \dots (2)$$

A is false from (2), B from (1), C from (1 and 2)

D "may be" true

6. Visual inspection

7 to 13

7. Reports by G followed by D cannot be in appropriate order because both are first assistants. According to the conditions given in the question, each of the first assistants delivered their report exactly after his or her captain.
8. The order of delivery of the reports would be: MGNDAL or MDNGOAL
9. If the second speaker was a captain, he must be N and the first speaker was M because the first captain to speak was M and captain N spoke after him. In this case the seventh speaker was a first assistant because each of the first assistants delivered their report exactly after his or her captain.
10. The order of delivery of the reports would be: MNGLAOD or MNDLAOG

11. The order of delivery of the reports would be:
 MGNAODL or MGNALDO or
 MGNDAL or MGNDLAO
12. The correct order would be:
 MDNGOAL or MGNDAL or
 MDOGNAL or MGODNAL
13. Since O speaks immediately after L, L has no first assistant. In this case D, G and A must be first assistants of M, N and O respectively.

14 to 17

14. Mr Donald required silence in the offices next to his Mr Mike and Mr Brown need to consult each other while working. So, Mr Donald should occupy the office farthest from Mr Brown.
15. Ms Hardy has to be allotted the office number 5 and she is allergic to tobacco smoke, so the offices next to her are to be occupied by non-smokers. Hence, smokers should be seated in the offices 1, 2 and 3.
16. Mr Mike and Mr Brown need adjacent offices. So, Mr Mike cannot be seated in the office numbers 1 and 6. Ms. Hardy is in office number S & offices next to her i.e. 2 & 4 must be occupied by non-smokers. So, Mr. Mike being a smoker cannot have office no. 2 or 4. The only possible office number for him is office number 3.

17. There will be no request for change of office for options (a), (c) & (d). But if Ms. Hardy installs a noisy machine than Ms. Robert may have problem in using telephone as she is next to her. Also, Mr. Brown who is also next to Ms. Hardy may have problem with Mr. Mike.

18 to 23

18. If two individuals serve on committee B then three individuals should serve on committee A, because committee A should consist of exactly one member more than committee B. Hence, four individuals should serve on committee C.
19. The minimum number of individuals on committee A and B could be 2 and 1 respectively. Hence, the largest number that can serve together on committee C is 6.
20. In case R is the only individual serving on committee B then T and S should serve on committee A, because they don't serve on committee C.

22. If three individuals are serving on committee B, four individuals should serve on committee A. So, the total number of members of committee C should be two. Z and Y don't serve on committee A. Hence, they work on committee C.
23. Committee C can't have three members. So, option (c) and option (d) cannot be the answers. Again T doesn't serve on committee C. So option (a) is also ruled out.
24. If video of Yannie is played at slot D, then both the advt. must be aired in slot A & H. Now, 2 of

consecutive videos of Jennifer Lopez must be in B & C, else there will be more than 2 videos consecutively. Now, video of Ricky Martin must be in slot F.

A	B	C	D	E	F	G	H
Advt.	J Lo.	J Lo.	Yannie	J Lo.	R.M.	J. Lo.	Advt.

25. If C is not selected, then A & B must be selected. As B & H cannot be selected together, so H could not be in the committee.

PRACTICE EXERCISE 2

Directions for questions 1 to 4: Read the following passage and solve the questions based on it.

Each group of questions in this section is based on a set of conditions. In while answering some questions, it may be useful to draw a rough diagram. Choose the response that most accurately and completely answers each question.

A company wants to select a team of four call center executives from its centre based in South India for a transfer to their newly set up centre in north India. The company is managed by professional managers and is very particular about human resources and Personal relations. There are seven team members of equal ability: X, Y and Z (who are senior), and A, B, C and D (who are junior). The company requires two senior executives and two junior in the team. It is necessary that all the executives in a particular team are friendly with each other, in order to maintain team spirit and avoid any personal relation problems in the new centre. The relationship between the seven executives is as follows:

- (i) Y and A are not friendly
 - (ii) Z and C are not friendly
 - (iii) A and B are not friendly
1. If A is on the team, then which other executives must be on the team as well?
 - (a) X, Y and D (b) X, Z And D
 - (c) X, Z and B (d) X, Z and C
 2. Which statement(s) must be false?
 - I. Y and C are never selected together
 - II. Z and B are never selected together
 - III. Z and D are never selected together
 - (a) I only (b) I and II only
 - (c) I and III only (d) I, II and III
 3. If both Y and Z are selected, which of the executives must be on the team with them?
 - (a) Both C and D (b) Only D
 - (c) Both B and A (d) Both B and D
 4. Which of the following statements are true for X?
 - I X must be selected as one of the senior executives on the team
 - II X must be selected, if C is selected
 - III X cannot be selected, if both A and C are rejected.
 - (a) I only (b) II only
 - (c) II and III (d) I, II and III

Directions for questions 5 to 9: Read the following passage and solve the questions based on it.

Five different kinds of sweets to be given to the children: Halwa, Burfi, Laddu, Kaala jamun, Rasgulla. The children, Joginder, Kedarnath, Girish, Trilochan and Rameshwar went to see K. C. Das, who gave sweets to each one of them as per the following details.

- (i) Kedarnath got either *burfi* or *rasgulla*.
 - (ii) Trilochan did not receive *laddu* or *kaala-jamun*.
 - (iii) Among the five children, one received *laddu* and one *burfi*.
 - (iv) No other child received the same treat as Kedarnath.
 - (v) Neither Joginder nor Girish got *kaala-jamun*.
 - (vi) At least one child received *kaala-jamun*.
5. What sweet did Rameshwar receive?
 - (a) *Halwa*
 - (b) *Burfi*
 - (c) *Laddu*
 - (d) *Kaala-Jamun*
 6. If Kedarnath received *Rasgulla*, which of the following must be true?
 - (a) If Joginder received *laddu*, Girish received *halwa*.
 - (b) If Joginder received *burfi*, Girish received *halwa*.
 - (c) If Joginder received *halwa*, Trilochan received *burfi*.
 - (d) If Girish received *laddu*, Trilochan received *rasgulla*.
 7. If Trilochan received *halwa*, which of the following is a complete and accurate list of the children who could have also received *halwa*?
 - (a) Joginder and Kedarnath
 - (b) Kedarnath and Girish
 - (c) Rameshwar and Girish
 - (d) Joginder and Girish.
 8. If Kedarnath received *burfi*, which of the following must be false?
 - (a) If Joginder received *laddu*, Girish received *halwa*.
 - (b) If Joginder received *halwa*, Trilochan received *rasgulla*.
 - (c) If Joginder received *rasgulla*, Girish received *halwa*.
 - (d) If Girish received *laddu*, Trilochan received *rasgulla*.

9. If Girish received *burfi*, which of the following must be false?
- Joginder received *laddu*
 - Trilochan received *halwa*
 - Kedarnath received *rasgulla*
 - Trilochan received *rasgulla*

Directions for questions 10 to 12: Read the following passage and solve the questions based on it.

Shiva spent 14 days exclusive of travel in a total of six cities.

Each city that he visited was in either one of the three states: Gujarat, Uttar Pradesh, Maharashtra. Each of the states has many cities. Shiva visited at least one city in each of the three states. He spent at least two days in each city. He spent the whole day in each of the cities that he visited.

10. If Shiva spent exactly eight days in the various cities of Gujarat, then which one of the following cannot be true?
- He visited exactly two cities in Maharashtra.
 - He visited exactly two cities in Uttar Pradesh.
 - He visited exactly two cities in Gujarat.
 - He visited more cities in Uttar Pradesh than in Maharashtra.
11. If the city of Ahmedabad is in Gujarat and Shiva spent as many days as possible in Ahmedabad and as few days as possible in each of the other cities that he visited, then which one of the following must be true?
- Shiva could not visit any other city in Gujarat.
 - Shiva could visit four cities in Uttar Pradesh.
 - Shiva could spend six days in Ahmedabad.
 - Shiva could not spend more than four days in Maharashtra.
12. If Shiva spent three days in the cities of Uttar Pradesh and seven days in the cities of Maharashtra, then which one of the following must be false?
- He visited more cities in Gujarat than in Uttar Pradesh.
 - He visited exactly three cities in Maharashtra.
 - He visited more cities in Maharashtra than in Gujarat.
 - He visited exactly two cities in Maharashtra.

Directions for questions 13 to 17: Read the following passage and solve the questions based on it.

There are six teachers, viz., A, B, C, D, E and F in a school. Each of the teachers teaches two subjects, one compulsory and one optional subject. D's optional

subject was History while three of the other teachers have it as their compulsory subject. E and F have Physics as one of their subjects. F's compulsory subject is Mathematics which is an optional subject for both C and E. History and English are A's subjects but in terms of compulsory and optional subjects, they are just the reverse of D's subjects. Chemistry is an optional subject for only one of them. The only female teacher in the school has English as her compulsory subject.

13. What is C's compulsory subject?
- History
 - Physics
 - Chemistry
 - English
14. Who is the female member in the group?
- A
 - B
 - C
 - D
15. Which of the following has the same compulsory and optional subjects as F?
- D
 - B
 - A
 - None of these
16. Disregarding which is the compulsory and which is the optional subject, who has the same two subject combinations as F?
- A
 - B
 - E
 - D
17. Which of the following groups has History as their compulsory subject?
- A, C, D
 - B, C, D
 - C, D
 - A, B, C
18. Eight books are kept one over the other. Counting from the top the second, fifth and the sixth books are on plays. Two books on plays are kept between two books on compositions. One book of plays is between two books on poetry while the book kept at the top of the book of Literature is a book of composition. Which book is fourth from the top?
- Plays
 - Poetry
 - Composition
 - Literature

Directions for questions 19 to 21: Read the following passage and solve the questions based on it.

The after sales service manager of White Goods Appliances Ltd is making an assignment roster for the three technician teams in the city of Indraprastha. Each team will be assigned one of the sectors of the city: sector Pratham, sector Dwitiya and sector Tritiya. Each team will consist of two out of the following technicians: Nagabhushanam, Phaneesh, Ramaswamy, Swaminathan, Tirthankar and Visheshwar. Each technician will be assigned to exactly one team. Ramaswamy, Tirthankar and Visheshwar have each completed a special

electro-mechanical appliances maintenance training programme; whereas Naghbushanam, Phaneesh and Ramaswamy each has at least five years of work experience; Swaminathan, Tirthankar and Visheshwar do not. The service manager must observe the following restrictions while making the assignment roster:

- (i) Each team must include at least one technician who has completed the special training.
 - (ii) Each team must include at least one technician who has at least five years of work experience.
 - (iii) Nagabhushanam must be assigned to sector Pratham or sector Dwitiya.
- 19.** If Phaneesh is assigned to sector Dwitiya, which of the following must be true?
- (a) Tirthankar is assigned to sector pratham
 - (b) Swaminathan is assigned to sector Tritiya
 - (c) Visheshwar is assigned to sector Dwitiya
 - (d) Visheshwar is assigned to sector Tritiya
- 20.** The service manager cannot make an acceptable roster that assigns:
- (a) Phaneesh to sector Pratham and Visheshwar to sector Tritiya
 - (b) Ramaswamy to sector Pratham and Tirthankar to sector Dwitiya
 - (c) Swaminathan to sector Pratham and Nagabhushanam to sector Dwitiya
 - (d) Nagabhushanam to sector Dwitiya and Phaneesh to sector Tritiya
- 21.** If Tirthankar is assigned to sector Tritiya, which of the following must be true?
- (a) Phaneesh is assigned to sector Pratham
 - (b) Ramaswamy is assigned to sector Dwitiya
 - (c) Tirthankar is Nagabhushanam's partner
 - (d) Nagabhushanam is Visheshwar's partner

Directions for questions 22 to 25: Read the following passage and solve the questions based on it.

An inexperienced Yoga teacher, posing as an expert on yogic exercises (*asanas*) prescribed a schedule of exercises for a pupil. Choosing from exercises *Anubittasana*, *Bhujangasana*, *Chakrasana*, *Dhanurasana*, *Sukhasana*, *Tadasana*, *Ushtrasana* and *Vyagrasana*, the pupil must perform a routine of exactly

five different *asanas* each day. In any day's routine, except the first day, exactly three of the exercises must be the ones that were included in the routine of the previous day, and any permissible routine must also satisfy the following conditions:

- (i) If *Anubittasana* is in routine, *Ushtrasana* cannot be done in that routine.
 - (ii) If *Bhujangasana* is in a routine, *Sukhasana* must be one of the exercises done after *Bhujangasana* in that routine.
 - (iii) If *Chakrasana* is in a routine, *Ushtrasana* must be one of the exercises done after *Chakrasana* in that routine.
 - (iv) The fifth exercise of any routine must be either *Dhanurasana* or *Tadasana*.
- 22.** If one day's routine is *anubittasana*, *bhujangasna*, *vyagrasna*, *sukhasana* and *tadasana*, each of the following could be the next day's routine, except:
- (a) *Bhujangasna*, *Chakrasana*, *Vyagrasana*, *Sukhasana*, *Tadasana*
 - (b) *Bhujangasna*, *sukhasana*, *Ushtrasana*, *Vyagrasana*, *Dhanurasana*
 - (c) *Vyagsana*, *Sukhasana*, *Tadasana*, *Ushtrasana*, *Dhanurasana*
 - (d) *Vyagsana*, *Sukhasana*, *Dhanurasana*, *Anubittasana*, *Tadasana*
- 23.** Which of the following is true for any permissible routine?
- (a) *Anubittasana* cannot be the third exercise
 - (b) *Bhujangasana* cannot be the third exercise
 - (c) *Chakrasana* cannot be the fourth exercise
 - (d) *Tadasana* cannot be the fourth exercise
- 24.** If the pupil chooses *Chakrasana* and *Vyagrasana* for the first day's routine, which of the following could be the other three exercises chosen?
- (a) *Anubiittasana*, *Sukhasana*, *Tadasana*
 - (b) *Bhujangasana*, *Dhanurasana*, *Ushtrasanas*
 - (c) *Bhujangasna*, *Sukhansana*, *Ushtrasana*.
 - (d) *Sukhasana*, *Dhanusarana*, *Vyagrasana*.
- 25.** If *Chakrasana* is the third exercise in a routine, which of the following cannot be the second exercise?
- (a) *Bhujangasna* (b) *Dhanurasna*
 - (c) *Sukhasana* (d) *Tadasana*

ANSWER KEYS

- | | | | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 1. (b) | 2. (d) | 3. (d) | 4. (d) | 5. (d) | 6. (c) | 7. (d) | 8. (c) | 9. (d) | 10. (c) |
| 11. (b) | 12. (d) | 13. (d) | 14. (d) | 15. (d) | 16. (c) | 17. (d) | 18. (c) | 19. (b) | 20. (a) |
| 21. (d) | 22. (a) | 23. (c) | 24. (b) | 25. (a) | | | | | |

HINTS AND EXPLANATIONS**1 to 4**

- If A is on the team, Y and B cannot be selected. Hence, other members are X, Z and D because Z and C cannot be selected together.
- Y and C can be selected along with X and B or D. Z and B can be selected along with X or Y and D. Z and D can be selected along with X and Y and A or B.
- If Y and Z are selected, A and C cannot be selected. Hence, two junior members are B and D only.
- If C is selected, Z cannot be selected. Hence, X must be there as one of the two senior members.

5 to 9**5.**

	Rasgulla	Halwa	Burfi	Laddu	Kaala-jamun
Joginder		-			x
Kedarnath	x	-		x	x
Girish	x				x
Trilochan		x	x		
Rameshwari	x	x	x	✓	x

10 to 12

Shiva spent 14 days in 6 cities with at least 2 days in each city. So, he could either spend 2 days in 5 cities & 4 days in 6th city or he can spend 2 days in 4 cities & 3 days in 2 cities.

- Shiva must visit at least 3 cities of Gujrat in 8 days. So, correct option is (c).
- Shiva must have spent 4 days in Ahmedabad & 2 days in other 5 cities. Clearly option (c) is incorrect. It is possible for him to spend 4, 2 & 8 days in Gujrat, U.P. & Maharashtra. So, option (d) is also incorrect. He can also spend 2 days each in Maharashtra & U.P. & all remaining days in Gujrat. So, option (a) is also incorrect. So, correct option is (b).
- He must have visited 1 city of U.P. & 3 cities of Maharashtra with 3, 2 & 2 days in those cities. So, option (d) must be false.

13 to 17

- We get the following table: A-H-E; B-H-C; C-H-M; D-E-H; E-P-M; F-M-P. Now all the questions can be answered.
- The female member is the person who teaches English.
- None of the teachers have the same compulsory and optional subjects.
- E and F have Physics and Mathematics.
- A, B and C have History as compulsory subject, from the above table.
- The books on plays are the fifth and sixth, also the other two books on plays are between the two books on composition. Hence, the book on composition is fourth from the top.

19 to 21

19. If Phaneesh is assigned to sector Dwitiya, then Naghbhushanam must be assigned to sector Pratham & Ramaswamy must be assigned to sector Tritiya. Now, the 2nd member assigned to Tritiya must be Swaminathan as Tirthankar & Visheshwar, both have completed the training programme like Ramaswamy. So, only Swaminathan can be the other person in Tritiya
20. If Phaneesh is assigned to sector Prathama, then Naghbhushanam must be assigned to sector Dwitiya & Ramaswamy must be assigned to sector Tritiya. Now, the 2nd member assigned to Tritiya cannot be Visheshwar, as both have completed the training programme & we need just 1 such person. So, option (a) is not acceptable arrangement. Rest options are acceptable
21. If Tirthankar is assigned to sector Tritiya, then Ramaswamy must be assigned to sector Pratham or Dwitiya as both of them cannot be assigned to same sector. Now, Naghbhushanam must be assigned to sector Pratham or Dwitiya as it is given condition. Now the partner with Naghbhushanam cannot be Tirthankar as both must be assigned to different sectors. Also, both Naghbhushanam & Ramaswamy cannot be kept in same sector. So, the partner with Naghbhushanam must be Visheshwar. So, option (d) must be true

22 to 25

For simplicity, let us denote each yogic exercise (Asanas) by 1st letter only

22. If C is in routine, then U must be 1 of the exercises done after it. In option (a), we have C but not U. So, option (a) could not be the next day's routine
23. If C is the 4th exercise for any schedule, then 5th exercise must be U (condition iii). But, the last (i.e. 5th) exercise for any schedule can be D or T (condition iv). So, option (c) cannot be true for any permissible schedule
24. We have chosen C & V for the schedule of 1st day. As U must follow C, so 1 of the other 3 exercises must be U. As the 5th exercise for any schedule can be D or T. So, we must have either D or T as 1 of the 3 other exercises. From given options, only (b) have U & D (from D & T). Rest options are not feasible.
25. We know that U must follow C in any schedule. So, if C is 3rd exercise, U must be either 4th or 5th. But, the 5th exercise can be D or T. So, if C is 3rd exercise, U must be the 4th & D or T is the 5th exercise. But, S must follow B in any schedule. So, if B is 2nd exercise then we have no position after 2nd (i.e. 3rd or 4th or 5th) for S. So, B cannot be the 2nd exercise. Correct option is (a)

PRACTICE EXERCISE 3

Each group of questions in this section is based on a set of conditions. While answering some of the questions, it may be useful to draw a rough diagram. Choose the response that most accurately and completely answers each question.

Directions for questions 1 to 5: *Read the following passage and solve the questions based on it.*

Seven instructors—J, K, L, M, N, P and Q, teach management courses at a premier institute in east India. Each instructor teaches during only one term; either the first term, or the second term, or the third term. The following conditions apply:

Directions for questions 6 to 10: Read the following passage and solve the questions based on it.

Sourav's Fish Salon serves a special Friday night seafood banquet consisting of seven courses: hilsa, pomfret, Indian shrimp, rahu, kingfish, lobster, and bhetki. Diners are free to select the order of the seven courses, according to the following conditions:

- (i) The kingfish is served sometimes after rahu.
 - (ii) Exactly one course should be served between the pomfret and the Indian shrimp.
 - (iii) The lobster is served some time before the pomfret.
 - (iv) The kingfish is either the fifth or the course to be reserved sixth. The hilsa is the second course to be served.

6. Which one of the following sequences would make for an acceptable banquet?

 - (a) Rahu, hilsa, lobster, bhetki, pomfret, kingfish, Indian shrimp
 - (b) Rahu, hilsa, bhetki, pomfret, kingfish, Indian shrimp, lobster
 - (c) Lobster, hilsa, pomfret, rahu, kingfish, Indian shrimp, bhetki
 - (d) Lobster, hilsa, rahu, kingfish, pomfret, bhetki, Indian shrimp

7. If the kingfish is the fifth course served, then which one of the following must be true?

 - (a) Pomfret is the third course served
 - (b) Indian shrimp is the fourth course served
 - (c) Bhetki is the seventh course served
 - (d) Lobster is the first course served

8. Which one of the following would make it possible to determine the exact order of the course?

 - (a) Pomfret is the fourth course served
 - (b) Indian shrimp is the fifth course served
 - (c) Kingfish is the sixth course served
 - (d) Lobster is the first course served

9. If kingfish is the sixth course served, then which one of the following cannot be true?

 - (a) Rahu is the fifth course served
 - (b) Indian shrimp is the seventh course served

- (c) Pomfret is the fifth course served
 (d) Lobster is the third course served
- 10.** If bhetki is the third course served, which one of the following must be true?
- Pomfret is the fourth course served
 - Kingfish is the fifth course served
 - Rahu is the first course served
 - Indian shrimp is the seventh course served

Directions for questions 11 to 16: *Read the following passage and solve the questions based on it.*

During one week, a human resource director conducts five interviews for a new job; one interview per day, Monday through Friday. There are six candidates for the job: Ram, Shyam, Trilochan, Usha, Veena and Kishore. Not more than two candidates are interviewed more than once. Neither Shyam nor Usha nor Veena is interviewed more than once, and no other candidate is interviewed more than twice. The schedule of interviews is subject to the following conditions:

- If Trilochan is interviewed, then he must be interviewed on Monday and Friday.
 - If Shyam is interviewed, then Usha is also interviewed; with Shyam's interview taking place earlier than Usha's interview.
 - If Ram is interviewed twice, then Ram's second interview takes place exactly two days after his first interview.
 - If Veena is interviewed, then Kishore is interviewed twice; with Veena's interview taking place after Kishore's first interview and before his second interview.
 - If Usha is interviewed, then Ram is also interviewed; with Usha's interview taking place on a day either immediately before or immediately after a day on which Ram is interviewed.
- 11.** Which of the following could be a complete and accurate list of candidates that the human resources director interviews and the days on which those interviews take place?
- Monday: Shyam; Tuesday: Usha; Wednesday: Ram; Thursday: Kishore; Friday: Ram
 - Monday: Shyam; Tuesday: Kishore; Wednesday: Ram; Thursday: Kishore; Friday: Usha
 - Monday: Trilochan; Tuesday: Ram; Wednesday: Shyam; Thursday: Ram; Friday: Trilochan
 - Monday: Trilochan; Tuesday: Ram; Wednesday: Kishore; Thursday: Veena; Friday: Trilochan

- 12.** If Veena is interviewed on Tuesday, then which one of the following must be true?
- Trilochan is interviewed on Friday
 - Usha is interviewed on Thursday
 - Ram is not interviewed
 - Shyam is not interviewed
- 13.** If Kishore is not interviewed, then which one of the following must be true?
- Ram is interviewed on Thursday
 - Shyam is interviewed on Tuesday
 - Trilochan is interviewed on Monday
 - Usha is interviewed on Wednesday
- 14.** If Shyam is interviewed, then which one of the following could be true?
- Kishore is interviewed on both Tuesday and Wednesday
 - Usha is interviewed on Monday
 - Veena is interviewed on Tuesday
 - Shyam is interviewed on Thursday
- 15.** If neither Usha nor Trilochan are interviewed, then each of the following must be true except:
- Ram is interviewed on Monday
 - Ram is interviewed on Thursday
 - Veena is interviewed on Tuesday
 - Kishore is interviewed on Wednesday
- 16.** If both Usha and Veena are interviewed, then which one of the following is a complete and accurate list of the days on which Kishore could be interviewed?
- Monday, Friday
 - Tuesday, Thursday
 - Monday, Wednesday, Friday
 - Tuesday, Wednesday, Thursday

Directions for questions 17 to 21: *Read the following passage and solve the questions based on it.*

K. C. Das is preparing special for the sweet packages *Puja*. Different sweet packages are numbered 1 through 5 from left to right, and K. C. Das fills them with different sweets. Each package will contain at least one, but not more than two of the following types of sweets: *Gulabjamun*, *Kaju Barfi*, *Petha*, *Rasgulla*, *Sohan Halwa* and *Cham Cham*. Each type of sweet will be placed in at least one sweet package. These sweets will be packed either in a bucket, a carton or a tin. K. C. Das fills the package according to the following conditions:

- At least two packages must contain *Rasgulla*.
- Exactly two packages must contain *Kaju Barfi*, and these packages cannot be adjacent to each other.

- (iii) Both packages that contain *Kaju Barfi* must be to the left of any package that contains *Gulabjamun*.
 - (iv) Package 2, 3 and 4 cannot contain *Sohan Halwa*
 - (v) Any package that contains *Rasgulla* must be packed in a carton.
 - (vi) Any package that contains *Kaju Barfi* must be packed in a bucket.
 - (vii) Package 2 is packed in a carton.
17. Which one of the following cannot be true?
- Package 1 is packed in a tin
 - Package 2 contains *Cham Cham*
 - Package 3 is packed in a tin
 - Package 4 contains *Kaju Barfi*
18. If a package containing sweets packed in a tin is not adjacent to a package packed in a bucket, then which one of the following must be true?
- Package 1 contains *Petha*
 - Package 4 contains *Kaju Barfi*
 - Package 4 contain *Rasgulla*
 - Package 5 contains *Gulabjamun*
19. If *Rasgullas* are contained in the maximum number of packages, which one of the following must be true?
- Package 3 is packed in a bucket
 - Package 4 is packed in a bucket
 - A package containing *Sohan Halwa* is packed in a bucket
 - A package containing *Gulabjamun* is packed in a carton.
20. If package 4 contains *Petha* and *Cham Cham*, which one of the following pairs of sweets must be contained in the same package?
- Kaju Barfi* and *Sohan Halwa*
 - Gulabjamun* and *Petha*
 - Rasgulla* and *Cham Cham*
 - Gulabjamun* and *Sohan Halwa*
21. If package 3 is packed in a tin, which one of the following could be false?
- Package 1 contains *Sohan Halwa*
 - Package 2 contains *Rasgulla*
 - Package 3 contains *Cham Cham*
 - Package 4 is packed in a bucket

Directions for questions 22 to 25: Read the following passage and solve the questions based on it.

Six horses named Aparajit, Bahadur, Chetak, Dhundumar, Pakshiraj, and Vijay are entered in a race. The big starting gate is divided into exactly seven

positions numbered consecutively 1 to 7. Seven jockeys, also numbered from 1 to 7 are eligible to ride the horses in the race. Each jockey's number corresponds to the numbered position on the starting gate from which that jockey, if assigned to a horse, will ride. Exactly one jockey will not be assigned to any of the horses and the starting gate position corresponding to that jockey's number will remain vacant for the race. Jockeys will be assigned horses and the horses will run from the starting gate position in accordance with the following restrictions:

- (i) Either Aparajit or Chetak must be ridden by Jockey 1.
 - (ii) Pakshiraj must be ridden by Jockey 4 or else by Jockey 5.
 - (iii) Bahadur and Pakshiraj must have at least one horse separating the two of them at starting gate.
 - (iv) Chetak must run from a starting gate position which has a lower number than the starting gate position from which Vijay runs.
22. If the horses complete the race, from the first to the last, in exactly the order 6, 5, 4, 3, 2 and 1 (corresponding to the number of their jockeys); and if Bahadur is the horse that wins the race, then each of the following horses could have been among the top three in the race except:
- Chetak
 - Dhundumar
 - Pakshiraj
 - Vijay
23. If Jockey 5 is the one not assigned to any horse, which of the following could be true?
- Aparajit is ridden by Jockey 4
 - Vijay is ridden by Jockey 6
 - Bahadur is ridden by Jockey 6
 - Chetak is ridden by Jockey 7
24. If Dhundumar is incapable of running the race and no replacement horse is found; and if the horses that run, finish the race from the first to the last, in the order 1, 2, 4, 6 and 7 (corresponding to the numbers of their jockeys) then which of the following must have finished last in the race?
- Aparajit
 - Bahadur
 - Chetak
 - Pakshiraj
25. If Chetak runs from the starting gate position 5 and the starting gate position 6 is vacant, then which of the following must be true?
- Vijay starts from the starting gate position 2
 - Aparajit starts from the starting gate position 1
 - Pakshiraj starts from the starting gate position 3
 - Dhundumar starts from the starting gate position 3

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (d) | 2. (a) | 3. (c) | 4. (d) | 5. (b) | 6. (a) | 7. (c) | 8. (b) | 9. (a) | 10. (d) |
| 11. (a) | 12. (d) | 13. (c) | 14. (a) | 15. (d) | 16. (c) | 17. (a) | 18. (c) | 19. (a) | 20. (a) |
| 21. (c) | 22. (a) | 23. (c) | 24. (a) | 25. (b) | | | | | |

HINTS AND EXPLANATIONS**1 to 5**

1. Note that all other choices violate some condition or the other. Only in option (d), we get

J	K	L	M	N	P	Q
1	3	3	3	2	3	1

Hence, all the conditions are fulfilled.

2. If L teaches during the first term, M also teaches during the first term, which means that four teachers should teach during the third term. But in the given conditions this is not possible.
3. If M = 3, L is also 3, there are two teachers for the first term and four for the third term.
4. KPQ can be two only, which leaves J and N same, which is not possible.
5. The only possibility is that 1, 4 & 2 instructors must be teaching in 1st, 2nd & 3rd term respectively. K teaches in 3rd term. L & M must teach in same term & they cannot teach in 1st or 3rd term as it will result in more number of teachers than required. So, both L & M must teach in 2nd term. So, (b) is correct option.

6 to 10

6. Note that all the choices violate some condition or the other, except (a).
7. If K = 5, L = 1/3, P = 4 and S = 6. Hence, B = 7.
8. If S = 5, H = 2, P has to be 4 and K = 6. Hence, all positions can be determined.
9. If K = 6, H = 2, then P must be 5 as there is no position left for it. Hence, R cannot be 5.
10. If S = 7, H = 2, B = 3, then all conditions can be determined.

11 to 16

11. Note that all conditions except the first, violate some condition or the other.

12. If V = Tuesday, then K must come twice and S cannot be interviewed since S, U and R come together and there is no place for all three.
13. If K is not interviewed, then V is also not interviewed. Hence, T gets interviewed on Monday and Friday.
14. If S is interviewed, then U and R must be interviewed and in the balance days V, K and K must be interviewed. Note that all other choices violate some conditions of the other.
15. If U and T are not interviewed, S is also not interviewed. So R is interviewed twice and K cannot be interviewed on Wednesday.
16. We get SURVKK; Hence, K can be interviewed on Monday, Wednesday or Friday.

17 to 21

17. Package 2 is packed in a carton, so KB is not in 2. If package 1 is in tin, KB is only in 3 or 4 and they cannot be adjacent
18. If package 4 contains R, it is in a carton, packages 3 and 1 contain KB and are in bucket. All conditions are fulfilled.
19. If R is in the maximum number of packages, then K is in package 1 and 3.
20. If package 4 contains P and C, then KB is in package 1 and 3, package 2 and 5 contain R, hence package 1 must contain SH.
21. If package 3 is in a tin, it contains P or G/J as well.

22 to 25

22. If B = 6, then P = 4 or 5. Since C < V, then C cannot occupy 4 or 5, hence C cannot be in the top three positions.
23. Since 5 is closed, P = 4. Then B must have one horse separating them, hence he must be at 6.
24. We can have C = 1, then P = 4 and B = 6. In this case, both A = 7.
25. If C=5, A has to be at 1.

PRACTICE EXERCISE 4

Directions for questions 1 to 3: Read the following passage and solve the questions based on it.

The National Museum Curator must group nine sculptures—Q, R, S, T, V, W, X, Y and Z in tables numbered consecutively from 1–12. The sculptures will be placed in three groups, each group representing a different period of the Indian civilization. The groups must be separated from each other by at least one unused table, but unused tables cannot occur within any group. Three of the sculptures are from the Indus Valley Civilization period (3000 BC–1500 BC), two are from the Mauryan period (322 BC–185 BC) and four are from the Gupta empire period (AD 320–AD 540).

The following table gives the period details of the different sculptures:

Directions for questions 4 to 6: Read the following passage and solve the questions based on it.

A business school publishes three issues of their research Journal in a year. The editor decided that the upcoming three issues 1/m April, August and

December 1/m would carry articles written by seven of the most reputed professors of the school. Each of the seven authors (T, U, V, W, X, Y and Z) will have at least one article published but some may have more than one article published. The following restrictions apply to the publication of the articles:

Directions for questions 7 to 9: Read the following passage and solve the questions based on it.

The CBI was keeping an eye on four suspected lady criminals—Meenakshi, Razia, Sharmila and Theresa while monitoring their movements in and out of a multi-storey building they discovered a pattern and made the following observations:

- (i) No suspect ever entered or left the building together with another suspect.

- (ii) Each of the suspects entered and later left the building, only once every day.
- (iii) No suspect ever left the building in the same order (first, second, third and fourth) in which she entered the building
- (iv) Both while entering the building and leaving, Razia was always earlier than Sharmila.
7. On a certain day, the two suspects who entered the building first were also the first to leave. Then the last two suspects to enter the building could be
- Meenakshi and Razia
 - Meenakshi and Theresa
 - Razia and Sharmila
 - Razia and Theresa
8. On a certain day, Meenakshi and Theresa were the second and the third suspected enter the building and Meenakshi also left the building before Theresa did. Then the order in which the suspects left the building, from the first to the fourth, must be

- Meenakshi, Razia, Sharmila, Theresa
 - Meenakshi, Razia, Thresa, Sharmila
 - Razia, Meenakshi, Sharmila, Theresa
 - Razia, Sharmila, Meenakshi, Theresa
9. On a day when Razia was the second suspect to enter the building and Theresa was the third, which of the following must be true?
- Razia leaves the building first
 - Meenakshi leaves the building first
 - Meenakshi leaves the building third
 - Theresa leaves the building second

Directions for questions 10 to 13: Read the following passage and solve the questions based on it.

On the occasion of the New Year celebrations, eight families went to Goa. Each member of the various families spent a particular amount during the carnival, but the total amount spent by any family was always an integer. Given below is the average amount spent by each member of the various families:

Name of the family	Average amount spent per person	Name of the family	Average amount spent per person	Name of the family	Average amount spent per person	Name of the family	Average amount spent per person
Gagan	2.125	Lapa	3.1428	Rio	2.111	Apang	3.25
Kumar	3.166	Zora	4.5	Chaman	5.20	Sarkar	4.33

- (i) The number of members in the Gagan family was four more than that of the Chaman family.
- (ii) The number of members of the Apang family was half of that of the Sarkar family.
- (iii) The number of members in the Chaman family was less than the sum of that of the Lapa and the Zora.
- (iv) Sum of the number of members of the Lapa family and the Zora family was 28.
- (v) The sum of the members of the Sarkar family and the Apang family was equal to the number of the members of the Rio family as well as the Kumar family.
- (vi) The number of persons in any family varied between 12 and 36.
10. What was the total sum of the amount spent by the Lapa and the Zora families?
- 107
 - 111
 - 134
 - 136

11. What was the total amount spent by all the families?
- 595
 - 677
 - 744
 - 750
12. If 1/6th of the number of members of the Apang, Gagan and Kumar families were adults and the rest were children, then what was the total number of children in all the three families?
- 60
 - 70
 - 80
 - 90
13. What was the total number of members who visited Goa?
- 210
 - 200
 - 190
 - 180

Directions for questions 14 to 17: Read the following passage and solve the questions based on it.

A, B, C, D and E are members of a detective agency. To maintain impersonification, they operate under the

code names P, Q, R, S and T, not necessarily in the same order. Following are the details pertaining to their impersonification:

- (i) If B is R, then D is S
 - (ii) If A is Q, then C is S
 - (iii) If D is not T, then E is S
 - (iv) A is Q if and only if B is S or P
 - (v) If C is not T then, B is not P
 - (vi) D is R, and E is not S if and only if B is Q
 - (vii) If A is R, then C is T
14. Who operates under the name of R?
- (a) A
 - (b) B
 - (c) C
 - (d) D
15. Who operates under the name of Q?
- (a) A
 - (b) D
 - (c) C
 - (d) E
16. Who operates under the name of S?
- (a) E
 - (b) A
 - (c) C
 - (d) D
17. Under what name does C operate?
- (a) P
 - (b) Q
 - (c) R
 - (d) S

Directions for questions 18 to 19: Read the following passage and solve the questions based on it.

A, B, C, D and E competed at the Delhi half marathon, and ranked first through fifth.

The following is the conversation recorded after the marathon:

- A: "I was not last"
- B: "C got the bronze"
- C: "A ended behind E"
- D: "E got silver"
- E: "D didn't get gold"

It is also given that the 1st, 2nd and the 3rd rankers won the Gold, Silver and the Bronze Modals respectively.

The gold and silver medalists lied, but the other three told the truth.

18. Who among the following won the gold medal?
- (a) A
 - (b) B
 - (c) E
 - (d) Cannot be determined
19. Which of the following statements are not true?
- I. A won the bronze medal.
 - II. E won the silver medal.
 - III. C ended behind A, who ended behind E.
 - IV. D ended behind B.
- (a) I and II
 - (b) II and III
 - (c) III and IV
 - (d) I and IV

Directions for questions 20 to 22: Read the following passage and solve the questions based on it.

A professor gave five projects—1, 2, 3, 4 and 5 to five students—S, C, L, M and R as a part of the internal group assessment programme. He gave it to them at 7 p.m. The following table gives the time taken by each of them in finishing the different assignments and the time at which each of them goes to sleep.

Student	Time taken to complete projects (in hour's)					Time of going to sleep
	1	2	3	4	5	
S	2	5	1.5	3	5	10 p.m
C	4	2	3	1	4	11 p.m
L	1	3	4	2	1.5	9 p.m
M	1.5	2.5	3.5	3	3	10 p.m
R	5	4	3.5	2	4	12 Midnight

In case of an internal group assessment programme, all the assignments are needed to be done but not necessarily by each one of them. Hence, the group decides that each one of them will do exactly one project out of the given five projects.

20. What is the least time in which the group assignment will be done?
- (a) 1.5 hours
 - (b) 2 hours
 - (c) 2.5 hours
 - (d) 3 hours
21. What is the cumulative time spent by all of them if they finish it in the minimum possible time?
- (a) 7.5 hours
 - (b) 8.5 hours
 - (c) 9 hours
 - (d) 10 hours
22. The assignment has to be finished on that particular calendar day only. What is the maximum possible time in which this assignment will be done?
- (a) 3.5 hours
 - (b) 4 hours
 - (c) 4.5 hours
 - (d) 5 hours

Directions for questions 23 to 25: Read the following passage and solve the questions based on it.

Mohan went to the market and bought a few oranges, mangoes and bananas. He bought a total of 42 fruits. The details of the fruits purchased is as follows:

- (i) The number of bananas is less than half the number of oranges

ANSWER KEYS

- 1.** (c) **2.** (b) **3.** (d) **4.** (b) **5.** (c) **6.** (c) **7.** (b) **8.** (a) **9.** (a) **10.** (a)
11. (a) **12.** (a) **13.** (d) **14.** (c) **15.** (b) **16.** (a) **17.** (c) **18.** (b) **19.** (a) **20.** (b)
21. (b) **22.** (d) **23.** (c) **24.** (c) **25.** (c)

HINTS AND EXPLANATIONS

1 to 3

1. The positions are: Gupta(1–4), vacant = 5, Maurya (6–7) vacant = 8, Indus (9–11), vacant = 12. Therefore the unused table spares are 5,8 and 12.
 2. Y cannot be on table 9 as there would be no place to fix three objects.
 3. QZX have to be together. They can start from table 1 or 2.

4 to 6

4. Y must be published in August, otherwise there would be no place for W. Y & Z cannot be published together. So, only possible option is (b).
 5. Same as the last question.
 6. Since U, V and W cannot be repeated and Y must be in the selection. Hence, option (c)

7 to 9

- R cannot be later than S. Therefore only option (b) satisfies this condition.
 - The order for entry is: RMTS. Then the order for leaving can only be MRST.
 - The order for entry is MRTS. For leaving, S cannot be the fourth so she must be the second or the third. In that case, R must be the first.

10 to 13

The total amount spent by the different families was in integers. The average amount spent by the members of the Apang family was 3.25. So the number of members of this family should be either 4 or a multiple of 4, to make the total amount spent by the family an integer. Similarly, the number of members of the Gagan family should be either 8 or a multiple of 8. The table below shows the probable number of family members:

Table

Family	Average expenditure of family members	Probable number of members	Exact members	Amount spent by the whole family
Apang	$3.25 = 3 + \frac{1}{4}$	4,8,12,16,20,24,...	12	39
Gagan	$2.125 = 2 + \frac{1}{8}$	8,16,24,32,...	24	51
Kumar	$3.166 = 3 + \frac{1}{6}$	6,12,18,24,...	36	114
Lapa	$3.1428 = 3 + \frac{1}{7}$	7,14,21,28,...	14	44
Zora	$4.5 = 4 + \frac{1}{2}$	2,4,6,8,10,12,14...	14	63
Rio	$2.111 = 2 + \frac{1}{9}$	9,18,27,36, ...	36	76
Chaman	$5.20 = 5 + \frac{1}{5}$	5,10,15,20,25, ...	20	104
Sarkar	$4.33 = 4 + \frac{1}{3}$	3,6,9,12,15,18, ...	24	104
Total			180	595

10. From the above table, it can be determined that the sum of the amount spent by both the families = $44 + 63 = 107$. Hence, the correct option answer is (a).
11. From the table we can see that the correct answer is option (a).
12. One sixth of the total members of the Apang, Gagan and Kumar families = $(1/6)(12 + 24 + 36) = 12$. So, the number of children = $72 - 12 = 60$. Hence, the answer is (a)
13. The answer is option (d).

14 to 17

Using (i)—If B is R, then D is S. However, we cannot conclude that if D is S, then B is R. If B is R, then D is S [from (i)]. Let us assume that B is R, then D is S. From (iii), as D is not T, E is S. But Both D and E cannot be S. So, our assumption (namely B is R) itself is not valid. Hence we can conclude that B is not R.

Using (ii), (iv), and (v)—If B is S, then A is Q [from (iv)]. In such case, C is S [from (iii)]. Once again it is not acceptable, as B and C both cannot be S. Hence

the assumption made is invalid in this case too (that B is S). So, B is not S. If B is P, then A is Q [from (iv)]. In that case, C is S [from (ii)]. As C is not T, B is not P [from (iv)]. This contradicts the assumption that (B is P) with which we started off. So this is also invalid. Hence, B is not P.

As B is neither S nor P, we also get from (iv) that A is not Q. Looking at (iii) again we get from this that D is not S. (If D is S, D is not T and hence E is S. This is not possible, as both D and E cannot be S.)

Let us summarize the findings till now:

A	B	C	D	E
Not Q	Not R	Not S	Not S	Not P

Hence, B can only be Q or T. Now, if B is Q, D is R and E is not S [from 4].

But if D is R, E must be S, according to (iii). We cannot have a situation where one given statement is contradicted by another given statement. Hence, B cannot be Q. So, the only possibility is that B is T. So we are sure now that B is T.

Looking at (vi) again, D is R and E is not S, if and only if B is Q. Now, as B is not Q, it follows that D is not R. It also follows that E is S. If A is R, then C is T (vii) But we know that B is T, so C is not T. It follows that A is not R. Thus, A is not R, A is not Q, A is not T (as B is T), and A is not S (as E is S). Hence A is P.

Coming to D, D is not P or S or T (as A is P, E is S and B is T). We have also seen above that D is not R. Hence, D is Q.

The person left out till now, namely C, has to be R in that case. So, A, B, C, D and E operate under the names of P, T, R, Q and S respectively.

18 to 19

A couldn't be the 1st or 2nd, for he would be telling the truth; or the 5th, for he would be lying; so he was 3rd or 4th.

If D was telling the truth, then E would be lying. Thus D would be the 1st, and lying at the same time which is contradictory. Thus, D is lying, and he is the 1st or 2nd.

If E was lying, D would be the 1st, so E would have to be the 2nd, then D would have been telling the truth. Thus, E is the 3rd, 4th or 5th and D must be 2nd.

Now, only B or C could be the 1st. If B isn't the 1st, as he couldn't be the 2nd, he would have to be the 4th or 5th because C would be the 3rd, But nobody would be the 1st; the only solution then is B, D, E, A and C.

20 to 22

20. We must assign 1st project to M as we need least time for 1st project. Similarly 4th project is given to R. Similarly 2nd, 3rd & 5th projects are given to C, S & L respectively. The time required is 2 hours.
21. The cumulative time (using answer 20) is $1.5 + 2 + 1.5 + 1.5 + 2 = 8.5$ hour. (The projects are allotted as were allotted in answer 20).
22. As each person is doing exactly 1 project, so the maximum time for the assignment is the maximum time by any person for any project. As, maximum required by any person for any project is shows. So, the correct option is (d).

23 to 25

Let us represent number of oranges, bananas & mangoes as O, B & M. We are given,

$$O + B + M = 42 \quad (1)$$

$$B < \frac{1}{2} O \quad (2)$$

$$M > \frac{1}{3} O \quad (3)$$

$$M < \frac{3}{4} B \quad (4)$$

So, from (4) B must be a multiple of 4 or near to it. So, by (2) O must be a multiple of 8 or near to it. Similarly by (3) O is a multiple of 3 or near to it. So, O must be a multiple of 24 or near to it. So, let O = 24, then B < 12 & M > 8 & < 9 (near about). To make M a possible number, we can make adjustments as O = 23; B = 11 & so, M = 8.

Chapter

16

MASTERING LOGICAL REASONING

PRACTICE EXERCISE 1

INSTRUCTIONS

- ❑ Directions for answering the questions are given before each group of questions. Read these directions carefully and answer the questions by darkening the appropriate circles on the Answer Sheet. Each question has only one correct answer.
 - ❑ All questions carry three marks each. Each wrong answer will attract a penalty of one mark.
 - ❑ Do your rough work only on the Test Booklet and NOT on the Answer Sheet.

Directions for questions 1 to 4: *Read the information given below and solve the questions based on it.*

Six products – U, V, W, X, Y and Z – are to be placed in the display window of a vending machine with six compartments, numbered 1 through 6 from left to right. The products must be placed in the window, one product in each compartment, according to the following conditions:

U cannot be immediately to the left or immediately to the right of V.

W must be immediately to the left of X.

Z cannot be in compartment 6.

3. If U is placed in compartment 5, which of the following products must be placed in compartment 6?
 - (a) V
 - (b) W
 - (c) X
 - (d) Y

4. If Z is placed in compartment 3, immediately to the right of X, which of the following products must be placed in compartment 5?
 - (a) Y
 - (b) V
 - (c) W
 - (d) X

Directions for questions 5 to 8: *Read the information given below and solve the questions based on it.*

Some people – Tomas, Nadine, Pavel, Marta, Rachel, Fred, and Kurt – are planning to travel down a river on two rafts. The group will be assigned to the rafts according to the following conditions:

Tomas must be assigned to the same raft as Rachel,
 Fred cannot be on the same raft as Pavel unless Marta is also on that raft,
 The maximum number of persons on each raft is four,
 Neither Nadine nor Pavel can be assigned to the same raft as Kurt.

5. If Fred is assigned to the same raft as Nadine, which of the following must be true?
 - (a) Kurt is assigned to the other raft.
 - (b) Marta is assigned to the other raft.
 - (c) Pavel is assigned to the other raft.
 - (d) Rachel is assigned to the same raft as Fred and Nadine.

6. If Rachel is assigned to the same raft as Pavel, which of the following must be true?
 - (a) Kurt is assigned to the same raft as Rachel and Pavel.
 - (b) Nadine is assigned to the same raft as Kurt.
 - (c) Nadine is assigned to the raft other than the one to which Pavel is assigned.
 - (d) Rachel and Pavel are assigned to the raft carrying four people.

7. If Kurt is assigned to the same raft as Marta, which of the following must be true?
 - (a) Fred is assigned to the same raft as Nadine.
 - (b) Fred is assigned to the same raft as Tomas.
 - (c) Nadine is assigned to the same raft as Pavel.
 - (d) Nadine is assigned to the same raft as Kurt and Marta.

8. If Rachel is assigned to the same raft as Fred, which of the following is a complete and accurate list of the people who must then be assigned to the other raft?
 - (a) Fred, Pavel
 - (b) Marta, Nadine, Pavel
 - (c) Marta, Tomas
 - (d) Kurt, Marta, Nadine

Directions for questions 9 to 14: *Read the information given below and solve the questions based on it.*

A flat wilderness area has four widely separated shelters – F, G, W, and X – that are connected by exactly four straight trails – Q, R, S, and T – that are equal to each other in length and connect the shelters in the following ways:

Q connects F and W only.

R connects G and W only.

S connects F and G only.

T connects G and X only.

The shelters are at the ends of the trails.

1.206 Logical Reasoning _____

9. Which of the following is the order in which a hiker, starting with F, using only trails and using no trail more than once, must reach the other shelters?
- (a) G, W, X (b) W, G, X
(c) W, X, G (d) X, W, G
10. If a hiker is at X and wants to reach F by a sequence of trails no longer than necessary, there are how many trail sequences of minimal length from which to choose?
- (a) One (b) Two
(c) Three (d) Four
11. If a hiker restricts herself to the trails, any of the following is a possible sequence in which full lengths of trails are hiked EXCEPT
- (a) Q, S, R, T, S (b) R, Q, S, R, Q
(c) S, T, T, R, Q (d) T, R, R, T, T
12. If a hiker walks the full length of each trail exactly once, which of the following lists all those shelters and only those shelters at which the hiker must be exactly twice?
- (a) G (b) F and G
(c) G and W (d) G and X
13. If by taking shortcuts that stray from the trails, a hiker could travel from W to X over a shorter distance than the shortest distance between W and X by trail alone, which of the following must be true?
- (a) The shortest distance by trail alone from F to X is less than the shortest distance by trail alone from W to X.
(b) The shortest sequence of trails between F and X is the shortest distance between F and X.
(c) The route composed of R and T is not a straight line.
(d) R meets T at a right angle.
14. If the straight-line distance between F and X is the same as the straight-line distance between W and X, which of the following can result if new straight trails are added between F and X and between W and X?
- (a) The shortest distance by trail between any shelter and any other shelter is the same.
(b) The number of trails required for the shortest possible hike by trail between any shelter and any other shelter is one.
(c) The shortest distance by trail between F and X is less than the shortest distance between W and X.
(d) A hiker must travel fewer trails to travel the shortest distance between F and X than to travel the shortest distance between F and G.

Directions for questions 15 to 18: Read the information given below and solve the questions based on it.

A contractor will build five houses in a certain town on a street that currently has no houses on it. The contractor will select from seven different models of houses – T, U, V, W, X, Y, and Z. The town's planning board has placed the following restrictions on the contractor:

No model can be selected for more than one house,

Either model W must be selected or model Z must be selected, but both cannot be selected,

If model Y is selected, then model V must also be selected,

If model U is selected, then model W cannot be selected.

15. If model U is one of the models selected for the street, then which of the following models must also be selected?

(a) T (b) W
(c) X (d) Z

16. If T, U, and X are three of the models selected for the street, then which of the following must be the other two models selected?

(a) V and W (b) V and Y
(c) V and Z (d) W and Y

17. Which of the following is an acceptable combination of models that can be selected for the street?

(a) V, W, X, Y, Z (b) T, U, X, Y, Z
(c) T, V, X, Y, Z (d) U, V, W, X, Y

18. If the model Z is one model not selected for the street, then the other model NOT selected must be which of the following?

(a) T (b) U
(c) V (d) W

Directions for questions 19 to 22: Read the information given below and solve the questions based on it.

The owner of a computer store is planning a window display of five products. Three are to be hardware items selected from K, L, M, N, and O, and two are to be software manuals selected from R, S, T, and U. The display items are to be selected according to the following conditions:

If K is displayed, U must be displayed.

M cannot be displayed unless both L and R also displayed.

If N is displayed, O must be displayed, and if O is displayed, N must be displayed.

If S is displayed, neither T nor U can be displayed.

ANSWER KEYS

- 1.** (d) **2.** (b) **3.** (d) **4.** (a) **5.** (a) **6.** (d) **7.** (c)
8. (b) **9.** (b) **10.** (a) **11.** (a) **12.** (a) **13.** (c) **14.** (b)
15. (d) **16.** (c) **17.** (c) **18.** (b) **19.** (a) **20.** (a) **21.** (d)
22. (d)

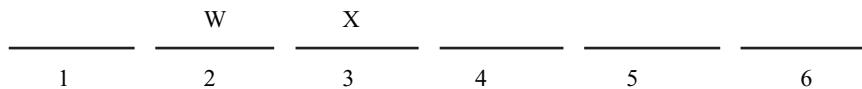
HINTS AND EXPLANATIONS

1. Following diagram can be drawn:

- A) $\begin{array}{ccccccc} \text{U} & \text{Z} & \text{V} & \text{W} & \text{X} & \text{Y} \\ \hline 1 & 2 & 3 & 4 & 5 & 6 \end{array}$
- B) $\begin{array}{ccccccc} \text{V} & \text{Z} & \text{U} & \text{W} & \text{X} & \text{Y} \\ \hline 1 & 2 & 3 & 4 & 5 & 6 \end{array}$
- C) $\begin{array}{ccccccc} \text{W} & \text{X} & \text{V} & \text{Z} & \text{U} & \text{Y} \\ \hline 1 & 2 & 3 & 4 & 5 & 6 \end{array}$
- D) $\begin{array}{ccccccc} \text{X} & \text{W} & & & & & \\ \hline 1 & 2 & 3 & 4 & 5 & 6 \end{array}$

Here option (d) is not true according to the conditions given that is W is immediate left of X which is violating. Whereas option (a), (b), (c) are all satisfying the conditions given. Hence the answer is option (d).

2. Following diagram can be drawn:



The answer is option B that is in 2nd compartment W must be placed according to the given condition – W is immediate left of X. Hence the answer is option (b).

3. Following diagram can be drawn:

- A) $\begin{array}{ccccccc} & & & & \text{U} & \text{V} & \\ \hline 1 & 2 & 3 & 4 & 5 & 6 \end{array}$
- B) $\begin{array}{ccccccc} & & & & \text{U} & \text{W} & \\ \hline 1 & 2 & 3 & 4 & 5 & 6 \end{array}$
- C) $\begin{array}{ccccccc} & & & & \text{U} & \text{X} & \\ \hline 1 & 2 & 3 & 4 & 5 & 6 \end{array}$
- D) $\begin{array}{ccccccc} \text{W} & \text{X} & \text{V} & \text{Z} & \text{U} & \text{Y} & \\ \hline 1 & 2 & 3 & 4 & 5 & 6 \end{array}$

According to the conditions given, we can see option (d) follows the conditions. Options (a), (b), (c) are not true as they are violating the conditions given. Hence the answer is option (d).

4. Following diagram can be drawn:

A)	W	X	Z	U/V	Y	U/V
	1	2	3	4	5	
B)	W	X	Z	U	V X	Y
	1	2	3	4	5	6
C)	W	X	Z	U	W X	
	1	2	3	4	5	6
D)	W	X	Z	U	X V	
	1	2	3	4	5	6

Here Y must be place in compartment 5 if Z is placed in compartment 3, immediately to the right of X which is option (a). If take option (b), V cannot be in compartment 5 as it is given that U cannot be immediately to the left or immediately to the right of V. Options (c) and (d) are not possible at all. Hence the answer is option (a).

5. It is given in the condition that **neither Nadine nor Pavel can be assigned to the same raft as Kurt**, so option (a) is true. Whereas option (b) is not true as Marta is not related to Nadine here at all, similarly options (c) and (d) don't have a connection with Nadine. Hence the answer is option (a).
6. The answer is option (d) is true whereas option (a) is not true as it is violating the condition given that **Kurt cant assigned the raft to neither Naple nor Pavel** also option (b) is not true with the same condition and option (c) is again not matching with the conditions given. Hence the answer is option (d).
7. Here options (a) and (d) are not true as they are violating the same condition that **Kurt cant assigned the raft to neither Naple nor Pavel**. Option (b) is also not true as it is given that **Tomas must be assigned to the same raft as Rachel** which is violating. Hence the answer is option (c).
8. Here option (a) cannot come to the list of other raft as **Fred is already in one list**. Option (c) is also not true as it is given that **Tomas must be assigned to the same raft as Rachel** which is violating the condition. Also option (d) is not true because it is given that **Nadine and Kurt cannot be on same raft**. In option (b) there seems to be accurate list of people without violating any condition. Hence the answer is option (b).
9. According to the given question:
 Here shelter F starting from trail Q reaches to shelter X in a sequence – W, G, X using each trail only once that trails Q, R, S, T and sequence found to be in option (b) Hence the answer is option (b).
10. Here hiker is at X that is in trail T and want to reach shelter F in minimum length, then there is trail S which is connected with shelter F a point where hiker want to reach so there is only one length which is minimum. Hence the answer is option (a).
11. The answer is option (a) as it is not following the sequence in which full lengths of trails are hiked as per the given scenario. Other options are in the sequence. Hence the answer is option (a).
12. The answer is option (a) as when a hiker starts walking from Q to trail T he reaches twice with the shelter G as per given in the rule. Hence the answer is option (a).

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13. Here option (a) is not true because it is violating the conditions of trails and shelters, similarly option (b) is not true and option (d) also violating the given scenario. In option (c) as the distance between W and X is to find the route composed of R and T is there. Hence the answer is option (c).
14. According to the given question option (b) is the answer because number of trails required for the shortest possible hike by trail between any shelter and any other shelter is one. Option (a) is not true as distance is not same. Similarly in options (c) and (d) are not matching with the given question. Hence the answer is option (b).
15. The answer is option (d) that is Z as it is given in the rule that is W is selected than Z cannot and vice-versa, also given that Y and V are selected together and if U is selected then W cannot selected. So option (b) cannot be the answer as per the rule, and options (a) and (c) are not mentioned in the rule. Hence the answer is option (d).
16. Option (a) is not the answer as it is given in question that T, U, X are three models; so from V and W, model W cannot be selected as model U is there and it is given in rule that if U is selected then W cannot be selected. Same is the case in option (d) In option (b), model V and Y cannot be the answer as it is given that if V is selected then, Y must also be selected. Hence the answer is option (c).
17. In option (a), model W and model Z both are selected together which is not as per the rule given. Option (b) also violates the rule as model V and Y should be selected together so here only model Y is present and in option (d) again if model U is selected then model W cannot be selected. Hence the answer is option (c).
18. In option (b), model U cannot be selected because if model Z is not selected then model W must be selected as per the given rule and if model W is selected then model U cannot be selected as it is also given in the rule that if model U is selected then model W cannot selected. Hence the answer is option (b).
19. An acceptable display is K, L, M, R, U that is option (a) as it is satisfying all the conditions. Option (b) is incorrect, as it is violating the condition – If K is displayed, U must be displayed. Similarly, options (c) and (d) are violating the conditions. Hence the answer is option (a).
20. Only one group is acceptable to complete the display, which is given in option (a) As it is given that – If K and T are the first two display items to be selected, that is K is from hardware and T is from software manual, so now 2 from hardware is left and 1 from software manual. Hence the answer is option (a).
21. Since, T and U displayed are from software manuals, so option (a), cannot be true as it is given that only two are selected from software manuals. Option (b) is incorrect as it is given in the condition that if K is displayed, U must also be displayed, not vice-versa. Similarly, option (c) is incorrect as it is stated that – M cannot be displayed unless both L and R also displayed. So, option (d) is left, which is satisfying the conditions. Hence the answer is option (d).
22. As per given conditions, T cannot be displayed if N and O are not displayed. Options (a), (b), and (c) must be displayed. Hence the answer is option (d).

PRACTICE EXERCISE 2

INSTRUCTIONS

- Directions for answering the questions are given before each group of questions. Read these directions carefully and answer the questions by darkening the appropriate circles on the Answer Sheet. Each question has only one correct answer.
 - All questions carry three marks each. Each wrong answer will attract a penalty of one mark.
 - Do your rough work only on the Test Booklet and NOT on the Answer Sheet.

Directions for questions 1 to 6: *Read the information given below and solve the questions based on it.*

Three children live at houses with different colored doors. Following are the details of the children:

Child Name – Govind, Jai, Sama
House Numbers – 1, 2, 3
Sandy Lane
Door – Blue, Green, Red
Road – Bridge Street, Cherry Road,

Sama's house No. is 1 lower than Jai's. Govind does not live at House No.1, but does not have a green door. One child lives at No.2 at Cherry Road. House No.1 has a red door, but is not on Sandy lane.

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Directions for questions 7 to 12: Read the information given below and solve the questions based on it.

Chef Sudhir is preparing orders of toast for three customers A, B and C.

Assume that all the three customers ordered at exactly the same time, and the time to place bread in and remove toast from the toaster is negligible.

Sudhir has two toasters that can each toast 2 pieces of bread at the same time, and 1 knife to apply both butter and jam.

- (i) It takes 1 minute to lightly toast 2 pieces of bread.
 - (ii) It takes 1 minute 30 seconds to moderately toast 2 pieces of bread.
 - (iii) It takes 2 minutes to darkly toast 2 pieces of bread.
 - (iv) It takes 10 seconds to apply butter to a piece of toast.
 - (v) It takes 15 seconds to apply jam to a piece of toast.

Following are the orders:

Customer A wants 4 pieces of toast, moderately toasted, with butter on each piece.

Customer B wants 2 pieces of toast, lightly toasted, with butter and jam on each piece.

Customer C wants 3 pieces of toast, darkly toasted, with butter on 1 piece, nothing on the others.

Waiting time for any customer is the total time taken by Sudhir to serve that particular customer. For example, if A had to wait for 2 minutes, and after serving A, B is served in another 1 minute, then total waiting time for B will be 3 minutes.

Overall objective of Sudhir is to minimize the total combined waiting time.
Total combined waiting time = Individual waiting time of A + individual waiting time of B + Individual waiting time of C.

Directions for questions 13 to 16: Go through the information given below and solve the questions based on it.

You are the Quality Control manager at a restaurant. Go through the case facts given below and solve the questions based on it:

Restaurant produces chicken nugget box (1,000 boxes at a time in a batch). Restaurant has to ensure that it does not supply undercooked nuggets (known as defective) to the customers. If a customer receives a defective nugget box, company has to pay a penalty of ₹150 per nugget box. To check the level of preparedness of nuggets, any of the two tests can be used:

Test 1		Test 2	
Cost	₹6 per nugget box	Cost	₹9 per nugget box
Detection Rate	80%	Detection Rate	100%

Restaurant can re-cook undercooked nuggets at a cost of ₹75 per nugget box. This box can be now sold to customer as it is now certainly properly cooked. All the boxes which are detected as defective must be re-cooked and after that, these boxes are properly cooked now.

Let 'x' be the number of defective nugget boxes per batch.

13. Manager should not use any quality control test, if it is expected that

- (a) $x < 100$
- (b) $100 < x < 200$
- (c) $x > 200$
- (d) None of these

14. If $200 < x < 400$, then

- (a) You should use Test 1
- (b) You should use Test 2
- (c) You can use Test 1 or Test 2
- (d) None of these

15. If $x = 1000$, you should use

- (a) Test 2
- (b) Test 1 and Test 2
- (c) Test 1 or No test
- (d) None

16. Company should be indifferent between Test 1 and No Test if it finds that the number of defective boxes is equal to

- (a) 50
- (b) 100
- (c) 200
- (d) Not possible

Directions for questions 17 to 19: Answer the questions based on the following information.

Sixteen teams have been invited to participate in the ABC Gold Cup cricket tournament. The tournament is conducted in two stages. In the first stage, the teams are divided into two groups. Each group consists of eight teams, with each team playing every other team in its group exactly once. At the end of the first stage, the top four teams from each group advance to the second stage while the rest are eliminated. The second stage comprises of several rounds. A round involves one match for each team. The winner of a match in a round advances to the next round, while the loser is eliminated. The team that remains undefeated in the second stage is declared the winner and claims the Gold Cup.

The tournament rules are such that each match results in a winner and a loser with no possibility of a tie. In the first stage, a team earns one point for each win and no points for a loss. At the end of the first stage, teams in each group are ranked on the

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basis of total points to determine the qualifiers advancing to the next stage. Ties are resolved by a series of complex tie-breaking rules so that exactly four teams from each group advance to the next stage.

ANSWER KEYS

- 1.** (c) **2.** (b) **3.** (b) **4.** (d) **5.** (b) **6.** (c) **7.** (c)
8. (b) **9.** (a) **10.** (b) **11.** (b) **12.** (a) **13.** (a) **14.** (b)
15. (a) **16.** (b) **17.** (c) **18.** (b) **19.** (c) **20.** (b)

HINTS AND EXPLANATIONS

1 to 6

Following is the arrangement:

Child	Color of Door	House Number	Road
Govind	Green	3	Sandy lane
Jai	Blue	2	Cherry Road
Sama	Red	1	Bridge Street

1. Sama lives as Bridge Street. Hence option (c) is the answer.
 2. House number 2 has blue colored door. Hence option (b) is the answer.
 3. It can be seen from the table that option (b) is the answer.
 4. As obvious from the above table, it can be determined for all three of them. Hence option (d) is the answer.
 5. Child who lives at Cherry road (Jai) has his house number 2 and color of door is blue. Hence option (b) is the answer.
 6. Jai's house color of door is blue. Hence option (c) is the answer.

7 to 12

Total Combined waiting time = 8 minutes 55 seconds

Customer (A) will have to wait 4 minutes 10 seconds; Customer (B) will wait 2 minutes 35 seconds; and customer (C) will wait 2 minutes 10 seconds. C's three slices plus one of B's will toast first. B's first slice will have butter and jam applied while the second slice of B's order is toasting. After 2 minutes, A's toast will begin. C's order will be buttered in 10 more seconds, for a total of 2 minutes 10 seconds. Then, B's last slice will be buttered and jam applied, for a total waiting time of 2 minutes 35 seconds. After A's order is toasted and 1 slice buttered, 4 minutes 10 seconds will have elapsed.

7. Customer C will be served 1st after 2 minutes 10 seconds. Hence option (c) is the answer.
8. Customer B will be served 2nd. Hence option (b) is the answer.
9. Customer A will be served 3rd. Hence option (a) is the answer.
10. Combined total waiting time = Waiting time of A + Waiting time of B + Waiting time of C = 4:10 + 2:35 + 2:10 = 8 minutes 55 seconds. Hence option (b) is the answer.
11. As obvious from the explanation above, A will wait for 4 minutes 10 seconds. Hence option (b) is the answer.
12. As obvious from the explanation above, C will wait for 2 minutes 10 seconds. Hence option (a) is the answer.

13 to 16:

Total cost = Cost of Testing + Re-cook charge + Penalty

It can be seen that if the number of defective nugget boxes per batch is very low, for example, 10, then it is better to pay the penalty on this, than to use any test.

13. Total cost = Cost of Testing + Re-cook charge + Penalty
Using Test 1, total cost of testing = ₹6 × 1000 = ₹6000
Using options, at x = 100, Cost of Test 1 = Penalty paid for x = 100.
Using Test 1, Detection = 80 % of 100 = 80. These 80 will be reworked upon and for remaining 20, company will pay penalty.
Total cost = Cost of Testing + Re-cook charge + Penalty = ₹6000 + 80 × ₹75 + 20 × ₹150 = ₹15,000.
For x = 100, penalty = ₹150 × 100 = ₹15000. Hence option (a) is the answer.

14. Check for x = 300.

Total cost using Test 1:

$$\text{Cost of testing} = ₹6 \times 1000 = ₹6000$$

Out of total defective 300 boxes, 80% will be detected. So, total detected boxes = 80% of 300 = 240 boxes. These 240 boxes will be reworked upon and remaining 60 boxes will go undetected. As per the rule, restaurant will have to pay penalty on these 60 boxes.

$$\text{Re-cook charges} = ₹75 \times 240 = ₹18000$$

$$\text{Penalty} = ₹150 \times 60 = ₹9000$$

So, total cost using Test 1 = Cost of Testing + Re-cook charge + Penalty = ₹6000 + ₹18000 + ₹9000 = ₹33,000.

Total cost using Test 2:

$$\text{Cost of testing} = ₹9 \times 1000 = ₹9000$$

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Out of total defective 300 boxes, 100% will be detected. So, total detected boxes = 100% of 300 = 300 boxes. These 300 boxes will be reworked upon. Re-cook charges = ₹75 × 300 = ₹22500

So, total cost using Test 2 = Cost of Testing + Re-cook charge + Penalty = ₹9000 + ₹22500 + ₹0 = ₹31,500.

It can be seen that Total cost of Test 1 < Total cost of Test 2. Hence test 2 should be used. Hence option (b) is the answer.

15. Option (a) is the answer.

16. Using solution to Q(13), Penalty for x = 100 is equal to Total cost of Test 1 for x = 100.

Hence answer is – No test or Test 1 if x = 100.

Hence option (b) is the answer.

17 to 19

17. There shall be 8 teams in each group. Each team in a group shall be playing with

every other team. Hence, total number of matches shall be $\left(\frac{7 \times 8}{2}\right) = 28$ in one

group. Hence, in both the groups, there shall be 56 matches. This is

for the first stage. Thereafter, there are 8 teams in knockout rounds from which one winner emerges, or 7 losers are identified. Hence, 7 more matches, i.e. in all 63 matches. Hence option (c) is the answer.

18. Under extreme conditions, the following can be the maximum number of matches won.

Teams	A	B	C	D	E	F	G	H
A	NA	✓	✓	✓	✓	✓	✗	✗
B	✗	NA	✓	✓	✓	✓	✓	✗
C	✗	✗	NA	✓	✓	✓	✓	✓
D	✗	✗	✗	NA				
E	✗	✗	✗		NA			
F	✗	✗	✗			NA		
G	✓	✗	✗	✓	✓	✓	NA	✓
H	✓	✓	✗	✓	✓	✓	✗	NA

In the above table, ✓ represents win and ✗ represents loss.

From the table, A, B, C, G and H can win five matches each. Hence, we cannot decide that which team will qualify for the second round. Therefore, the minimum number of wins that can assure a place in the second stage is 6. Hence option (b) is the answer.

19. There are 8 teams. Hence, there would be 7 matches in 3 rounds. In general, any knockout or elimination format of tournament will have $(n-1)$ matches if there are n teams. Hence option (c) is the answer.
20. 60 cannot be the answer because then to arrive at a total of 121, the other box will have to weigh 61 kg. 64 is wrong too, because then to add up to 121, the other weight will have to be 57 and to make up to a total of 120, the next box shall have a weight 63 which obviously makes the maximum possible total as $64 + 63 = 127$. 62 is the correct answer because the other boxes shall be 59, 54, 56. These will give all the totals given above. Hence option (b) is the answer.

PRACTICE EXERCISE 3**INSTRUCTIONS**

- Directions for answering the questions are given before each group of questions. Read these directions carefully and answer the questions by darkening the appropriate circles Sheet. Each question has only one correct answer.
- All questions carry three marks each. Each wrong answer will attract a penalty of one mark.

1. Three children won prizes in the Tech India Quiz contest. They are from three schools: Lancer, Columbus and Leelavati, which are located in different states. One of the children is named Binod. Lancer school's contestant did not come first. Leelavati school's contestant's name is Rahman. Columbus school is not located in Andhra Pradesh. The contestant from Maharashtra got third place and is not from Leelavati School. The contestant from Karnataka did not secure first position. Columbus school's contestant's name is not Badal.

Which of the following statements is TRUE?

- (a) 1st prize: Rahman (Leelavati), 2nd prize: Binod (Columbus), 3rd prize: Badal (Lancer)
 - (b) 1st prize: Binod (Columbus), 2nd prize: Rahman (Leelavati), 3rd prize: Badal (Lancer)
 - (c) 1st prize: Rahman (Lancer), 2nd prize: Badal (Columbus), 3rd prize: Binod (Leelavati)
 - (d) 1st prize: Binod (Columbus), 2nd prize: Badal (Lancer), 3rd prize: Rahman (Leelavati)
2. Mother Dairy sells milk packets in boxes of different sizes to its vendors. The vendors are charged ₹20 per packet up to 2000 packets in a box. Additions can be made only in a lot size of 200 packets. Each addition of one lot to the box results in a discount of one rupee on all the packets in the box. What should be the maximum size of the box that would maximize the revenue per box for Mother Dairy?
 - (a) 2400 packets
 - (b) 3000 packets
 - (c) 4000 packets
 - (d) None of these
 3. All employees have to pass through three consecutive entrance doors to enter into the office and one security guard is deployed at each door. These security guards report to the manager about those who come to office after 10 AM. Ms Rani is an employee of this office and came late on the annual day. In order to avoid report to the manager she had to pay each security guard half of the money she had in her purse and 2 rupees more besides. She found only one rupee with her at the end. How much money Ms Rani had before entering the office on the annual day?
 - (a) ₹40
 - (b) ₹36
 - (c) ₹25
 - (d) ₹42

Directions for questions 4 to 5: Answer the questions based on the following information. Director of an institute wants to distribute teaching assignments of HRM, Psychology, Development Studies, Trade policy and Finance to five of six newly appointed faculty members. Prof. Fotedar does not want any assignment if Prof. Das gets one of the five. Prof. Chaudhury desires either HRM or Finance

or no assignment. Prof. Banik opines that if Prof. Das gets either Psychology or Trade Policy then she must get the other one. Prof. Eswar insists on an assignment if Prof. Acharya gets one.

4. Which of the following is valid faculty – assignment combination if all the faculty preferences are considered?
 - (a) Prof. Acharya – HRM, Prof. Banik – Psychology, Prof. Chaudhury – Development studies, Prof. Das – Trade Policy, Prof. Eswar – Finance
 - (b) Prof. Chaudhury – HRM, Prof. Das – Psychology, Prof. Acharya – Development studies, Prof. Banik – Trade Policy, Prof. Eswar – Finance
 - (c) Prof. Acharya – HRM, Prof. Banik – Psychology, Prof. Eswar – Development studies, Prof. Das – Trade Policy, Prof. Fotedar – Finance
 - (d) Prof. Banik – HRM, Prof. Fotedar – Psychology, Prof. Eswar – Development studies, Prof. Chaudhury – Trade Policy, Prof. Acharya – Finance
5. If Prof. Acharya gets HRM and Prof. Chaudhury gets Finance, then which of the following is not a correct faculty-assignment combination assuming all faculty preferences are considered?
 - (a) Prof. Das – Development Studies, Prof. Banik – Trade Policy
 - (b) Prof. Fotedar – Development Studies, Prof. Banik – Trade Policy
 - (c) Prof. Banik – Development Studies, Prof. Eswar – Trade Policy
 - (d) Prof. Banik – Development Studies, Prof. Das – Trade Policy

Directions for questions 6 to 8: Answer the questions based on the following information. Five women decided to go for shopping to South Extension, New Delhi. They arrived at the designated meeting place in the following order: 1. Aradhana, 2. Chandrima, 3. Deepika, 4. Heena and 5. Sumitra. Each of them spent at least ₹1000. The woman who spent ₹2234 arrived before the woman who spent ₹1193. One of them spent ₹1340 and she was not Deepika. One woman spent ₹1378 more than Chandrima. One of them spent ₹2517 and she was not Aradhana. Heena spent more than Deepika. Sumitra spent the largest amount and Chandrima the smallest.

6. What was the amount spent by Heena?
 - (a) ₹1193
 - (b) ₹1340
 - (c) ₹2234
 - (d) ₹2517
7. Which of the following amount is spent by one of the women?
 - (a) ₹1139
 - (b) ₹1378
 - (c) ₹2571
 - (d) ₹2518
8. The lady who spent ₹1193 is:
 - (a) Aradhana
 - (b) Chandrima
 - (c) Deepika
 - (d) Heena

Directions for questions 9 to 11: Answer the questions based on the following information. In a motor race competition certain rules are given for the participants to follow. To control direction and speed of the motorists, guards are placed at different signal points with caps of different colour. Guard with red cap indicates the direction of participant's movement and guards with green cap indicates the speed of the participant's movement. At any signal point presence of three guards, two guards and one guard with red cap means the participant must stop, turn left and turn right respectively. Signal points with three guards, two guards and one guard with green cap means the participants must move at 10, 4 and 2 km/hour respectively. Kartikay,

one of the participants, starts at a point where his car was heading towards north and he encountered signals as follows: at start point one guard with green cap; after half an hour two guards with red cap and two guards with green cap at first signal; after fifteen minutes one guard with red cap at second signal; after half an hour one guard with red cap and three guards with green caps at third signal; after 24 minutes two guard with red cap and two guards with green cap at fourth signal; after 15 minutes three guard with red cap at fifth signal. (Time mentioned in each case is applicable after crossing the previous signal).

9. Total distance travelled by Kartikay from starting point till last signal is:
- 9 km.
 - 10 km.
 - 8 km.
 - 12 km.
10. What would be the final position of Kartikay if one guard with red cap and two guards with green caps were placed at the first signal point after the starting point?
- 3.0 km to the west and 2.0 km to the south
 - 3.0 km to the west and 4.0 km to the north
 - 5.0 km to the east and 4.0 km to the north
 - 2.0 km to the west and 4.0 km to the south
11. If at the starting point Kartikay was heading towards south what would be his final position?
- 3.0 km to the east and 4.0 km to the south
 - 5.0 km to the east and 4.0 km to the south
 - 3.0 km to the west and 4.0 km to the south
 - 5.0 km to the west and 2.0 km to the north

Directions for questions 12 to 15: Answer the questions based on the following information. Mr Mansingh has five sons – Arun, Mahi, Rohit, Nilesh and Saurav, and three daughters – Tamanna, Kuntala and Janaki. Three sons of Mr Mansingh were born first followed by two daughters. Saurav is the eldest child and Janki is the youngest. Three of the children are studying at Trinity School and three are studying at St. Stefan. Tamanna and Rohit study at St. Stefan school. Kuntala, the eldest daughter, plays chess. Mansorover school offers cricket only, while Trinity school offers chess. Beside, these schools offer no other games. The children who are at Mansorover school have been born in succession. Mahi and Nilesh are cricketers while Arun plays football. Rohit who was born just before Janki, plays hockey.

12. Arun is the _____ child of Mr Mansingh.
- 2nd
 - 3rd
 - 6th
 - 5th
13. Saurav is a student of which school?
- Trinity
 - St. Stefan
 - Mansorover
 - Cannot be determined
14. What game does Tamanna play?
- Cricket
 - Hockey
 - Football
 - Cannot be determined
15. Which of the following pairs was not born in succession (ignore the order)?
- Mahi and Nilesh
 - Kuntala and Arun
 - Rohit and Janki
 - Arun and Rohit

Directions for questions 16 to 20: *Read the information and solve the questions based on it.*

A museum curator must group nine paintings – F, G, H, J, K, L, M, N, and O – in twelve spaces numbered consecutively from 1-12. The paintings must be in three groups, each group representing a different century. The groups must be separated from each other by at least one unused wall space. Three of the paintings are from the eighteenth century, two from the nineteenth century, and four from the twentieth century.

Unused wall spaces cannot occur within groups.

G and J are paintings from different centuries.

J, K, and L are all paintings from same century.

Space number 5 is always empty.

F and M are eighteenth-century paintings

N is a nineteenth-century painting.

16. If the paintings are hung in reverse chronological order by century, the unused wall spaces could be

- (a) 1, 5, and 10 (b) 1, 6, and 10
- (c) 4, 7, and 8 (d) 5, 8, and 12

17. Which of the following is a space that CANNOT be occupied by a nineteenth-century painting?

- (a) Space 1 (b) Space 6
- (c) Space 8 (d) Space 11

18. If J hangs in space 11, which of the following is a possible arrangement for spaces 8 and 9?

- (a) F in 8 and M in 9 (b) K in 8 and G in 9
- (c) N in 8 and G in 9 (d) 8 unused and H in 9

19. If the twentieth-century paintings are hung in spaces 1-4, which of the following CANNOT be true?

- (a) Space 8 is unused
- (b) Space 9 is unused
- (c) N is hung in space 9
- (d) M is hung up in space 12

20. If the first five paintings, in numerical order of spaces, are F, O, M, N, G, which of the following must be true?

- (a) Either space 1 or space 4 is unused
- (b) Either space 7 or space 12 is unused
- (c) H hangs in space 11
- (d) Two unused spaces separate the eighteenth-century and nineteenth-century paintings

ANSWER KEYS

- | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|
| 1. (a) | 2. (b) | 3. (b) | 4. (d) | 5. (d) | 6. (b) | 7. (a) |
| 8. (c) | 9. (a) | 10. (a) | 11. (c) | 12. (c) | 13. (a) | 14. (d) |
| 15. (b) | 16. (d) | 17. (a) | 18. (d) | 19. (c) | 20. (a) | |

HINTS AND EXPLANATIONS

1.

Name	School	State
Rehman	Leelavati	Andhra Pradesh
Binod/Badal	Lancer/Columbous	Karnakata
Badal/Binod	Lancer/Columbous	Maharashtra

So, correct option is (a)

2. For 2000 packets the price is ₹20.

$$\begin{aligned} \text{So, revenue} &= 2000 \times 20 \\ &= ₹40,000 \end{aligned}$$

For 2200 packets the prices is ₹19.

For 2400 packets the prices is ₹18.

Calculating revenue in each case, we will get the maximum revenue for 3000 packets.

3. Money left to Ms. Rani

After 3rd door = ₹1

After 2nd (before 3rd) = ₹6

After 1st (before 2nd) = ₹16

Similarly, amount she was having in start is ₹36.

Option (b) is correct.

4. The faculty-assignment combination in option (d) do not violates any condition.

Rest all option violates at least 1 condition.

5. If prof. Das gets psychology or trade policy then prof. Banik must get the other.

So, if prof. Das got trade policy, then prof Banik must get psychology. So, the combination given in option (d) is not possible.

6 to 8

We know 4 exact values for amount spent which are ₹2234, ₹1193, ₹1340 & ₹2517.

Further we know that 1 woman spent ₹1378 more than the chandrima who spent the smallest amount & we also know the smallest amount which can be spent is ₹1000.

So, the woman who spent ₹2517 must have spent ₹1378 more than Chandrima.

So, amount spent by Chandrima is ₹1139.

Sumitra spent ₹2517. As Heena spent more than Deepika who did not spent ₹1340. So, the amount spent by Heena & Deepika are ₹1340 & ₹1193 respectively.

9. After 30 minutes Kartikay travelled 1 km & his position is (0, 1). For next 15 min he travelled 1 km & his position is (-1, 1). For next 30 min he travelled 2 km and his position is (-1, 3). For next 24 minutes, he travelled 4 km & his position is (3, 3). For next 15 min he travelled 1 km & his position is (3, 4).

$$\begin{aligned} \text{Total distance travelled} &= 1 + 1 + 2 + 4 + 1 \\ &= 9 \text{ km} \end{aligned}$$

Option (a) is correct.

10 to 11

Can be solved like 9.

12 to 15

We can solve this question as tabular arrangement with 8 rows & 5 columns, where each row shows each child. The 5 columns show, order (eldest to youngest), name, gender, school & game.

It is given that 3 sons were born first & then 2 daughters. So, gender for 1 to 3 is male & for 4 & 5, female. Saurav & Janaki are eldest & youngest & Janaki is daughter. So, gender for 8th child must be female & gender for 6th & 7th children must be male. Kuntala is eldest daughter & she plays chess. She must be from Trinity school as Trinity school offers only chess So, she must be 4th child. Rohit was born just before Janaki & so he must be the 7th child. He plays hockey & his school is St. Stefan. The table will be as follows:

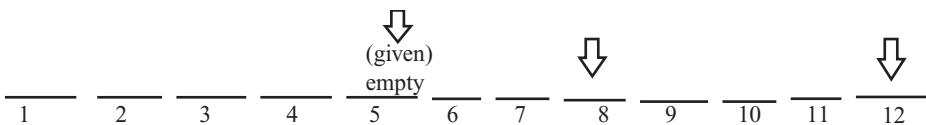
Order	Name	Gender	School	Game
1	Saurav	Male		
2		Male		
3		Male		
4	Kuntala	Female	Trinity	Chess
5		Female		
6		Male		
7	Rohit	Male	St. Stefan	Hockey
8	Janaki	Female		

Further, 3 children are studying in St. Stefan & 3 are studying in Trinity. So, remaining 2 must be studying in Mansorover. The children who are at Mansorover School have been born in succession. Mansorover school offers only cricket in games. Mahi & Nilesh are cricketers. So, the 2 children who are studying in Mansorover school must be Mahi & Nilesh who are both males & they must be 2nd & 3rd children of Mr. Mansingh. One of the 5 sons is Arun who plays football. So, Arun must be the 6th child & his school must be St. Stefan (as Trinity offers only chess as game). Tamanna, one of the 3 daughters, is studying in St. Stefan & she must be the 5th child. So, the school in which Saurav & Janaki are studying must be Trinity & so they must be playing chess (as Trinity offers only chess). The table will be as shown below:

Order	Name	Gender	School	Game
1	Saurav	Male	Trinity	Chess
2	Mahi/Nilesh	Male	Mansorover	Cricket
3	Nilesh/mahi	Male	Mansorover	Cricket
4	Kuntala	Female	Trinity	Chess
5	Tamanna	Female	St. Stefan	

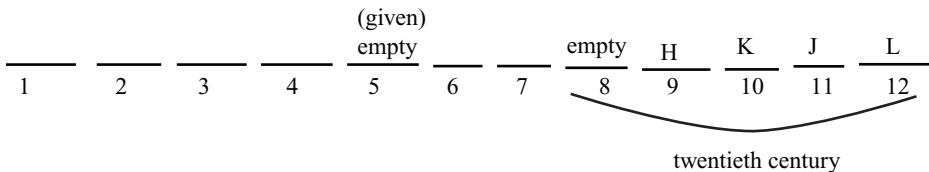
6	Arun	Male	St. Stefan	Football
7	Rohit	Male	St. Stefan	Hockey
8	Janaki	Female	Trinity	Chess

12. Arun is the 6th child of Mr. Mansingh
 13. Saurav is a student of Trinity school
 14. The game which is played by Tamanna cannot be determined
 15. Kuntala & Arun is 4th & 6th child of Mr. Mansingh. So, they are not in succession
 16. Following diagram can be drawn:



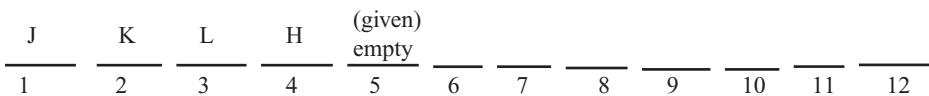
Options A, B, C are not the answers because they cannot be used as unused walls as per the given condition that unused wall spaces cannot occur within groups. Hence the answer is option (d).

17. The answer is option A as the centuries are in chronological order so according to that eighteenth century should come at space 1. Hence the answer is option (a).
 18. Following diagram can be drawn:



According to the given rule J, K, L belong to same century and are at the end so we put it in twentieth century. Hence the answer is option (d).

19. Following diagram can be drawn:



Here option is not true as N is in nineteenth century which is given so it should come in space 6, 7 or 8 not in 9. Other options are true. Hence the answer is option (c).

20. According to the conditions given, F, O, M belong to eighteenth century and N, G belong to nineteenth century. Hence the answer is option (a).

PRACTICE EXERCISE 4

Directions for questions 1 to 6: *Read the following passage and solve the questions based on it.*

My brother Vinit while was planning to go home last year was confused about the clothes that he should carry with him. He had the following types of clothing: belts, hats, jackets, ties, vests, T-shirts and handkerchiefs. It was also known that he had with him several pieces of each of the seven types of clothing. Finally, he set up an algorithm to decide the clothes that he would be taking along with him.

- (i) If he packed ties, then he did not pack handkerchiefs.
 - (ii) If he packed belts, then he did not pack jackets.
 - (iii) If he packed belts, then he packed at least one handkerchief.
 - (iv) If he packed jackets, then he packed at least one vest.
 - (v) If he packed vests, then he packed at least one handkerchief.
 - (vi) If he packed handkerchiefs, then he packed at least two of them.
 1. Which one of the following could be a complete list of the clothing that my brother packed?
 - (a) One belt, one T-shirt, one vest, two handkerchiefs.
 - (b) One belt, one tie, one T-shirt, three handkerchiefs.
 - (c) Two belts, one ties, three T-shirts.
 - (d) One jacket, one T-shirt, two vests and one handkerchief.
 2. If Vinit did not pack any handkerchiefs, what was the maximum number of the different types of clothing that he could pack?
 - (a) Two
 - (b) Three
 - (c) Four
 - (d) Five
 3. Which one of the following statements must be false?
 - (a) Vinit packed exactly three items of clothing, one of which was a vest.
 - (b) Vinit packed exactly four items of clothing, one of which was a hat.
 - (c) Vinit packed exactly three items of clothing, one of which was handkerchief.
 - (d) Vinit packed exactly three items of clothing, one of which was a belt.
 4. If Vinit packed as many items of clothing as possible, then it must be true that he did not pack one of the following types of clothing.
 - (a) Belts
 - (b) Hats
 - (c) Ties
 - (d) Jackets
 5. If Vinit packed at least one item, find out which one of the following are the minimum and the maximum numbers of the types of clothing that he could pack?
 - (a) 1,4
 - (b) 1,5
 - (c) 1,6
 - (d) 2,5
 6. If Vinit did not pack any vests, then it could be true that he packed one or more
 - (a) Ties and jackets
 - (b) T-shirts and belts
 - (c) Ties and belts
 - (d) T-shirts and ties

Directions for questions 7 to 9: Read the following passage and solve the questions based on it.

The production, marketing, human resource, finance and management information system managers of a particular company meet for a round table meeting to discuss

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the strategy of the company. Out of the five, three are men and the other two are women. The following restrictions apply to their seating arrangement:

- (i) The two women will not be seated next to each other.
- (ii) The production manager, a man, will always be seated as far as possible from the marketing manager.
- (iii) The finance manager will always be seated next to a woman.

7. If the human resource manager is a man, which of the following is definitely not true?
 - (a) The marketing manager is sitting in between the two women
 - (b) The marketing manager is sitting in between two men
 - (c) The finance manager is a man
 - (d) The marketing manager is a woman
8. If the finance manager always has a woman to his right, in how many different arrangements can the marketing manager be a woman?
 - (a) 2
 - (b) 3
 - (c) 4
 - (d) 5
9. If the management information system manager is sitting just to the right of the production manager, which of the following statement(s) is/are definitely True?
 - I. The marketing manager and the finance manager sit next to each other.
 - II. The human resource manager has to be a woman.
 - III. The management information system manager has to be a man.
 - (a) I only
 - (b) I and II
 - (c) I and III
 - (d) II and III

Directions for questions 10 to 14: *Read the following passage and solve the questions based on it.*

The Snehans Apartment Welfare Association offers three activities to its members skating, soft ball and steam bath. To avail all these facilities the association has made separate activity centres, one each for all the three activities. The following table gives the details pertaining to the number of different types of members, the capacity of each type of activity centre and the time that must be invested in the individual activities (if used):

	In Time	Number of Members	Skating	Soft ball	Steam Bath
Males	7.30 a.m.	200	90 minutes	75 minutes	20 minutes
Females	8.30 a.m.	160	60 minutes	40 minutes	15 minutes
Children	9.00 a.m.	220	60 minutes	90 minutes	N.A
Capacity			250	120	30

All members are divided into three categories based on their age and sex as males, females and children. All members report at the In-time and all of them do skating first. Members are entitled to use the specialties via. skating, softball or steam bath according to the first-come, first-served basis and the availability of space in that particular activity centre.

For example: All males (200) whose in-time is time is 7.30 a.m. are allowed to skate as the capacity of the skating centre is 250. When the females report at their in-time (8.30 a.m.) there are only 50 places available in the skating centre. So, the rest of the 110 females wait till it becomes available.

The additional information is given as below:

Directions for questions 15 to 16: *Read the following passage and solve the questions based on it.*

There are five identical looking boxes containing different objects in each of them and every box has a label indicating its contents. The following table shows the correct description of the contents and the label on each box:

Contents	Label
Two Pins	PP
Two Balls	BB
Two Clips	CC
One Pin and one Clip	PC
One Ball and one Clip	BC

- 15.** Somebody has mischievously interchanged these labels in such a way that no box carries the correct label describing its contents.

How many of the following statement/s is/are definitely true?

- 16.** Out of the five given boxes, three of the boxes have got their labels interchanged. It is also known that the boxes with the right labels contain at least one pin or at least one ball inside it. In how many ways can the labels be put on the five boxes satisfying the above given conditions?

Directions for questions 17 to 22: Read the following passage and solve the questions based on it.

Transparency International is UN watch-dog which gives ranks to all the member countries of the UN in terms of the corruption level in the government machinery. There are 190 member countries of the UN since its establishment in 1945 and all of them are awarded the ranks which are valid for a particular year. The lower the rank, the less corruption infested the country is. And the higher the rank, the more corrupt the country is.

In the following table, the ranks of ten countries for three consecutive years are given. A positive change shows that the ranking has improved over the previous year and a negative change shows that the ranking has worsened over the previous year.

Table 1

Rank in 2006	Change over 2005	Country	Change over 2004
51	+3	Sri Lanka	-5
52	+4	Zambia	-3
53	+6	New Zealand	-7
54	-2	Tango	-3
55	+2	Austria	-3
56	-1	Hungary	+4
57	A	Australia	D
58	B	Kenya	E
59	C	Mozambique	F
60	Zero	UAE	NA

Somehow the data for Australia, Kenya and Mozambique are missing from the table. NA indicated that the country was not in the list of the given ranks in that particular year.

Directions for questions 23 to 25: *Read the passage below and solve the questions based on it.*

Five friends—Amar, Binit, Charu, Deeksha, Eshwar, went to a fair. At a shooting stall there are three things to be shot—balloons, coins and needles. The number of

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balloons shot are 1, 4, 5, 6 and 8, while the number of coins shot are 0, 1, 2, 4 and 6. Following details are available:

- (i) The number of coins shot by Amar is three times the number of coins shot by the person who shot 4 balloons.
- (ii) Three persons including the one who shot four coins, did not shoot any needle.
- (iii) Binit did not shoot any needle.
- (iv) The one who shot one balloon did not shoot any needle or coin. It is also known that he was not Charu.
- (v) Deeksha shot balloons and coins but no needle.
- (vi) Charu shot half as many coins as the person who shot twice as many balloons as he did.
- (vii) Eshwar shot two more balloons than Amar, but Amar shot two more coins than Eshwar.

23. Which of the following is true?

- (a) Charu shot 8 balloons and 4 coins but no needle.
- (b) The person who shot 5 balloons and one coin did not shoot any needle.
- (c) The person who shot an equal number of balloons and coins also shot needles.
- (d) The person who shot 4 balloons and 2 coins also shot needles.

24. Who shot an equal number of coins and balloons?

- (a) Amar
- (b) Binit
- (c) Charu
- (d) Deeksha

25. Which of the following is true?

- (a) Deeksha shot 5 balloons
- (b) Amar shot 8 balloons
- (c) Eshwar shot 1 balloon
- (d) Eshwar shot 6 balloons

ANSWER KEYS

- | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|
| 1. (a) | 2. (b) | 3. (c) | 4. (c) | 5. (b) | 6. (d) | 7. (a) |
| 8. (b) | 9. (a) | 10. (d) | 11. (d) | 12. (a) | 13. (d) | 14. (c) |
| 15. (b) | 16. (d) | 17. (b) | 18. (c) | 19. (b) | 20. (d) | 21. (a) |
| 22. (c) | 23. (a) | 24. (a) | 25. (a) | | | |

HINTS AND EXPLANATIONS

1 to 6

- 1. All option after than option (a) violates at least 1 condition.
- 2. If he did not pack hankerchief, he can take hat, tie & T-shirt with him. So, the maximum number of different types of clothing is 3.
- 3. If he packs hankerchief, then there must be at least 2 of them. So, the statement of option (c) must be false.

4. If he choose tie, he cannot choose hankerchief, so there will be loss of 2 item as hankerchief must be at least 2, if they are packed. So, he did not pack ties.
5. For minimum he can choose hat & then there will be only 1 type of clothing (as there is no condition for hat).

For maximum, there could be 2 hankerchiefs, 1 belt, 1 jacket, 1 vest, T-shirt & hats (no tie). So, for maximum there can be 6 different types of clothing.

So, correct answer is (1, 6).

6. As there is no vest, so there is possibility of no hankerchief & there cannot be any jacket. With belt, there must be hankerchiefs. So, we can choose option (d) only.

7 to 9

Five categories of the managers are:

- (1) Production (P)
- (2) Marketing (M)
- (3) Human (H)
- (4) Finance (F)
- (5) Management Information System (MIS)

Number of men = 3 and number of women = 2.

F will always sit next to a woman hence he is a male. The production manager is a male.

7. If H is a male:

Male – H, F, P

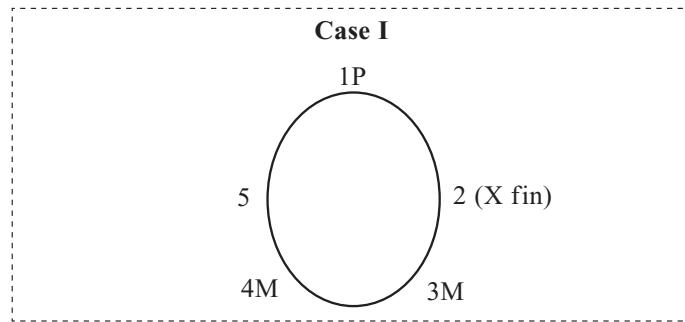
Female – M, MIS

As M herself is a woman so she cannot sit between the two women.

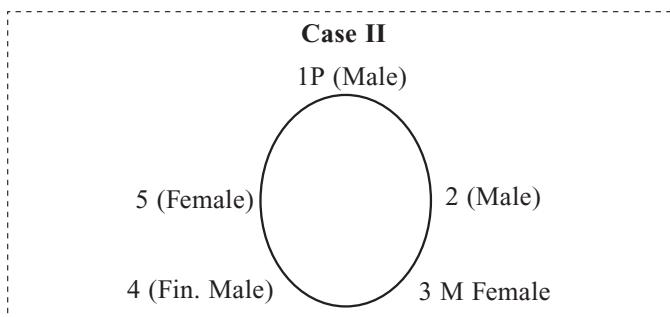
The statement in option (a) is definitely not true

Hence, the answer is option (a).

- 8.



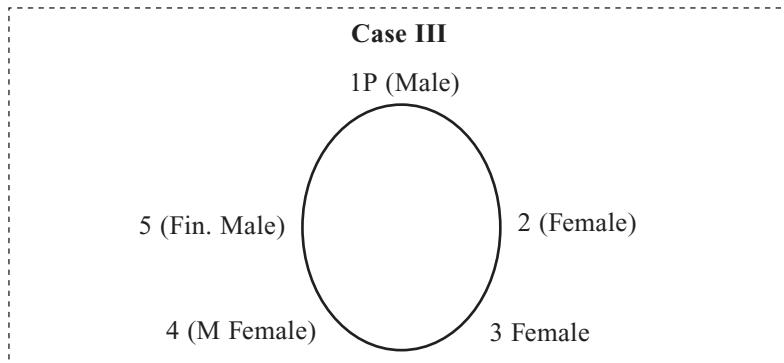
Look at the above figure, finance (F) cannot be at the second position as he always has a woman to his right whereas P i.e., production manager is a man.



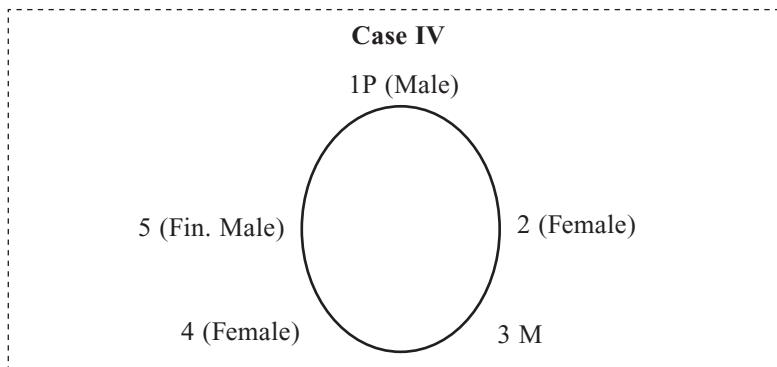
Assuming F is at the 4th position. Now M should be at the 3rd position because

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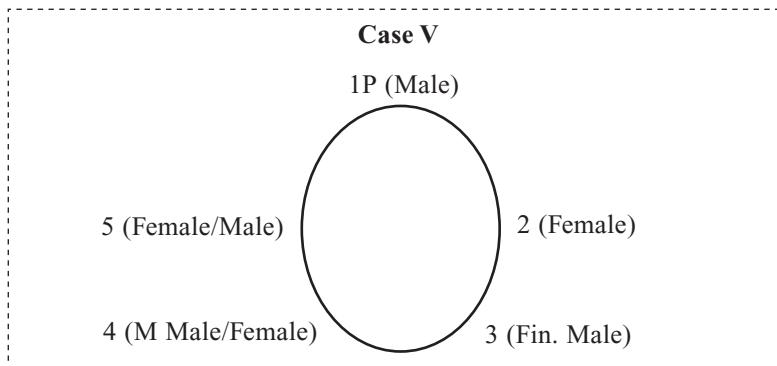
P should be seated as far as possible from M. Now M is a female as M is at the right of F. So 2nd position is occupied by a male as females cannot sit together. So the 5th position is occupied by a female. This is the 1st way.



When F is at the 5th position and the 4th position is occupied by M who is female because she is on the right of F. Therefore, the 2nd position is occupied by a female and the 3rd is occupied by a male. This is the 2nd way.



Not possible.



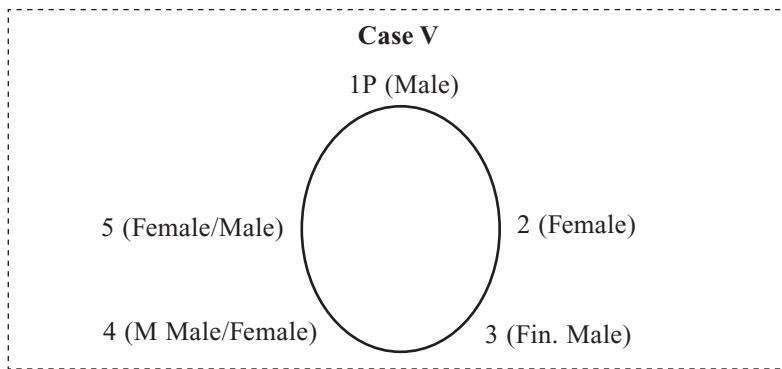
When F is at the 3rd position, the 2nd is occupied by a female. Now the 4th position is occupied by M who can be a male/female. But we can take a case from here in which M is a female. In that case the 5th position is occupied by a male.

This is the 3rd way.

Hence, in all, three arrangements are possible.

So, the answer is option (b).

9. We can solve by negating the options given:



If MIS is a female and M is at the 4th position then the 3rd position can be occupied by F who is a male and the 2nd position by H who can be a female. So the condition III negated that H has to be a woman.

Now, let us see another case where H is a male. Now the 2nd option also gets negated that H has to be a female.

Therefore the answer is (I) only. Hence the option (a) is the correct answer.

10 to 14

	N1	Skating			N2	Soft ball			N3	Steam Bath			
	In=R	Entry	Exit		R	Entry	Exit		R	Entry	Exit		
Males	200	7.30	7.30	9.00	100	9.00	9.00	10.15	20	10.15	10.15	10.35	
	50	8.30	8.30	9.30		20	9.30	9.30	10.10	5	10.15	10.25	10.45
					10	9.30	10.10	10.50	10	10.10	10.10	10.25	
Females					10	10.10	10.10	10.50	5	10.50	10.50	11.05	
	110	8.30	9.00	10.00					5	10.50	10.50	11.05	
					56	10.00	10.15	10.55					
									20	10.55	10.55	11.10	
	90	9.00	9.00	10.00	44	10.00	10.15	11.45	8	10.55	11.05	11.20	
					1	10.00	10.50	12.20					
Kids		9.00	9.30	10.30	19	10.30	10.50	12.20					
	50				6	10.30	10.55	12.25					
	80	9.00	10.00	11.00	40	11.00	11.00	12.30					

10. For 40 children (at the bottom of the table) the waiting time is zero. Hence, option (d) is correct.

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11. A total of 20 males go through all the three centers in the minimum possible time. At 7.30 a.m. they enter the centre and at 10.35 a.m. they exit from the steam bath centre. Hence, 10% of the males took the minimum possible time. Therefore, option (d) is correct.
12. A total of 10 women took the minimum time (at 8.30 a.m. they enter and at 10.25 a.m. they exit from the steam bath centre). Similarly, 8 females took the maximum time (at 8.30 a.m. they entered whereas at 11.20 a.m. they exit from the steam bath centre). So, the difference between the maximum and the minimum is $10 - 8 = 2$. Hence, the option (a) is correct.
13. The maximum time taken by any male (5) is 135 minutes (from 7.30 a.m. to 10.45 a.m.). The maximum time taken by a female (8) is 170 minutes (8.30 a.m. to 11.20 a.m.) which is greater than the maximum time taken by any male. Hence, option (d) is correct.
14. At 9 a.m. all the males will be out of the skating centre and the only people inside the centers will be females. The total number of females inside the skating activity centre at 9 a.m. = 160. Hence, 90 more members can be accommodated inside. So, $(220 - 90)$ 130 children will be waiting.

15 to 16

15. Only statements I and II are definitely true.
16. The correct ones should be either PP + BB, or, PP + BC, or, BC + PC.

17 to 22**17.**

2006	2005	Country	2004
57	A	Australia	D
58	B	Kenya	E
59	C	Mozambique	F

The possible ranks for these three countries in 2005 = 51/53/58.

The minimum difference will occur if the signs of the change (+ or -) for these three countries are the same.

57	51	Australia
58	58	Kenya
59	53	Mozambique

Hence, net change = 12

Alternatively, for minimum change = Sum of ranks in 2006 – sum of ranks in 2005 = $(57 + 58 + 59) - (51 + 58 + 53) = 12$.

18.

57	51	Australia	60
58	53	Kenya	58
59	58	Mozambique	56

Hence, the maximum value of D + E + F = $9 + 5 + 2 = 16$

19.

57	51	Australia	56
58	53	Kenya	57
59	58	Mozambique	58

Min value of D + E + F = 9

20. Cannot be determined because the ranks in 2005 and 2004 can be interchanged to give different answers.
21. The ranks available for 2004 = 56/57/58/60. Obviously the ranks 57 and 58 can be given to Australia and Kenya in 2006 as well as 2004. Hence, the difference = 0.
22. Since the question asks for possibility, we will have to see all the different options possible.

Ranks available for 2005 = 51/53/58 and

Ranks available for 2004 = 56/57/58/60.

We can see that rank 58 is available for both the years 2004 and 2005. The same rank can be given to Kenya during the whole given period.

23 to 25

We can make table for this arrangement with 5 rows (1 for each friend) & 4 columns showing their names, & number of balloons, coins & needles shot by them. The number of balloons shot are 1, 4, 5, 6 & 8 while the number of coins shot are 0, 1, 2, 4 & 6.

The number of coins shot by Amar is 3 times the number of coins shot by the person who shot 4 balloons. So, Amar must have shot 6 coins & the person who shot 4 balloons must have shot 2 coins. The information about Amar can be shown in 1st row & about other person in 2nd row

The person who shot 1 balloon did not shoot any needle or coin & he was not Charu. This information can be filled in 3rd row

Eshwar shot 2 more balloons & 2 less coins than Amar. So, he must have shot 4 coins. There is only 1 possibility for numbers of balloons shot by them & it is 6 & 8 balloons by Amar & Eshwar. This information can be filled in 4th row

The person who shot 4 coins did not shoot any needle, so Eshwar did not shoot any needle. The table obtained is as:

Name	No. of balloons	No. of coins	No. of needles
Amar	6	6	
	4	2	
Charu	1	0	0
Eshwar	8	4	0

Charu shot half as many coins as the person who shot twice as many balloons as he did. So, the other person must have shot exactly twice as many balloons & coins as Charu. The only possibility is that the other person is Eshwar & Charu is person in row 2nd. Deeksha shot balloons & coins but not needle, so must be in row 5th with 5

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balloons & 1 coin & 0 needle. The 3rd row must have Binit. The number of needles shot by Amar & charu must not be 0

Name	No. of balloons	No. of coins	No. of needles
Amar	6	6	Non-zero
Charu	4	2	Non-zero
Binit	1	0	0
Eshwar	8	4	0
Deeksha	5	1	0

23. Charu shot 4 balloons & 2 coins & shot some needles too. So, statement in option (a) must be wrong. So, correct option is (a)
24. Amar shot 6 balloons & 6 coins. So, Amar shot an equal number of coins & balloons
25. Deeksha shot 5 balloons. So, option (a) is correct

PRACTICE EXERCISE 5

Directions for questions 1 to 6: Read the following passage and solve the questions based on it.

Looking upon the influx of high profile and sensitive cases in the Supreme Court. The CJI has decided that each case will be heard on a day to day basis by making a group of judges out of seven senior judges—Bindra, Goel, Kalyan, Mahajan, Deshbandhu, Raheja and Sinha. However all the judges need to serve on the panels collectively. They can serve either alone or in groups together, consistent with the following conditions:

- (i) Bindra serves on every panel that Kalyan serves on.
 - (ii) Kalyan serves on every panel that Sinha serves on.
 - (iii) Mahajan serves on every panel that Raheja does not serve on.
 - (iv) If Bindra serves on a panel then neither Goel nor Mahajan serve on that panel.
1. Which one of the following could be a complete list of the judges who serve together on one panel?
 - (a) Goel, Kalyan, Raheja, Sinha
 - (b) Goel, Mahajan, Deshbandhu, Raheja
 - (c) Bindra, Kalyan, Mahajan, Deshbandhu
 - (d) Bindra, Deshbandhu, Raheja, Sinha
 - (e) Goel, Kalyan, Deshbandhu, Sinha
 2. What is the maximum number of judges who could serve on a panel that Raheja does not serve on?
 - (a) Two
 - (b) Three
 - (c) Four
 - (d) Five
 - (e) Six
 3. If exactly three judges serve together on a panel, then each of the following must be true except
 - (a) Bindra and Kalyan both serve on the panel.
 - (b) Raheja and Deshbandhu both serve on the panel.
 - (c) Deshbandhu and Mahajan both serve on the panel.
 - (d) Kalyan and Deshbandhu both serve on the panel.
 - (e) Goel and Raheja both serve on the panel.
 4. If Sinha and Deshbandhu serve together on a panel, then exactly what would be the size of the panel?
 - (a) One
 - (b) Two
 - (c) Three
 - (d) Four
 - (e) Five
 5. If Goel and Deshbandhu serve on a panel together, then which one of the following must be true?
 - (a) Sinha does not serve on the panel
 - (b) Bindra also serves on the panel
 - (c) Raheja also serves on the panel
 - (d) Kalyan also serves on the panel
 - (e) Mahajan does not serve on the panel
 6. What is the largest possible size of the panel?
 - (a) 4
 - (b) 5
 - (c) 6
 - (d) 5 or 6
 - (e) Cannot be determined

Directions for questions 7 to 11: Read the following passage and solve the questions based on it.

There are seven friends—A, B, C, D, E, G and H at a B-School. They specialize in exactly one of the two areas: Marketing or Systems. The students choose their specialization in accordance with the following:

- (i) If D specializes in Systems then B specializes in Marketing.
- (ii) If E specializes in Systems then H and A both specialize in Marketing.
- (iii) G does not choose the same specialization as D.
- (iv) If C specializes in Systems, then B also specializes in Systems.

7. Which one of the following could be a complete and accurate list of students who specialize in Systems?
 - (a) D, E, C
 - (b) H, A, G
 - (c) B, H, C
 - (d) B, A, G, C
 - (e) D, B, H, G
8. If D specializes in Marketing then which one of the following must not be true?
 - (a) E specializes in Marketing
 - (b) G specializes in Marketing
 - (c) B specializes in Systems
 - (d) C specializes in Systems
 - (e) H specializes in Systems
9. If H and G both specialize in Systems, then which one of the following could be true?
 - (a) E and A both specialize in Marketing
 - (b) C and A both specialize in Systems
 - (c) D and A both specialize in Marketing
 - (d) B and C both specialize in Systems
 - (e) D and E both specialize in Systems
10. What is the maximum number of friends who could specialize in Systems?
 - (a) 2
 - (b) 3
 - (c) 4
 - (d) 5
 - (e) 6
11. Which one of the following is a pair of friends who cannot specialize in Marketing together?
 - (a) H and G
 - (b) D and B
 - (c) D and G
 - (d) H and A
 - (e) B and G

Directions for questions 12 to 15: *Read the following passage and solve the questions based on it.*

King Amitabh of Bollysteel organized initials to decide the groom for his daughter in two steps—The preliminary stage and the final stage. The preliminary stage comprised of a written test whereas in the final stage there was an archery competition. The archery competition consisted of five rounds wherein the contestants could score from 2 to 9 points in each round. The prince who scored the maximum points in these five rounds would be considered the winner in the overall standing and would marry the princess.

When the results of the preliminary stage were announced, it was found that only five princes—Shikari, Bhikhari, Atyachari, Juari and Hazari, qualified the preliminary stage and hence these were the only contestants left to complete in the final stage.

During the final stage, however, the inilats who was tabulating the scores of the princes started taking sporadic short naps and so at the end, when King Amitabh asked for the score-card to find out the final winner, he was presented the following Table:

	1st Round	2nd Round	3rd Round	4th Round	5th Round
Shikari	9		8		3
Bhikhari		2	3		
Atyachari	2	9	4	8	
Juari	4	6		5	8
Hazari		3			9

However, the initials has made the following observations too:

- (i) No two princes had scored equally in any round.
 - (ii) The difference between the total points scored by Prince Shikari and Prince Juari was 6 points.
 - (iii) Prince Bhikhari's total points were always greater than that of Prince Atyachari's total points.
 - (iv) Prince Shikari scored an even number of points both in the 2nd and the 4th rounds.
 - (v) Each of the five princes scored greater than or equal to 24 points in the five rounds.
 - (vi) There was tie between any two princes in their overall points.
12. Prince Juari won the competition and married the Princess. Also, Prince Bhikhari scored 28 points from the five rounds. Then which of the following could be false?
- (a) Prince Atyachari scores more points than Prince Hazari in round 4
 - (b) Prince Shikari scores more points than Prince Hazari in round 2
 - (c) Prince Bhikhari scores more points than Prince Hazari in round 1
 - (d) Prince Juari scores more than Prince Shikari in round 3
 - (e) None of these
13. If Prince Juari scores 5 points in the 3rd round and Prince Atyachari scores 4 points in the 5th round, then which of the following will definitely be false?
- (a) Prince Shikari is 1st in the overall standing
 - (b) Prince Hazari is 2nd in the overall standing
 - (c) Prince Atyachari is 3rd in the overall standing
 - (d) Prince Juari is 4th in the overall standing
 - (e) None of these
14. If Prince Hazari scores 2 points in the 3rd round. Then, which of the following statements is sufficient to decide the winner?
- I. Prince Atyachari scores the maximum possible points in the 5th round.
 - II. Prince Juari scores the maximum possible points in the 3rd round.
- (a) Only I
 - (b) Only II
 - (c) I and II
 - (d) Even I and II together are not sufficient to decide the winner
 - (e) Using either I or II will be sufficient to decide the winner
15. If Prince Atyachari scores 5 points in the 5th Round but Prince Hazari becomes the winner with the least possible total points, then what is the least possible points scored by Prince Hazari in the 3rd round?
- (a) 5
 - (b) 6
 - (c) 7
 - (d) 8
 - (e) Cannot be determined

Directions for questions 16 to 17: Read the following passage and solve the questions based on it.

There are seven persons—I, J, K, L, M, N and O in a family. They have one set each of the following three games—cards, baseball and tag.

Following are the details pertaining to the games that they play among themselves:

- (i) Each person must play exactly two out of the three games.
- (ii) I must play cards.
- (iii) K must play tag.
- (iv) N must play baseball.
- (v) M must play both games which I plays.
- (vi) O must play both games which L plays.
- (vi) Cards must be played by either 3 or 4 persons
- (vii) Baseball must be played by either 4 or 6 persons
- (ix) Tag can be played by any number of persons as long as there are a minimum of 2 persons.

16. If K plays the same two games as N plays, then which of the following is not true?

- (a) I plays cards
- (b) N plays cards
- (c) K plays baseball
- (d) N plays tag
- (e) None of these

17. If I and N play tag and four persons play cards, then the persons playing cards besides I and M are necessarily one of the following options.

- (a) J and K
- (b) J and N
- (c) K and N
- (d) K and O
- (e) None of these

Directions for questions 18 to 20: Read the following passage and solve the questions based on it.

- (i) In a newly constructed market, six shops on a floor in two rows facing North and South are allotted to U, V, W, X, Y and Z, not necessarily in that order. The number of shops in both the rows are equal in number.
- (ii) V gets a North-facing shop and is not next to X.
- (iii) W, which is next to Z gets a South-facing shop and Y gets a North-facing shop.

18. If X and Z get diagonally opposite shops and both these shops can never be at the extremes, then in how many ways can the allotments of the shops done?

- (a) 2
- (b) 4
- (c) 6
- (d) 8
- (e) None of these

19. In the above question, whose shop is between V and X?

- (a) Z
- (b) Y
- (c) W
- (d) U
- (e) Cannot be determined

20. In Q. 18, the shops of which other pairs, apart from X and Z are diagonally opposite to each other?

- (a) U and Y
- (b) V and U
- (c) V and W
- (d) Y and X
- (e) None of these

Directions for questions 21 to 25: Read the following passage and solve the questions based on it.

During the Doha Asian Games 2006, the following teams played in the soccer event—Afghanistan, Nepal, Pakistan, India, South Korea and Bangladesh. In the event, each team played with every other team exactly once.

The following was the scoring pattern of the event:

- (i) Each win gave three points to the winning team
- (ii) Each draw gave one point to each of the teams
- (iii) There was no point for a loss.

Following was the table of the points at the end of all the matches in the soccer event. The table showed the ranks of the teams in terms of points scored by them in the decreasing order of their total points.

Some information had been deliberately kept on hold due to certain reasons which were not to be made public. Even the results of the matches were not declared.

However, on public demand the result of only one match, which was played between India and Pakistan, was declared. It was announced that Pakistan had beaten India.

It was also given that no two teams finished with the same number of points.

For the sake of convenience, all the teams were denoted by their initials only.

Table 1

Position	Team	Won	Drawn	Lost	Goals For	Goals Against	Total points
1	A				17	5	15
2	N				9	6	10
3	P					2	8
4	I				2	5	
5	S K				7	11	2
6	B				8	16	

21. Which of the following matches was a draw?
 - (a) I vs N
 - (b) I vs S K
 - (c) B vs N
 - (d) B vs S K
 - (e) None of these
22. What was the total number of points scored by I?
 - (a) 3
 - (b) 5
 - (c) 6
 - (d) 7
 - (e) Cannot be determined
23. Find the total number of goals scored in the match between N and P.
 - (a) 3
 - (b) 2
 - (c) 0
 - (d) 4
 - (e) Cannot be determined
24. The number of goals scored by A against I could be at the most
 - (a) 2
 - (b) 3
 - (c) 4
 - (d) 5
 - (e) 6
25. For how many teams could we determine the total points?
 - (a) 4
 - (b) 5
 - (c) 6
 - (d) 5 or 6
 - (e) Cannot be determined

ANSWER KEYS

- | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 1. (b) | 2. (b) | 3. (d) | 4. (e) | 5. (a) | 6. (b) | 7. (b) |
| 8. (b) | 9. (a) | 10. (c) | 11. (c) | 12. (c) | 13. (c) | 14. (b) |
| 15. (c) | 16. (b) | 17. (a) | 18. (b) | 19. (b) | 20. (a) | 21. (d) |
| 22. (c) | 23. (c) | 24. (b) | 25. (c) | | | |

HINTS AND EXPLANATIONS**1 to 11**

- The option (a); (c); (d) & (e) contradicts at least 1 of the given 4 conditions.
So, correct option is (b)
- As Raheja is not in the panel, so there must be Mahajan. Now, Bindra cannot serve on this panel & so Kalyan too cannot serve the panel. Further, Sinha too cannot serve the panel. So, there can be maximum 3 judges to serve the panel who are Mahajan, Goel & Deshbandhu.
- If we have Kalyan on panel, we must also have Bindra & Sinha too. So, if Kalyan & Deshbandhu are there on panel, there must be at least 4 on the panel. So, statement of option (d) is not true.
- If Sinha serve on a panel, Kalyan will also serve the panel. Now, Bindra will also be there. As there is Bindra, so Goel & Mahajan cannot serve the panel. Raheja can also be added. Deshbandhu is already in the panel. So, there are total 5 members in the panel.
- If there is Goel, we cannot have Bindra, Kalyan or Sinha. So, option (a) is correct.
- There are 2 condition based on Bindra. So, we can make 2 cases of including & excluding him. If we include Bindra there can be 5 members & if we exclude him, there can be 3.
- Only option (b) do not contradict any of the given 4 conditions. All other option contradicts at least 1 condition.
- As G do not choose the same specialization as D, so G cannot specialize in the marketing. Correct option is (b).
- As H specializes in system, so E must not have taken system for the specialization. So, the specialization of E is marketing. So, option (a) could be true.
- G, C, B, E & D could specialize in systems while H & A can do specialization in marketing. So, maximum 5 friends could specialize in systems.
- D & G cannot choose same specialization as per condition (iii).

12 to 15

- Shikari-Juari = 6. Prince Shikari and Prince Juari will always have a difference of 6 points in their overall points. Though any one of them may have 6 points more than the other.
- Considering the overall points, Bhikhari > Atyachari.

- Also Prince Shikari scores 4/8 point in the 2nd round and 2/4/6 points in the 4th round.

We can conclude the following:

12. If Prince Juari wins the competition and marries the princess and Prince Bhikhari scores 28 points from the given 5 rounds, then the table will be as given below:

Table 2

Prince	1st Round	2nd Round	3rd Round	4th Round	5th Round	Total
Shikari	9	4	8	2	3	26
Bhikhari	7	2	3	9	7	28
Atyachari	2	9	4	8		
Juari	4	6	9	5	8	32
Hazari		3			9	

If Shikari has scored points in the 2nd and the 4th rounds then the score of Juari should be 32 (i.e., 6 more). And in this case Juari has to score 9 points in the 3rd round.

Option (a), (b) and (d) will definitely be true for all cases. Only statement (c) could be false.

Hence, the correct option is (c).

13.

Prince	1st Round	2nd Round	3rd Round	4th Round	5th Round	Total
Shikari	9	8	8	6	3	34
Bhikhari	7	2	3	9	7	29
Atyachari	2	9	4	8	4	27
Juari	4	6	5	5	8	28
Hazari		3			9	

Since, The total points scored by Juari are 28 so, Shikari will score a total of 34 points. So, he must have scored 8 points in the 2nd round and 6 points in the 4th round. Also, Prince Atyachari has scored a total of 27 points. Hence, Prince Bhikhari must score 29 points (as there are no ties) so Bhikhari scores 8,9,7 points respectively from the 1st, 4th and the 5th rounds. As it can be clearly seen from the table that Atyachari is fourth or fifth even though we do not know about Hazari's score.

So, option (c) is the correct answer.

14. According to statement I, Prince Atyachari can score a maximum of 5 points in the 5th round which make his total points 28. As Prince Bhikhari can score a maximum of 29 points and Atyachari's score is always less than Bhikhari's score we get table as given below:

Table 3

Prince	1st Round	2nd Round	3rd Round	4th Round	5th Round	Total
Shikari	9		8	6		
Bhikhari	8	2	3	9	7	29
Atyachari	2	9	4	8	5	28
Juari	4	6		5	8	
Hazari		3	2		9	

According to statement II, Juari scores the maximum possible point which is 9 in the 3rd round. Then his total will be 32. Also, Hazari can score a maximum of 30 points if he scores 7 points each in the 1st and the 4th rounds. So, Juari will always be the winner with a total of 32 points.

Prince	1st Round	2nd Round	3rd Round	4th Round	5th Round	Total
Shikari	9	4	8		2	26
Bhikhari	8	2	3	9	7	29 (max)
Atyachari	2	9	4	8	4	28 (max)
Juari	4	6		5	8	32
Hazari		3		7	9	

Hence, statement II alone is sufficient to answer the question.

Therefore, option (b) is the answer.

15.

Prince	1st Round	2nd Round	3rd Round	4th Round	5th Round	Total
Shikari	9		8		3	26
Bhikhari	8	2	3	9	7	29 (max)
Atyachari	2	9	4	8	5	28 (max)
Juari	4	6		5	8	32
Hazari	7	3		7	9	

The minimum score required by Hazari to win is 33 points. When Prince Atyachari scores 5 points in the 5th round, then the total points scored by him are 28. So, Prince Bhikhari must score more than 28 points. But taking into consideration the given table, Prince Bhikhari can score a maximum of 29 points if he scores 8, 9, 7 points in the 1st, 4th and the 5th rounds respectively. But, one among Juari and Shikari will at least score 32. And Hazari can score a maximum (for the 3rd round to be minimum) of 7 points each in the 1st and the 4th rounds. So, the least possible points scored by Prince

Hazari in the 3rd round = $33 - (7 + 3 + 7 + 9) = 7$ which makes his total score as 33.

Therefore, option (c) is the answer.

16 and 17

On the basis of the given information, we can make the following table:

Cards	Tag	Baseball
I		
M	K	N

16. If K plays the same two games as N plays, this means that K and N will play tag and baseball. Therefore options (a), (c) and (d) are true and option (b) is false.
17. I and N play tag and the fourth condition says that N must play baseball. Since no player can play more than two games, N cannot be one of the other two other persons playing cards. So options (b) and (c) are ruled out.

Option (d) cannot be the answer because O and L have to play together. Therefore option (a) is the correct answer.

18 to 20

There are six shops U, V, W, X, Y and Z arranged in two rows such that the number of shops in both the rows are equal in number.

18. Using the given statements, we can conclude that:

North-facing shop: X, Y, V

South-facing shop: W, Z, U

Hence, there are four arrangements possible.

U	Z	W
V	Y	X

OR,

U	Z	W
X	Y	V

OR,

W	Z	U
V	Y	X

OR,

W	Z	U
X	Y	V

Hence, option (b) is the answer.

19. The shop between V and X is Y.

Hence, the answer is option (b).

20. It can be seen that diagonally opposite to each other are U and Y.

Hence, the answer is option (a).

21 to 25

There are total 6 teams & each team played with every other team exactly once. So, there were total 15 matches. Each team played 5 games. The teams got 3, 1 & 0 points for win, draw & loss. The table given is incomplete which is as

Position	Team	Won	Drawn	Lost	Goals For	Goals Against	Total Points
1	A				17	5	15
2	N				9	6	10
3	P					2	8
4	I				2	5	
5	SK				7	11	2
6	B				8	16	

The goals for & goals against for all 6 teams must be equal, so the number of goals for P must be 2. A got 15 points, so it has won all 5 matches (with 0 lost or drawn). N got 10 points, so it must have won 3 games & 1 must be drawn while it lost 1 game. In a similar way we can conclude that P won 2 games, while it lost 1 & 2 were drawn. SK lost 3 games, 2 were drawn & it did not win any game. For teams I & B, it cannot be clearly found. We know I lost from P & A won all 5 games, so I must have at least 2 losses. As B got 5th position, so it must have got 0 or 1 point.

Case 1: If B got 0 point: It must have lost all 5 games with 0 win & drawn. Then possibilities for I are:

1st scenario for I: 0 win, 0 loss & 5 drawn & 5 points- Not feasible as A has no drawn.

2nd scenario for I: 1 win, 1 loss & 3 drawn & 6 points- not feasible as I must have at least 2 loss (1 from A as it has won all 5 matches & 1 from P, as it is given information).

3rd scenario for I: 2 win, 2 loss & 1 drawn & 7 points- it seems feasible with 12 matches in win-loss & 3 in draws.

This (case 1- 3rd scenario) gives following table:

Position	Team	Won	Drawn	Lost	Goals For	Goals Against	Total Points
1	A	5	0	0	17	5	15
2	N	3	1	1	9	6	10
3	P	2	2	1	2	2	8
4	I	2	1	2	2	5	7
5	SK	0	2	3	7	11	2
6	B	0	0	5	8	16	0

In this possible scenario, I lost 2 matches which must be won by P & A. N must have lost match against A. It must have won against P, SK & B. It must have drawn with I. Now, A & B have 0 draws, while N & SK have 2 draws, but It is not possible as it shows 2 draw matches between them, while they played with each other just once. So, this scenario is not feasible.

Case 2: If B got 1 point: It must have lost 4 games with 0 win & 1 drawn. Then possibilities for I are:

1st scenario for I: 0 win, 1 loss & 4 drawn & 4 points- not feasible as I must have at least 2 losses (1 from A as it has won all 5 matches & 1 from P, as it is given information).

2nd scenario for I: 1 win, 2 loss & 2 drawn & 5 points- it seems feasible with 11 matches in win-loss & 4 in draws.

3rd scenario for I: 2 win, 3 loss & 0 drawn & 6 points- it seems feasible with 12 matches in win-loss & 3 in draws.

Case 2: 2nd scenario gives following table:

Position	Team	Won	Drawn	Lost	Goals For	Goals Against	Total Points
1	A	5	0	0	17	5	15
2	N	3	1	1	9	6	10
3	P	2	2	1	2	2	8
4	I	1	2	2	2	5	5
5	SK	0	2	3	7	11	2
6	B	0	1	4	8	16	1

But in this case, P & N both can have only 1 loss against A. Now, I lost against A & P. So, I must have drawn against N. Further, match between N & P must been drawn. So, there must be 2 draws for N. But, N can have only 1 draw match. So, this scenario is not feasible

Case 2: 3rd scenario gives following table:

Position	Team	Won	Drawn	Lost	Goals For	Goals Against	Total Points
1	A	5	0	0	17	5	15
2	N	3	1	1	9	6	10
3	P	2	2	1	2	2	8
4	I	2	0	3	2	5	5
5	SK	0	2	3	7	11	2
6	B	0	1	4	8	16	1

In this case I lost 3 matches, which must be from A, P & N (it is clear I lost to P & A, it lost to N as SK & B won no match, so it can lose 3rd match from N only) & won 2 matches against SK & B. P lost just 1 match which must be against A, so its match with N must been a draw. The 2nd draw for P must been with SK, else SK will left alone with 2 draws. So, match between P & SK was draw & P won from I & B. N won from I, SK & B, lost against A with a draw against P. SK lost against A, N & I, with draw with B & P. B lost 4 matches it played with A, P, N & I, its match with SK was draw.

So, A- won all 5 matches against N, P, I, SK & B, no loss, no draw

N- won against I, SK & B, lost to A, draw with P

P -won against B & I, lost to A, draw with N & SK

I- won against SK & B, lost to A, N & P, no draw

SK- no win, lost to A, N & I, draw with P & B

B- no win, lost to A, N, P & I, draw with SK

21. B vs SK was a draw
22. I has 2 win & 3 losses, so its total score is 6 points
23. P won 2 matches & it scored 2 goals in total 5 games, so the score of both the matches it won (against I & B) must been 1-0 (P scored 1 & opponent scored 0). Now, total goals against P in series are 2. But, its match with N must been a draw. It must not have scored any goal in that match. As match is a draw, so N must have also scored 0 goals in that match. So, total goals scored in P vs N match must been 0.
24. I won 2 matches & it scored 2 goals in total 5 games, so the score of both the matches it won (against SK & B) must been 1-0 (I scored 1 & opponent scored 0). Now, total goals against I in series are 5 & it lost total 3 games. If we want to maximise the goals against I in I vs A match, then goals against I in other 2 matches it lost must be minimised. So, if we assume it lost both matches with score of 0-1 (I scored 0 & opponent team scored 1). Then, A could have scored 3 (maximum possible) goals against it in A vs I match.
25. We can find total points for all 6 teams i.e. for A, N, P, I, SK & B (which are 15, 10, 8, 6, 2 & 1 respectively).

PRACTICE EXERCISE 6

Directions for questions 1 to 6: Read the following passage and solve the questions based on it.

- (i) Six businessmen from six different nations are staying in six successive in a hotel.

(ii) Each of them owns a number of cars and has donated to a number of institutions last year.

(iii) The businessman in room number 102 owns twice as many cars as the businessman who donated to 8 institutions last year.

(iv) The businessman from Uruguay and the businessman in room number 106 together own a total of 40 cars.

(v) The businessman from Argentina owns 8 cars less than the businessman from England but donated to 10 more institutions last year.

(vi) Four times the number of cars owned by the businessman in room number 104 is lesser than the number of institutions to which he donated last year.

(vii) The businessman in room number 103 owns 12 cars and donated to 8 institutions last year.

(viii) The businessman who owns 16 cars donated to 24 institutions last year.

(ix) The businessman in room number 105 owns 8 cars and donated to 2 institutions less than the businessman from Canada last year.

(x) The Brazilian businessman is staying two rooms ahead of the English businessman who is staying two rooms ahead of the Canadian businessman.

1. In which room is the Brazilian businessman staying?
(a) Room number 102 (b) Room number 103
(c) Room number 104 (d) Room number 105

2. How many institutions did the Argentinean businessman donate to last year?
(a) 8 (b) 3
(c) 18 (d) 24

3. The businessman of which country is staying in room number 106?
(a) Argentina (b) Canada
(c) Uruguay (d) Germany

4. The businessman of which country donated to 24 institutions last year?
(a) Argentina (b) Uruguay
(c) Canada (d) Germany

5. The businessman of which country owns the maximum cars?
(a) Argentina (b) Uruguay
(c) Germany (d) Brazil

6. How many cars does the English businessman own?
(a) 8 (b) 12
(c) 4 (d) 20

Directions for questions 7 to 11: Read the following passage and solve the questions based on it.

The table below represents the average price of all the cars sold in a particular year from the year 2000–2004.

Table 5

Year	2000	2001	2002	2003	2004
Average price (in ₹ thousand)	30	40	P	30	50

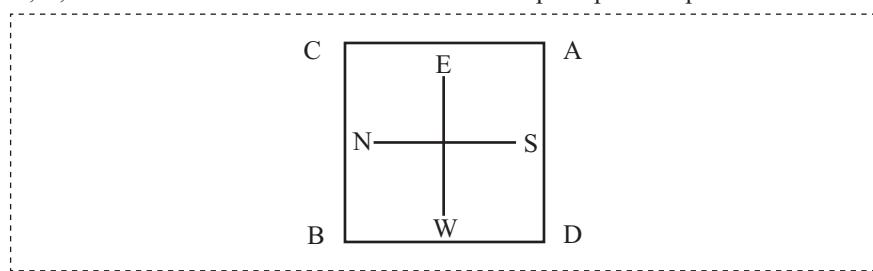
Table 6

Years	Number of cars sold
Total number of cars sold in 2000 + 2001	A
Total number of cars sold in 2001 + 2002	B
Total number of cars sold in 2002 + 2003	C
Total number of cars sold in 2003 + 2004	D
Total number of cars sold in 2004 + 2000	E

(Additional information for questions 10 to 11: Disregard table 2 for both the questions).

Directions for questions 12 to 14: *Read the following passage and solve the questions based on it.*

The following questions are based on the diagram given below, showing four persons—A, B, C and D stationed at the four corners of a square piece of plot as shown:



E – East, S – South, W – West and N – North

12. From the original position, B and D move one and a half lengths of sides clockwise and anti-clockwise respectively. Which one of the following statements is true?
- B and D are both at the mid-point between A and C
 - D is at the mid-point between A and C; and B is at the corner originally occupied by C
 - B is at the mid-point between A and C; and D is at the corner originally occupied by A
 - B and D are both at the mid-point between A and D
13. From the positions in the original figure, C and A move diagonally to the opposite corners and then one side each clockwise and anti-clockwise respectively. Where is A now?
- | | |
|------------------------------|------------------------------|
| (a) At the north-west corner | (b) At the north-east corner |
| (c) At the south-east corner | (d) At the south-west corner |
14. From the positions in the original figure, C and A move diagonally to the opposite corners and then one side each clockwise and anti-clockwise respectively. B and D move two sides each clockwise and anti-clockwise respectively. Who is now at the north-west corner?
- | | |
|-------|-------|
| (a) A | (b) B |
| (c) C | (d) D |

Directions for questions 15 to 19: Read the following passage and solve the questions based on it.

All the roads of a city are straight and perpendicular or parallel to each other. Roads A, B, C, D and E are parallel to one another. Roads G, H, I, J, K, L and M are parallel to one another.

- (i) Road A is 1 km east of road B
 - (ii) Road B is 0.5 km west of road C
 - (iii) Road D is 1 km west of road E
 - (iv) Road G is 0.5 km south of road H
 - (v) Road I is 1 km north of road J
 - (vi) Road K is 0.5 km north of road L
 - (vii) Road K is 1 km south of road M
15. Which is essentially true?
- | | |
|----------------------------------|----------------------------|
| (a) E and B intersect | (b) D is 2 km west of B |
| (c) D is at least 2 km west of A | (d) M is 1.5 km north of L |
16. If E is between B and C, then which of the following is false?
- D is 2 km west of A
 - C is less than 1.5 km from D
 - E is less than 1 km from A
 - D is less than 1 km from B
17. If road E is between B and C, then the distance between A and D is
- 0.5 km
 - 1 km
 - 1.5 km
 - 1.8 km
18. Which of the following possibilities would make two roads coincide?
- L is 0.5 km north of I
 - C is 1 km west of D
 - D is 0.5 km east of A
 - E and B are 0.5 km apart

19. If K is parallel to I and K is 0.5 km south of J and 1 km north of G, then which two roads would be 0.5 km apart?
- I and K
 - J and K
 - J and H
 - G and J

Directions for questions 20 to 23: *Read the following passage and solve the questions based on it.*

Mintu Babu lives in a smaller house than her brother. Mintu Babu lives in a larger house than her parents. Mintu Babu's children live with her. Mintu Babu has no other relatives.

20. If four females and two males live in a house smaller than Mintu Babu's brother, then, how many of Mintu Babu's children are boys and girls respectively?
- 1, 0
 - 0, 1
 - 2, 1
 - 1, 2
21. If Mintu Babu's relative U lives in a larger house than her relative S, Then, all of the following may be true except
- S is U's father
 - S is U's mother
 - U is younger to S
 - S is younger to U
22. Out of all the relatives of Mintu Babu who could possibly be either older or younger than her, none are the same age or older, then, how many of Mintu Babu's relatives must be younger than her?
- Less than 2
 - 2
 - 3
 - More than 3
23. If the number of males related to Mintu Babu equals the number of females then which of the following can be true?
- Mintu Babu has 4 children
 - Mintu Babu has 3 children
 - Mintu Babu has 1 child
 - Mintu Babu has 2 children

Directions for questions 24 and 25: *Read the following passage and solve the questions based on it.*

Three committees are formed from eight people, viz., F, G, H, I, J, K, L, and M. Two of the committees have three members and one of the committees has only two members. Certain other conditions are as follows:

- (i) G serves with M
 - (ii) L serves with only one other person
 - (iii) F does not serve with M
24. If K, J and I serve on different committees, which one of the following must be true?
- K serves with G
 - I serves on a committee of two
 - I serves on a committee of three
 - H serves on a committee of two
25. Which of the following is inconsistent with the given conditions?
- K serves with H
 - M serves with H
 - M, H and I serve together
 - F does not serve with G

ANSWER KEYS

- | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|
| 1. (d) | 2. (c) | 3. (d) | 4. (d) | 5. (b) | 6. (b) | 7. (a) |
| 8. (d) | 9. (c) | 10. (d) | 11. (c) | 12. (a) | 13. (d) | 14. (b) |
| 15. (d) | 16. (a) | 17. (d) | 18. (d) | 19. (b) | 20. (d) | 21. (d) |
| 22. (c) | 23. (b) | 24. (a) | 25. (d) | | | |

HINTS AND EXPLANATIONS**1 to 6**

From the given information:

Room	Country	Cars	Donations
101			
102			
103		12	8
104		(y)	> 4y
105		8	x - 2
106			

Here, the Brazil businessmen can stay in either room no. 105 or room no. 106. But from the options of the first question of the set, it must be 105. Let us fill the other data from it.

Room	Country	Cars	Donations
101	Canada	—	y + 2
102	Uruguay	24	
103	England	12	8
104	Argentina	4	18
105	Brazil	8	y
106	Germany	16	24

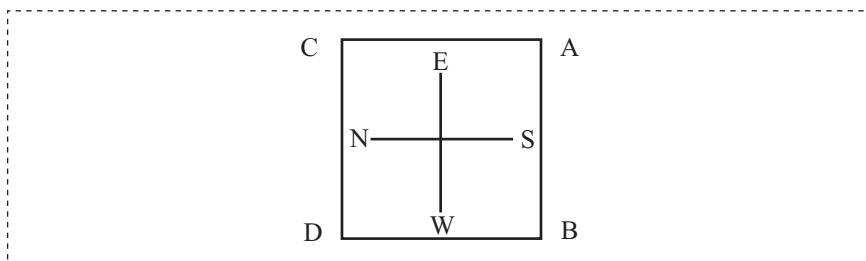
1. The Brazilian businessman is staying in room number 105.
2. The Argentinean businessman donated to 18 institutions.
3. The German businessman is staying in room number 106.
4. The German businessman donated to 24 institutions.
5. From the given options, the businessman from Uruguay owns the maximum cars.
6. The businessman from England has 12 cars.

7 to 11

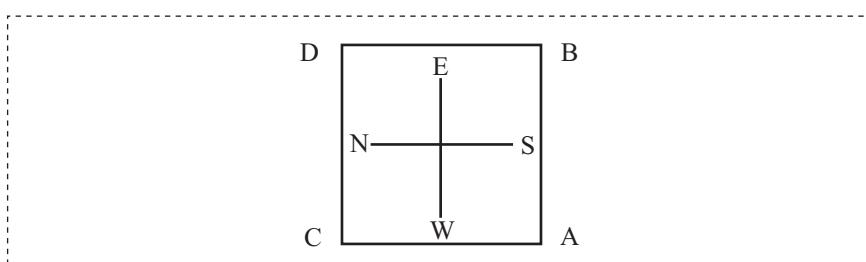
7. Using (I) if value of $P = 40$, then on two consecutive years 2001 and 2002, it has remained the same. This is only possible if the average in 2002 = 40.
 Using (II) despite the value of P not given, we can find all the other things if A, B, C, D and E are given as equal. Hence, this statement is wrong and only I is true.
8. Using I, if the value of $P = 40$, then there are two possibilities for 2002. Either all the cars have been sold for 40 itself or no car has been sold. Hence, this statement is incorrect.
 Using the given information in II we cannot find out. The average price of all the cars sold in 2002.
 Hence, none of the two statements is true.
9. We need all the unknowns to find the value.
10. Using the solution given for Q. 8, if $P = 30$ or $P = 40$ is given, we can find that either no car has been sold or all the cars have been sold at the same price. Still we have the total freedom to increase the number of cars sold in 2000 or 2004 etc. We should also not forget that using the average we cannot find out the number of articles involved.
 Hence, this cannot be determined uniquely.
11. From the given options if $P = 30$, then in 2003 no car is sold.

12 to 14

12. The position will be like this:



13. The position will be like this:



14. This is similar to the above question. B is now in north west direction.
15. By using the conditions (vi) & (vii) we can interpret that M is 1.5 km north of L. Correct option is (d).

16. B is 1 km west of A & so 1 km west of B is 2 km west of A. But D is 1 km west of E which is not at B but between B & C. So, D cannot be 2 km west of A. Correct option is (a).
17. B is 1 km west of A & C is 0.5 km west of A while D is 1 km west of E which is between B & C. So, D must be between 1.5 km & 2 km of A.
18. If E is 0.5 km east of B, then it may coincide with C as C is 0.5 km east of A. Correct option is (d).
19. In the given scenario, J & K will be 0.5 km apart of each other. Correct option is (b).

20 to 23

Mintu Babu's parents (1 M, 1 F) live in the smallest house.

Mintu Babu stays with her children in the medium house.

So, Mintu Babu's brother stays in the largest house.

20. Given that 4 females and 2 males live in smaller house, 3 females and 1 male stay in Mintu Babu's house.
Hence, Mintu Babu has 3 children (1 boy and 2 girls).
21. The only relatives of Mintu Babu are:
U, staying in the larger house, is her brother.
S, staying in the smaller house, is her father/mother.
Hence, the statement 'd' cannot be true.
22. There are 3 relatives of Mintu Babu, who must be younger than her.
23. From Q. 20, it is clear that Mintu Babu has 3 children.

24 to 25

24.

Committees	Two Members
K, G, M	I, L
J, F, H,	J, L
I, F, H	

25. Use the list of the people given above.

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PART 2

DATA INTERPRETATION

SECTION 1

UNDERSTANDING DATA INTERPRETATION

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Chapter

17

INTRODUCTION TO DATA INTERPRETATION

LEARNING Objectives

In this chapter, you will learn:

- What do we understand with data?
- What is data interpretation?
- Different ways of representing the data
- Problem solving techniques

WHAT IS DATA INTERPRETATION?

Data Interpretation is the act of transforming data with the objective of extracting useful information and facilitating conclusions on the basis of the given data. Depending upon the type of data and the questions, we might be required to apply certain statistical tools with various methods to represent the given data.

Before we move ahead to see and learn the various methods of representing data, let us understand some basics.

WHAT IS DATA?

Data is a means to represent facts, concepts or instructions in a formalized manner suitable for communication, interpretation or processing by humans or other automatic modes.

In other words, propositions like measurements or observations of a variable, which may comprise numbers, words or images can be quantified with the help of data.

Data can be a numerical or non-numerical fact and figure related to a particular social, economic or political event etc.

Let us see some examples of data:

Yesterday the Sensex closed at 14,004 points.

25% of the total population of India is below The poverty line.

In the last general elections in India, 40% of the total seats were won by regional parties. Data can be further understood to be an agent to cause the sentiments and even sometimes it can be effect also.

If the data given is distinct and separate, i.e., It can be counted (1, 2, 3....), then it is known as Discrete Data. For example, population of a country, production of cars in a manufacturing plant.

However, if the data takes any value within a finite or infinite interval, then it is known as a Continuous Variable. For example, the percentage of sugar in mangoes or weight/height etc., are continuous variables.

Significance of Organized Data

It is said, “Trust only two—God and data.” Since God cannnot be everywhere to prove a point, we have to resort to data to validate points or make inferences. The significance of data can be further illustrated by the fact that data is the basis of an argument. In fact, data is the starting point for most arguments.

2.4 Data Interpretation

However, data if not properly managed is not of much use. People at the higher echelons of any organization will have no time to go through the details of all the reports. The need for organized data becomes more pertinent because data can be used to describe a current situation with respect to its future possibility. Data can establish a relationship between different phenomenon like expenditure government in the various sectors of its annual budget vis-a-vis the priority sectors; The per capita income of different countries in relation to the number of deaths due to a particular disease.

For maximum utilization of data, it should be formatted properly for easy interpretation and deduction. However, in CAT and other B-School entrance examinations, we should not expect easy-to-comprehend data. Rather, the students should be prepared to find data which is difficult to interrelate or comprehend.

Different Ways of Representing Data

Data representation in the DI section is primarily of two types:

Narration Based

Also known as caselets, these questions often involve stories that define a situation and give details of various parameters involved; including their inter-relationships.

Example

Mittal has recently acquired four companies, viz. Bank of Bozoland (BOB), My Own Bank (MOB), Zany Obliterated Bank (ZOB) and Dogmatically Obscure Bank (DOB). He noticed that the sales of DOB are half than that of BOB, whereas, the profits of DOB are double than that of BOB. The expenses of ZOB are ₹3 crores less than that of DOB, whereas, the profits of MOB is ₹1 crore less than that of ZOB. The expenses of BOB are three times than that of DOB. It is also known that the sales of ZOB are ₹15 crore or one-fourth of MOB's sales. All the figures are for 1992–93. An insider further informs Mittal that the sales of DOB are ₹10 crores more than that of ZOB and the expenses of BOB are 90% of its own sales. Sales – Expenses = Profit

Pictorial

This is the most common form of data representation. In such problems, data is presented in various pictorial forms such as line graphs, bar diagrams, line charts etc.

The important point to remember pertaining to all these questions is the fact that each and every question asked in the CAT is based on some logic and reasoning meant to check your aptitude. Few questions that involve numbers may also require a basic level of calculation skills.

Let us see the various pictorial representation of data:

Table

Tabular method is the most fundamental way of representing data. In fact, most of the different kinds of data presentation formats like the bar charts, line charts etc. originate from the table. In other words, presenting the data in a tabular format is the first step in forming other types of data presentation formats.

Example

The table given below shows the break-up of the percentage of people of different age groups frequenting bars in 4 different metro cities viz., Delhi, Hyderabad, Bangalore and Patna in the year 2002.

Cities	Percentage break-up for age groups (Years) in 2006							
	Up to 15	15– 20	20– 25	25– 30	30– 35	35– 40	Above 40	
Delhi	8	13	24	21	11	17	6	
Hyderabad	3	8	35	23	10	16	5	
Bangalore	4	21	27	11	8	14	15	
Patna	1	7	43	32	9	5	3	

The tabular format is considered to be the most versatile data presentation method. All data which can be expressed in any other format can also be expressed in the format of a table. On the other hand, it is quite possible that data that can be presented in a tabular format, cannot be presented in any other format like the pie chart etc.

Pie Chart

Pie charts are a typical type of data representation where data is represented as a part of a circle. The circle represents the total value (or 100%), and the different parts represent certain proportions (or percentage) of the total. In a pie chart, the arc length of each sector (and in turn its central angle and area), is proportional to the part it represents.

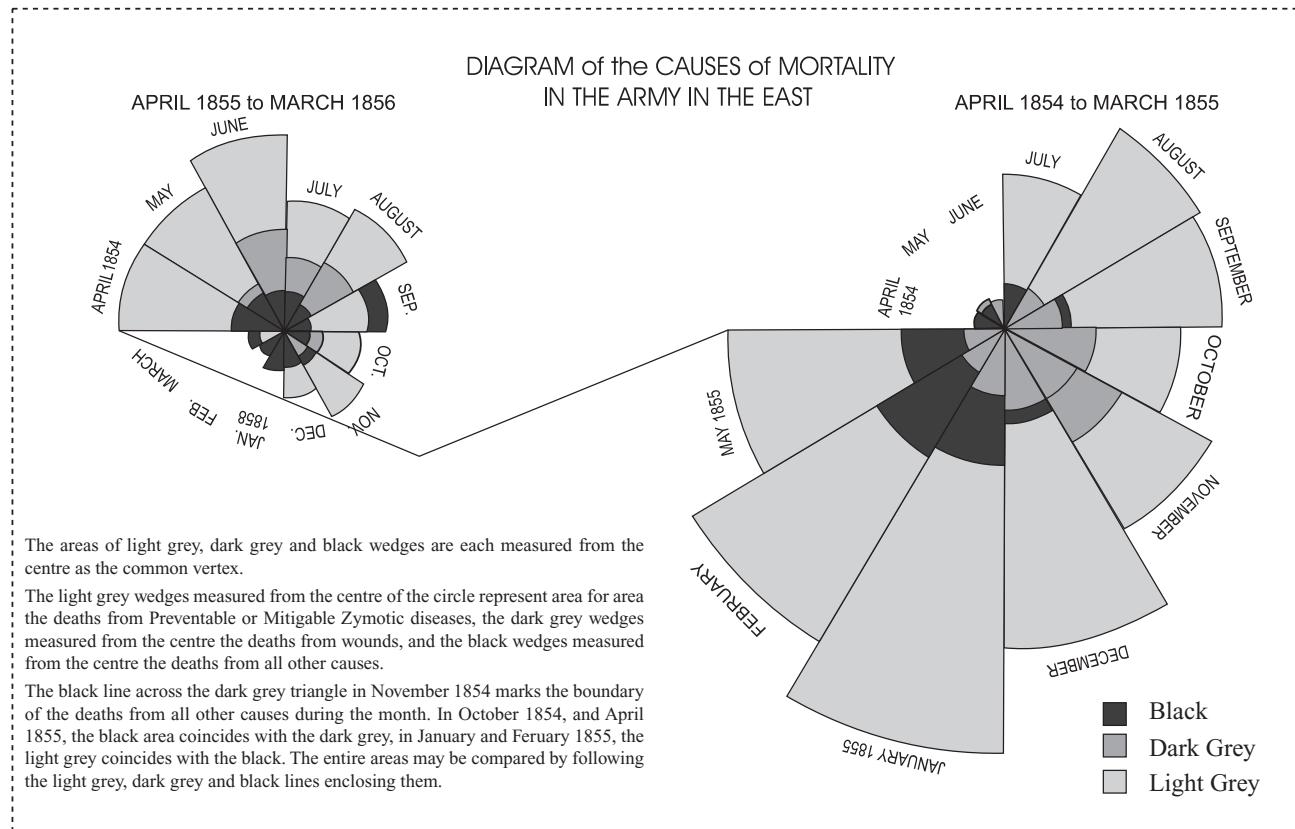
The origin of the pie chart is traced back to Florence Nightingale in 1858. This was the year when

she presented a paper on the causes of deaths in her army in the eastern part of the world.

Following is the pie chart originally developed by Florence Nightingale in the year 1858. (Actually called by her as the ‘Polar Area Diagram’).

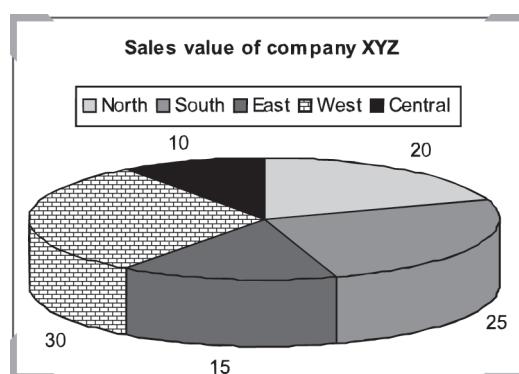
The below graphic gives the number of deaths that occurred from diseases that could have been prevented (in light grey), those that were the results of wounds (in dark grey) and those due to other causes (in black).

There are two approaches to constructing a pie chart from any given data:



- (A) Degree Approach:
The central angle in a circle represents 360° , so any part or segment in a pie chart is calculated as a proportion of 360° .
 - (B) Percentage Approach:
In this case, any part or segment in a pie chart is calculated as a part of 100%.

Example



2.6 Data Interpretation

If we convert the same pie chart into the degree format, we will be required to do the following conversions:

Total	=	100%	=	360°
Hence		1%	=	3.6°
Central	=	10%	=	36°
North	=	20%	=	72°
South	=	25%	=	90°
East	=	15%	=	54°
West	=	30%	=	108°

Limitations of Pie Charts

Despite the pie chart being one of the most important ways to represent data, it is marred by limitations of its own:

- Pie charts can be used only when the sum of all categories is given, for example if the categories represent proportions or percentage of a total.
- A single pie chart can represent only one continuous variable.

Significance of Pie Charts

The pie chart has gained prominence due to the following reasons:

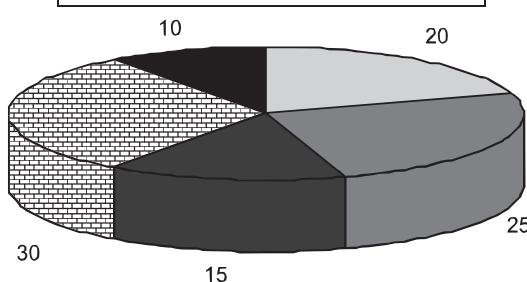
- In a pie chart, we get a clear picture of the contribution of different sectors to the build up of the total. E.g., presentation of budgets.
- Comparing two pie charts is easier than comparing two bar charts or any other format of data representation.

Example

Let us see the following data:

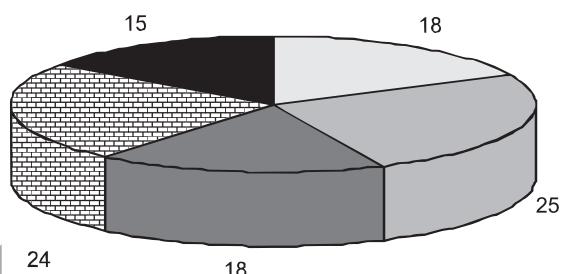
Sales value of company XYZ in 2005

□ North □ South ■ East ■ West ■ Central



Sales value of company XYZ in 2006

□ North □ South ■ East □ West ■ Central



Sales value in 2005 = ₹180 crores

Sales value in 2006 = ₹204 crores

Question

What is the percentage increase in the sales value of the East zone?

Solution

There are two percentage increases (A) The total sales value of company XYZ is increasing. (B) The percentage contribution of the East zone is increasing.

Percentage increase in The total sales value of the company XYZ = 30%

Percentage increase in the percentage contribution of the East zone = 20%

Hence, the net percentage increase = 56%
(Successive increase of 20% and 30%)

Types of Pie Charts

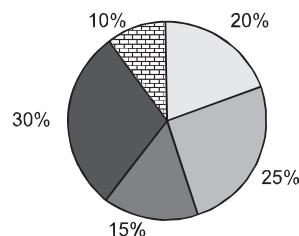
There are two types of pie charts:

(A) Normal Pie Chart

This displays the contribution of each component of the pie.

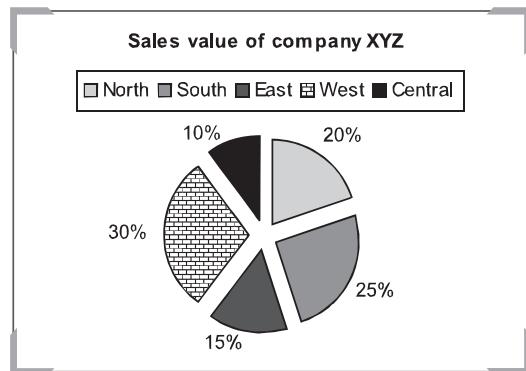
Sales value of company XYZ

□ North □ South ■ East ■ West ■ Central



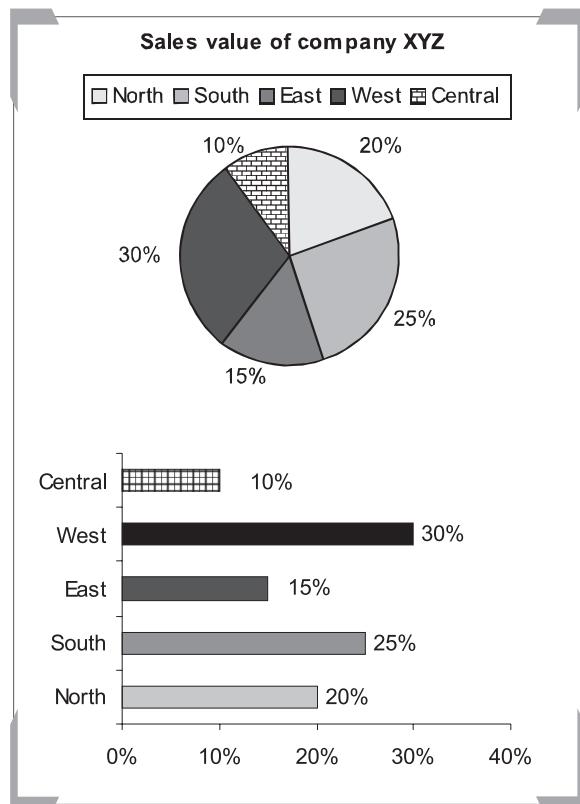
(B) Exploded Pie Chart

This pie chart has all the characteristics of a normal pie chart, the only addition is that the contribution of individual segments is highlighted.



Bar Chart/Bar Graph

The bar chart, in comparison to the pie chart is more versatile in representing data. It has been proven that representation using lengths as in the case of bar charts is a better indicator of data vis-a-vis pie charts wherein data is categorized in terms of areas.

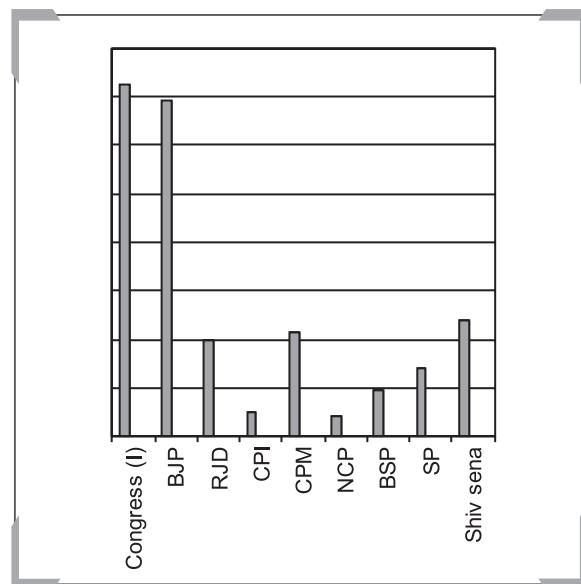


In the above diagram, the same data has been represented length-wise in the bar chart and area-wise in the pie chart. Obviously, it is easier to see the contribution of the various segments in the bar chart than in the pie chart.

A therefore, is a chart with rectangular bars of lengths proportional to the values which they represent. Usually, the terms 'bar chart' and 'bar graph' are used interchangeably. It should also be noted that in a bar chart, what matters is the length of the bar and not the width of the bar.

Example

The following bar chart represents the number of seats won by different parties in the last general election.



Significance of Bar Charts

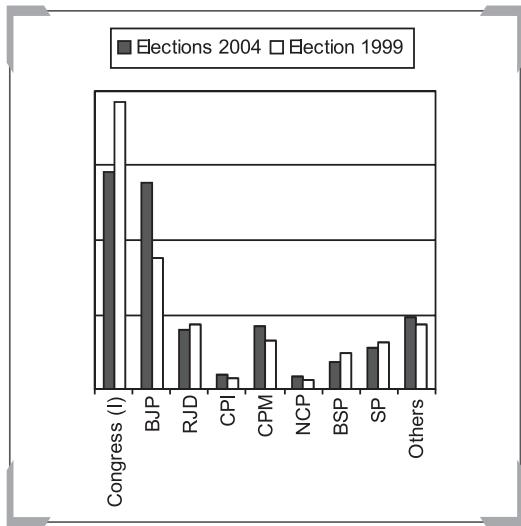
Following are the major specialities of bar charts:

Unlike the pie chart, a single bar chart can be used to compare two, or more than two continuous variables.

Example

The following bar chart represents the number of seats won by different parties in two general elections:

2.8 Data Interpretation



Since the length parameter is easier to study than the area parameter, a bar chart gives a quick understanding of the various ranks. Hence the time taken to understand the data becomes considerably lower in a bar chart as compared to other formats of data presentation.

Types of Bar Charts

There are three types of bar charts:

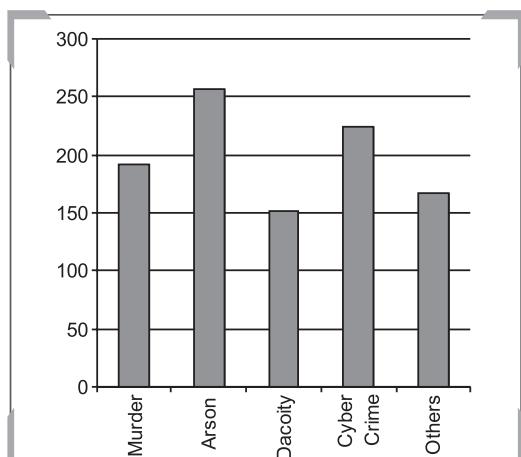
(A) Normal Bar Chart

This is a simple bar chart with the values of different segments represented in the form of bars, which could be either horizontal, vertical or both.

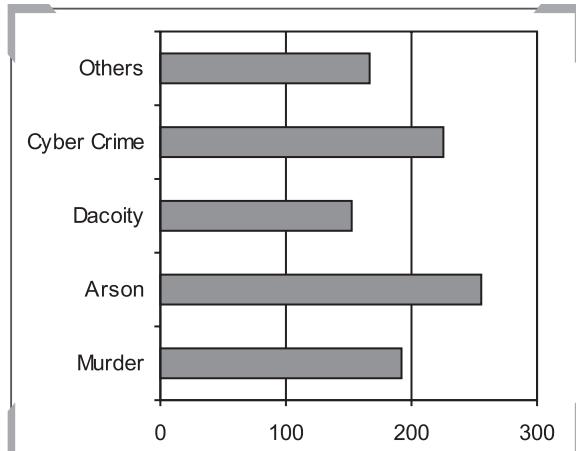
Example

The following bar chart represents the crime cases reported in Delhi in 2007:

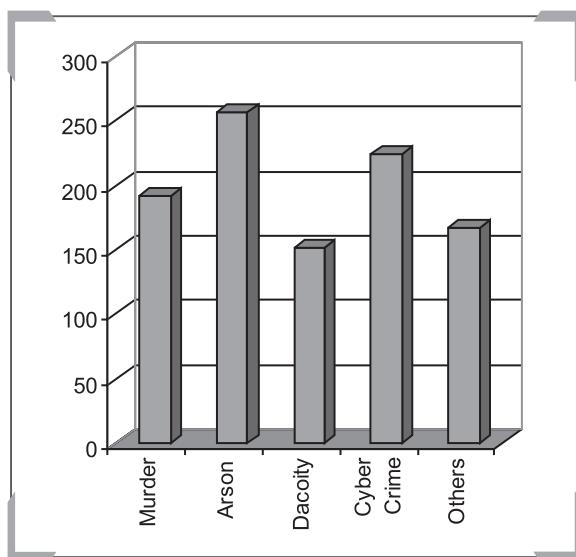
Bar Chart with Vertical Bars



Bar Chart with Horizontal Bars



Bar Charts with 3-D Effects



(B) Stacked Bar Chart Value-wise

When the same variable is to be represented on more than one parameters like; year etc., then we can have a stacked bar chart.

(C) Stacked Bar Chart Percentage-wise

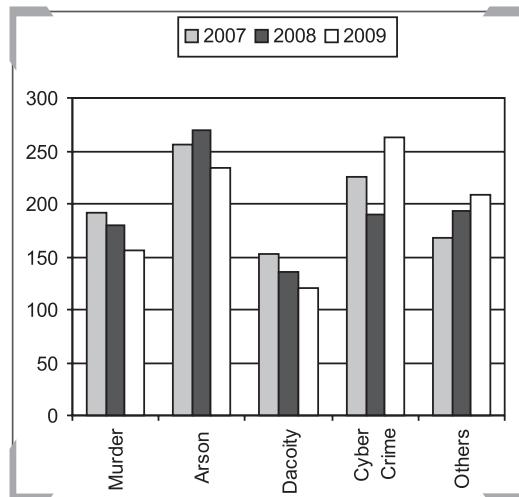
The only difference between value-wise and percentage-wise bar charts is that in the former we apply values to stack the bars and in the latter we apply percentages.

Stacked Bar Charts are also known as Cumulative Bar Charts.

Example

Here, we will see the same data in a normal bar chart, value-wise stacked bar chart and stacked bar chart percentage-wise

Normal Bar Chart



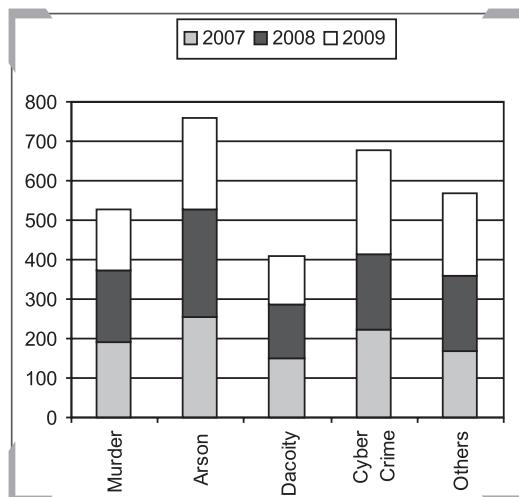
Following things can be observed in the above bar chart:

Bars representing different crimes in different years are proportional to the crimes reported.

The above bar chart takes the minimum value as 100, however the same bar chart could take the minimum value as 0 or 50 or anything else as well. The question here is, what will happen if we take the minimum value as 150?

Since some of the values are less than 150, what will happen to those? Find out yourself without using a computer.

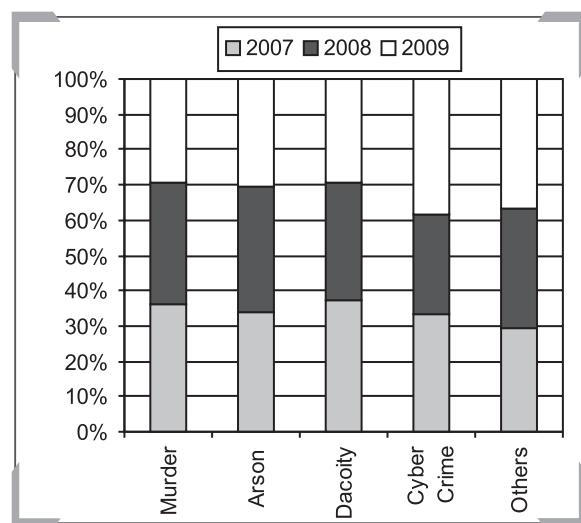
Stacked Bar Chart Value-wise



Following things can be observed in the above stacked bar chart:

- The total number of murders have been added up in one bar and the different years are shown as a part of that total.
- The same data could also have been represented by taking the sum of all the crimes reported in a particular year as a total, and the individual crimes as a part of that total.

Stacked Bar Chart Percentage-wise



Following things can be observed in the above stacked bar chart:

- The total number of murders have been added up and they equal to 100%; and the murders reported in different years have been taken as a percentage of that total.
- The same data could have been represented by taking the sum of all the crimes reported in a particular year as a total, and the individual crimes as a part of that total.

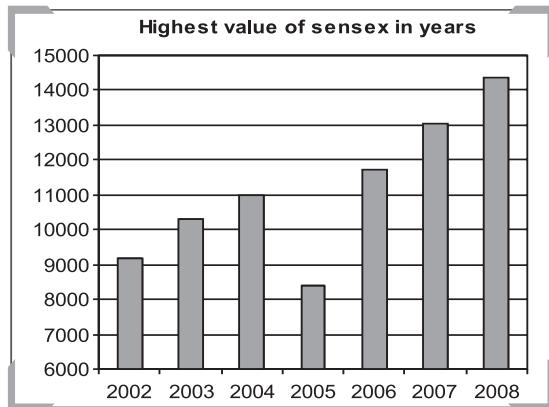
Line Chart/X-Y Chart

Line charts are seen as simplified forms of the normal bar chart.

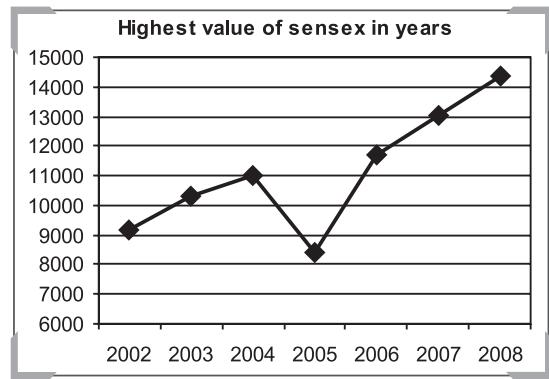
Example

The bar chart given below represents the highest values of the sensex in the given years.

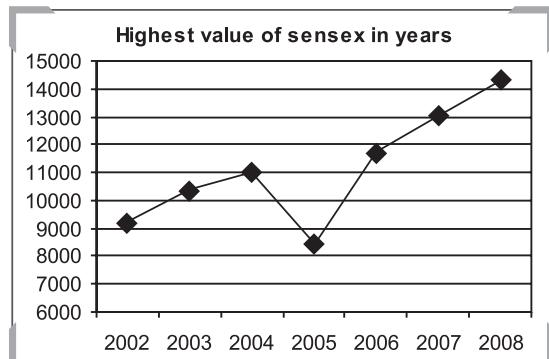
2.10 Data Interpretation



If we convert the same data into a line chart, it will look like this:



Sometimes in case of line charts, the lines are not given and only the dots are indicated in the graph. Let us see an example with the same data:



Significance of Line charts

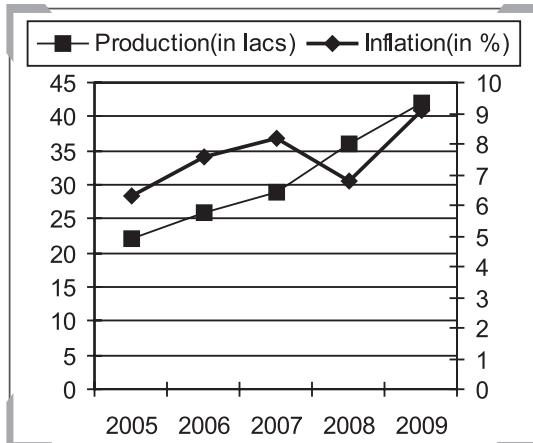
- Generally Line charts are used in case time is one of the variables in the data. The 'time' variable can be

in the form of hour, day, months years or anything that represents chronological order of events.

- It is easier to calculate the percentage changes in a line chart and thereby understand the trends of the data in a better way.
- A line chart becomes very handy in case of data with two different scales.

Example

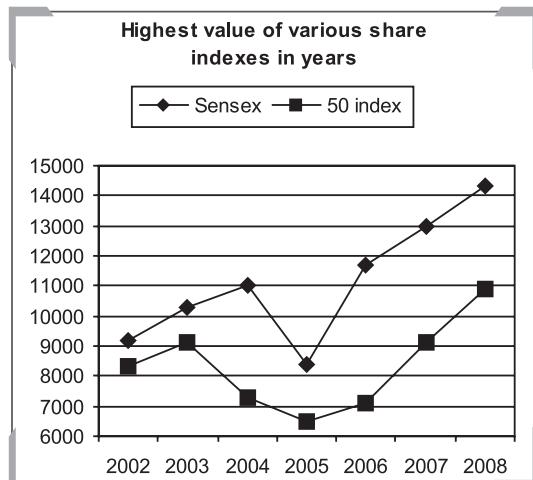
The line chart given below represents the production of soaps by a company over a period of five years and the inflation for the same period.



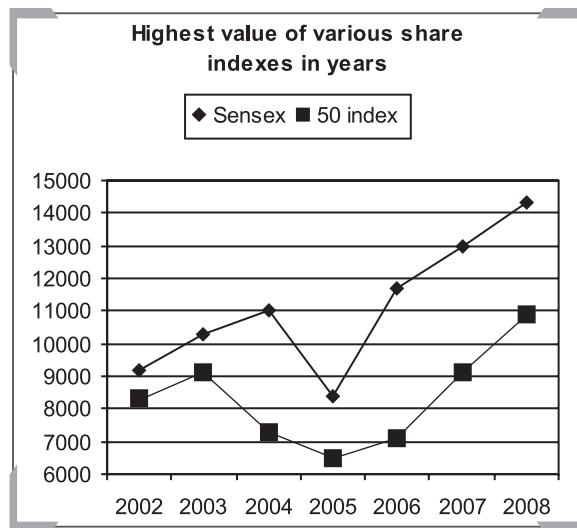
- Two or more than two variables can be represented on a line chart very easily. Besides, we can see the movement of data very easily in case of a line chart.

Example

Below given line chart represents the movements of the highest value of two indices over a given period:



The same data can be represented using dots only also:



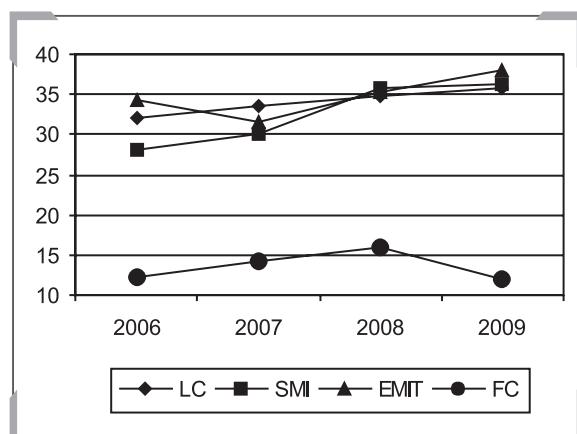
Types of Line Charts

Broadly, line charts are of three types:

Normal Line Chart

This is a simple line chart representing two or more than two variables.

In the chart given below, The total number of enrolments for four different years of for four coaching institutes are represented:

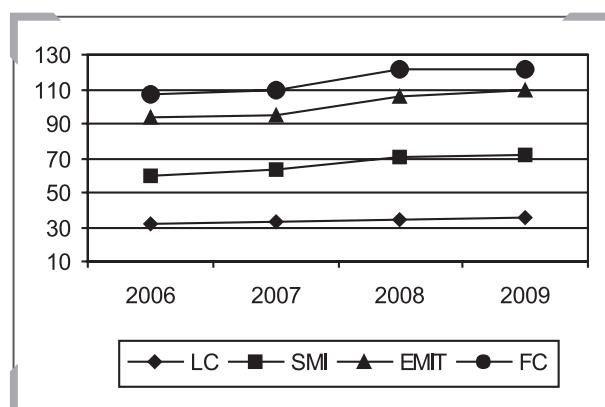


Stacked Line Chart

In a stacked line chart, the values keep on getting added to obtain the next value.

Example

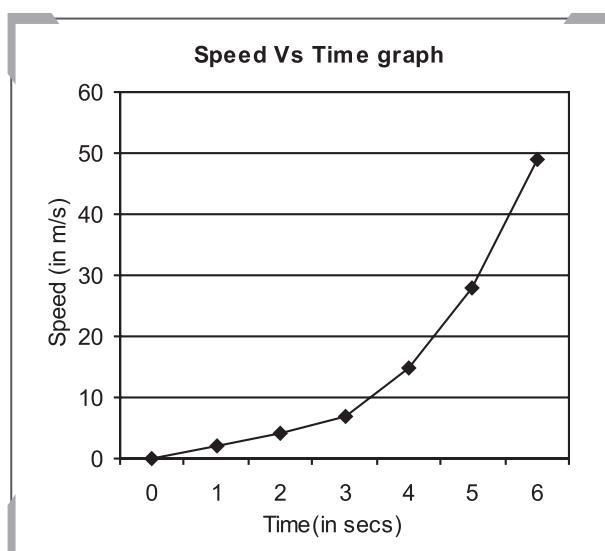
Here, the bottom line (of LC) gets added with the values of SMI to represent the value of SMI. Now this represented value of SMI is added to the actual value of EMIT to give the value of EMIT on the chart. And finally, the same is done with the value of FC.



Hence, in a stacked line chart, to obtain the values of different constituents/segments, either start with the top line or the bottom line and then keep on subtracting the values to obtain the next value.

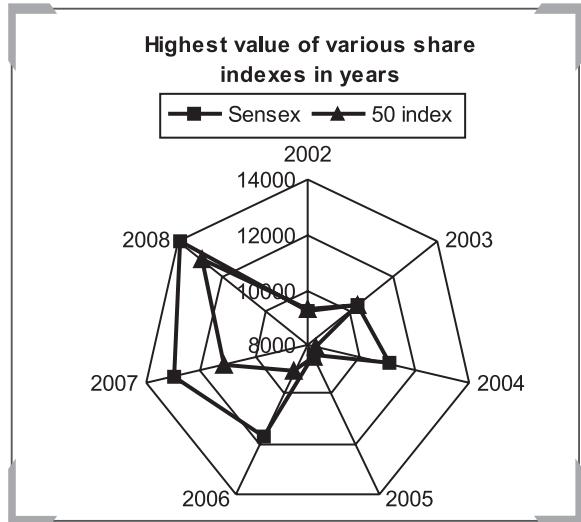
Time-Speed-Distance Line Chart

This line chart is used in tables of data collected from experiments on physical processes.



Radar Diagram

This diagram every value is represented with respect to a central point. All the changes in the values are expressed in the form of distance from this center point.

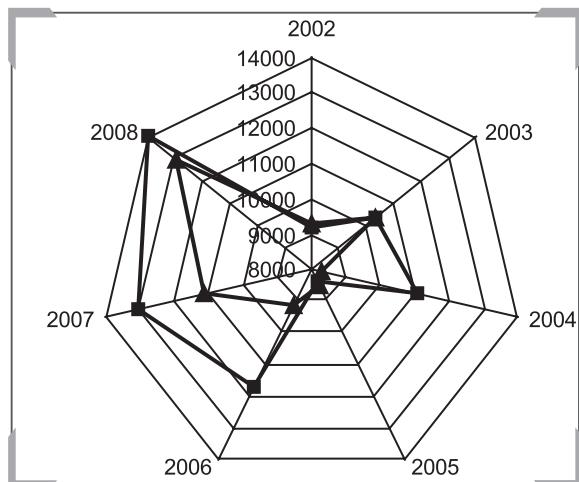


Example

The radar diagram given below represents the highest value of two indices over a given period.

It can be seen that the centre value = 8000. With every passing circle the value increases by 2000. Since here are seven years, the diagram takes the shape of a heptagon.

Had there been only six years, it would have taken the shape of a hexagon, as shown below:



Similarly, had there been only four years, the diagram would have been in the shape of a square.

Area Diagram

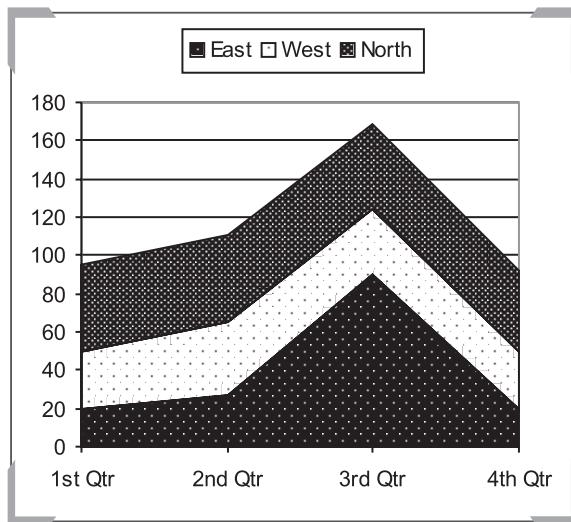
In case of an area diagram, the values are represented in terms of areas.

Example

Data set given is:

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
East	20	27	90	20
West	30	38	34	30
North	45	46	45	42

The stacked area diagram corresponding to the table given above will be like this:



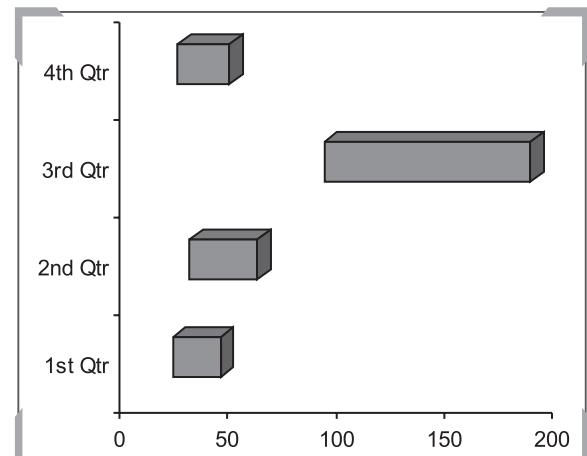
Floating Diagram

A floating diagram is used to represent the difference in any given variable between two different periods.

Example

We will convert the following table into a floating diagram:

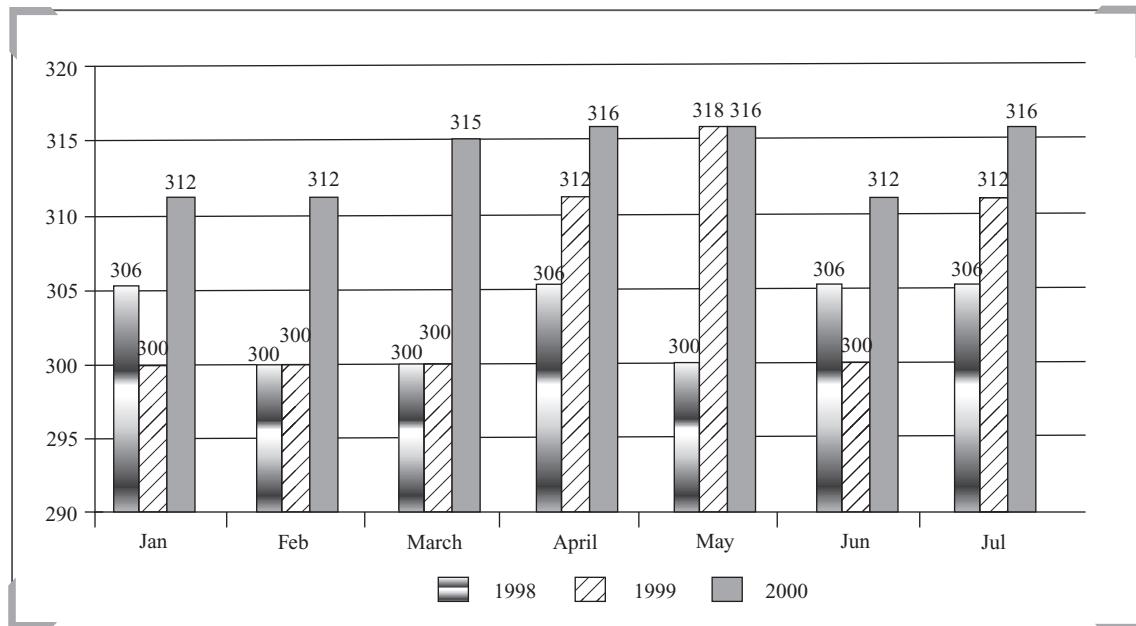
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
2000	20	28	90	22
2001	22	31	95	24



PRACTICE EXERCISE 1**Bar Chart**

Directions for questions 1 to 7: Refer to the following bar graph and solve the questions based on it.

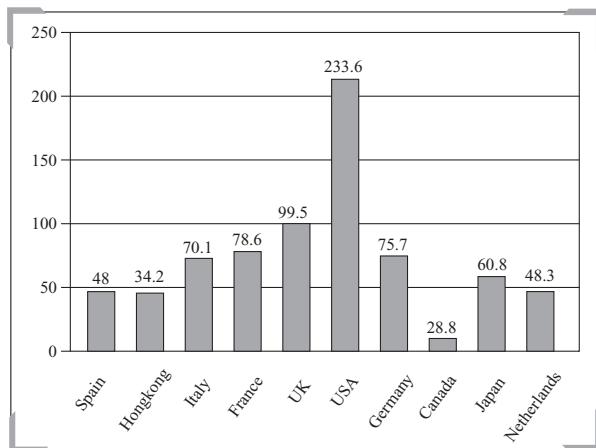
The following bar chart shows the monthly expenditure of a family comprising of five persons over a period of seven months during three different years.



1. In any of the given years, which month sees the maximum percentage increase in expenses with respect to the previous month?
 (a) February (b) March
 (c) April (d) June
2. What is the average monthly expenditure of the whole family in the year 2000?
 (a) ₹314000 (b) ₹315000
 (c) ₹316000 (d) Cannot be determined
3. In April 2000, what was the percentage increase in expenditure over April 1999?
 (a) 1.2% (b) 2%
 (c) 6% (d) 9.4%
4. Which period has shown the same change in trend across all the given three years?
 (a) February-March
 (b) May-June
 (c) March-April
 (d) January-February
5. Which of the following statements is correct?
 (a) In 1998, May-June were the two consecutive months during which the expenditure was the maximum.
 (b) During May-June 1999, the expenditure was the maximum for the year.
 (c) Expenditure during January-February was the same in 1998 as well as in 1999.
 (d) None of these
6. For how many months of the given years the expenditure has been consistently increasing or decreasing?
 (a) 0 (b) 1
 (c) 2 (d) 3
7. Out of the following months in the options, Which month accounts for the maximum combined expenditure for three years?
 (a) March (b) May
 (c) April (d) February

Directions for questions 8 to 14: Refer to the following bar graph and solve the based on it.

The bar chart given below represents top 10 exporters and their export value (in billion \$) in 2008.



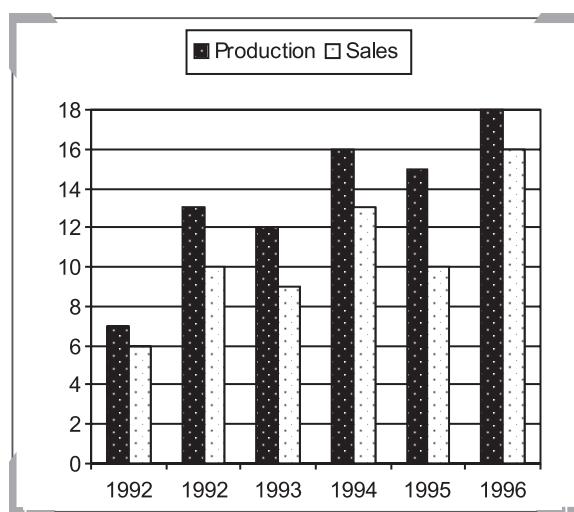
8. If India also joins the top ten exporters list by becoming the 11th largest exporter, then what will be the effect on the average exports of these 11 countries; provided the export value of India is \$ 10 billion?
 - The average will increase by 1 billion dollars
 - The average will decrease by 1 billion dollars
 - The average will increase by 1.1 billion dollars
 - None of these
9. The ratio of exports between Spain and Japan is (approximately)
 - 3 : 4
 - 19 : 15
 - 15 : 19
 - 4 : 5
10. What is the average export of all the countries in billion dollars for the year 2008?
 - 77.66
 - 76.76
 - 76.67
 - Cannot be determined
11. If the exchange rate per dollar is ₹43 then find the difference between the values of exports by Hong Kong and UK in Rupee.
 - 28.179×10^9
 - 28.179×10^{10}
 - 28.079×10^{10}
 - 28.079×10^{11}
12. If the average export of the top ten exporters is calculated how many of the top ten exporting countries have higher export than this average?
 - 3
 - 4
 - 5
 - Cannot be determined
13. If the average export of the top ten exporters is calculated, how many countries have higher export than this average?

- 3
- 4
- 5
- Cannot be determined

14. To fight the US hegemony, the countries have decided to merge their operations by adding their exports value. What is the minimum number of countries needed to merge their operation so that their combined exports is more than the exports value of the US? (None of these ten countries export to each other.)
 - 3
 - 4
 - 5
 - None of these

Directions for questions 15 to 20: Refer to the following bar graph and solve the questions based on it.

Amount of production and sales by a company over the years (in lacs tonnes)



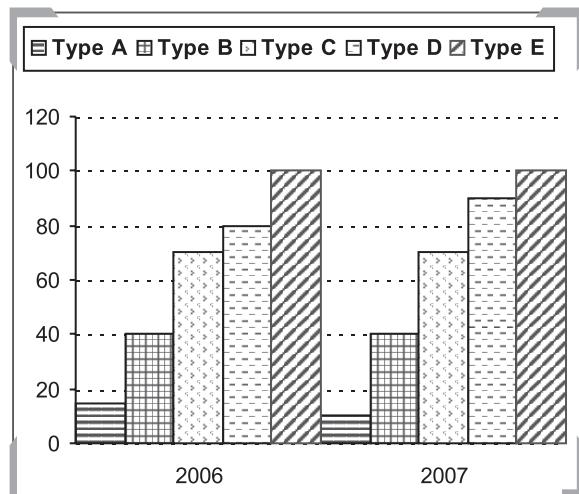
15. What is the difference between the sales of 1993 and 1995 (in thousand tonnes)?
 - 1000
 - 50
 - 100
 - 500
16. Total sales of 1991 and 1992 together are approximately what percentage of the sales in 1994?
 - 120%
 - 100%
 - 50%
 - 200%
17. What is the approximate percentage increase in production from 1993 to 1994?
 - 20%
 - 33%
 - 70%
 - 100%
18. The percentage of sales to production is maximum in which of the following years?
 - 1992
 - 1994
 - 1996
 - 1991

2.16 Data Interpretation

Directions for questions 21 to 25: Refer to the following bar graph and solve the questions based on it.

The following bar chart gives the cumulative percentage of five different types of bikes produced by Kajaj during the given two years:

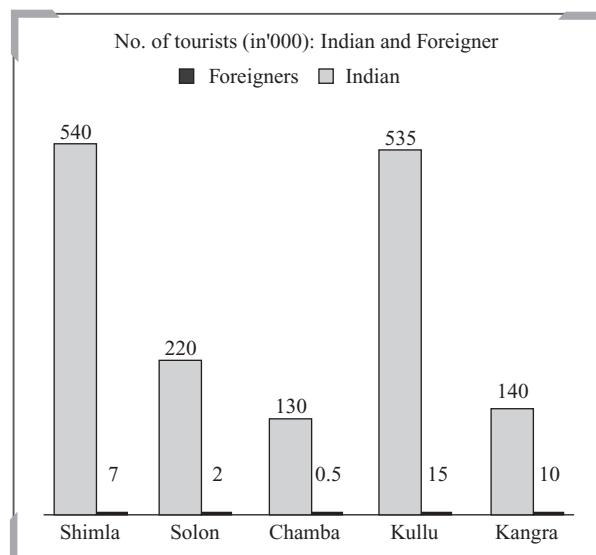
Total Bikes produced in 2006 is 4,50,000.



Total bikes produced in 2007 is 520,000.

Directions for questions 26 to 30: Refer to the following bar graph and solve the based on it.

The bar graph given below shows the five districts of the state of Himachal Pradesh and the number of tourists visiting them. For the given bar chart, total number of Indian tourists is more than the total number of foreign tourists. None of the tourists can be Indian as well as foreigner.

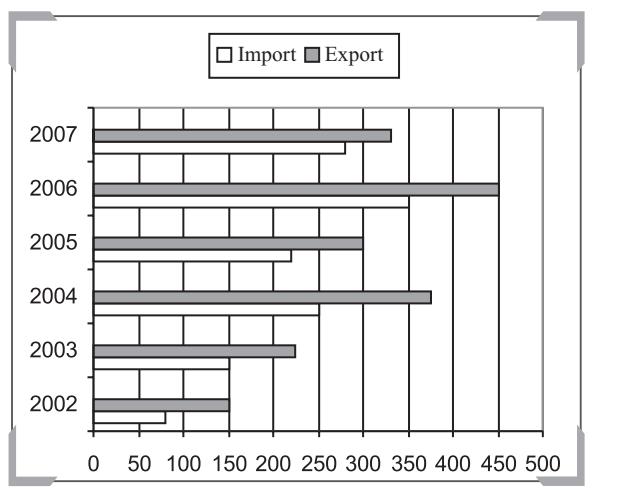


30. Which of the following districts has the minimum ratio of Indian and foreign tourists?

(a) Shimla (b) Solon
(c) Chamba (d) Kangra

Directions for questions 31 to 35: Refer to the following bar graph and solve the questions based on it.

The following bar charts represents the value of exports and imports (in ₹crores) of a country for the given period:



(All the values in the above bar chart are the multiples of 10).

ANSWER KEYS

- 1.** (c) **2.** (d) **3.** (a) **4.** (c) **5.** (d) **6.** (b) **7.** (b) **8.** (d) **9.** (d) **10.** (d)
11. (d) **12.** (a) **13.** (a) **14.** (a) **15.** (c) **16.** (a) **17.** (b) **18.** (c) **19.** (c) **20.** (c)
21. (d) **22.** (d) **23.** (b) **24.** (c) **25.** (c) **26.** (d) **27.** (a) **28.** (c) **29.** (c) **30.** (c)
31. (d) **32.** (c) **33.** (b) **34.** (b) **35.** (b)

HINTS AND EXPLANATIONS

1 to 5

1. This question can be solved by visual inspection.
 2. To find the average monthly expenditure during the year 2000, the total income for the year has to be known. In the chart, the income of only seven months is known. Therefore it cannot be determined.
 3. Value (April 2000) = 316
Value (April 1999) = 312
Approximate % age increase = 1.2%

4. The same increasing trend is seen every year during the period March-April.

5. In 1998, the period during which the expenditure was maximum was June-July.

In 1999, the period of maximum expenditure was April-May.

So, option (a) and (b) are incorrect. Option (c) is obviously incorrect.

Hence option (d) has to be true.

2.18 Data Interpretation

6. Only April satisfies these conditions.
7. Visual inspection we can see that option (b) is correct. It should also be noted that we have to find out of the options given.

8 to 14

8. The average will decrease by 6.11 billion dollars. Hence, option (d) is the correct answer.
9. Required ratio = 4 : 5
10. Cannot be determined because the data is given only for the top ten exporters.
11. Required difference = $(99.5 - 34.2) \times 43 \times 10^9 = \text{₹}28.079 \times 10^{11}$ (1 billion = 10^9)
12. The average is 77.6. Now it can be seen that only three countries have more than this.
13. There is no difference between this and the last question. Understand that the average is calculated for the top ten countries only, and the only countries which can have exports higher than the average exports can be the countries which are in the list of the top ten exporter countries.

15 to 20

15. The difference between sales of 1993 and 1995 = 1 lacs or 100,000
16. Sum of sales of 1991 and 1992 = $6 + 10 = 16$ lacs
Required Answer = $\frac{16}{13} \times 100 = 123\%$
17. Percentage increase in production from 1993 to 1994
 $\frac{16-12}{12} \times 100 = 33.33\%$
18. Percentage of sales to production is maximum in the year when the difference between them is minimum.
19. Percentage drop in sales from 1992 to 1993
 $= \frac{1}{10} \times 100 = 10\%$

20. By visual inspection we can see that the correct answer is option (c).

21 to 25

22. Production of E type bikes in 2006
 $= (100 - 80)\% \text{ of } 4,50,000$
 $= 20\% \text{ of } 4,50,000 = 90,000$
And in 2007 = $10\% \text{ of } 5,20,000 = 52,000$
Total production = $90,000 + 52,000 = 1,42,000$
So, the number of bikes
 $= 15\% \text{ of } 1,42,000 = 21,300$

23. Production of A type bikes in 2006 = 67,500
Production of A type bikes in 2007 = 52,000
 $\text{Required \%} = \frac{67,500 + 52,200}{9,70,000} \times 100 = 12.3\%$
 \approx Closest to option (b)
24. By visual inspection we can say that option (c) is correct answer
25. Percentage production of B type bikes in 2007 =
that in 2006 (given) = $(40 - 15) = 25\% \text{ of } 5,20,000$
 $= 1,30,000$.

26 to 30

26.
Required % = $\frac{540 - 130}{540} \times 100 = 75\%$
27. Percentage share of foreign tourists visiting HP
 $\frac{34.5}{1600} \times 100 = 2\%$

28. Ratio = $535 : 15 = 107 : 3$

31 to 35

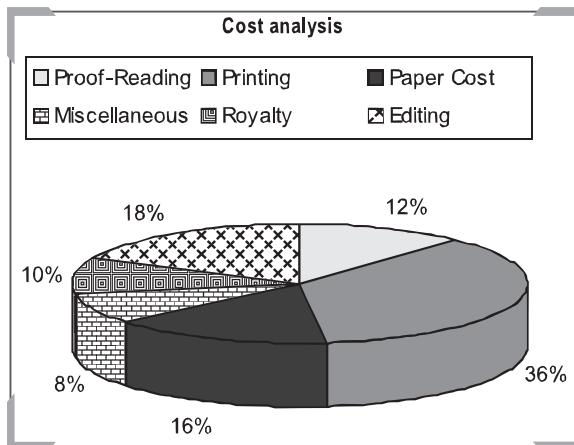
31. Required % age = $\frac{450}{250} \times 100 = 180\%$

PRACTICE EXERCISE 2

Pie Chart

Directions for questions 1 to 5: Refer to the following pie chart and solve the questions based on it.

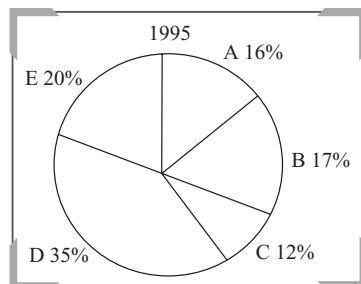
Following is the cost analysis of a book “Pearson’s Guide to Quantitative Aptitude for CAT”.



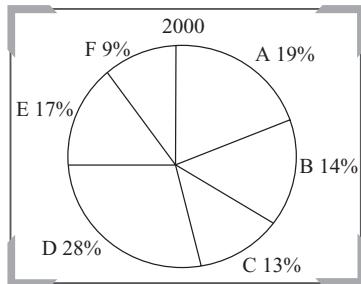
1. What is the central angle showing the cost of paper?
 (a) 42.8° (b) 32.6°
 (c) 36.8° (d) 57.6°
2. If the cost of printing is ₹23,400 what would the cost of royalty be?
 (a) ₹6500 (b) ₹2340
 (c) ₹4680 (d) ₹7840
3. If the miscellaneous expenditure amounts to ₹18,000 then what is the expenditure on editing?
 (a) ₹8000 (b) ₹14400
 (c) ₹46800 (d) None of these
4. The royalty on the book is less than the editing expenditure by
 (a) 8% (b) 80%
 (c) 44.44% (d) None of these
5. If 5500 copies of the book are published and the miscellaneous expenditure amounts to ₹36,960 and the marked price is 40% above the cost price, then the marked price of each copy is
 (a) ₹122.50 (b) ₹117.60
 (c) ₹126.40 (d) ₹92.40

Directions for questions 6 to 10: Refer to the following pie charts and solve the questions based on it.

The pie charts given below represent the market share of different players in the electronics market in the year 1995 and 2000. A new player F has entered the market in the given period.



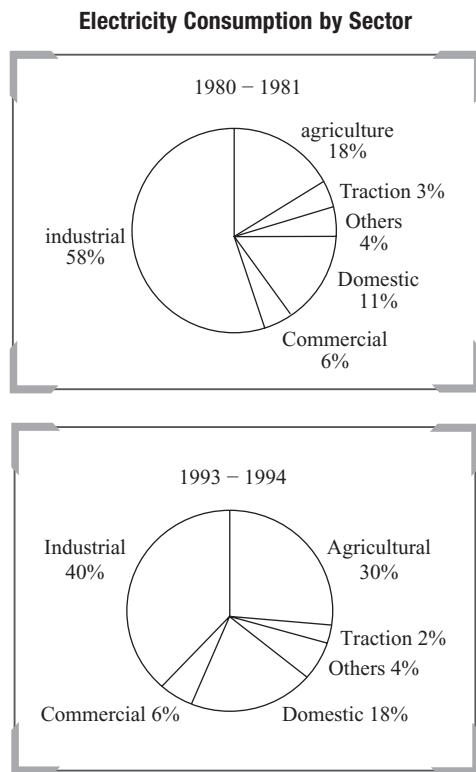
Market size = \$ 2.3 billion



Market size = \$ 3.7 billion

6. What is the percentage increase in the sales of A in the year 2000 over 1995?
 (a) 90% (b) 60%
 (c) 80% (d) 50%
7. Find the CAGR with which the market has grown for the period 1995–2000?
 (a) 18% (b) 10%
 (c) 5% (d) 12%
8. If the new entrant F has grown at the expense of B, C, and E, what would be the change in the net value of sales of E in the year 2000, had F not entered the market?
 (a) \$ 111 million (b) \$ 340 million
 (c) \$ 247 million (d) Cannot be determined
9. What is the increase in sales (in \$ million) of A, B and C put together, over the 5 years period?
 (a) 103 (b) 1202
 (c) 668 (d) 854

Directions for questions 11 to 17: Refer to the following pie charts and solve the questions based on it.



1980–1981, then what is the percentage increase in the electricity consumption of the agricultural sector in the given period?

- (a) 50%
(b) 100%
(c) 150%
(d) None of these

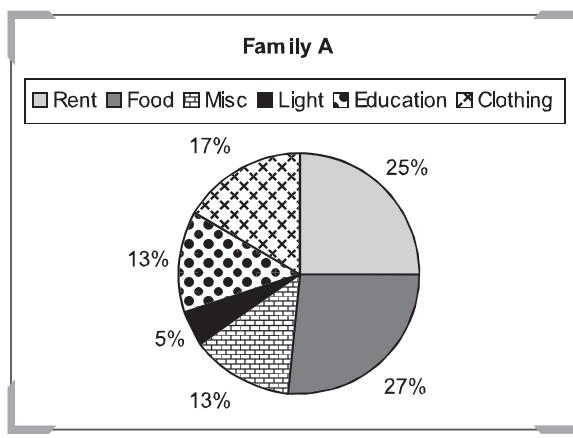
15. What is the minimum number of sectors required to be added up in order to be more than 50% of the consumption for the period in 1993–1994?
(a) 1
(b) 2
(c) 3
(d) 4

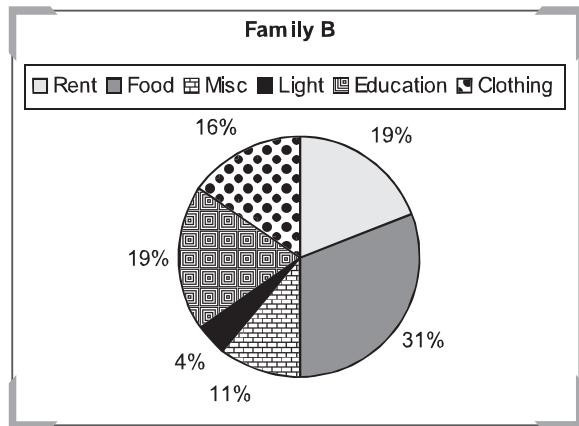
16. The agricultural consumption of electricity doubled from 1980–81 to 1993–94. By how much percentage has the total electricity consumption grown from 1980–81 to 1993–94?
(a) 20%
(b) 25%
(c) 50%
(d) Cannot be determined

17. If the electricity consumption of the ‘others’ category has remained constant over the period, then what is the percentage increase in the electricity consumption of the domestic category?
(a) 63%
(b) 38%
(c) 58%
(d) Cannot be determined

Directions for questions 18 to 23: Refer to the following pie charts and solve the questions based on it.

The two pie charts given below provide the expenses of two families:



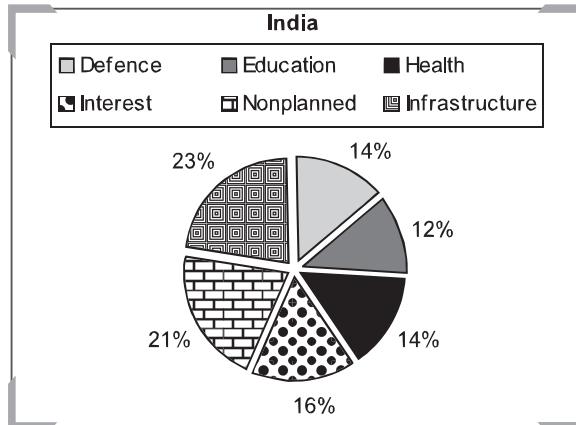
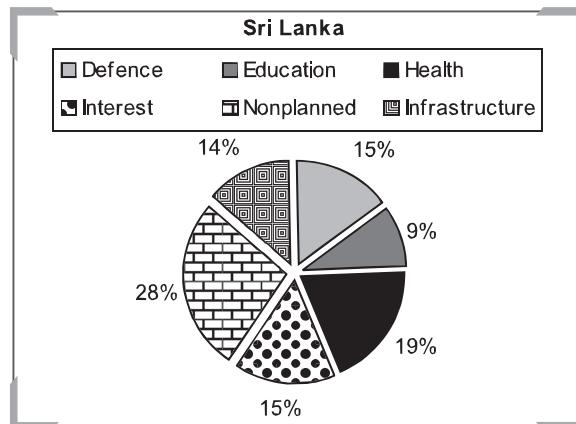
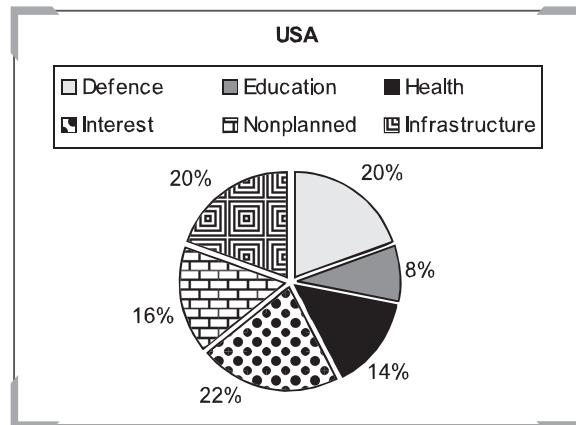


Total expenses = ₹72,000.

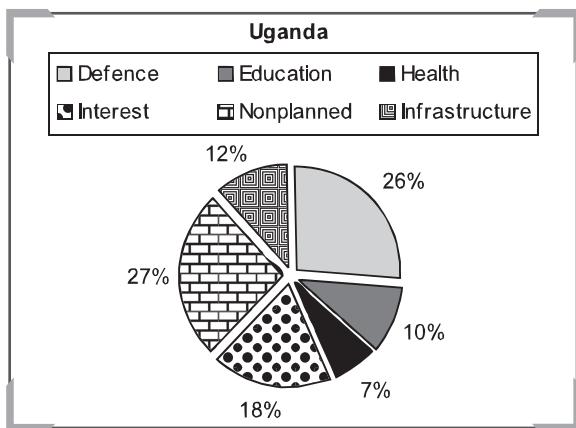
18. Both the families decide to double the total expenditure keeping the pattern of spending the same as given above. What will be the new ratio of expenditure on food between family A and family B?
 (a) 27:31 (b) 31:27
 (c) 2:3 (d) 3:2
19. If the total expenses of family B increase three-fold, keeping the expenses on education the same as given above, what will be the expense on education?
 (a) 6.33% (b) 57%
 (c) 19% (d) None of these
20. What will be the expenses on light by family A, as a percentage of expense on light by family B?
 (a) 120% (b) 83.33%
 (c) 62.5% (d) 66.66%
21. If family A and family B decide to combine their expenses, then which one of the following heads will be responsible for the highest expenses?
 (a) Rent
 (b) Miscellaneous
 (c) Food
 (d) Education
22. In the above question, how many heads will have a lower percentage share in the combined total expenses of both the families than the percentage share of family B under the same head?
 (a) 1 (b) 2
 (c) 3 (d) 4
23. Under how many heads are the expenses of family B more than the expenses of family A?
 (a) Less than 3
 (b) More than 3
 (c) Equal to 3
 (d) Cannot be determined

Directions for questions 24 to 30: Refer to the following pie charts and solve the questions based on it.

The following pie charts represent the budget expenditure of certain countries on various sectors for the year in 2007:



2.22 Data Interpretation



or education. How many of the above countries are under military rule?

ANSWER KEYS

- 1.** (d) **2.** (a) **3.** (d) **4.** (c) **5.** (b) **6.** (a) **7.** (b) **8.** (d) **9.** (c) **10.** (a)
11. (d) **12.** (d) **13.** (b) **14.** (c) **15.** (b) **16.** (a) **17.** (a) **18.** (a) **19.** (a) **20.** (b)
21. (c) **22.** (b) **23.** (b) **24.** (a) **25.** (a) **26.** (d) **27.** (d) **28.** (d) **29.** (a) **30.** (a)

HINTS AND EXPLANATIONS

1 to 5

- 1.** Required Angle = $(16/100 \times 360) = 57.6^\circ$

4. If the editing charges are ₹18, royalty is ₹10. On ₹18, it is less by 8. On ₹100, it is less by $(8/18 \times 100)\% = 44.44\%$

5. Let the total expenditure be ₹x. Then, $8 : 100 = 36960 : x$. So $x = ₹462000$. Therefore Cost Price of 5500 copies of the book = ₹4,62,000. Cost Price of each copy = ₹(4,62,000/500) = ₹84. So, marked price = 140% of ₹84 = ₹117.60.

6 to 10

6. There are two successive increases—First is the total increase of 60% approx. (\$ 3.7 bn in 2000 from \$ 2.3 billion in 1995) and second is the percentage share of A by 20% approx. Hence total percentage increase = 92%.
7. Market size in 2000 = \$ 3.7 billion
 Market size in 1995 = \$ 2.3 billion
 Therefore, growth rate
 $= [(3.7/2.3)^{1/5} - 1] \times 100 = 10\%$
 Hence, option (b) is the correct answer.
 $[3.7/2.3 = 1.6, \text{ now to find } (1.6)^{1/5}, 1.1^3 = 1.331 \text{ and}$
 $1.1^2 = 1.21 \text{ and } 1.3 \times 1.2 = 1.6$
 Thus, $1.6^{1/5} = 1.1]$
8. Since we do not know what part of market share of B, C and E has been eaten up by F, so cannot be determined.
9. Sales value for A + B + C in 2000 = $(13 + 14 + 19)\%$ of 3.7 billion = $46\% \times 3.7 = 1.702$ billion
 Sales value for A + B + C in 1995 = $(16 + 17 + 12)\%$ of 2.3 billion = 1.035 billion.
 Hence increase in sales value = $1703 - 1035 = \$ 668$ million.
 Hence, option (c) is the correct answer.

11 to 17

11. Since the total consumption for the given years is not known, we cannot determine it.
12. Since the total consumption for the given years is not known, we cannot determine it.
13. Total consumption has increased by 20%. So, any sector that shows an increase of even 25% will give us a net increase of 50%. There are only two sectors—agriculture and domestic. Therefore, option (b) is the correct answer.
14. There are two increases—one is the increase in the share of agriculture (66.66%) and the other is an increase of 50% in total. Net increase = 150%
 Therefore, option (c) is the correct answer.
15. By visual inspection. We can see that the correct answer is option (b)
16. There is an increase in the share of agriculture (66.66%), to make the agricultural consumption double, total consumption is to be increased by 20%.

17. The electricity consumption of the ‘others’ category has remained constant over the period. It means that the total consumption of 1980–1981 = Total consumption of 1993–1994. So, the only increase = $[(18-11)/11] \times 100 = 63.64\%$

18 to 23

18. If the percentage increase in the expenditure of both the families, is the same then the ratio will be the same.
19. The total consumption has become 3 times more keeping the expenses on education the same. Hence the percentage consumption on education will become 1/3rd of the present.
20. By visual inspection we can see that option (c) is the correct answer.
21. It should be understood that the final percentage of expenditure will always be in between the percentage of family A and family B (It is true of any mixture that the percentage composition of the mixture will be always in between the percentage compositions of the components).
22. By visual inspection we can see that the correct answer is option (b).

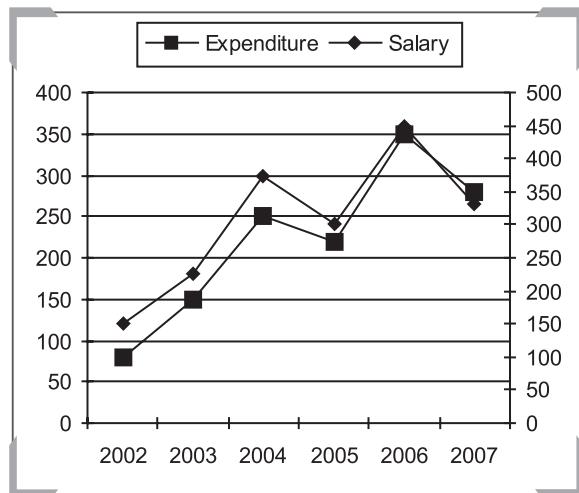
24 to 30

24. By visual inspection we can see that option (a) is the correct answer.
25. By visual inspection we can see that option (a) is the correct answer.
26. Understand the logic that “If a country is under military rule, it will spend maximum on defence and minimum on either health or education” does not mean that if a country is spending maximum on defence and minimum on either health or education, then it will under military rule.
 [For more—See Logical Links in Part 1 of this book]
27. By visual inspection. we can see that option (d) is the correct answer.
28. Since individual expenditures of the countries are not given, we cannot determine it.

PRACTICE EXERCISE 3**Line Chart**

Directions for questions 1 to 7: Refer to the following line chart and solve the questions based on it.

The line chart given below represents the salary and expenditure (in ₹) of Guru Gulab Khatri for the given period.



It is given that the salary is greater than the expenditure at least for four years. All the values are multiples of 5.

- By what percentage has the salary of Guru Gulab Khatri increased in 2004 over 2002?
(a) 210% (b) 150%
(c) 100% (d) 250%
- By what percentage has the expenditure of Guru Gulab Khatri increased in 2004 over 2003?
(a) 66.66% (b) 133.33%
(c) 150% (d) None of these
- For how many years the salary is more than expenditure?
(a) 4 (b) 5
(c) 6 (d) Cannot be determined
- Which year is the percentage increase in the salary of Guru Gulab Khatri maximum?
(a) 2003 (b) 2004
(c) 2006 (d) 2003 or 2006
- A year is said to be comfortable, if Guru Gulab Khatri is able to save at least 30% of his salary. How many years are comfortable during the given period?
(a) 2 (b) 3
(c) 4 (d) 5

- What is the maximum difference (in ₹) between the salary and the expenditure for any year?

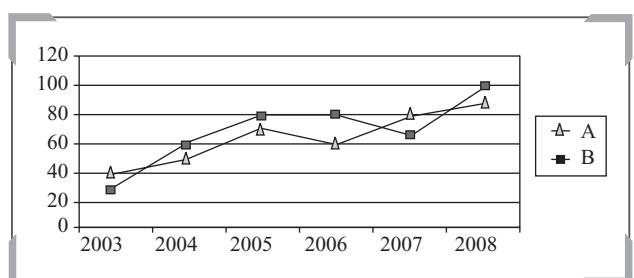
(a) 70 (b) 75
(c) 125 (d) 100

- For how many years is the difference between the salary and the expenditure more than ₹80?

(a) 2 (b) 3
(c) 4 (d) 5

Directions for questions 8 to 12: Refer to the following line chart and solve the questions based on it.

Percentage profit earned by the two companies A and B over the years



- If the income for company A in the year 2004 was ₹35 lacs what was the expenditure for company B in the same year?

(a) ₹123.5 lacs
(b) ₹128 lacs
(c) ₹132 lacs
(d) Cannot be determined

- If the income of company A in 2006 and the income of company B in 2007 are equal, what will be the ratio of expenditure of company A in 2006 to the expenditure of company B in 2007?

(a) 26 : 7 (b) 17 : 16
(c) 15 : 170 (d) None of these

- During which of the following years is the ratio of percentage profit earned by company A to that of company B, the maximum?

(a) 2003 and 2006 (b) 2005 and 2007
(c) 2003 only (d) 2008 only

- If the expenditure of company B increases by 20% from 2005 to 2006, the income in 2006 will be how many times the income in 2005?

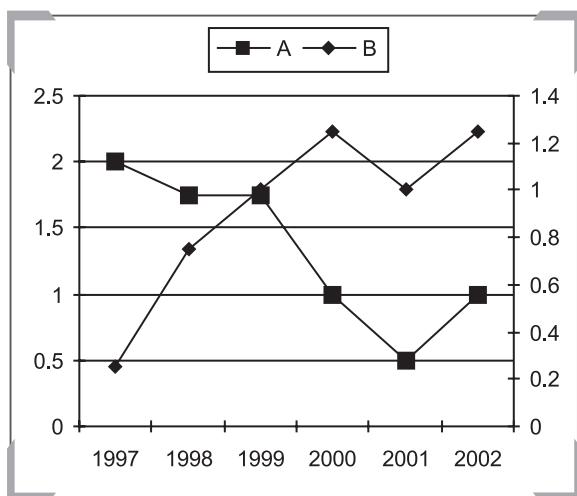
(a) 2.16 times (b) 1.2 times
(c) 1.8 times (d) None of these

12. If the income of company A in 2006 was ₹36 lacs, what was the expenditure of company A in 2006?
- ₹12.5 lacs
 - ₹18.8 lacs
 - ₹20 lacs
 - None of these

Directions for questions 13 to 17: Refer to the following line chart and solve the questions based on it.

The following line chart represents the ratio of exports (in ₹) to imports (in ₹) of two countries A and B over the given period:

Left Axis = Country A ; Right Axis = Country B



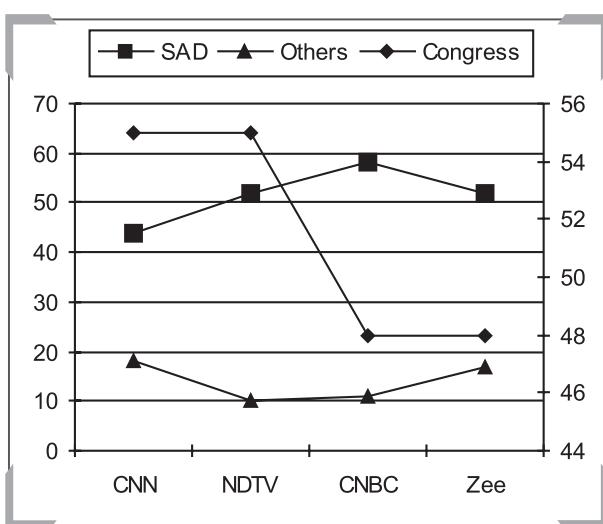
All the values are multiples of 0.25.

13. For how many years do both the countries have their respective exports more than their imports?
- 1
 - 2
 - 4
 - None of these
14. Due to some compulsions, one year during the period given these two countries have to do business between themselves only and they are not allowed to export to or import from any other countries. Which out of the following years is possibly that year?
- 1997
 - 1998
 - 1999
 - None of these
15. What can be said regarding the imports/exports of the two countries?
- The value of exports of country A is constantly on the decline from 1997 to 2001.
 - The value of imports of the country B is constantly on the rise from 1997 to 2000.
 - The value of imports of country A is equal to the value of import in 2002 (ratio = 1 for both the years)
 - none of these

16. For how many years is the value of exports of country B is constantly on the rise over the previous year for country B?
- 2
 - 3
 - 4
 - Cannot be determined
17. For how many years is the value of imports of country A is constantly on the rise over the previous year?
- 2
 - 3
 - 4
 - Cannot be determined

Directions for questions 18 to 20: Refer to the following line chart and solve the questions based on it.

The line chart given below represents the projections of seats for the coming Punjab assembly elections according to surveys done by four different agencies.



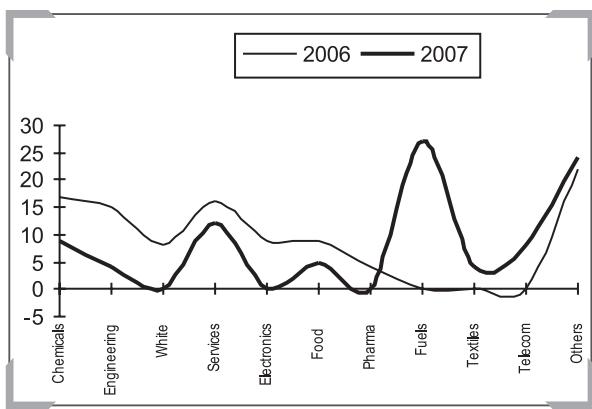
The following observations have also been made regarding the projected seats:

- The others have won less than 20 seats according to the projections made by each of the agencies.
 - According to NDTV, the Congress' projected seats are more than the projected seats for the SAD.
 - The total number of seats have been won by only three parties—Congress, SAD and the others.
 - According to CNBC, the difference between projected seats of SAD and Congress is 20.
18. If we add the projected seats of each of the parties individually, then which of the following will have the maximum number of projected seats?
- Congress
 - SAD
 - Congress or SAD
 - Others

2.26 Data Interpretation

Directions for questions 21 to 25: Refer to the following line chart and solve the questions based on it.

The following line charts give the FDI (in \$ billion) in 2006 and 2007 for the different sectors in India:



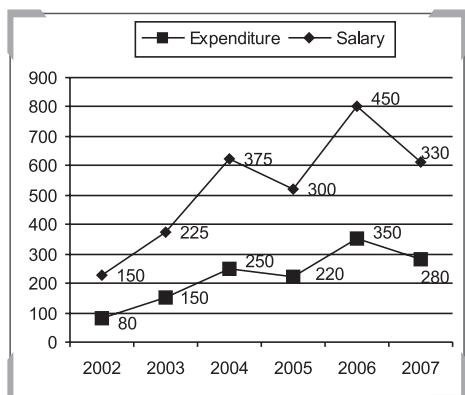
ANSWER KEYS

- 1.** (b) **2.** (a) **3.** (c) **4.** (b) **5.** (b) **6.** (c) **7.** (a) **8.** (d) **9.** (b) **10.** (c)
11. (b) **12.** (d) **13.** (d) **14.** (d) **15.** (d) **16.** (d) **17.** (d) **18.** (c) **19.** (c) **20.** (d)
21. (c) **22.** (b) **23.** (d) **24.** (b) **25.** (d)

HINTS AND EXPLANATIONS

1 to 7

For the sake of convenience, use the following chart (with the same data) to find out the solution:



Now all the questions can be done with ease.

8 to 12

8. Income-expenditures of company A and B cannot be correlated. Hence cannot be determined.
9. Expenditure of company A in 2006 = Income in 2006 of (A) \times (100/160) = Income in 2006 of (A) \times 5/8
Expenditure of Company B in 2007 = Income in 2007 of (B) \times (100/170) = 10/17 of Income in 2007 of B
Now, [Expenditure in 2006 of (A)/Income in 2007 of (B)] = (5/8) \div (10/17) [Since Income in 2006 of (A) = Income in 2007 of (B)]
$$= \frac{5}{8} \times \frac{17}{10} = \frac{17}{16}$$
10. Ratio A : B is greater than 1 in only 2003 and 2007. It is 1.33 in 2003 and 1.1 in 2007.
11. Percentage profits are the same for two years, hence if expenditure increases by 20% the income should also increase by 20%. Hence, the required ratio = $120/100 = 1.2$

13 to 17

13. This never happens. Understand that if export is more than import, then the ratio will be more than 1. If export is equal to import, then the ratio will be equal to 1 and if export is less than import, then the ratio will be less than 1.
14. The ratio of one to the other should be reciprocal.
15. Despite the ratio being on a decline for country A, we cannot comment about the value of exports. it might be a possibility that imports have increased keeping exports constant. Similarly both the other options (b) and (c) can be refuted on the same grounds.
16. Since only the ratio is given, we cannot comment on the values.
17. Since only the ratio is given, we cannot command on the values.

18 to 20

Following is the table pertaining to the data set given:

	CNN	NDTV	CNBC	Zee
SAD	44	52	58	52
Congress	55	55	48	48
Others	18	10	11	17

21 to 25

Following is the table pertaining to the data given:

	Chemical	Engineering	White Goods	Services	Electronics	Food	Pharmaceutical	Fuel	Textiles	Telecommunication	Others
2006	17	15	8	16	9	9	4	0	0	0	22
2007	9	4	0	12	0	5	0	27	4	8	24

PRACTICE EXERCISE 4

Table

Directions for questions 1 to 4: Refer to the following table and solve the questions based on it.

The following table gives the exports of top six industries (in value terms) from India in 2007:

	Exports (₹crore)	Growth (in %)
Glass industry	1093	11.7
Coal Industry	1080	7
Ruby Industry	913	-8.7
Nickel Industry	663	7.1
Software Industry	605	-12.3
Diamond Industry	505	-1.5

The overall exports from India increased by 20% to ₹19,500 crore in 2007.

Directions for questions 5 to 9: Refer to the following table and solve the questions based on it.

The following table gives the number of vehicles (in '000s) of different models and colours sold in two cities—Patna and Lucknow—in a given year.

Type	Patna					Lucknow				
	Colour					Colour				
	Black	Red	Blue	White	Silver	Black	Red	Blue	White	Silver
A	40	25	55	75	15	45	32	40	60	20
B	20	35	60	80	20	30	37	39	81	35
C	35	30	50	90	35	40	42	41	6	37
D	45	40	45	85	40	35	39	37	90	42
E	50	35	35	60	30	50	44	43	77	22
F	55	42	40	65	52	47	34	45	87	17

Directions for questions 10 to 14: Refer to the following table and solve the questions based on it.

The table given below gives the marks obtained by six students in six subjects:

Student	History (150)	Science (200)	Geography (150)	English (200)	Hindi (100)	Math (200)
A	75	110	90	140	75	170
B	105	130	75	130	80	140
C	95	105	80	150	90	160
D	85	115	95	125	65	135
E	115	135	110	145	70	125
F	120	160	96	110	55	145

Marks in bracket are Total Marks.

10. What is the difference between the percentage marks obtained by student B in History and the percentage marks obtained by student C in Hindi?
 - (a) 25
 - (b) 20
 - (c) 35
 - (d) 30
11. The marks obtained by student A in Math are how many times the percentage marks obtained by student F in Science?
 - (a) 2.5
 - (b) 4.125
 - (c) 1.125
 - (d) 2.125
12. What is the difference between the percentage marks obtained by student C in English and the average percentage marks of all the six subjects?
 - (a) 82
 - (b) 38
 - (c) 7
 - (d) 14
13. In how many of the given subjects has student D got more than seventy percent marks?
 - (a) none
 - (b) one
 - (c) two
 - (d) three
14. Approximately, what is the average percentage marks obtained by the six students in English?
 - (a) 67%
 - (b) 72%
 - (c) 80%
 - (d) Data inadequate

Directions for questions 15 to 18: Refer the following table and solve the questions based on it.

The following table gives the number of students from different locations who appeared and passed in the Xth standard examination conducted by CBSE over the years:

Year	Rural		Semi-urban		State Capitals		Metropolitans	
	Appeared	Passed	Appeared	Passed	Appeared	Passed	Appeared	Passed
1990	1651	209	7897	2511	5057	1464	9537	3212
1991	1832	314	8561	2932	7163	3242	10152	4015
1992	2154	935	8133	2466	8251	3151	9697	3033
1993	5035	1792	9436	3525	8526	3627	11245	5157
1994	4911	1656	9782	4012	9013	4315	12512	6323
1995	5626	2391	9965	4266	1729	4523	13625	6411

15. For the students from which of the following locations was there a continuous increase in both the appeared and passed member of candidates?
 - (a) semi-urban
 - (b) state capital
 - (c) state capital and rural
 - (d) None of these
16. In which of the following years was the percentage passed to appeared candidates from the semi-urban area the least?
 - (a) 1991
 - (b) 1993
 - (c) 1990
 - (d) 1992
17. By what approximate value did the percentage drop in the number of semi-urban candidates who appeared from 1991 to 1992?
 - (a) 5
 - (b) 10
 - (c) 15
 - (d) 8
 - (e) 12
18. The total number of candidate who passed from the rural locations in 1993 and the semi-urban locations in 1990 was exactly equal to the total number of candidates who passed from the state capitals in which of the following years?
 - (a) 1990
 - (b) 1993
 - (c) 1994
 - (d) None of these

Directions for questions 19 to 21: Refer to the following table and solve the questions based on it.

The following table gives the average marks obtained by 20 boys and 20 girls in five subjects from five different schools P, Q, R, S and T:

Subject	Maximum Marks	P		Q		R		S		T	
		B	G	B	G	B	G	B	G	B	G
English	200	85	90	80	75	100	110	65	60	105	110
History	100	40	55	45	50	50	55	40	45	65	60
Geography	100	50	40	40	45	60	55	50	55	60	65
Math	200	120	110	95	85	135	130	75	80	130	135
Science	200	105	125	110	120	125	115	85	90	140	135

In the above table, B = Boys and G = Girls

19. What were the total marks obtained by the boys in History from school Q?
(a) 900 (b) 1000
(c) 800 (d) 1300

20. In which of the following subjects did the girls have the highest average percentage marks in all the schools?
(a) Science (b) Geography
(c) English (d) History

21. What is the average mark obtained by all the students of school P taking all the subjects into account?
(a) 82 (b) 84
(c) 80 (d) Cannot be determined

23. During 1996, what is the approximate share of domestic sales of cars of the manufacturer B?
(a) 10.5% (b) 25.5%
(c) 15.5% (d) 19.5%

24. During 2000, the sales of which manufacturer has shown the maximum percentage increase over the previous year?
(a) A (b) B
(c) C (d) D

25. With respect to which of the following combinations, is the sales of cars the highest over the given period?
(a) D, 2000 (b) A, 1998
(c) A, 2000 (d) A, 1999

26. Which of the following manufacturers has a

Directions for questions 22 to 28: Refer to the following table and solve the questions based on it.

The following table shows the domestic sales of cars of five manufacturers from 1995 to 2000. (All the figures are in thousands)

Manufacturer	1995	1996	1997	1998	1999	2000
A	440	480	470	500	520	510
B	400	410	415	415	420	430
C	380	390	390	400	420	495
D	360	380	400	415	440	500
E	480	440	440	420	425	435

Directions for questions 29 and 30: Refer to the following table.

The following table captures the comparative performance of LIC and HDFC in the housing sector in the last four years. (All figures are in ₹crores).

Attribute	1994–1995		1993–1994		1992–1993		1991–1992	
	LIC	HDFC	LIC	HDFC	LIC	HDFC	LIC	HDFC
Loan Sanctions	618.0	1495.0	564.0	1025	607	859	511	758
Dues	24.2	29.6	20.0	27.8	16.1	25.17	5.32	19.57
Total Loans	1672.0	3747.0	1283.0	3071	852	2561	401	2125
Default Percentage	1.45	0.79	1.56	0.91	1.89	.98	1.32	0.93
Total Revenue	251.0	780.0	175.0	608	109	473	44.4	371
Net Profit	41.4	146.1	21.53	105	13.5	55.55	6.71	45.6

ANSWER KEYS

- 1.** (c) **2.** (a) **3.** (d) **4.** (c) **5.** (d) **6.** (a) **7.** (d) **8.** (c) **9.** (a) **10.** (b)
11. (d) **12.** (c) **13.** (a) **14.** (a) **15.** (d) **16.** (d) **17.** (a) **18.** (d) **19.** (a) **20.** (a)
21. (d) **22.** (a) **23.** (d) **24.** (c) **25.** (d) **26.** (d) **27.** (c) **28.** (c) **29.** (b) **30.** (d)

HINTS AND EXPLANATIONS

1 to 4

	Export (₹Crore)	
	2006	2007
Glass Industry	978	1093
Coal Industry	1009	1080
Ruby Industry	1000	913
Nickel Industry	619	663
Softwares Industry	690	605
Diamond Industry	513	505
Total	16250	19500

1. The share of Glass in the total exports for 2007 = $1093/19500 \times 100 = 5.6\%$.
 2. Overall exports have increased by 20% while none of the given six industries have grown by 20%. So, we can conclude that the market shares for all the six industries will decrease in 2003. Hence option (a) is the correct answer.
 3. Coal has the maximum exports in 2006. Hence, its market share is the maximum.
 4. Exports for the given six industries in 2006 = 4809 crore
Exports for the given six industries in 2007 = 4859 crore
Therefore, percentage increase in the exports = $[(4859 - 4809)/4809] \times 100 = 5000/4809 = 1.05\%$.

2.32 Data Interpretation

5 to 9

5. The difference between the white-coloured cars sold is the minimum in the B type model.
6. Blue (E + D) = $43 + 37 = 80$ = White (B)
7. Required difference = $(50 - 34) \times 1000 = 16,000$
8. Required Percentage = $173/192 \times 100 = 90\%$
9. White-c = 90,000

10 to 14

10. The difference in percentage marks of B (History) and C (Hindi) = $90 - 70 = 20$
11. The percentage of marks obtained by F in Science = $160/200 \times 100 = 80\%$
Required Value = $170/80 = 2.125$
12. Average percentage of marks of C = $680/1000 \times 100 = 68\%$
Percentage of marks of C in English = $150/200 \times 100 = 75\%$
Required difference = $75 - 68 = 7$
14. Average percentage of marks in English

$$= \left(\frac{140+130+150+125+145+110}{6} \right) \times \frac{100}{200}$$
$$= 67\%$$

15 to 18

15. By visual inspection.

19 to 21

19. Average marks obtained by 20 boys in History from school Q = 45
Therefore, Total marks = $20 \times 45 = 900$
20. From visual inspection it is clear that Science is the desired subject.
21. The table gives the data pertaining to only 40 students of the school and it is not given if this is the total number of students in the school. Therefore it cannot be determined

22 to 28

22. It is a simple calculation. Alternatively, it can be observed that A has always been more than the others except but for one year.
23. Required share
 $= (410/480 + 410 + 390 + 380 + 440) \times 100 = 19.5\%$
24. It can be observed that the difference is the highest in case of manufacturer C. We can further observe that the largest percentage growth would be for C, as the base is the smallest.
26. By visual inspection we can say that option (d) is the correct answer.
27. By visual inspection we can say that option (c) is the correct answer. Manufacturers are B, C, D.
28. By visual inspection we can say that option (d) is the correct answer.

29 to 30

29. It happens only in 1992–1993

Chapter

18

DEVELOPING THE SKILLS

LEARNING Objectives

In this chapter, you will learn:

- Different constituents of Data Interpretation
- Various skill-sets required and the methods to acquire the same
- Calculations required
- How to excel in these calculations and the calculations specific to a particular data-set
- How to interpret the data
- Connecting different data-sets

CONSTITUENTS OF DATA INTERPRETATION (DI)

Data Interpretation is primarily aimed at assessing the candidate's ability to analyse the given data, arrive at meaningful conclusions and to take appropriate decisions. In many ways, this section truly reflects a business situation; where one is required to take a decision on the basis of available information and future trends.

In any DI question, students will be required to go through the data-set and make necessary relationships between "what is given?" and "what is asked?" These questions simulate the kinds of detailed analyses of relationships that management students must perform in solving problems under strict time restrictions.

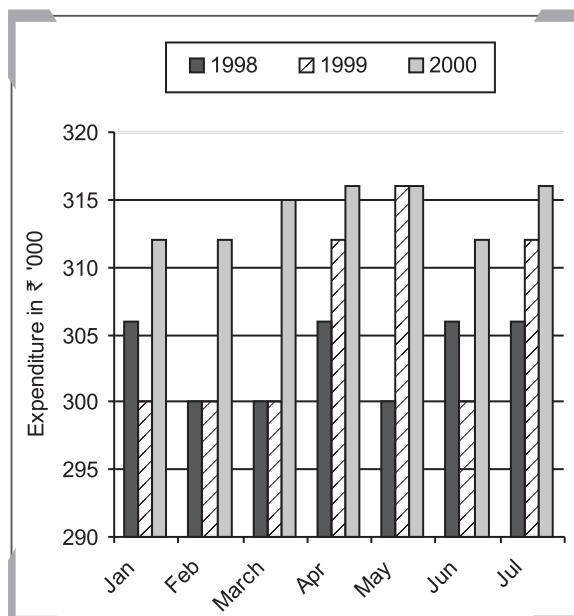
Each DI question contains three separate parts —

- (A) Data-set,
- (B) Explanations and restrictions given for the data and
- (C) Question/s.

Data-Set

The data pertaining to the question can be represented in various formats—pie chart, bar chart, line chart etc. The data-set introduces a sample or a report of some activity, done in the past, present or the future.

Example



In the above data-set, we see the expenses of a family for three years from January to July.

The same data-set can be represented by other formats like the line chart etc. keeping the essence of the data, the same.

We will learn more ways of presenting the data and how they can be inter-related, ahead in this chapter.

Explanations and Restrictions

These should be seen as the guiding principles or the helping factors associated with the data-set. Explanations help us in knowing and understanding the data better; on the other hand, restrictions narrow down our focus to what is being asked and what is to be extracted.

Example

The following are the final results of standard X. The students were tested in English, Hindi, Science, Math, Social Science, Drawing, Craft, PT and Scout-Guide. For a better presentation of the mark sheet, the scores in the first four subjects are consolidated into A1, the next three into A2 and last three into A3. The final score is the total of these three scores A1, A2 and A3. On the basis of the final score the students get their ranks. The table below gives the scores of the top eleven students of the class.

Name	Grade	Final Score	A1	A2	A3	Drawing	PT	Social service
Anana	A	725	282	217	226	80	81	69
Pankaj	B	864	310	87	267	85	86	92
Vamshi	C	812	300	290	222	70	91	74
Ram	C	805	270	262	273	65	79	97
Shann	D	900	391	292	217	96	86	81
Saket	D	876	301	297	278	65	87	93
Mini	C	825	296	296	233	50	89	91
Rashi Singh	E	905	320	290	295	72	99	99
Parul	B	895	310	290	295	72	99	98
Rakesh Rathi	B	870	276	296	298	63	99	99
Gauri	C	888	361	270	257	82	78	92

Without the given explanation, we would not have any idea about how to arrive at A1/A2/A3 and how the grades are being awarded.

Questions

And now finally, the tools to check how much you have been able to interpret the data and relate it to the explanations/restrictions given.

Here, are a few questions based upon the data-set given above:

We will see the solution of the questions given above in the next part. Let us now go through the skill-set required to excel in the Data Interpretation section.

SKILL-SET REQUIRED

Till now, we have understood that DI questions test the following:

- Ability to understand the data and retain that in mind.
 - Exposure to various types of data presentation formats
 - Understanding of how restrictions limit and order behaviour
 - The ‘logic’ inside a data-set and the algorithm to extract it to arrive at a solution

It should be noted, that even if a student has not gone through a formal training or practice of DI for any aptitude exam including CAT, can have an understanding of data and exposure to the various formats of presenting the data, just by virtue of going through any standard newspaper regularly.

However, while discussing the skill-set required, we will assume that the student is at the basic level and has just started going through DI.

Skill 1—Knowing the Terminology

There can be various economic or non-economic terms like CAGR, inflation etc., involved in the data-set, and it is a prerequisite to have a good understanding of these terms.

Example

If the production of wheat in 2004 was 100 million tonnes and in 2007 it was 133 million tonnes, then find the (A) Percentage Growth, (b) SAGR, (c) CAGR.

Solution

- (A) Percentage Growth = [Growth/Initial value] × 100 = 33%
- (B) SAGR (Simple Annual Growth Rate)—It is the average growth rate over the given period. It is calculated by dividing the growth percentage by the number of years involved.
- In the above case, SAGR = $33/3 = 11\%$
- (C) CAGR (Compounded Annual Growth Rate)—It is the year to year growth rate over the given period. To calculate this, we take the help of the fundamentals of compound interest. We take the final value as the amount after the given period and the initial value as the principal.

In the above case,

$$133 = 100 \left(1 + \frac{r}{100}\right)^3$$

Hence, $r = 10\%$ (approx.)

Skill 2—Knowing the Different Formats of Presenting the Data

Having discussed earlier, the significance of organized data, we can automatically conclude that the same data when presented in an unorganized way makes difficult reading and is not of much use. The same data can be presented differently. In one format, it might make easy reading; in another format, it might make difficult reading.

Example

	Location 1	Location 2	Location 3	Location 4	Location 5
2004	112	128	98	132	102
2005	118	147	120	120	108
2006	120	144	126	124	113

Explanation

A company is selling its products at five different locations and the sales value (₹ thousands) of different locations for three consecutive years is given.

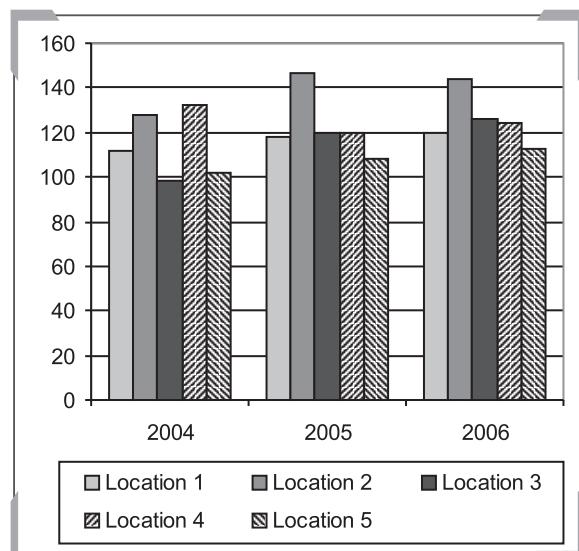
Question

- Which of the following locations has the maximum sum of sales value for the three years?
 - Location 1
 - Location 2
 - Location 3
 - Location 4

Solution

This question simply requires the sum of the sales value of each of the locations for three years. Obviously, location 2 is the answer.

However, if we convert the same data into a bar chart, then it can be seen by simple observation that location 2 is the answer.



Since the bar of location 2 is above the other two for two years and in 2004, it is just a bit lower than one of the bars; we can simply say that location 2 produces the maximum combined sales value for the three years.

Question

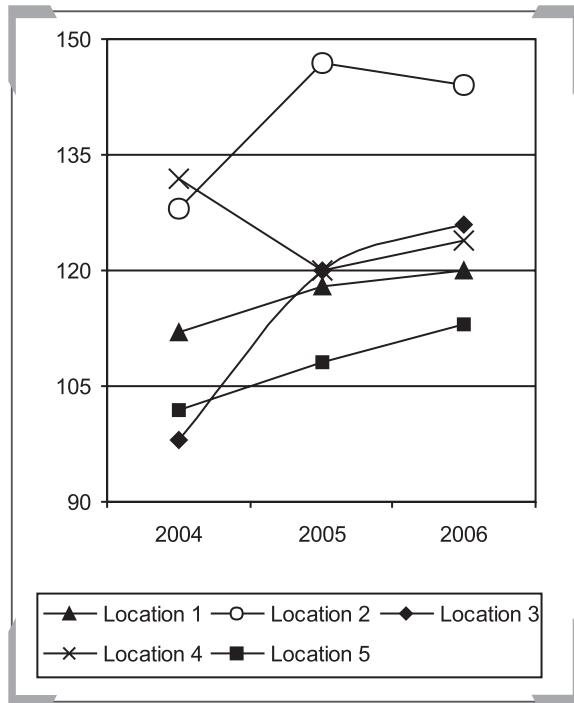
- Which of the following locations has the minimum sum of sales value for the three years?
 - Location 1
 - Location 2
 - Location 3
 - Location 5

Solution

It can be seen that the bar of location 5 is lower than all the bars for two years and once it is equal to the bar of location 3; hence, location 5 produces the minimum combined sales value for the three years.

2.36 Data Interpretation

If we convert the same data into a line chart, it becomes more obvious than the bar chart that location 2 and location 5 give the maximum and minimum sales value for the given period.



Question

3. Which of the following locations has seen the maximum percentage increase in the sales value in 2005 over 2004?

Solution

If we try to solve this question with the help of bar chart, it becomes a bit difficult without having the actual values. So, we are left with either the line chart or the given table.

In case of a table, this question can definitely be solved by calculation and observation. But if we see the same situation in case of a line chart, we can simply rule out location 1/location 4/location 5 as the answer. Now, from the remaining two locations 2 and 3, despite the slope being almost the same, the base in location 3 is very low with respect to the base in location 2. Hence, location 3 will have more percentage increase.

We will learn more about the different formats of presenting data, ahead in this chapter.

Hence, we can see that with different forms of data representation, one can gather different conclusions

just by visual inspection. However, the speed with which this conclusion can be drawn depends heavily on the kind of chart given.

Skill 3—Knowing What is to be Found Out

In my experience of dealing with students from varied backgrounds, many a times I have seen that students are not able to solve a question because they have got very impressed with the data. And as a result, they lose track of what is to be found out.

Remember, never ever get ‘emotionally attached’ to a question.

As an examinee, you are not supposed to get into the technicalities of the data. Rather, you should focus upon what is being asked in the question, and how to extract information from the data-set relevant to the given question.

However, during practice, one needs to focus not just on solving the problems on hand, but also on building an algorithm to solve similar problems whenever they occur.

Cracking the questions require a very systematic approach. The primary focus should be on understanding the question. It would be worthwhile to read the question patiently and carefully. At this juncture, efforts towards building your vocabulary and improving your reading skills might help you. One must pay attention to otherwise innocuous words and phrases such as “at most” or “at least”, “cannot be less than”, “cannot be more than” etc.

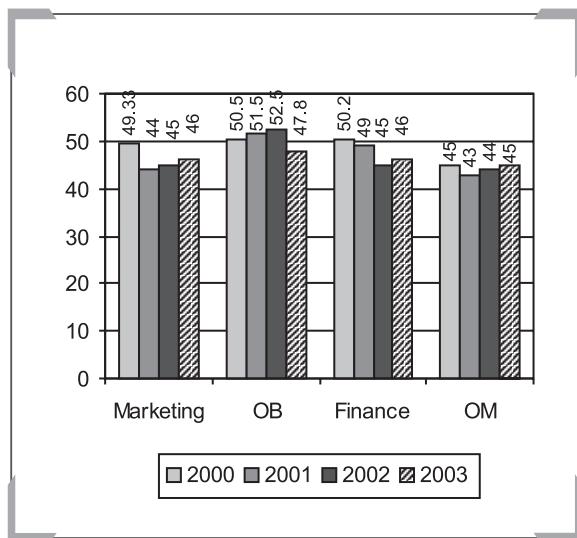
Till now we have discussed data, the significance of organized data and the skill set required to solve the questions.

Let us see a few questions from an actual CAT DI paper:

CAT 2005

A management institute was established on 1 January 2000 with 3, 4, 5, and 6 faculty members in the Marketing, Organizational Behaviour (OB), Finance, and Operations Management (OM) areas respectively, to start with. No faculty member retired or joined the institute in the first three months of the year 2000. In the next four years, the institute recruited one faculty member in each of the four areas. All these new faculty members, who joined the institute subsequently over the years, were 25 years old at the time of their joining the institute. All of them joined the institute on April 1. During these four years, one of the faculty members

retired at the age of 60. The following diagram gives the area-wise average age (in terms of number of completed years) of faculty members as on April 1 of 2000, 2001, 2002, and 2003.



- From which area did the faculty member retire?
 - Finance
 - Marketing
 - OB
 - OM

To solve this question, following things were required:

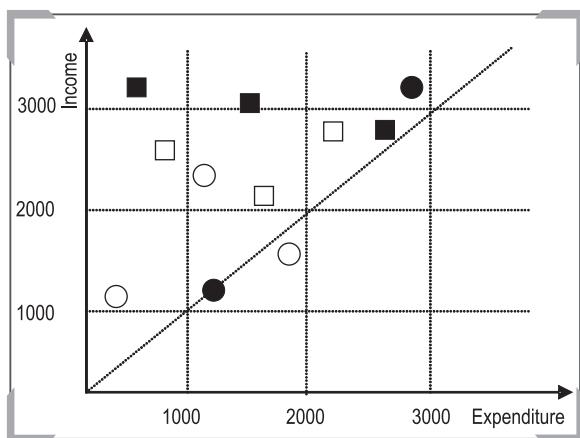
- Understanding the passage given at the beginning of the DI set.
- Understanding the above bar chart.
- Understanding the question and the process of how to inter-relate the data.

Of course we can calculate the sum of ages of all the faculty members in all the areas and for all the years. There were 3 faculty members in Marketing in 2000 (inception of the institute), hence, the sum of completed years of these three faculty members in 2000 = $49.33 \times 3 = 148$ years. But the main problem lying ahead is, for how many years and areas can we do the same thing? As this will involve a good amount of calculation, it will require a good amount of time and patience.

CAT 2004

The data points in the figure below represent the monthly income and expenditure data of individual

members of the Ahuja family (■), the Bose family (□), the Coomer family (○), and the Dubey family (●). For these questions, saving is defined as



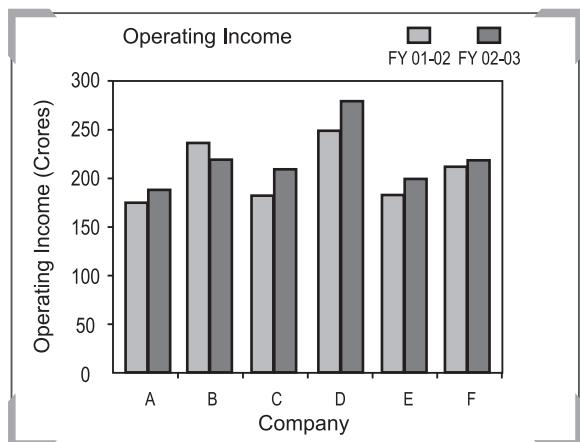
- Which family has the lowest average income?
 - Ahuja
 - Bose
 - Coomar
 - Dubey

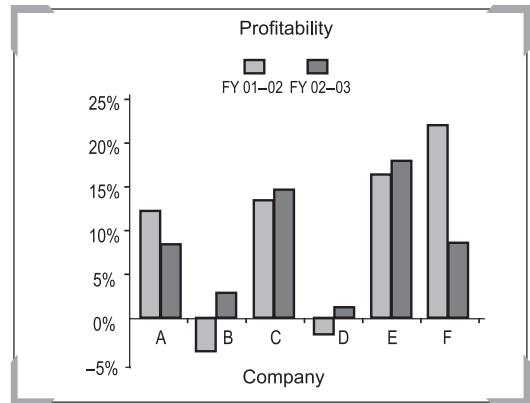
To solve this question, following things are required—

- Understanding the data as given above.
- Understanding the question and the process of how to inter-relate the data.

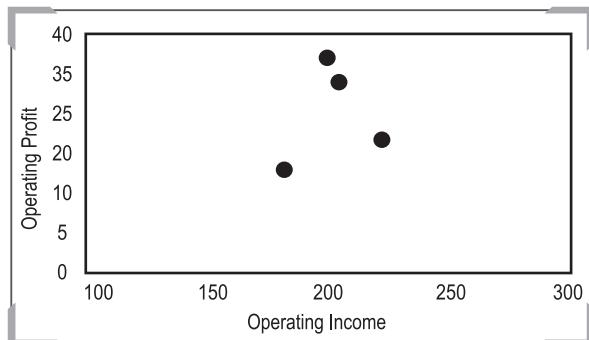
CAT 2003 (Re-Test)

The profitability of a company is defined as the ratio of its operating profit to its operating income, typically expressed in percentage. The following two charts show the operating income as well as the profitability of six companies in the Financial Years (FYs) 2001–2002 and 2002–2003.





The operating profits of four of these companies are plotted against their respective operating income figures for the FY 2002–2003, in the third chart given below.



3. What is the approximate average operating profit, in FY 2001–2002, of the two companies excluded from the third chart?
- 7.5 crore
 - 3.5 crore
 - 25 crore
 - Cannot be determined

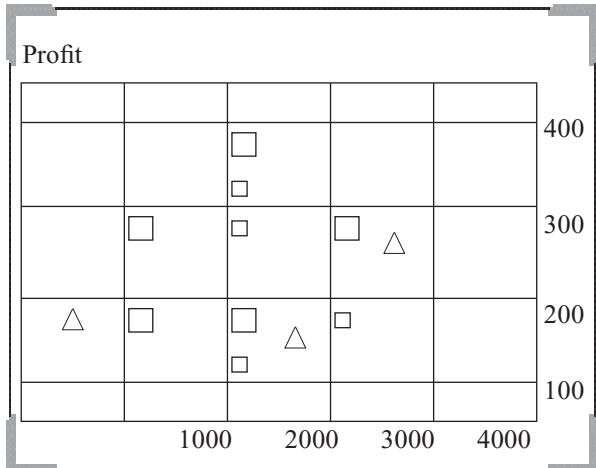
To solve this question, following things are required—

- Understanding of the definitions given above
- Understanding of the above representations of the data-set

The biggest problem one would face while solving this question is how to inter-relate the data given.

CAT 2003 (Leaked)

Each point in the graph below shows the profit and turnover data for a company. Each company belongs to one of the three industries: textile, cement and steel.



4. For how many companies does the profit exceed 10% of the turnover?
- 8
 - 7
 - 6
 - 5

To solve this question, following things are required:

- Understanding of the above representations of the data-set.
- Finding out which one is textile, cement and steel.

(For solution of all these questions refer to CAT papers given in this book.)

- The above examples illustrate a few simple facts:
- Data is an important tool for decision-making and drawing inferences.
- However, having only the data does not serve the purpose; it should be presented in a proper format.
- Despite the data being presented in a proper way, the most important thing is having the capability to interpret it.

CALCULATION TECHNIQUES

Despite the trend at CAT having shifted from easy-to-understand-data-with-difficult-calculations to more logical questions with lesser calculations, it is not advisable to sit for CAT without being reasonably good at quick calculations and approximations.

The importance of a good calculation speed can be understood with the following statistics:

We are taking a sample of a student who attempts 15 questions in DI at CAT. All the figures taken ahead are ‘on an average’ basis.

Number of calculations/questions
 $= 4-5$ calculation

Hence, the total number of calculations done
 $= 60-75$ calculations

If a calculation takes 6 seconds on an average,
then time invested in doing calculations only
 $= 360-450$ secs
 $= 6-7.5$ minutes

Now if we double our calculation speed, we would have 3-4 minutes of extra time. What leverage can be taken from this ‘generated time’ depends totally upon the caliber of the student. Even if a student solves only one question than what he actually would have, and gets it right; the percentile in DI might differ by 1-2 percentile.

Following are the most frequent type of calculations done at CAT—

Addition

This is the most important calculation and takes the lion’s share of the whole calculation section. Addition is also treated as the building block for all the other calculations like subtraction, multiplication etc.

Unfortunately, we don’t have any scut for additions. The only thing that can be done is, practice.

I would suggest a 4×4 table for this practice:

	Column 1	Column 2	Column 3	Column 4
Row 1				
Row 2				
Row 3				
Row 4				

Fill in this table with two digit numbers and add all the columns and rows. To obtain a faster speed, it is advisable that both the digits are added simultaneously. For this, we need to train our mind to retain both the digits of a number simultaneously and then add it in one go with the two digits of the other number.

I would suggest, that rather than adding the unit digit first, add the tens place digit first; and while your brain is adding the tens place digit, your eyes should have captured the unit digit.

Sample table:

	Column 1	Column 2	Column 3	Column 4	
Row 1	36	42	67	98	243
Row 2	46	54	28	72	200
Row 3	58	45	82	89	274
Row 4	49	58	36	92	235
	189	199	213	351	

Rate your calculation speed:

Equal to or less than 15 seconds— Excellent

More than 15 seconds— Less than or equal to 30 seconds— Good

More than 30 seconds— Less than or equal to 60 seconds— Average

More than 60 seconds— A lot work is needed

The above given time includes time for writing the sum and it does not consider the time taken for creating the table and putting values inside it.

The idea is that if, $3 + 4 = 7$ can be done without any effort (ask yourself after doing the addition if did you put any effort), then we could be in a position to do $79 + 68 = 147$ also without any effort. And with this practice exercise, we want to achieve the same.

Subtraction

Once we attain a good speed in addition, subtraction too will become fast as a natural outcome.

Multiplication

Here, again addition is the key. However, it is advisable to know the basics of Vedic maths for multiplication.

Some of the methods are given below:

Base Method

In this method of multiplication, we use a number as a base, like 10, 50, 100 etc. We should try to assume the base that is closer to both the numbers.

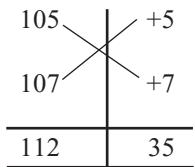
Examples

1. 105×107

Both the numbers are close to 100, so let us assume 100 as the base. We will now find the deficit/surplus from the base.

2.40 Data Interpretation

Base = 100, Surplus = 5 and 7



Right part (after slash) is the product of the surplus. Since base = 100 and surplus are 5 and 7, so product would be $5 \times 7 = 35$.

Left part (before slash) could be either number plus surplus of the other multiplicand. Hence left part would be either $(105 + 7)$ or $(107 + 5) = 112$ (both will always be the same) i.e., 112.

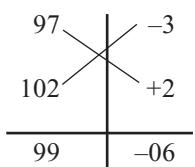
Left part would be the equivalent to Number \times 100. In this case, $112 \times 100 = 11200$

Now we will add both the right part and the left part $= 11200 + 35 = 11235$

Hence, the result of the multiplication would be 11235.

Example

$$2. \quad 97 \times 102$$



$$97 \times 102$$

Base = 100, Deficit = $97 - 100 = -3$,
Surplus = $102 - 100 = 2$

Right part will now be $(-3) \times 2$ i.e., -06 . To take care of the negative we will borrow 1 from the left part, which is equivalent to borrowing 100 (because we are borrowing from the hundred digits of the left part). Thus this part will be $100 - 06 = 94$.

So, the answer = 9894

Place value Method

In this method of multiplication, every digit is assigned a place value and we do the multiplication by equating the place values of multiplicands with the place value of the product.

Examples

$1_3 \quad 2_3 \quad 5_1 \quad 4_0$
$\times \quad 3_3 \quad 3_2 \quad 2_1 \quad 1_0$
$6 \quad 5 \quad 4 \quad 3 \quad 2 \quad 1 \quad 0$

Conventionally, the unit digit is assigned a place value of 0, tens place digit is assigned a place value of 1, hundreds place digit is assigned a place value of 2, thousands place digits is assigned a place value of 4 and so on.

Now, this multiplication is a two-step process:

Step 1—Add the place values of digits of the numbers given (1254×3321) to obtain the place value of the digits of the product.

For example, using the place values of the multiplicands i.e., using 0, 1, 2 and 3 of the number 1254 and the same place values 0, 1, 2 and 3 of the other multiplicand 3321, we can get 0 place value in the product in just one way i.e., adding 0 and 0.

$1_3 \quad 2_3 \quad 5_1 \quad 4_0$
$\times \quad 3_3 \quad 3_2 \quad 2_1 \quad 1_0$
$6 \quad 5 \quad 4 \quad 3 \quad 2 \quad 1 \quad 0$

Place value 1 in the product can be obtained in two ways:

$1_3 \quad 2_3 \quad 5_1 \quad 4_0$
$\times \quad 3_3 \quad 3_2 \quad 2_1 \quad 1_0$
$6 \quad 5 \quad 4 \quad 3 \quad 2 \quad 1 \quad 0$

Place value 2 can be obtained in three ways:

$1_3 \quad 2_3 \quad 5_1 \quad 4_0$
$\times \quad 3_3 \quad 3_2 \quad 2_1 \quad 1_0$
$6 \quad 5 \quad 4 \quad 3 \quad 2 \quad 1 \quad 0$

Place value 3 can be obtained in four ways:

$$\begin{array}{r}
 & 1_3 & 2_3 & 5_1 & 4_0 \\
 \times & 3_3 & 3_2 & 2_1 & 1_0 \\
 \hline
 6 & 5 & 4 & 3 & 2 & 1 & 0
 \end{array}$$

Place value 4 can be obtained in three ways:

$$\begin{array}{r}
 & 1_3 & 2_3 & 5_1 & 4_0 \\
 \times & 3_3 & 3_2 & 2_1 & 1_0 \\
 \hline
 6 & 5 & 4 & 3 & 2 & 1 & 0
 \end{array}$$

Place value 5 can be obtained in two ways:

$$\begin{array}{r}
 & 1_3 & 2_3 & 5_1 & 4_0 \\
 \times & 3_3 & 3_2 & 2_1 & 1_0 \\
 \hline
 6 & 5 & 4 & 3 & 2 & 1 & 0
 \end{array}$$

Place value 6 can be obtained in one way:

$$\begin{array}{r}
 & 1_3 & 2_3 & 5_1 & 4_0 \\
 \times & 3_3 & 3_2 & 2_1 & 1_0 \\
 \hline
 6 & 5 & 4 & 3 & 2 & 1 & 0
 \end{array}$$

And this is the maximum place value that can be obtained.

Step 2—Now multiply the corresponding numbers one by one.

$$\begin{array}{r}
 & 1_3 & 2_3 & 5_1 & 4_0 \\
 \times & 3_3 & 3_2 & 2_1 & 1_0 \\
 \hline
 6 & 5 & 4 & 3 & 2 & 1 & 4_b
 \end{array}$$



$$\begin{array}{r}
 & 1_3 & 2_3 & 5_1 & 4_0 \\
 \times & 3_3 & 3_2 & 2_1 & 1_0 \\
 \hline
 6 & 5 & 4 & 3 & 2 & 3_1 & 4_0
 \end{array}$$



$$\begin{array}{r}
 & 1_3 & 2_3 & 5_1 & 4_0 \\
 \times & 3_3 & 3_2 & 2_1 & 1_0 \\
 \hline
 6 & 5 & 4 & 3 & 5_2 & 3_1 & 4_0
 \end{array}$$



$$\begin{array}{r}
 & 1_3 & 2_3 & 5_1 & 4_0 \\
 \times & 3_3 & 3_2 & 2_1 & 1_0 \\
 \hline
 6 & 5 & 4 & 4_3 & 5_2 & 3_1 & 4_0
 \end{array}$$

And so on, we can find the product = 4164534

This method is most useful in case of multiplications of 2 digits \times 2 digits or 2 digits \times 3 digits or 3 digits \times 3 digits multiplication.

Example

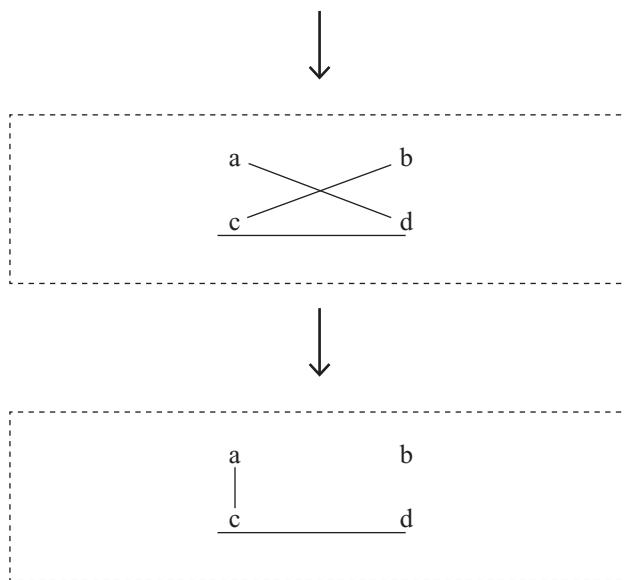
3. $ab \times cd$

$$\begin{array}{r}
 a & & b \\
 & c & \hline & d
 \end{array}$$



$$\begin{array}{r}
 a & & b \\
 & c & \hline & d
 \end{array}$$

2.42 Data Interpretation



Similarly, we can have a proper mechanism for multiplication of 2 digits \times 3 digits or 3 digits \times 3 digits using the above given place value method.

Division

Most of the division calculations can be done by approximation techniques without actually finding the original value.

Example

$$\begin{array}{r} 3548 \\ \hline 4182 \end{array}$$

Let us approximate this value.

There are three golden rules of approximation:

1. Range of approximation should be $\pm 2\%$ with respect to the actual result.
2. Approximation should be done only if the options are at a considerable gap, say $\pm 5\%$ at least.
3. One of the key things to be kept in mind while doing approximation is the direction of the approximation i.e., one should know if the actual result will be more or less than the approximated result.

We should know that in any division, if the numerator and the denominator are both either increased or decreased by the same percentage, then the result will be exactly the same. While it is practically not possible to find such situations always, we will use this to know

the direction while doing approximation for the above calculation:

Approximation 1

Eliminate the unit digit of both the numerator and the denominator

$$\frac{3548}{4182} \approx \frac{354}{418}$$

Now, the objective is to break the numerator into the parts of the denominator.

$$354 = 209(50\% \text{ of } 418) + 145$$

$$145 = 105(25\% \text{ of } 418 \text{ approx.}) + 40$$

$$40 = 10\% \text{ of } 418$$

$$\text{Hence, net value} = 85\% = 0.85$$

Is this value more or less than the actual value?

Let us compare it with the actual result = 0.8483, which is a slightly less than the approximated result of ours.

Approximation 2

Eliminate the unit and tens place digit of both the numerator and the denominator

$$\frac{3548}{4182} \approx \frac{35}{41}$$

$$35 = 20.5(50\% \text{ of } 41) + 14.5$$

$$14.5 = 12(30\% \text{ of } 40 \text{ approx.}) + 2.5 = 30\% \text{ of } 41 + 6\% \text{ of } 41(\text{approx.})$$

$$[\text{Since } 0.41 = 1\% \text{ of } 41]$$

Hence, net value = 86% = 0.86. This is slightly more than the actual value.

Ratio Comparison

This is one of the most important calculations and is very extensively sought after in DI. On an average, while performing 100 odd calculations in DI, at least 8–10 calculations will be on comparing the ratios. Normally there are two methods for comparing two or more than two ratios:

Cross Multiplication Method

This is one of the conventional methods of comparing two ratios.

Example

Let us compare $11/15$ and $13/18$.

$$\frac{11}{15} \quad \frac{13}{18}$$

Cross multiplying the numerator of the 1st fraction with the denominator of the 2nd fraction and denominator of the 1st fraction with the numerator of the 2nd fraction,

$$\frac{11 \times 18}{198} \quad \frac{13 \times 15}{195}$$

Since, 198 is greater than 195; so the 1st fraction ($11/15$) is greater than the 2nd fraction ($13/18$).

Decimal Calculation Method

$$\frac{11}{15} = 0.7333 \quad \frac{13}{18} = 0.722$$

Obviously, here the 1st fraction $\left(\frac{11}{15}\right)$ is greater than the 2nd fraction $\left(\frac{13}{18}\right)$.

However, if we have to compare $3156/5438$ and $3423/5822$, then using any of the above two methods becomes cumbersome and a good amount of time will be required.

Here, we will compare ratios with the help of percentage.

Percentage Comparison Method

Let us first understand this with the help of the following ratios:

1st Case

$$\frac{10}{15} \xrightarrow{100\%} \xrightarrow{100\%} \frac{20}{30}$$

2nd Case

$$\frac{10}{15} \xrightarrow{100\%} \xrightarrow{200\%} \frac{30}{30}$$

3rd Case

$$\frac{10}{15} \xrightarrow{300\%} \xrightarrow{200\%} \frac{30}{60}$$

In the 1st case, percentage change in numerator ($100\%\uparrow$) = percentage change in denominator ($100\%\uparrow$), So ratios are equal.

In the 2nd case, percentage change in the numerator ($200\%\uparrow$) > percentage change in the denominator ($100\%\uparrow$). So the 2nd ratio is greater than the 1st ratio.

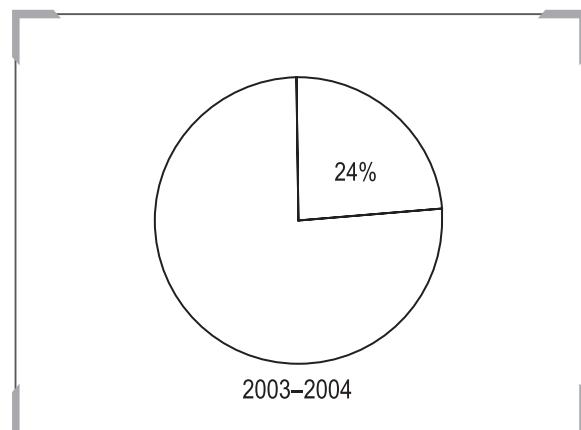
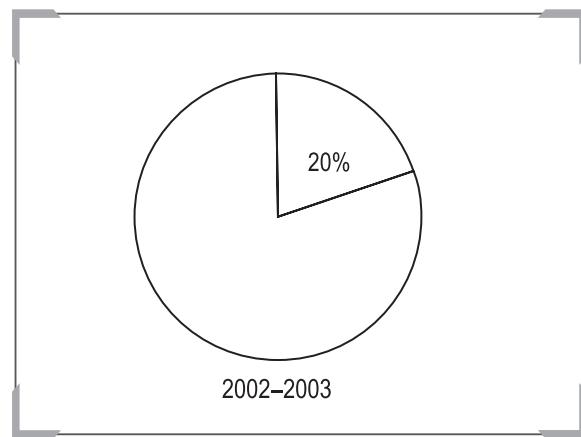
In the 3rd case, percentage change in the numerator ($200\%\uparrow$) < percentage change in the denominator ($300\%\uparrow$). So the 1st ratio is greater than the 2nd ratio.

This particular example can also be seen as a general rule for determining the order of ratios.

Besides these general calculation techniques, there are certain techniques specific to particular types of data presentation formats:

Pie Chart Calculation Technique

The following figure shows the sales of *Due North Inc.* for the year 2002–2003 and 2003–2004. It is also given that the share of North India in the total sales figure is 20% and 24% for the two respective years.



2.44 Data Interpretation

The total sales for 2002–2003 is ₹1202 crores and for 2003–2004, it is ₹1381 crores.

Question

What is the percentage growth in the sales value of North India in 2003–2004 over the sales value of 2002–2003?

Solution

The normal way of doing this question is –

$$\begin{aligned} \text{Sales value of North India in 2002–2003} \\ = ₹240.4 \text{ crores} \end{aligned}$$

$$\begin{aligned} \text{Sales value of North India in 2003–2004} \\ = ₹331.4 \text{ crores} \end{aligned}$$

$$\text{So, growth} = ₹91 \text{ crore}$$

$$\text{So, Percentage growth} =$$

$$\frac{\text{Growth}}{\text{Initial Value}} \times 100 = 37.93\%$$

Alternatively, there are percentage increases in two factors of the given pie-charts, i.e., share is increasing from 20% to 24% and then the total sales value is increasing from ₹1202 crores to ₹1381 crores.

Rather than calculating the sales value of the individual years, we can directly calculate the net percentage change by calculating the percentage changes independently in the above mentioned two factors.

$$\text{Percentage growth in share} = 20\%$$

$$\left(\frac{\text{Growth} \times 100}{\text{Initial Value}}; \text{and remember that it is not } 4\% \right)$$

$$\text{Percentage growth in total value} \approx 15\% \text{ approx.}$$

$$\begin{aligned} \text{So, } 100 \rightarrow 20\% \uparrow \rightarrow 120 \rightarrow 15\% \uparrow \rightarrow 138, \text{ OR} \\ 100 \rightarrow 15\% \uparrow \rightarrow 115 \rightarrow 20\% \uparrow \rightarrow 138 \end{aligned}$$

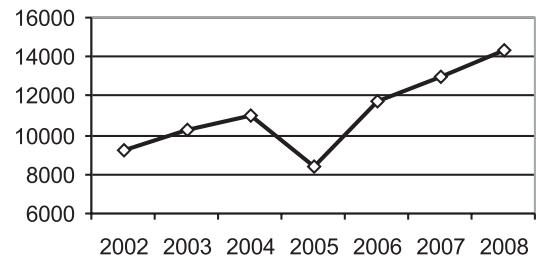
$$\text{So, net percentage growth} = 38\%$$

Line Chart/Bar Chart

In case of line charts bar charts, understanding the process of slope calculation between two consecutive periods/constituents/segments, can give us the highest or lowest percentage change in the whole chart.

Example

Highest Value of Sensex in years



Question

When does the highest percentage increase occur between any two years during the whole period?

Solution

Let us start by going through the slopes of different lines joining the two values.

(Slope is defined as the tangent of the angle formed by the line in an anti-clockwise direction with the X-axis.)

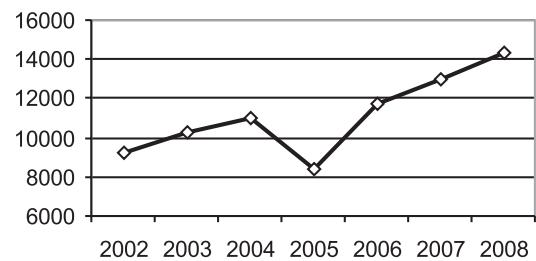
If we find out the angle at the place of slope, it will serve the purpose.

It can be seen in the above line chart that the angle between 2005 and 2006 is the highest. Hence, the maximum percentage increase occurs during 2005–2006.

What is to be done if the angle formed between the two different periods is almost the same?

Let us see this through a final example:

Highest Value of Sensex in years



In the line chart given above, the line between 2006–2007–2008 is almost straight; hence the slope is almost the same. But, as we can see, the base

(or, denominator) is lower in 2005 than in 2006, hence, the percentage increase in 2005–2006 will be higher than 2006–2007.

Whatever we have discussed till now about line charts is true for bar charts as well.

CONNECTING DIFFERENT DATA-SETS

We have seen in Chapter 1, Introduction to Data Interpretation, that there exists a certain relationship among almost all the data presentation formats, it is quite possible to convert a data-set given in one format to a data-set in another format.

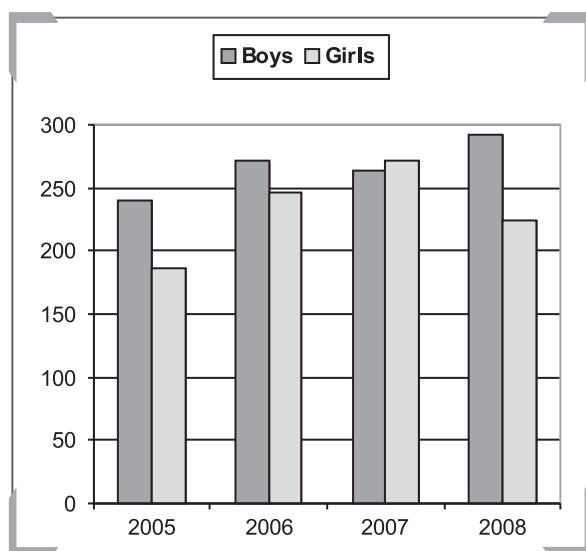
Example

A number of boys and girls passed out from a school during 2005–2007:

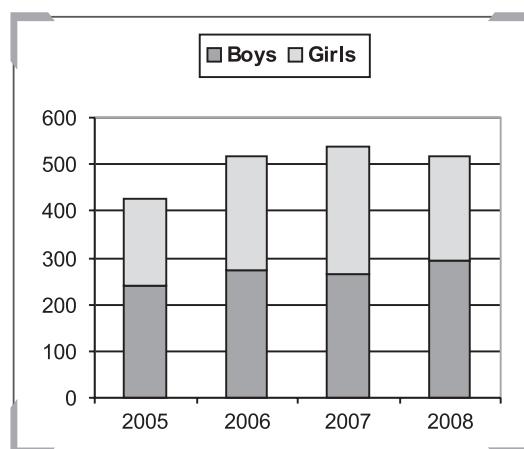
Tabular Presentation

	Boys	Girls
2005	240	186
2006	272	246
2007	264	272
2008	292	224

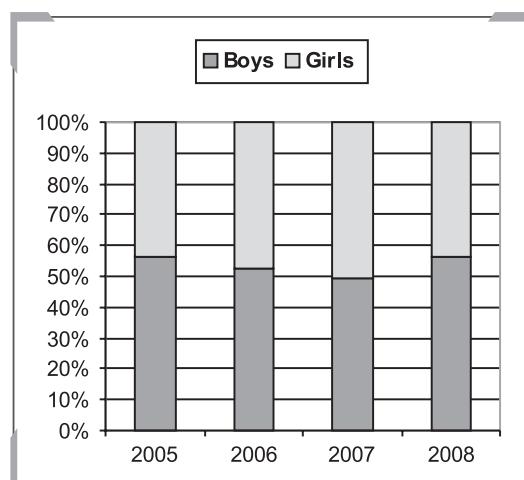
Bar Chart



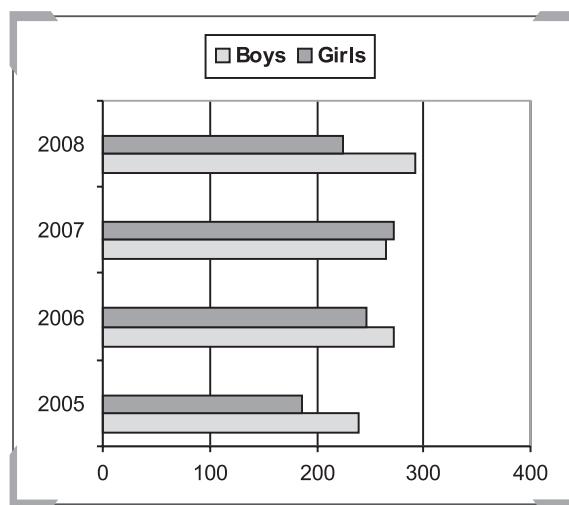
Value-Wise Stacked Bar Chart



Percentage-wise Stacked Bar Chart

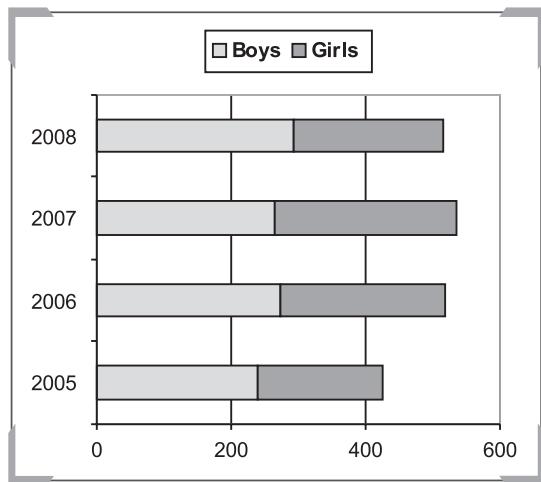


Horizontal Bar Chart

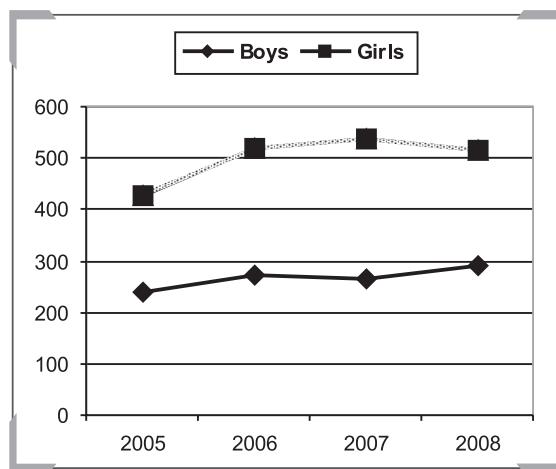


2.46 Data Interpretation

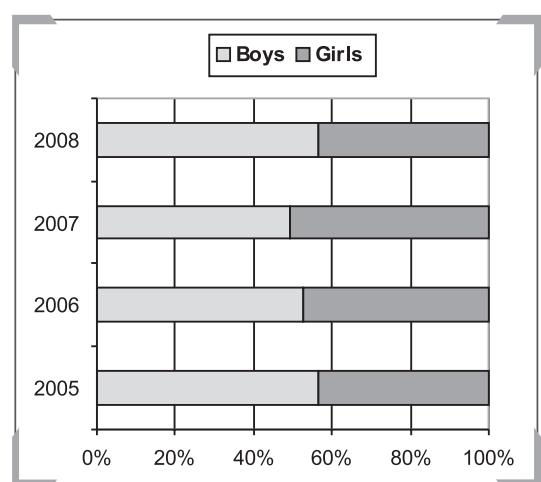
Horizontal Value-wise Stacked Bar Chart



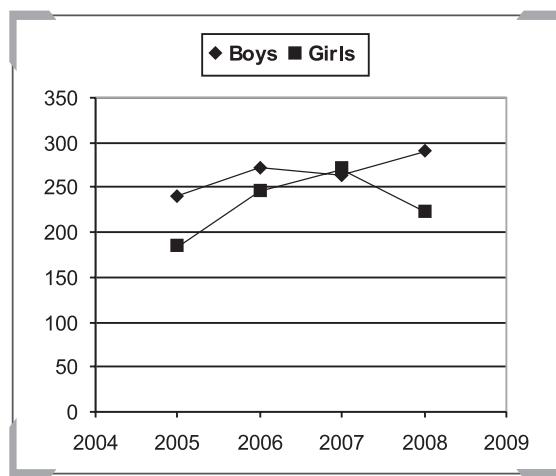
Stacked Line Chart



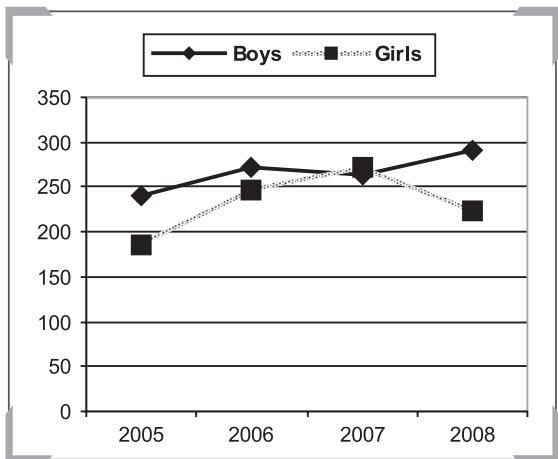
Horizontal Percentage-wise Stacked Bar Chart



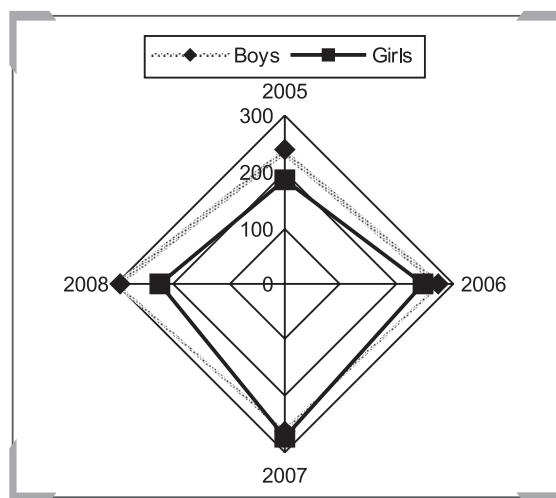
Line chart (with dots)

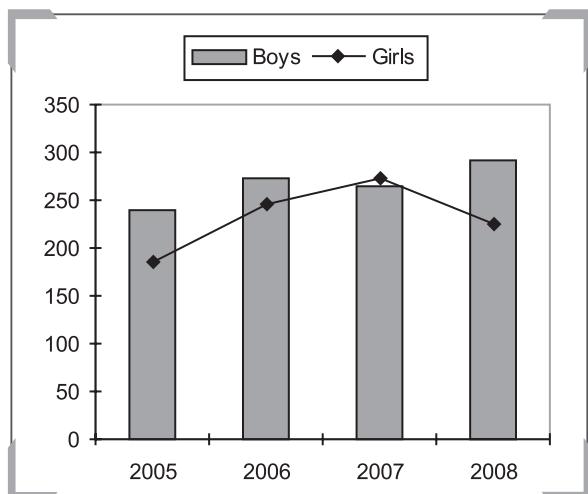
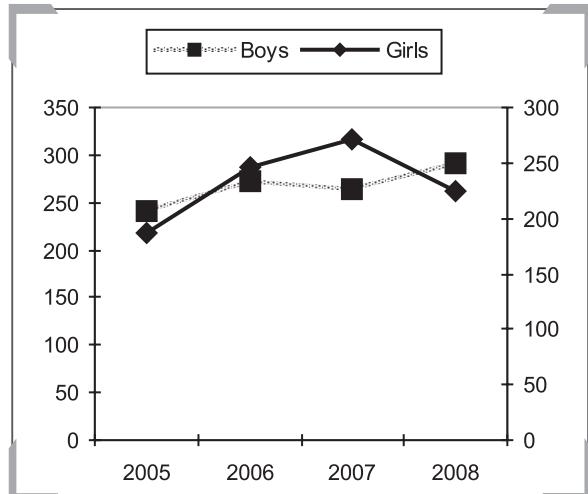
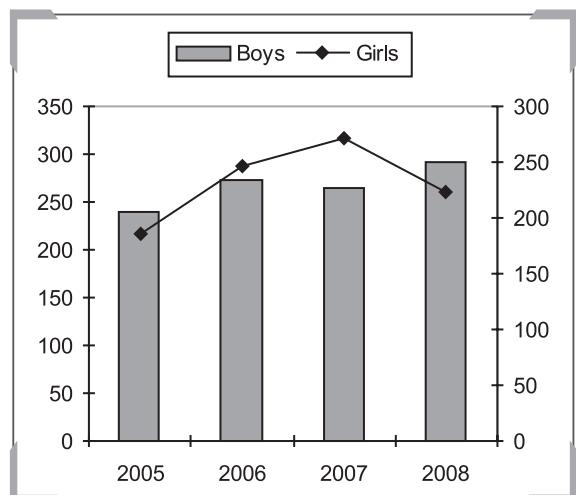
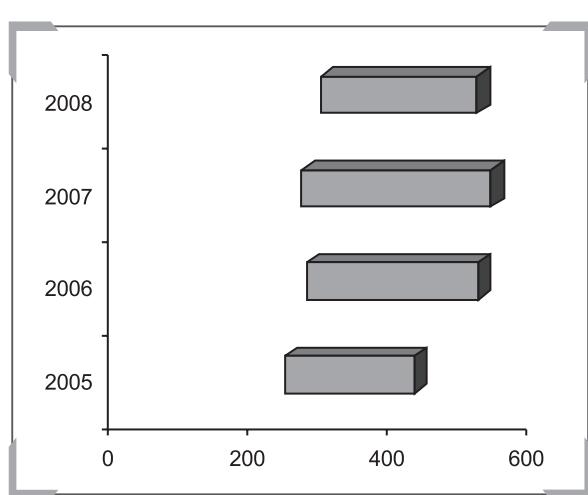
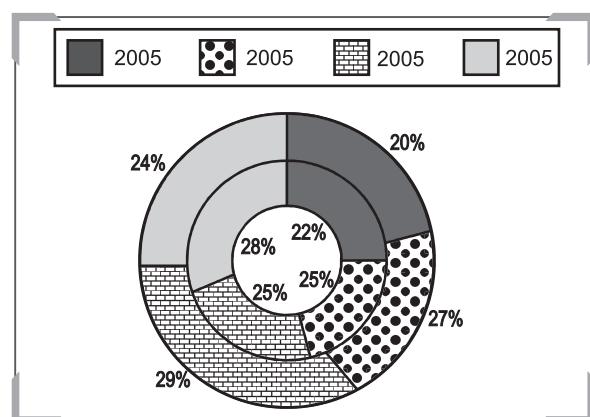


Line Chart



Radar Diagram



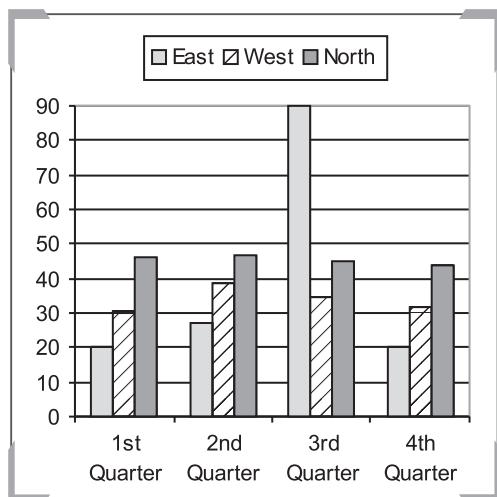
Combination Chart (Line Chart + Bar Chart)**Line Chart with Independent Axes****Combination Chart (Line Chart + Bar Chart) with Independent Axes****Floating Diagram****Doughnut Graph**

PRACTICE EXERCISE 1

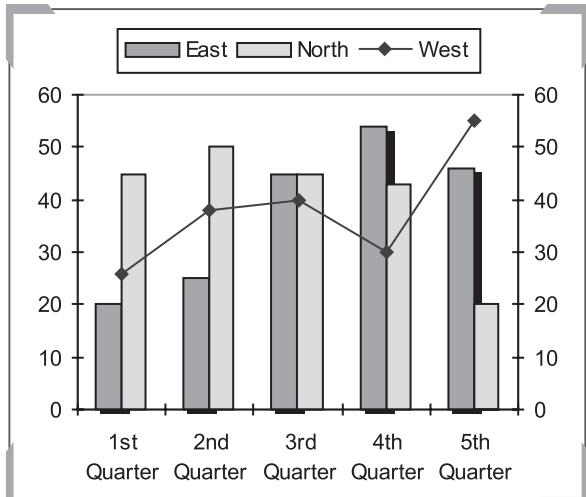
1. Convert the following table into (i) bar chart (ii) line chart (iii) set of pie charts.

	BJP+	Congress	Communist	RJD+	Others
1996	154	214	38	32	72
1999	198	172	46	46	56
2004	234	146	52	42	34

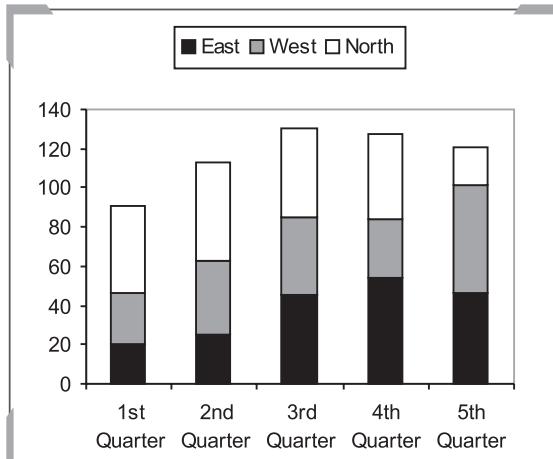
2. Convert the above given table into a line chart with two different axes—BJP on one axis and all the other parties on the second axis.
3. Convert the below given bar chart into (i) line chart (ii) table



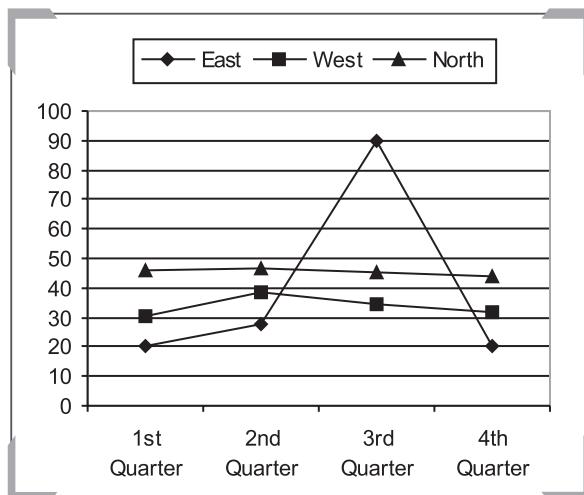
4. Convert the below given line chart on two axes into (i) line chart on a single axis (ii) table (iii) bar chart.



5. Convert the below given stacked bar chart into (i) normal bar chart (ii) line chart (iii) pie charts.



6. Convert the below given line chart into (i) bar chart (ii) stacked bar chart (iii) pie charts.



7. Rank the following ratios in descending order (without actual calculation):

$$3426/4536 \quad 3754/4765$$

$$3954/4865 \quad 4024/5128$$

$$3136/4129$$

8. Rank the following ratios in ascending order (without actual calculation):

$$7324/6453$$

$$7212/6123$$

$$8345/7128$$

$$8523/7027$$

$$6873/5896$$

Chapter

19

DATA SUFFICIENCY

LEARNING Objectives

In this chapter, you will learn:

- How does a typical Data Sufficiency question look like
- Similarity/Dissimilarity between Data Sufficiency questions and Quantitative Aptitude questions
- Various do's and don'ts of solving Data Sufficiency questions
- Process of solving the questions

DATA SUFFICIENCY QUESTIONS

Data Sufficiency questions are designed to test the student's ability to reason with a limited set of data and to reach a valid conclusion. To solve data sufficiency questions, we should have a clear understanding of the different situations that might come with the questions. Besides, we should be clear with the format of the possible questions and various do's and don'ts related to the above situation and solution.

In most of the cases, a data sufficiency question will have the following structure:

Q. A question will be asked.

Statement 1 – One set of information will be given.

Statement 2 – Another set of information will be given.

On the basis of the statements, four or five different options will be provided. One of those options will be the most probable choice and hence the answer.

Significance of Data Sufficiency

In post MBA life, a manager is virtually burdened with the weight of the data—sometimes organized and

sometimes unorganized. DS questions test the ability of the future managers to prune the data to make decisions. Apart from testing the decision making ability of the individual, DS questions also try to evaluate the ability of the student to see into the future that is visualize and predict what can happen in the next 2–3 minutes. Try to understand this—We might find the answer to the question asked in 2–3 minutes time with the help of the given statements, but can we find out the answer right away without actually investing those 2–3 minutes. So, the question now is—Can we predict correctly what is going to happen in the next 2–3 minutes without actually living those 2–3 minutes?

A data sufficiency question is designed—by virtue of its design and content—in such a way that it essentially checks students' ability to reason out. In most of the cases of DS questions, basic concepts of Quantitative Aptitude will be required.

Various do's and don'ts of Data Sufficiency

The process to solve the DS questions is a bit different from the process involved in solving the QA or LR/DI questions. There are certain key things that we should

keep in mind before solving the DS questions. Let us look at them one by one:

1. Understanding the options

This is the first step in solving the DS questions. One must go through the options and understand them clearly. Sometimes, the options given in data set themselves can become a perennial source of problem.

Let us understand the statements given in the options:

If the option statement reads like—"If the question can be solved by using only one of the statements alone, but not by the other statement alone".

It means—Out of the given two (or, more) statements, only one statement can answer the question given, and the other statement cannot give the answer to the question given. In this case either the first statement will give the answer or the second one, but not both simultaneously i.e., if the first statement can give the answer, then second statement cannot give the answer and vice-versa.

If the option statement reads like—"If the question can be solved by using either of the statements alone".

It means—Out of the given two (or more) statements, the question can be solved by using any one of the statements alone. In this case either first statement will give the answer or the second one used individually and independently.

If the option statement reads like—"If the question can be solved by using both (or all) the statements together, but not by either of the statements alone".

It means—Out of the given two (or more) statements, the question can be solved only if the information given in both (or all) the statements is used together. And, using only one of the statements alone cannot solve the given question.

If the statement reads like—"If the question cannot be solved by even using both the statements together".

It means—Out of the given two (or more) statements, the question cannot be solved even by using the information given in both (or all) the statements together.

Once you have understood the statements given in the options, you must not forget to see which statement corresponds to which option. CAT is known to introduce the surprise element quite often, and this also can be one of those surprises which might catch you unaware if you are not careful about this basic fact.

2. General awareness/assumptions are not allowed

As an unproclaimed rule, the element of general awareness cannot be used to solve the DS questions. However this is also true for QA and LR /OI, but its importance in DS increases manifold.

Let us understand this with an example:

Example 1

Is New Delhi the most polluted city in India?

Statement 1 – The Capital of India is the most polluted city in India.

Statement 2 – New Delhi is the capital.

Solution

Well, we can understand that statement 1 alone cannot answer the question, as it is not given that New Delhi is the capital of India.

If your answer is "Both the statements together can answer the question", think again. It is not given in statement 2 that New Delhi is the capital of India.

So, answer to this question is "Cannot be determined."

However, we should have a clear idea regarding the differences between a universal fact like "Pythagoras theorem" and general awareness like "New Delhi is the capital of India".

Universal facts like mathematical principles are not the general awareness stuff, and hence can be used.

Example 2

In how many days A and B working together can finish a work?

Statement 1—A can finish the same work alone in 10 days.

Statement 2—B can finish the same work alone in 15 days.

Solution

Understandably, we cannot have a unique answer to this question by using the statements alone. However, in this case we cannot solve this question even by using both the statement together.

FLAW DETECTOR—Had this question been a question in Quantitative Aptitude, we must have got the answer by using the methods of time and work. However, in this case of data sufficiency, since it is not given that A and B start working together and kept on working together till the work is finished, we cannot solve this question even by using both the statements together.

And we cannot make assumptions that they started working together and kept on working till the work is finished.

Answer should be unique

This is one aspect that makes the process of solving the DS questions different from the process of solving QA or DI/LR questions. While in case of QA, we can have multiple values of a variable; in DS there should be only one value of any variable or constant given.

Example 3

What is the value of x ?

$$\text{Statement 1}—x^2 - 5x + 6 = 0$$

$$\text{Statement 2}—x^2 + 2x - 15 = 0$$

Solution

Using statement 1, value of $x = 2, 3$

Since we are not getting unique value of x using statement 1 alone, we will say that statement 1 alone is not sufficient to give the answer.

Using statement 2, value of $x = -5, 3$

Since we are not getting unique value of x using statement 2 alone, we will say that statement 2 alone is not sufficient to give the answer.

Till now we have seen that using the statements alone is not sufficient to find the answer. Hence, we will move on to using both the statements together.

Using statement 1 and 2 simultaneously, we get a common unique value of $x = 3$.

Hence, “both the statements together are needed to answer the question.”

Example 4

What is the value of x , where x is the length of a rectangle?

$$\text{Statement 1}—x^2 - 5x + 6 = 0$$

$$\text{Statement 2}—x^2 + 2x - 15 = 0$$

Solution

Using statement 1, value of $x = 2, 3$

Since we are not getting unique value of x using statement 1 alone, we will say that statement 1 alone is not sufficient to give the answer.

Using statement 2, value of $x = -5, 3$

x being the length of the rectangle, it cannot be negative. Hence, $x = 3$ is the unique answer that we are getting using statement 2 alone.

Concern for the answer, and not the technicalities

Quite a few times it has been observed that students, rather than solving the questions, tend to get into the technicalities of the data. This furthers students’ ‘emotional attachment’ with the question ending up in the wastage of time and efforts.

Example 5

Can we fill up a big drum of 2000 litres capacity with exactly 88 litres of water (there is unlimited supply of water)?

Statement 1—There is a bucket having a of capacity 20 litres.

Statement 2—There is a bucket having a of capacity 50 litres and a mug of 3 litres capacity.

Solution

Using statement 1, we can fill anything in the multiples of 20 litres only. And it can never be ascertained that the drum has exactly 88 litres of water. So, answer to the question is—We may or may not be able to fill up a big drum with exactly 88 litres of water. And whatever the quantity of the water in the drum is, we can not be sure if this is exactly 88 litres of water.

Using statement 2, we can fill the drum exactly with 88 litres of water ($50 + 50 - 3 - 3 - 3 - 3$). Hence, answer to the question is—Yes, we can fill up a big drum with exactly 88 litres of water.

So, we can find the answer using statement 2 alone.

Example 6

Is $y > x$?

$$\text{Statement 1}—x^2 > y^2.$$

$$\text{Statement 2}—x^3 > y^3.$$

Solution

Using statement 1, assuming some of the values of x and y can tell us that in some cases $x > y$ and in some of the cases $y > x$.

x	y	Remarks
5	4	$x > y$
-5	-4	$y > x$

While assuming the values, we can take only those values of x and y that satisfy the given statement.

Using statement 2,

$$\begin{aligned}x^3 &> y^3 \\ \Rightarrow x &> y\end{aligned}$$

Now look at the question. Obviously, we are getting an answer that y is not greater than x .

Hence, statement 2 alone is sufficient to answer the question.

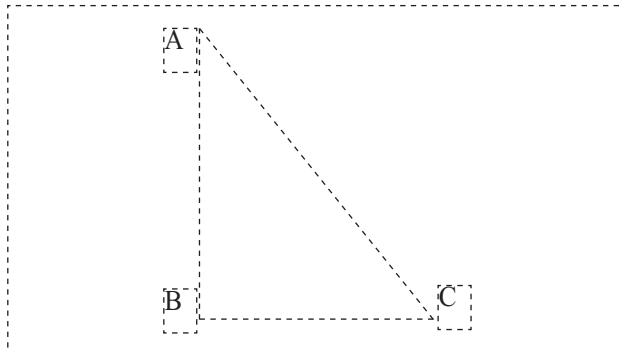
Look for the obvious, but don't miss the hidden

Looking at any of the statements gives us an idea of the facts given, and sometimes we get so enamored with these obvious facts that we fail to see something hidden. Evidently, there is no point saying that "You should not make silly mistakes" (because nobody does it intentionally anyway). However, we can reduce the incidences of these silly mistakes or missing some hidden information.

Some of the precautions that must be taken while tackling any DS question:

1. While assuming the values, take different set of values (like positive, negative, fractions between 0 and 1) to make an informed decision.

2. Any geometrical figure should not be taken as accurate unless it is given. For example, the below given triangle ABC given below cannot be taken as a right-angled triangle even though it appears to be so.



Hence, no conclusion should be drawn by finding proportionate value of length or the angle in any geometrical figure unless such are clearly stated.

Example 7

Is Arvind the father of Puja?

- Statement 1 — Puja is the daughter of Arvind.
Statement 2 — Arvind is the aunt of Abhishek.

Solution

Using statement 1, despite the fact that Puja is the daughter of Arvind, we cannot conclude that Arvind is the father of Puja. Arvind can be the mother too.

Using statement 2, in first impression statement 2 seems to be irrelevant, but looking closely at this statement gives us an idea that Arvind is a woman (only women can be aunts). And hence, we can conclude that Arvind is not the father of Puja.

Therefore, statement 2 alone is sufficient to answer the question.

PRACTICE EXERCISE 1

Directions for questions 1 to 25: Each item is followed by two statements, A and B. Answer each question using the following instructions.

Choose (a) If the question can be answered by one of the statements alone and not by the other.

Choose (b) If the question can be answered by using either statement alone.

Choose (c) If the question can be answered by using both the statements together, but cannot be using either statement alone.

Choose (d) If the question cannot be answered even by using both the statements together.

1. Is the point P on the circle with center O?
 - A. Q is a point on the circle and the distance from P to Q is equal to the distance from O to Q.
 - B. Q is on the circle and P, Q, O are vertices of an equilateral triangle.
2. Is Arvind the father of Puja?
 - A. Puja is the daughter of Arvind.
 - B. Arvind is the brother of Abhishek.
3. If the ratio of boys to girls attending school in 2000 was $1/3$, what was the ratio of boys to girls attending school in 2001?
 - A. 100 more boys were attending school in 2001 than in 2000.
 - B. 150 more girls were attending school in 2001 than in 2000.
4. If a and b are positive numbers, is $b > a$?
 - A. $a^2 > b$
 - B. $a^2 > b^2$
5. What is the area of the unshaded region in the given figure (Points E, F are on the line BC and point G is on the line AD)?

 - A. ABCD is a parallelogram.
 - B. Area of ABCD is 50 square units.
6. If the integer P is divisible by 15?
 - A. Sum of the digits of P equals 15.
 - B. Unit digit of P is 6.
7. Is Q a positive number?
 - A. $4Q + 24 > 0$
 - B. $4Q - 24 < 0$
8. How many chocolate bars, 2 inches wide and 4 inches long can be packed into carton C?
 - A. The inside dimension of carton C are 8 cm by 12 cm.
 - B. The width of carton C is equal to the height and $3/4$ of the length.
9. What are the values of x and y?
 - A. $3x + 2y = 45$
 - B. $y = 22.5 - 1.5x$
10. Is x an even number?
 - A. $4x + 3y$ is an even number.
 - B. $3x + 4y$ is an even number.
11. What is the ratio of the number of boys and girls in a school (Number of boys and girls are natural numbers)?
 - A. Number of boys is 40 more than girls.
 - B. Number of girls is 80% of the number of boys.
12. What is the difference between two numbers?
 - A. First number is 60% of the other number.
 - B. 50% of the sum of first and second number is 24.
13. How many marks did Arpit Sinha obtain in mathematics?
 - A. Arpit Sinha secured an average 55% marks in mathematics, physics, and chemistry together.
 - B. Arpit Sinha secured 10% marks more in mathematics than the average of mathematics, physics and chemistry.
14. Is $x > y$?
 - A. $\frac{(x^4 - y^4)}{x^3 + y^3} > 0$
 - B. $\frac{x^3 - y^3}{x^4 + y^4} > 0$
15. What is a two digit number?
 - A. The number obtained by interchanging the digits is smaller than the original number by 63.
 - B. Sum of the digits is 11.

2.54 Data Interpretation

16. x, y, and z are integers, is x an odd number?
A. an odd number is obtained when x is divided by 5.
B. $(x+y)$ is an odd number.
17. What is the number x?
A. The LCM of x and 18 is 36.
B. The HCF of x and 18 is 2.
18. Is y greater than x?
A. $x+y = 2$
B. $x/y = 2$
19. Which of the four numbers w, x, y, and z is the largest?
A. The average of w, x, y and z is 25.
B. The numbers w, x, and y are each less than 24.
20. P, Q, R, and S are four consecutive even integers. What is the value of the largest integer among these?
A. The average of the four numbers is the first prime number greater than 10.
B. The ratio between the largest and the smallest of the number is less than 10.
21. Is A greater than B?
A. $(A+3)$ is greater than $(B+2)$.
B. Fourth power of A is greater than third power of B.
22. Which of the following is greater: $\frac{a+x}{b+x}$ or $\frac{a}{b}$?
A. $\frac{a}{b} > 1$
B. x is positive.
23. How many boys and girls are there in the family of 7 children?
A. Each boy in the family has as many sisters as brothers.
B. Each girl in the family has as many brothers as sisters.
24. In how many days does Binod finish a certain work?
A. Binod is twice as efficient as Amar.
B. Akshay is twice as efficient as Binod.
25. What is the equation of the straight line AB?
A. Straight line AB is perpendicular to another straight line $3x + 5y = 10$
B. Straight line AB passes through the point (1, 2).

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (a) | 2. (b) | 3. (c) | 4. (a) | 5. (b) | 6. (a) | 7. (d) | 8. (c) | 9. (d) | 10. (d) |
| 11. (a) | 12. (c) | 13. (d) | 14. (a) | 15. (c) | 16. (a) | 17. (d) | 18. (c) | 19. (d) | 20. (a) |
| 21. (d) | 22. (c) | 23. (b) | 24. (d) | 25. (c) | | | | | |

HINTS AND EXPLANATIONS

1. Using statement A alone, since it is given that the centre of the circle is O, hence OQ is the radius of the circle. But point Q can be inside the circle or on the circle or outside the circle and in all these cases $OQ = PQ$. Hence, statement A alone does not give the answer.
Using statement B alone, $PQ = QO = PO$ = Radius of the circle.
Hence, point P is on the circle.
2. Using statement A alone, Arvind can be father or mother of Puja.
Using statement B alone, obviously it cannot be solved.
Using both the statements together, since Arvind is the brother of Abhishek, hence Arvind is a male. Hence Arvind is the father of Puja.
3. Using statement A alone, nothing can be concluded.
Using statement B alone, nothing can be concluded.
Using both the statements together, if the ratio of boys to girls in 2000 = $x/3x$, then the new ratio of boys to girls in 2001 = $\frac{x+100}{3x+150}$
Now everything depends upon the value of x. Hence cannot be determined uniquely.
4. Using statement A alone, depending upon the values of A and B, either can be greater ($A = 10, B = 1$ or $A = 5, B = 10$) according to the condition given in the statement.
Using statement B alone, since both the numbers a and b are positive, and $a^2 > b^2$, hence $a > b$.

So, the answer to the question is – No, b is not greater than a.

5. Using both the statements together, since the base and height of ABCD and unshaded region are same, hence the area of unshaded region is half of area (ABCD).
6. Using statement A alone, nothing can be concluded. Numbers can be 195 or 159 etc. Otherwise also, we know that if any number is divisible by 5 and 3 both, then the number will be divisible by 15. If the sum of the digits is 15, then the number is divisible by 3 but nothing can be said about the divisibility of this number by 5.

Using statement B alone, since the unit digit of P is 6, hence this number is not divisible by 5, and hence not divisible by 15.

Answer (a)

7. A. $4Q + 24 > 0$ Or, $4Q > -24$, or, $Q > -6$
Hence, Q can be negative or positive or zero as well.
- B. $4Q - 24 < 0$
Or, $4Q < 24$, or, $Q < 6$

Hence, Q can be negative or positive or zero as well.

9. Using statement A alone, since the equation is in two variables and there is one equation nothing can be concluded.

Using statement B alone, since the equation is in two variables and there is one equation nothing can be concluded.

Using both the equations together, both the equations are same. Hence, cannot be determined.

10. Is x an even number?

- A. $4x + 3y$ is an even number.
- B. $3x + 4y$ is an even number.

Using statement A alone, if $4x + 3y$ is an even number then both $4x$ and $3y$ should be either odd or both should be even. Both $4x$ and $3y$ cannot be odd (as $4x$ is even) and hence both of $4x$ and $3y$ are even.

Now even if $4x$ is even, then we cannot conclude that x is even or odd.

Using statement B alone, if $3x + 4y$ is an even number then both $3x$ and $4y$ should be either odd or both should be even.

If each of $3x$ and $4y$ is even, then x can take values like $x = 4/3$, which is neither odd nor even.

If each of $3x$ and $4y$ is odd, then $3x$ is odd. But using this we cannot conclude that x is also odd. X may be a fraction also like $x = 1/3$ or even it can be an odd number.

FLAW DETECTOR—Whenever we are required to assume the values, we should assume the different values viz. Positive nos., negative nos., fractional values and definitely the fractional values between 0 and 1 before validating our result.

11. Using statement A alone, we cannot determine the ratio of boys and girls.
Using statement B alone, Number of girls = $4/5$ Number of boys, now we can find out the ratio of boys and girls in the school.
12. Using statement A, we get the ratio between the two numbers but not the difference between the numbers. Statement B gives the sum of the numbers but not the difference. Using both the statements together gives the difference between the numbers.
13. In none of the statements given marks have been given in terms of numbers, hence we cannot find the marks obtained in mathematics.
14. Using statement A, we cannot determine if $(x^4 - y^4)$ is greater than zero or less than zero since we do not have the sign of $(x^3 + y^3)$. Hence we cannot determine anything.
Using statement B, we cannot determine if
 $(x^3 - y^3) > 0$ since $(x^4 + y^4) > 0$.
 $(x^3 - y^3) > 0$, so, $x > y$.
15. Using statement A alone gives that the difference between the digits of the number is 7. This gives the possibility of many numbers like 81, 92 etc.
Using statement B alone also gives the possibility of many numbers.
Using both the statements together, we get a unique number.
16. Using statement A alone, we get that the quotient obtained when x is divided by an odd number is odd. Hence x has to be odd.
Using statement B alone, one of x and y will be odd and other one will be even. So we cannot determine that which of x or y is even?
17. Using statement A, value of x can be $22 \times 30 - 1$. Hence, two values of x are possible.
Using statement B, value of x can be

2.56 Data Interpretation

$$21 \times 30 \times 5N \times 7N \times \dots,$$

where value of N can be any real number.

Using both the statements together, we can see that no unique value of X is possible.

- 18.** Using statement A alone cannot give us any result.

Using statement B alone cannot give us any result since the values of x and y can be positive as well as negative too.

Using both the statements together will give us the result.

- 19.** Using statement A alone cannot give us any result.

Using statement B alone gives that value of three of the given numbers is less than the average. Hence, fourth number will be greater than the average. So, this fourth number is largest.

- 20.** Using statement A alone, average of the given four numbers = 11, hence their sum = 44, hence the numbers will be 8, 10, 12, 14. Hence, the value of largest integer, whichever is that, is 14.

Using statement B alone is not going to give us the result.

PRACTICE EXERCISE 2

Directions for questions 1 to 20: *Each item is followed by two statements, A and B. Answer each question using the following instructions.*

Choose (a): If the question can be answered by one of the statements alone and not by the other.

Choose (b): If the question can be answered by using either statement alone.

Choose (c): If the question can be answered by using both the statements together, but cannot be using either statement alone.

Choose (d): If the question cannot be answered even by using both the statements together.

1. A, B, C, D are playing cricket and scored 96 runs together. Did A score the maximum runs?
 - A. A scored 23 runs.
 - B. B and C together scored 42 runs.
2. Is ab an even number?
 - A. a is divisible by 3.
 - B. $(b + 1)$ is divisible by 4.
3. Three teams of woodcutters took part in a competition (to cut the maximum quantity of wood). Which team could win the competition?
 - A. The first and the third teams cut twice as much as the second team cut.
 - B. The second and the third teams cut three times as much as the first team cut.
4. If m and n are integers, is m divisible by 11?
 - A. mn is divisible by 110.
 - B. n is divisible by 2.
5. On a fishing trip, Sanju and Ajay each caught some fishes. Who caught more fish?
 - A. Sanju and Ajay caught fishes in the ratio 2 : 3.
 - B. After Sanju stopped fishing, Ajay continued fishing until he caught 12 fishes.
6. What are the ages of three brothers (ages are natural numbers)?
 - A. The product of their ages is 21.
 - B. The sum of their ages is not divisible by 3.
7. Is $5x + 25$ is divisible by 50?
 - A. x is divisible by 5.
 - B. x is divisible by 10.
8. How many of a, b, c, d are odd, given that all of them are positive integers?

- A. $ad + bc$ is odd.
- B. $ac + bd$ is odd.
9. A is not shorter than B, who in turn, is not taller than C who is shorter than D. Who among A, B, C and D is the tallest?
 - A. C and A are of equal height.
 - B. B and A are of equal height.
10. If Bhushan or Charan passed the examination, then neither Sujan nor Tarun passed the examination. Did Bhushan pass the examination?
 - A. Tarun did not pass the examination.
 - B. Sujan passed the examination.
11. Six people—A through F—sit around a circular table, not necessarily in the same order. B and E sit opposite each other. Does C sit opposite D?
 - A. If C and E interchange their positions, then E will be to the immediate left of B.
 - B. If A and B interchange their positions, then B will be to the immediate left of E.
12. Average age of a, b, c, and d is 46 years. Who is the oldest among them?
 - A. c is 91 years old.
 - B. Ages (in years) of all of them are distinct natural numbers.
13. Product of a, b, c, and d is 1003 (a, b, c and d are all natural numbers). Which one is the largest among them?
 - A. $a > b > c$
 - B. $a > b > d$
14. What is the least common multiple of a x b, b x c and c x a (a, b, c are all natural numbers)?
 - A. least common multiple of a, b and c is 30.
 - B. The highest common factor of a, b and c is 2.
15. What are the values of m and n?
 - A. n is an even integer, m is an odd integer, and m is greater than n.
 - B. Product of m and n is 30.
16. On a given day, a boat ferried 1500 passengers across the river in 12 hours. How many round trips did it make?
 - A. The boat can carry 200 passengers at any time.
 - B. It takes 40 min each way and 20 min of waiting time at each terminal.

2.58 Data Interpretation

17. What is the value of x ?
A. x and y are unequal even integers, less than 10, and x/y is an odd integer.
B. x and y are even integers, each less than 10, and product of x and y is 12.
18. What are the ages of two individuals, x and y ?
A. The age difference between them is 6 years.
B. The product of their ages is divisible by 6.
19. If m and n are consecutive positive integers, is $m > n$?
A. $m - 1$ and $n + 1$ are consecutive positive integers.
B. m is an even integer.
20. Which of a, b, c and d is/are odd?
A. $ad + bc$ is odd.
B. $ac + bd$ is odd.

ANSWER KEYS

1. (a) 2. (d) 3. (c) 4. (d) 5. (a) 6. (d) 7. (a) 8. (c) 9. (b) 10. (a)
11. (c) 12. (c) 13. (a) 14. (d) 15. (d) 16. (a) 17. (d) 18. (d) 19. (a) 20. (a)

HINTS AND EXPLANATIONS

1. Using statement A alone, since the average runs scored by all of them = 24, and runs scored by A = 23, hence we can conclude that at least one of remaining three persons must have scored more than the score of A. So, A didn't score maximum runs.

Using statement B alone cannot give us any result.

2. Using statement A alone cannot give us any result.

Using statement B alone gives that b is an odd number.

Using both the statements together we get ab is an odd number.

4. Using statement A, at least one of m or n will be divisible by 11, but we are not sure that which of m or n will be divisible by 11.

Using statement B, n is divisible by 2 but it does not give that which of m or n is divisible by 11.

Using both the statements together, we cannot find if m is divisible by 11 or not.

5. Using statement A alone, we can find out that Sanju caught more fishes than Ajay whereas using statement B alone, we cannot find that who caught more fishes.

6. Using statement A alone, ages of the brothers can be 21, 1, 1 or 1, 7, 3. Hence, using statement A alone will not give us the unique answer.

Using statement B alone also will not give us the result.

Even after using both the statements together, we cannot find the ages of the brothers as both the possibilities $(21 + 1 + 1)$ and $(1 + 7 + 3)$ are not divisible by 3.

7. Using statement A alone, assuming some values of x ($= 5$ or $= 10$) gives that $5x + 25$ is sometimes divisible and sometimes not divisible.

Using statement B alone, whatever values of x we take, we see that $5x + 25 = 5(x + 5)$ is not divisible by 10.

8. Using both the statements together, we can find the answer.

9. This question can be answered by using either statement alone.

10. Question can be answered by using the statement B alone but not by statement A alone.

11. Question can be answered by using both the statements together but not by any of the statements alone.

12. Sum of their ages = 184 years.

Using statement A alone, since the age of C = 91 years, hence sum of ages of rest of them = 93 years. Using this we cannot find that who is oldest of them.

Using statement B alone we cannot get the answer.

Using both the statements together, since the age has to be natural number, so minimum possible age of any one of them = 1 year. So, the youngest of them can be 1 year old, second youngest of them

can be 2 years old, hence the maximum age of third person can be 90 years.

So, C is the oldest of them.

13. $1003 = 1 \times 1 \times 17 \times 59$

Using both the statements together, 'a' is the largest one.

14. Using statement A alone, values of a, b and c can be- 2, 3, 5 or 2, 3, 30. Hence, answer cannot be obtained using statement A only.

Using statement B alone, values of a, b and c can be 2, 4, 6 or 4, 6, 8 etc. Hence, answer cannot be obtained using statement B only.

Using both the statements together, values of a, b and c can be - 2, 6, 10 or 6, 10, 30. And we can

see that we are not getting a unique value of $a \times b$, $b \times c$ and $a \times c$.

15. (Don't forget to take the negative values of m and n)
16. This question can be answered by using statement B alone but not by using statement A alone.
17. (Don't forget to take the negative values of x and y)
18. Using statement A alone will not give us the answer.
Using statement B alone will not give us the answer.
Using both the statements together also will not give us the answer.
19. This question can be solved by using statement A alone but not by using statement B alone.

PRACTICE EXERCISE 3

Directions for questions 1 to 17: 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 first statement (statement A) alone but not by the second statement (statement B) alone.

Choose (2): If the question can be answered by second statement (statement B) alone but not by the first statement (statement A) alone.

Choose (3): If the question can be answered by using either statement alone

Choose (4): If the question can be answered by using both the statements together, but cannot be using either statement alone.

Choose (5): If the question cannot be answered even by using both the statements together

Now Choose the answer from the given options.

- B. Ratio of length of side BC and side CA = 4 : 5
 (a) 1 (b) 3
 (c) 2 (d) 4
 (e) 5

11. A bus is running with a uniform speed from Patna to Gaya. It met with an accident somewhere enroute. What is the speed of this bus?
 A. Due to this accident, speed of bus got reduced by 22%. And Due to this one bus reached Gaya 40 minutes late.
 B. Had the accident occurred 5 km ahead of the point where the accident occurred, it would have reached Gaya only 20 minutes late.
 (a) 1 (b) 3
 (c) 2 (d) 4
 (e) 5

12. There are five members—P, Q, R, S and T in a family. How many members of this family are male?
 A. T has two sisters—Q and S.
 B. P is the father of T and R is the only son of T.
 (a) 1 (b) 3
 (c) 2 (d) 4
 (e) 5

13. Which month is the current month?
 A. Sum of dates of last Monday of previous month and 1st Thursday of next month is 38 and both the dates are of the same year.
 B. Current year is a leap year and the month in the question is from current year.
 (a) 5 (b) 4
 (c) 3 (d) 2
 (e) 1

14. 1st January 19PQ is Monday, where P and Q are the last two digits of the year in such a way that maximum value of P and Q each is 6. Which is the next year when 1st January will be a Monday?
 A. 19PQ is a leap year.
 B. 19PQ is a non-leap year.
 (a) 1 (b) 3
 (c) 2 (d) 4
 (e) 5

15. A triangle is circumscribed by a circle. Is this triangle a right-angled triangle?
 A. Triangle is isosceles triangle.
 B. One side of the triangle is the largest possible chord of the circle.
 (a) 1 (b) 3
 (c) 2 (d) 4
 (e) 5

16. Triangle ABC is a right angled triangle. What is the distance between circumcentre and the centroid of this triangle ABC?
 A. Inradius of $\Delta ABC = 5$ units
 B. Two smaller sides of the ΔABC are 3 units and 4 units.
 (a) 1 (b) 3
 (c) 2 (d) 4
 (e) 5

17. What is the HCF of $(5a - 1)$ and $(5b - 1)$?
 A. HCF of a and b = 5
 B. a and b are natural numbers.
 (a) 1 (b) 3
 (c) 2 (d) 4
 (e) 5

Directions for questions 18 to 20: Each item is followed by three statements, A, B and C. Answer each question using the following instructions.

Mark (a): if the question can be answered by using any two statements together but not by using any statement alone

Mark (b): if the question can be answered by using either of the statements alone.

Mark (c): if the question can be answered only by using all the three statements together and neither by any pair of statements nor by any statement independently.

Mark (d): if the question cannot be answered using the statements in any case.

Mark (e): if none of the above four options are correct.

18. A football is kept inside a circular field. What is the probability of this ball being closer to the center of the circle than to the periphery of the ground?
 A. Radius of the circular field is 15 m.
 B. Radius of the football is 5 cm.
 C. Ratio of circumference and diameter of the circle is constant.

19. A and B are running continuously around a circular track with respective uniform speed. They start running from the same point at the same time. After how much time will they meet at the diametrically opposite point of their starting point?
 A. Speed of A is 20 m/s and speed of B is 35 m/s.
 B. Length of the track is 1000 m.
 C. Both A and B are running in the same direction.

20. At how many different points, graph of $f(x) = ax^2 + bx + c = 0$ will cut X-axis?
 A. $a > 0, b > 0$ and $c > 0$.
 B. Discriminant of $f(x) < 0$
 C. $a < 0$.

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (b) | 2. (c) | 3. (b) | 4. (c) | 5. (b) | 6. (c) | 7. (b) | 8. (e) | 9. (d) | 10. (d) |
| 11. (d) | 12. (e) | 13. (e) | 14. (a) | 15. (c) | 16. (c) | 17. (a) | 18. (e) | 19. (e) | 20. (e) |

HINTS AND EXPLANATIONS

1. Using statement A, y can have any integer value from 0–3, hence can be determined using statement A alone.
Using statement B, minimum value of y can be 16. And hence y is greater than 4.
2. Obviously, using the statements alone will not give the result. However, if we use both the statements together, then we will get the result that who is earning the least.
3. Using statement A only gives us two different sets of values of A and B – (101, 101) and (101, 1). So, unique value of HCF cannot be obtained.
Using the statement B only also does not give us a unique number.
However, using both the statements together gives us the values of A and B as – (101, 1). And HCF of these two numbers = 1.
4. Using statement A, we cannot find if the fathers of all the honest politicians are honest or not? It is only said that if the father is honest, then the son will be honest; however, it does not mean that son of dishonest politicians cannot be honest. [For more, see the chapter—Logical Link in the 1st part of this book]. So, nothing can be determined on the basis of this statement alone.
Using statement B, since son of only a dishonest politician can be a dishonest politician, hence we can conclude that if a politician is dishonest, then his father will also be dishonest. On the basis of this, if Dharam is dishonest politician then his father Ram is dishonest politician and if Ram is dishonest politician then his father Shyam is dishonest politician. And this answers our question.
5. Using statement A, nothing can be inferred about the even or odd nature of the function $y = f(x)$.
Using statement B, since the graph lies in only two quadrants opposite to each other, it cannot be the graph of any even function. Hence, $y = f(x)$ is not an even function.
6. Using statement A, since it is not given that what are the maximum marks for each of the papers, hence just by knowing that 300 marks are obtained by Pranav does not provide us with any other information.
Using statement B, Let us assume that the marks obtained by Pranav are $4x$, $5x$, $6x$, $7x$ and $8x$. Now, $4x = 30\%$. Hence, now we can find out that in how many papers Pranav has scored more than 50% marks.
7. Using statement A, if the remainder obtained when N is divided by 100 is 2, then the unit digit of N is 2. Hence, N cannot be a perfect square.
Using statement B, since the total number of factors of N is odd, hence N is a perfect square. [Total number of factors of any perfect square is odd and vice-versa is also true.]
8. Using statement A and B independently, we cannot find the speed of the trains. Even using both the two statements together, we get two speeds but we cannot find that which speed corresponds to which train.
Hence, the speed of the trains cannot be determined.
9. Obviously, it can be seen that using the statements alone will not give us the solution.
Using both the statements together, since the ratio of expenses is more than the ratio of income and both the fractions are proper fractions, hence it can be concluded on the basis of the data given that Rupesh is saving more than Vijay in all the cases.
10. Obviously, it can be seen that using the statements alone will not give us the solution.
Using both the statements together will give us the ratio of sides of the triangle. Using that we can find out if the triangle ABC is right-angled or not?
13. Using statement A alone,
Sum of dates of last Monday of previous month and 1st Thursday of next month is 38 is possible only if last Monday is 31st and 1st Thursday is 7th.

(Since if we take $30 + 8 = 38$, then 30 can be last Monday of any month but 8th can not be the 1st Thursday of any month)

So, 31st of last month is a Monday. Hence 7th of current month—14th of current month—21st of current month—28th of current month will be a Monday.

Now, if current month is a month with 30 days, then 5th of next month will be a Monday, so 7th of next month cannot be a Thursday.

If current month is a month with 31 days, then 4th of next month will be a Monday, so 7th of next month will be a Thursday.

Finally, we can conclude that previous month and current month, both are having 31 days. Since both the dates are of the same year, so current month is August.

We cannot find the answer using statement B alone.

14. We know that any leap year and leap year +5 will have same 1st January. Hence, $19(PQ + 5)$ will have its 1st January as Monday. Hence, question can be solved using statement A alone. However, statement B alone will not give us a unique result.

Nature of year	No. of years after which 1st January will be same
Leap year	5
Leap year + 1	6
Leap year + 2	6
Leap year + 3	11

15. Using statement A alone will not answer this question. Using statement B alone tells that one side of the triangle is the diameter of the circle and hence will be the hypotenuse of the circle. Hence, the triangle is right-angled triangle.
16. Using statement A alone, we cannot find the circum radius of the triangle ABC.

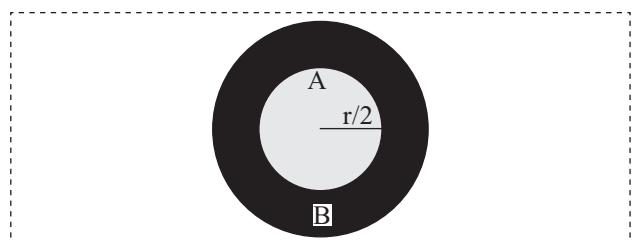
Using statement B alone, since the circum radius of the right-angled triangle is half the hypotenuse

of the triangle, so we can find out the circum radius of the triangle. And 1/3rd of this circum radius will be the distance between circum centre and the centroid. In short, 1/6th of the hypotenuse will be the distance between circum centre and the centroid.

18. This question can be solved without using any of the statements given.

Football will be closer to the center than to the circumference if point is lying in the segment A.

$$\text{Area of segment A} = 1/4\pi r^2$$



So, probability of point being closer to the circumference $= 1/4 \pi r^2/\pi r^2 = 1/4$

[The probability of ball being closer to the center = Area of the smaller circle inside/Area of the larger circle $(A/A+B) = 1/4$]

19. This question can be solved by using statement A individually. Since ratio of speed of A and speed of B = 4 : 7, hence total number of meeting points = 3 (if they are running in the same direction) and total number of meeting points = 11 (if they are running in the opposite direction). In none of these cases, A and B will meet at diametrically opposite point of their starting point.

Using statement B or statement C alone will not give us the result.

20. This question can be solved by using statement B alone. Since discriminant < 0 , hence this equation $f(x) = 0$ will not have any real root, and hence graph of $f(x) = 0$ will not cut X-axis.

So, graph of $f(x) = 0$ cuts X-axis at 0 point.

Using statement B or statement C alone will not give us the unique result.

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PART 2

DATA INTERPRETATION

SECTION 2

PRACTISING DATA INTERPRETATION

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Chapter

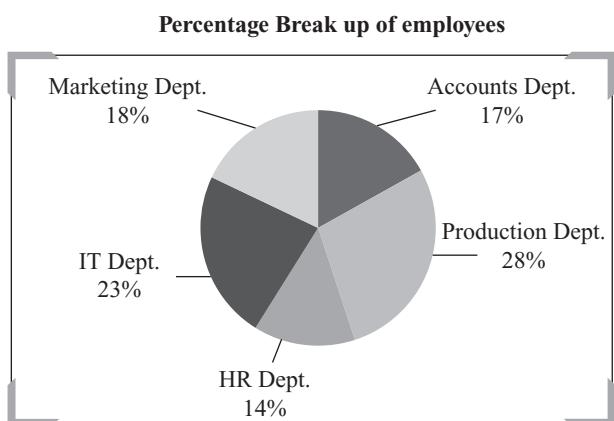
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FOUNDATION EXERCISES

PRACTICE EXERCISE 1

Directions for questions 1 to 5: Go through the data set given below and solve the questions based on it.

Following pie chart shows the break-up of employees working in various departments of an organization. Table provides the ratio of men to women. It is given that Total Number of Employees = 1800



Ratio of Men to Women

Department	Men	Women
Production	11	1
HR	1	3

Department	Men	Women
IT	5	4
Marketing	7	5
Accounts	2	7

2.68 Data Interpretation

Directions for questions 6 to 10: Go through the data set given below and solve the questions based on it.

Per cent profit earned by six companies over the years						
Company/ Year	P	Q	R	S	T	U
2004	11	12	3	7	10	6
2005	9	10	5	8	12	6
2006	4	5	7	13	12	5
2007	7	6	8	14	14	7
2008	12	8	9	15	13	5
2009	14	12	11	15	14	8

6. If the profit earned by Company R in the year 2008 was ₹18.9 lakhs, what was the income in that year?
(a) ₹303.7 lakhs (b) ₹264.5 lakhs
(c) ₹329.4 lakhs (d) ₹228.9 lakhs
(e) None of these

7. What is the percentage rise in per cent profit of Company T in year 2009 from the year 2004?
(a) 42 (b) 35
(c) 26 (d) 48
(e) None of these

8. If the profit earned by Company P in the year 2007 was ₹2.1 lakhs, what was its expenditure in that year?
(a) ₹30 lakhs (b) ₹15 lakhs
(c) ₹23 lakhs (d) ₹27 lakhs
(e) ₹None of these

Directions for questions 11 to 15: Go through the data set given below and solve the questions based on it.

Following table provides the data regarding the number of tickets sold (Number in thousands) in a week at multiplexes of six cities. Data has been given corresponding to five movies – A, B, C, D and E.

Movie →	A	B	C	D	E
City ↓					
Mumbai	20	15	35	26	18
Delhi	17	19	21	25	28
Kolkata	32	24	19	21	17
Chennai	18	21	32	28	34
Hyderabad	16	34	26	29	22
Lucknow	15	27	20	35	26

13. What is the average number of tickets of movie C sold in all the six cities?
 (a) 15,500 (b) 2,550
 (c) 24,000 (d) 25,500
 (e) None of these
14. The number of tickets of movie E sold in Chennai is what percentage of number of tickets of movie A sold in Mumbai?
 (a) 170 (b) 70
 (c) 30 (d) 130
 (e) None of these
15. In which city was the total number of tickets of all the five movies together sold the minimum?
 (a) Delhi (b) Chennai
 (c) Lucknow (d) Kolkata
 (e) None of these

Directions for questions 16 to 20: Go through the data set given below and solve the questions based on it.

Number of Entertainment shows held in various cities in a year (Number in Hundreds)

Cities	Shows				
	Dance	Music	Drama	Standup Comedy	Mimicry
M	15	21	24	0.8	0.9
N	12.4	13	26	2	0.5
O	5.7	8	12	0.3	0.2
P	11.3	6	18	1	1.5
Q	17	12.4	11	3	0.4
R	14	10.5	9.8	0.7	0.1

16. The mimicry shows held in city M are what per cent of the drama shows held in city O?
 (a) 7 (b) 8.5
 (c) 6.5 (d) 8
 (e) None of these
17. What is the average number of entertainment shows held in city P?
 (a) 756 (b) 678
 (c) 786 (d) 698
 (e) None of these
18. If the number of music shows in cities N and Q is increased by 5%, what will be the total number of music shows in both the cities together?
 (a) 2,602 (b) 2,667
 (c) 2,540 (d) 2,605
 (e) None of these
19. What is the respective ratio of the number of dance shows held in city N to the number of drama shows held in city R?
 (a) 49:62 (b) 49:51
 (c) 62:45 (d) 62:49
 (e) None of these
20. What is the total number of standup comedy shows held in all the cities together?
 (a) 820 (b) 740
 (c) 780 (d) 810
 (e) None of these

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (d) | 2. (e) | 3. (a) | 4. (c) | 5. (b) | 6. (d) | 7. (e) | 8. (a) | 9. (c) | 10. (b) |
| 11. (e) | 12. (e) | 13. (d) | 14. (a) | 15. (a) | 16. (e) | 17. (a) | 18. (b) | 19. (d) | 20. (c) |

HINTS AND EXPLANATIONS**1 to 5**

- Number of men working in the Marketing department
 $= 1800 \times \frac{18}{100} \times \frac{7}{12} = 189$
Hence option (d) is the answer.
- Number of women working in IT department
 $= 1800 \times \frac{23}{100} \times \frac{4}{9} = 184$
Hence required percentage $\approx \frac{184}{1800} \times 100 = 10$
Hence option (e) is the answer.
- Required ratio = 3:4. Hence option (a) is the answer.
- Required ratio = 2:9. Hence option (c) is the answer.
- Required percentage $= \frac{11}{12} \times 100 = 91.67$. Hence option (b) is the answer.

6 to 10

- If the expenditure be ₹X lacs, then $\frac{18.9}{x} \times 100 = 9$
 $\Rightarrow x = \frac{18.9 \times 100}{9} = ₹210$ lacs
Hence Income = ₹(210 + 18.9) lacs = ₹228.9 lacs.
Hence option (d) is the answer.
- Percentage increase $= \frac{4}{10} \times 100 = 40$
Hence option (e) is the answer.
- Required expenditure of the company $= \frac{2.1 \times 100}{7} = ₹30$ lacs. Hence option (a) is the answer.
- Average per cent profit $= \frac{7+8+13+14+15+15}{6} = 12\%$. Hence option (c) is the answer.
- Required difference $= 10 - \left(\frac{9+5+8+12+6}{5} \right) = 10\% - 8\% = 2\%$. Hence option (b) is the answer.

11 to 15

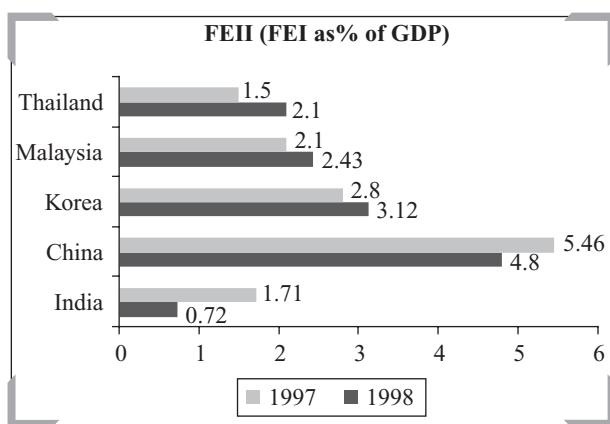
- Total number of tickets sold of movie B $= (15 + 19 + 24 + 21 + 34 + 27)$ thousands $= 140$ thousands
Required percentage $= \frac{34}{140} \times 100 = 24$. Hence option (e) is the answer.

- Required difference $= (27000 - 21000) = 6000$. Hence option (e) is the answer.
- Average number of tickets of movie C sold in all the cities $= \left(\frac{35+21+19+32+26+20}{6} \right)$ thousand $= \frac{153}{6}$ thousand $= 25500$. Hence option (d) is the answer.
- Required percentage $= \frac{34}{20} \times 100 = 170$. Hence option (a) is the answer.
- Total number of tickets sold of all the movies together:
Mumbai $\rightarrow (20 + 15 + 35 + 26 + 18)$ thousand $= 114$ thousand
Delhi $\rightarrow (17 + 19 + 21 + 25 + 28)$ thousand $= 110$ thousand
Kolkata $\rightarrow (32 + 24 + 19 + 21 + 17)$ thousand $= 113$ thousand
Chennai $\rightarrow (18 + 21 + 32 + 28 + 34)$ thousand $= 133$ thousand
Hyderabad $\rightarrow (16 + 34 + 26 + 29 + 22)$ thousand $= 127$ thousand
Lucknow $\rightarrow (15 + 27 + 20 + 35 + 26)$ thousand $= 123$ thousand
Hence option (a) is the answer.
- Required percentage $= \frac{0.9}{12} \times 100 = 7.5$. Hence option (e) is the answer.
- Required average $= \frac{11.3+6+18+1+1.5}{5} \times 100 = \frac{3780}{5} = 756$.
Hence option (a) is the answer.
- Number of music shows in cities N and Q $= 105\% \text{ of } (13 + 12.4) = 25.4 \times \frac{105}{100} = 2667$. Hence option (b) is the answer.
- Required ratio $= 12.4:9.8 = 124:98 = 62:49$. Hence option (d) is the answer.
- Total number of standup comedy shows $= (0.8 + 2 + 0.3 + 1 + 3 + 0.7) \times 100 = 780$. Hence option (c) is the answer.

PRACTICE EXERCISE 2

Directions for questions 1 to 5: Go through the data set given below and solve the questions based on it.

The following graph gives the data about foreign equity inflow index (FEII) for five countries for two years 1997 and 1998. FEII is taken as the ratio of foreign equity inflow (FEI) to the country's GDP. FEII is expressed as percentage in the graph.



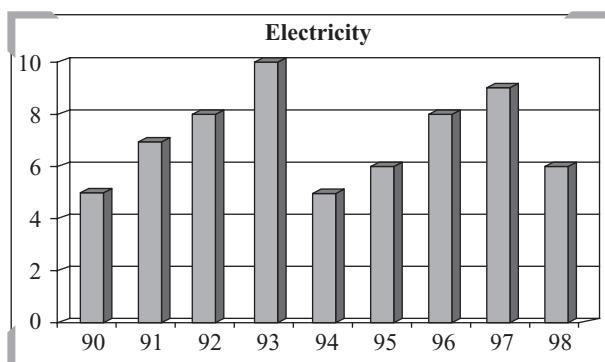
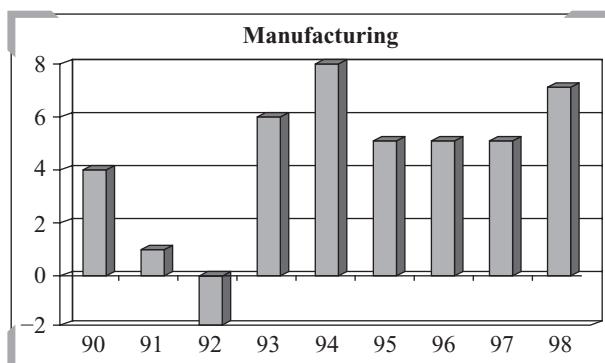
- Which country has shown the maximum percentage change in FEII in 1998 relative to 1997?
 - India
 - China
 - Korea
 - Malaysia
- If China's FEI is 10 times that of India in the year 1998, which of the following is true for 1998?
 - China's GDP is 70% more than India.
 - China's GDP is 40% more than India.
 - China's GDP is 50% more than India.
 - Nothing can be inferred.
- If GDP of India increased by 5%, GDP of China increased by 7% and that of Korea decreased by 2% from year 1997 to 1998, which of the following is/are true?
 - FEI to China was higher in 1998 than in 1997.
 - FEI to China was lower in 1998 than in 1997.
 - India's FEI has increased from 1997 to 1998.
 - FEI to Korea was lower in 1998 than in 1997.
 - Korea's FEI has increased in 1998 from 1997.
 - I and III
 - II and V
 - II, III and V
 - All of these

- Which of the following can be inferred from the given data?
 - China's GDP is more than India.
 - China's GDP is less than India
 - India's GDP is less than Malaysia
 - Nothing can be deduced
- In how many countries has the FEI increased from 1997 to 1998?
 - 1
 - 2
 - 3
 - cannot be determined

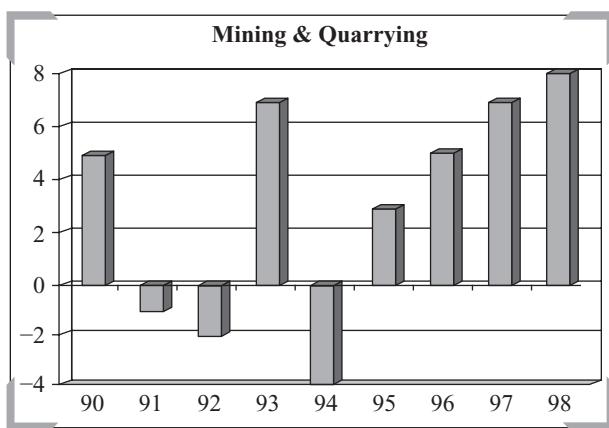
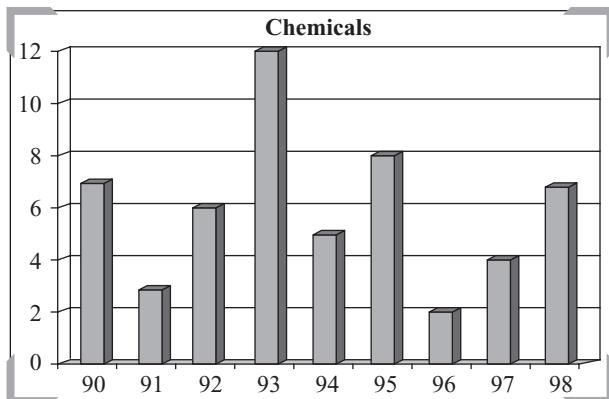
Directions for questions 6 to 12: Go through the data set given below and solve the questions based on it.

The following graphs provide data about four of the industrial sectors in the Republic of Reposia. Manufacturing constituted 20%, Mining & Quarrying 15%, Electricity 15% and Chemicals 10% of the Republic's total industrial production in 1989. For the period 90-98, the graphs give the percentage change in production over the previous year's production.

1989 production values has been assigned an index of 100 for each of the four sectors.



2.72 Data Interpretation



Directions for questions 13 to 18: Go through the data set given below and solve the questions based on it.

Following grid presents the percentage composition of five verticals under different sectors.

Sector	Factories	Employment	Fixed Capital	Variable Cost	Value Added
Government	18	15	14	22	25
Central	8	6	5	7	10
State	4	6	4	8	3
Central/State	6	3	5	7	12
Public	12	8	6	19	8
Private	55	65	72	54	62
Joint	15	12	8	5	5
Total	100	100	100	100	100

13. If the total work force was 76 million whereas the total value added was 225 million, then which of the following had the maximum value addition per worker?
 (a) Central (b) State
 (c) Central/State (d) Public

14. Which of the following sectors has the maximum fixed capital invested per factory?
 (a) Central (b) State
 (c) Central/State (d) Public

15. If the variable is proportional to the number of employees and the production per employee, then for which of the following is the production highest?
 (a) Government (b) Private
 (c) Joint (d) Public

16. If the government has a fixed capital of \$200 million in the Iron & Steel industry, which corresponds to 20.012% of its total investment as fixed capital, then how much did the government invest (in ₹million) in Maruti Udyog Ltd which forms 25% of the investment in the joint sector? (1US \$ = ₹45)
 (a) 6500 (b) 2500
 (c) 143 (d) 145

17. Maruti Udyog Ltd is a joint project of the Indian Government and Suzuki Motors Japan, each having equal stake. One fine day, the Indian government decides to disinvest from the venture due to losses occurring from labour problems. How many money will be disinvested?
 (a) ₹246 million
 (b) ₹6500 million
 (c) \$ 246 million
 (d) \$ 6500 million

18. Which of the following statements is true?
 (a) The number of government employees is more than that of the number of factories in the joint sector
 (b) The number of employees in the public is same as fixed capital of joint sector
 (c) both (a) and (b)
 (d) Cannot say

i. The women who spent ₹2234 arrived before the lady who spent ₹1193.
 ii. One women spent ₹1340 and she was not Dhenuka.
 iii. One women spent ₹1378 more than Chellamma.
 iv. One women spent ₹2517 and she was not Archana.
 v. Helen spent more than Dhenuka.
 vi. Shahnaz spent the largest amount and Chellamma the smallest.

19. What was the amount spent by Helen?
 (a) ₹1193
 (b) ₹1340
 (c) ₹2234
 (d) ₹2517

20. Which of the following amount was spent by one of them?
 (a) ₹1139
 (b) ₹1378
 (c) ₹2571
 (d) ₹2718

21. The women who spent ₹1193 is
 (a) Archana (b) Chellamma
 (c) Dhenuka (d) Helen

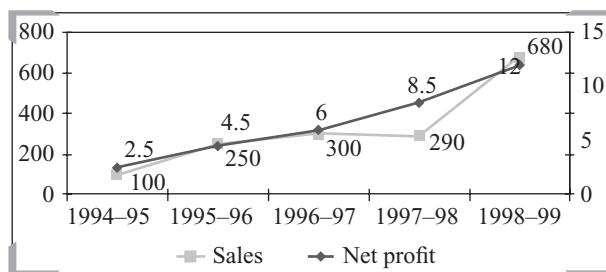
Directions for questions 22 to 25: Go through the data set given below and solve the questions based on it.

The figure below represents sales and net profit in ₹crore of IVP Ltd for five years from 1994–95 to 1998–99. During this period the sales increased from ₹100 crore to ₹680 crore. Correspondingly, the net profit increased from ₹2.5 crore to ₹12 crore. Net profit is defined as the excess of sales over total costs.

Year	Sales (₹crore)	Net profit (₹crore)	Total Costs (₹crore)
1994-95	100	2.5	97.5
1995-96	250	4.5	245.5
1996-97	300	6	294
1997-98	290	8.5	281.5
1998-99	680	12	668

Directions for questions 19 to 21: Go through the data set given below and solve the questions based on it.

Five women decided to go shopping to M.G. Road, Bangalore. They arrived at the designated meeting place in the following order: 1. Archana, 2. Chellamma, 3. Dhenuka, 4. Helen, and 5. Shahnaz. Each women spent at least ₹1000. below are some additional facts about how much they spent during their shopping spree.



22. The highest percentage of growth in sales, relative to the previous year occurred in
(a) 1995–96 (b) 1996–97
(c) 1997–98 (d) 1998–99

23. The highest percentage growth in net profit, relative to the previous year, was achieved in
(a) 1998–99 (b) 1997–98
(c) 1996–97 (d) 1995–96

2.74 Data Interpretation

24. Defining the profitability as the ratio of net profit to sales, IVP Ltd, recorded the highest profitability in
 (a) 1998–99 (b) 1997–98
 (c) 1994–95 (d) 1996–97
25. With profitability as defined in question 24, it can be concluded that:
- (a) Profitability is non-increasing during the five years from 1994–95 to 1998–99.
 (b) Profitability is non-decreasing during the five years from 1994–95 to 1998–99.
 (c) Profitability remained constant during the five years from 1994–95 to 1998–99
 (d) None of above.

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (a) | 2. (c) | 3. (b) | 4. (d) | 5. (d) | 6. (b) | 7. (d) | 8. (a) | 9. (a) | 10. (b) |
| 11. (b) | 12. (d) | 13. (c) | 14. (b) | 15. (b) | 16. (a) | 17. (b) | 18. (d) | 19. (b) | 20. (a) |
| 21. (c) | 22. (a) | 23. (d) | 24. (b) | 25. (d) | | | | | |

HINTS AND EXPLANATIONS

1 to 5

1. Percentage change for India = $\frac{0.72 - 1.71}{1.71} > 50\%$
 Percentage change for China = $\frac{5.46 - 4.8}{5.46}; 12\%$
 Percentage change for Korea = $\frac{3.12 - 2.8}{2.8} \approx 11\%$
 Percentage change for Malaysia = $\frac{0.33}{2.1} \approx 15\%$
 Hence, maximum % change is for India

2. For the year 1998

$$\text{For China, } \frac{\text{FEIH}_{\text{China}}}{\text{GDP}_{\text{China}}} = 0.048 \quad \dots \dots \dots (1)$$

$$\text{For India, } \frac{\text{FEIH}_{\text{India}}}{\text{GDP}_{\text{India}}} = 0.0072 \quad \dots \dots \dots (2)$$

$$\frac{\text{FEI}_{\text{China}}}{\text{FEI}_{\text{India}}} = 10$$

on dividing (1) by (2):

$$\frac{\text{GDP}_{\text{China}}}{\text{GDP}_{\text{India}}} \times 10 = \frac{0.048}{0.0072} = \frac{20}{3}$$

$$\Rightarrow \frac{\text{GDP}_{\text{China}}}{\text{GDP}_{\text{India}}} = \frac{3}{2} = 1.5$$

So percentage difference between China's GDP and India's GDP = 50%

3. Since the comparisons are for the same country in each case, assume the GDP as 100 in 1997 in all cases. So, GDP of China, India and Korea in 1998 is 105, 107 and 98 respectively.

$$\frac{\text{FEI}_{1998}}{\text{FEI}_{1997}} = \frac{\text{FEII}_{1998} \times \text{GDP}_{1998}}{\text{FEII}_{1997} \times \text{GDP}_{1997}}$$

$$\text{For China: } \frac{\text{FEI}_{1998}}{\text{FEI}_{1997}} = \frac{4.8 \times 107}{5.46 \times 100} < 1$$

$$\text{For India: } \frac{\text{FEI}_{1998}}{\text{FEI}_{1997}} = \frac{0.72 \times 105}{1.71 \times 100} < 1$$

$$\text{For Korea: } \frac{\text{FEI}_{1998}}{\text{FEI}_{1997}} = \frac{3.12 \times 98}{2.8 \times 100} < 1$$

So, II and V are correct.

4. It can be seen that all the values (FEII) are expressed as a ratio of FEI to GDP, the absolute values of GDP cannot be determined.
 5. Since only the ratios of GDP and FEI are known, the increase in one independent of other cannot be determined.

6 to 12

6. You may note that apart from a few years for manufacturing and mining & quarrying, the annual growth rates in most years have been positive and near the 5 – 6% mark for all the sectors. The other options [a], [c], and [d] are too far away to be

considered. Alternatively, for ease of calculation take the 1989 values for a manufacturing as 400, Mining & quarrying and Electricity as 300 each and Chemicals as 200. then, the final value for manufacturing would be nearly 580, that for mining & quarrying would be about 365; that for electricity would be around 550; and for Chemicals would be around 335.

\Rightarrow Initial value of production

$$= 400 + 300 + 300 + 200 = 1200$$

Final value of production

$$= 580 + 365 + 550 + 335 = 1830$$

\Rightarrow Overall % increase $\approx 52.5\%$

\Rightarrow Average annual growth = $52.5/9 = 5.85\%$

7. Electricity production has increased throughout (as growth rates are positive throughout) and the maximum production would be achieved in the last year, i.e., 98.
8. The production for manufacturing can be minimum either in 1989 or in 1992 (when the growth rate is negative).

If Manufacturing started with a production of 100 in 1989, then production in 1992 will be $100 \times 1.04 \times 1.01 \times 0.97 > 1$

So, the production in 1989 was the least

9. Electricity has shown the highest growth rate in all the years and therefore, would have the highest growth rate for the entire period.

10. Electricity in 1992:

$$100 \times 1.05 \times 1.07 \times 1.08 = 121.4$$

Chemicals in 1992:

$$100 \times 1.07 \times 1.03 \times 1.06 = 116.8$$

\Rightarrow In 1992, the index of chemicals is less than that of electricity by approximately 5.

11. Let Manufacturing in 1989 = 200 and

Chemicals in 1989 = 100

\Rightarrow Manufacturing in 1991:

$$200 \times 1.04 \times 1.01 = 210$$

and Chemicals in 1991:

$$100 \times 1.07 \times 1.03 = 110$$

$$\text{Required percentage } \frac{210 - 110}{110} \times 100 = 90\%$$

12. As can be seen directly from the graph, the highest increase (that of 8%) for Mining and Quarrying was in the year 1998, relative to 1997.

13 to 18

13. Values added per worker for various sectors will be proportional to following ratios:

Central	10/6
State	3/6
Central/state	12/3
Public	8/8/

14. Fixed capital per factory will be proportional to the following ratios:

Central	5/8
State	4/4
Central/state	5/6
Public	6/12

15. If the variables are proportional to the number of employees and the production per employees, then we can say that the variable cost is directly proportional to the production. Since the variable cost is maximum for private sector, it will also have the maximum production.

16. If 20% of govt. fixed capital is equal to \$ 200 million
 \Rightarrow Total govt. sector fixed capital = \$ 1000 m which is equivalent to 14% of the total fixed capital. Now, 25% of Govt. investment in joint sector i.e., 25% of the 8% of the total = 2% of total fixed capital will be given by:

$$(1000 \times 2)/14 = \$ 143 \text{ million}$$

Value in ₹ is given by:

$$143 \times 45 = ₹ 6450 \text{ million}$$

17. From the above question the money disinvested will be ₹ 6450 million.

18. Neither of the statements [A] or [B] can be inferred as we know only the percentages and not the actual values of the employees, factories or fixed capital.

19 to 21

One of the women spent $2517 - 1378 = 1139$, she is Chellamma. This is the only possibility as we add ₹ 1378 even to the least amount ₹ 1193, we will not be able to satisfy all the conditions given simultaneously.

So, the table obtained is:

Archana	Chellamma	Dhenuka	Helen	Shahnaz
2234	1139	1193	1340	2517

2.76 Data Interpretation

22 to 25

22. From graph it is clear that, growth in sales is negative for 1997–98. The change for 1996–97 is very small. We need to check for 1995–96 & 1998–99
For 1995–96 = $(250 - 100)/100 \times 100\% = 150\%$
For 1998–99 = $(680 - 290)/290 \times 100\% = 134.5\%$
So, the highest percentage change of growth of sales is for year 1995–96
23. In 1995–96, the change is from 2.5 to 4.5, clearly it is more than 50% change in net profit. In none other option, this change is even 50%. So, the highest percentage change of growth of net profit is for year 1995–96

We must try to solve such type of questions without actual calculation to save time

24. Profitability for 1994–95 = $2.5/100 = 0.025$
Profitability for 1996–97 = $6/300 = 0.02$
Profitability for 1997–98 = $8.5/290 = 0.029$
Profitability for 1998–99 = $12/680 = 0.018$
So, highest profitability was recorded for 1997–98.
25. Profitability for 1994–95 = $2.5/100 = 0.025$
Profitability for 1995–96 = $4.5/250 = 0.018$
Profitability for 1996–97 = $6/300 = 0.02$
Profitability for 1997–98 = $8.5/290 = 0.029$
Profitability for 1998–99 = $12/680 = 0.018$
So, we cannot conclude the statements of options (a), (b) & (c)

PRACTICE EXERCISE 3

Directions for questions 1 to 5: Go through the data set given below and solve the questions based on it.

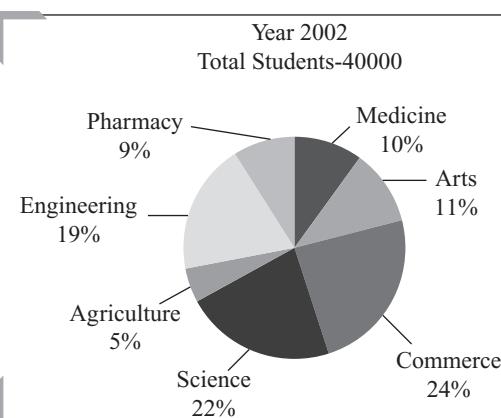
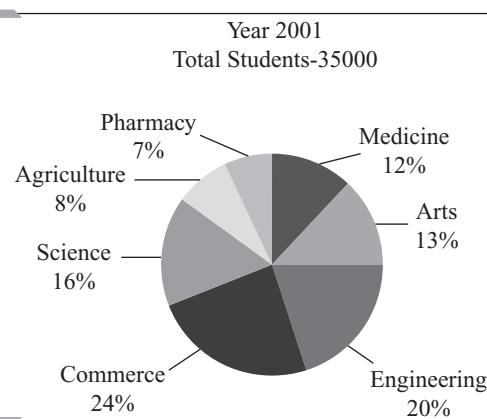
Following table provides the number of workers employed in six units or a factory during the years:

Year/Unit	A	B	C	D	E	F
1998	145	88	115	120	140	136
1999	128	76	122	112	152	132
2000	136	96	132	124	158	140
2001	183	92	125	135	166	126
2002	160	107	140	118	170	146
2003	152	110	148	128	175	150

- In the year 2000 the number of employed workers by unit ‘C’ is what per cent of the total number of employed workers by all the units in the same year (rounded off to two places of decimal)?
 - 16.39
 - 17.21
 - 16.88
 - 17.31
 - None of these
- For all the given years, what is the difference between the average number of workers in units D and E?
 - 37
 - 33
 - $33\frac{2}{3}$
 - $37\frac{1}{3}$
 - None of these
- In which year the percentage increase/decrease in the number of employed workers is minimum for unit ‘F’?
 - 1999
 - 2000
 - 2002
 - 2003
 - None of these
- For all the given years, in which unit the average number of employed workers were maximum?
 - D
 - A
 - C
 - E
 - None of these
- In the years 1998 and 1999, what is the approximate ratio between the number of employed workers in all the units?
 - 13:14
 - 37:36
 - 10:9
 - 13:11
 - 4:3

Directions to questions 6 to 10: Go through the data set given below and solve the questions based on it.

Number of students studying in different faculties in the years 2001 and 2002 from State X.



Answer all the questions based upon the pie charts given above.

- In which faculty there was decrease in the number of students from 2001 to 2002?
 - None
 - Commerce
 - Agriculture
 - Pharmacy
 - None of these
- What is the ratio between the number of students studying pharmacy in the years 2001 and 2002 respectively?
 - 4:3
 - 41:72
 - 2:3
 - 49:72
 - None of these

2.78 Data Interpretation

Directions to questions 11 to 15: Go through the data set given below and solve the questions based on it.

Following table gives the salary of six persons and the percentage break up of their salaries.

Person	Per Annum Income (₹In Lakhs)	Percentage break up of spending pattern					
		Eating out	Shopping	Watching Movies	Health	Savings	Miscellaneous
Ritu	2.05	21.8	14.6	20.4	16.4	14.5	12.3
Satish	2.25	20.9	15.7	15.6	11.4	15.3	21.1
Arun	1.95	14.3	16.6	18.5	21.5	16.4	12.7
Vidya	2.00	18.6	14.5	18.7	21.5	16.2	10.5
Arif	1.75	17.8	12.8	19.5	21.0	18.2	10.7
Suresh	1.70	12.0	18.6	10.5	18.2	22.4	18.3

11. What is the total amount of savings of all the persons together?
(a) ₹1,98,460 (b) ₹1,42,524
(c) ₹1,89,520 (d) ₹1,56,625
(d) ₹1,62,780

12. Who spends the maximum amount on shopping?
(a) Ritu (b) Suresh
(c) Satish (d) Arun
(e) Vidya

13. What is the respective ratio of total amount spent by Ritu on Eating out and Watching Movies together to the total amount spent by Arun on the same?
(a) 156:211
(b) 217:253
(c) 253:217

14. Amount spent by Suresh on health is what per cent of the total amount spent by all the people together on Health? (round off to two digits after decimal)
(a) 16.24 (b) 14.60
(c) 19.04 (d) 12.35
(e) None of these

15. Per annum income of Arif is **approximately** what per cent of the total per annum income of all the men together?
(a) 10 (b) 22
(c) 27 (d) 19
(e) 15

Directions to questions 16 to 20: Go through the data set given below and solve the questions based on it.

Following table provides the number of women working in various departments of six different organizations:

Department	Production	HR	IT	Finance	Marketing	Merchandising
Organization						
P	155	250	320	405	150	50
Q	178	300	415	328	127	90
R	58	275	204	250	188	66
S	102	190	198	200	190	75
T	110	100	256	305	250	85
U	60	150	225	220	168	35

ANSWER KEYS

- 1.** (e) **2.** (d) **3.** (d) **4.** (d) **5.** (b) **6.** (c) **7.** (d) **8.** (e) **9.** (b) **10.** (a)
11. (a) **12.** (c) **13.** (d) **14.** (b) **15.** (e) **16.** (d) **17.** (e) **18.** (c) **19.** (e) **20.** (a)

HINTS AND EXPLANATIONS

1 to 5

1. In the year 2000, the number of employed workers by unit C = 132

Total number of employed workers in all the units in year 2000

$$\equiv 136 \pm 96 \pm 132 \pm 124 \pm 158 \pm 40 \equiv 786$$

Therefore required percentage = $\frac{132}{786} \times 100 = 16.79$
Hence option (e) is the answer.

2. Total number of workers in unit 'D' during the given years = $120 + 112 + 124 + 135 + 118 + 128 = 737$

2.80 Data Interpretation

$$\text{Therefore Average} = \frac{737}{6}$$

Total number of workers in unit 'E' during the given years

$$= 140 + 152 + 158 + 166 + 170 + 175 + 961$$

$$\text{Therefore Average} = \frac{961}{6}$$

$$\text{Therefore required difference} = \frac{961}{6} - \frac{737}{6} = \frac{224}{6}$$

$$= 37\frac{1}{3}$$

Hence option (d) is the answer.

3. For unit 'F', the percentage change in the number of workers in the year:

$$\text{In 1999: } \frac{136-132}{136} \times 100 = 2.94\% \text{ decrease}$$

$$\text{In 2000: } \frac{140-132}{132} \times 100 = 6.06\% \text{ increase}$$

$$\text{In 2001: } \frac{140-126}{140} \times 100 = 10\% \text{ decrease}$$

$$\text{In 2002: } \frac{140-126}{126} \times 100 = 15.87\% \text{ increase}$$

$$\text{In 2003: } \frac{150-146}{146} \times 100 = 2.74\% \text{ increase}$$

Hence option (d) is the answer.

4. For each unit we need to find the total number of employees for all years. We can observe that E has the highest total value & so average value too.

5. Total number of employed workers in all units in 1998 = $145 + 88 + 115 + 120 + 140 + 136 = 744$

Total number of employed workers in all units in 1999 = $128 + 76 + 122 + 112 + 152 + 132 = 722$

$$\text{Therefore required ratio} = 744 : 722 = 37 : 36$$

Hence option (b) is the answer.

6 to 10

6. Let us 1st spend some time observing the data set, and identify if we can eliminate the some options through observation without doing actual calculation:

First, we will observe the data for options (b), (c) and (d).

Looking at option (d), Pharmacy cannot have decline in the data as its percentage share is rising and total number of students is also rising. Similarly option (b) cannot be the answer as share of commerce is fixed at 24%.

Number of students decreased from 2800 to 2000 in Agriculture. Hence option (c) is the answer.

7. Number of students studying Pharmacy in 2001 = 2450
Number of students studying Pharmacy in 2002 = 3600

Therefore Required ratio = $2450 : 3600 = 49 : 72$

Hence option (d) is the answer.

8. Difference = $7600 - 7000 = 600$

$$\text{Hence required percentage increase} = \frac{600}{7000} \times 100 = 8.57\%$$

Hence option (e) is the answer.

9. Total number of students in Arts and Commerce faculties in 2001 = $4200 + 7700 = 11900$

Total number of students in Arts and Commerce faculties in 2002 = $4400 + 9600 = 14000$

$$\text{Therefore required percentage} = \frac{12950}{14000} \times 100 = 92\%$$

Hence option (b) is the answer.

10. Question is asking for absolute value in the percentage change of different faculty across the two years \Rightarrow So we are required to calculate percentage increase as well as percentage decrease both, as applicable for different faculty.

Again, let us first observe the data set and identify if we can eliminate any option by simple observation of data:

We can eliminate option (b) Science – Percentage contribution of science has increased from 16% to 22% – so it cannot be the answer. (Going through the actual calculation, Science = $\frac{8800 - 5600}{5600} \times 100 = 57\%$)

Similarly option (c) Commerce cannot be the answer as it will have net percentage change = 14.28%. (We will calculate the change in total number of students only, and since the percentage contribution of commerce remains same in both the years, answer would be equivalent to the percentage change in the total number of students.) Hence even option (c) cannot be the answer.

Let us calculate for remaining three options:
Percentage change in the faculty of:

$$\text{Arts} = \frac{4550 - 4400}{4400} \times 100 = 3.2\%$$

$$\text{Engineering} = \frac{7600 - 7000}{7000} \times 100 = 8.57\%$$

$$\text{Medicine} = \frac{4200 - 4000}{4200} \times 100 = 4.7\%$$

[Since question asks for absolute value of percentage change, we do not care for percentage increase or percentage decrease].

Hence, the percentage change in Arts is minimum.
Hence option (a) is the answer.

11 to 15

11. Savings for different persons:

$$\text{Ritu} \rightarrow \frac{2.05 \times 14.5}{100} = ₹0.29725 \text{ lakh}$$

$$\text{Satish} \rightarrow \frac{2.25 \times 15.3}{100} = ₹0.34425 \text{ lakh}$$

$$\text{Arun} \rightarrow \frac{1.95 \times 16.4}{100} = ₹0.3198 \text{ lakh}$$

$$\text{Vidya} \rightarrow \frac{2 \times 16.2}{100} = ₹0.324 \text{ lakh}$$

$$\text{Arif} \rightarrow \frac{1.75 \times 18.2}{100} = ₹0.3185 \text{ lakh}$$

$$\text{Suresh} \rightarrow \frac{1.70 \times 22.4}{100} = ₹0.3808 \text{ lakh}$$

$$\text{Total savings} = ₹(0.29725 + 0.34425 + 0.3198 + 0.324 + 0.3185 + 0.3808) \text{ lakh} = ₹1.9846 \text{ lakh} = ₹198460$$

Hence option (a) is the answer.

12. Amount spent on shopping by:

$$\text{Satish} \rightarrow ₹ \frac{(2.25 \times 15.7)}{100} \text{ lakh} = ₹0.35325 \text{ lakh}$$

He spends maximum.

Hence option (c) is the answer.

13. Amount spent by Ritu on:

$$\text{Eating out} = \frac{(21.8 \times 2.05)}{100} = ₹0.4469 \text{ lakh}$$

$$\text{Watching movies} = \frac{20.4 \times 2.05}{100} = ₹0.4182 \text{ lakh}$$

$$\text{Total amount} = ₹(0.4469 + 0.4182) \text{ lakh} = ₹0.8651 \text{ lakh}$$

Amount spent by Arun on:

$$\text{Eating out} = \frac{1.95 \times 14.3}{100} = ₹0.27885 \text{ lakh}$$

$$\text{Watching movies} = \frac{18.5 \times 1.95}{100} = ₹0.36075 \text{ lakh}$$

$$\text{Total amount} = ₹(0.27885 + 0.36075) \text{ lakh} = ₹0.6396$$

$$\text{Required ratio} = 0.8651 : 0.6396 = 211 : 156$$

Hence option (d) is the answer.

14. Amount spent on health by:

$$\text{Suresh} \rightarrow ₹ \frac{1.70 \times 18.2}{100} \text{ lakh} = ₹0.3094 \text{ lakh}$$

Similarly,

$$\text{Ritu} \rightarrow ₹0.3362 \text{ lakh}$$

$$\text{Satish} \rightarrow ₹0.2565 \text{ lakh}$$

$$\text{Arun} \rightarrow ₹0.41925 \text{ lakh}$$

$$\text{Vidya} \rightarrow ₹0.43 \text{ lakh}$$

Arif → ₹0.3675 lakh

$$\text{Total expenditure on health} = ₹(0.3094 + 0.3362 + 0.2565 + 0.41925 + 0.43 + 0.3675) \text{ lakh} = ₹2.11885 \text{ lakh}$$

$$\text{Required percentage} = \frac{0.3094}{2.11885} \times 100 = 14.60$$

Hence option (b) is the answer.

15. Total annual income = ₹(2.05 + 2.25 + 1.95 + 2 + 1.751.7) lakhs = ₹11.7 lakhs

$$\text{Required percentage} = \frac{1.75}{11.7} \times 100 = 14.95 = 15$$

Hence option (e) is the answer.

16 to 20

16. Number of women working in HR departments = $250 + 300 + 190 + 100 + 150 = 1265$

$$\text{Required percentage} = \frac{190}{1265} \times 100 = 15.02$$

Hence option (d) is the answer.

17. Average number of women working in finance department from all organization together = $\frac{(405 + 328 + 250 + 200 + 305 + 220)}{6} = 284.66$

18. Number of women employees in organization:

$$P \rightarrow 155 + 250 + 320 + 405 + 150 + 50 = 1330$$

$$Q \rightarrow 178 + 300 + 415 + 318 + 127 + 90 = 1428$$

$$R \rightarrow 58 + 275 + 204 + 250 + 188 + 66 = 1041$$

$$S \rightarrow 102 + 190 + 198 + 200 + 190 + 75 = 955$$

$$T \rightarrow 110 + 100 + 256 + 305 + 250 + 85 = 1106$$

$$U \rightarrow 60 + 150 + 225 + 220 + 168 + 35 = 858$$

Clearly, Organization U has the least number of employees.

Hence option (c) is the answer.

19. Number of IT employees from organizations P, Q and U = $320 + 415 + 225 = 960$

Number of marketing department employees from organizations P, S and T = $150 + 190 + 250 = 590$

$$\text{Required ratio} = 96:59$$

Hence option (e) is the answer.

20. Number of employees in production department of organization Q = 178

Therefore Number of women in merchandising department of organization Q = $178 + 90 = 268$

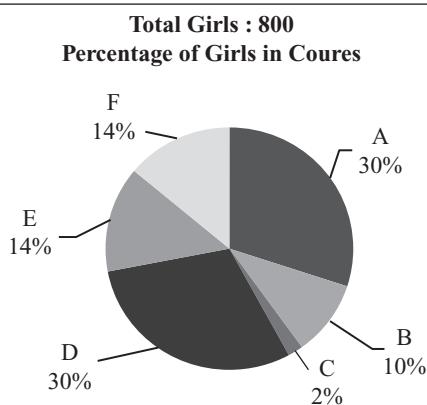
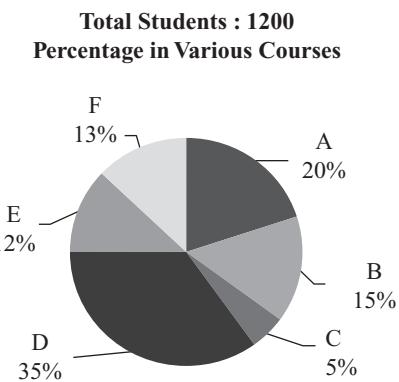
$$\text{Required percentage} = \frac{268}{1428} \times 100 = 18.77 = 19$$

Hence option (a) is the answer.

PRACTICE EXERCISE 4

Directions for questions 1 to 5: Go through the data set given below and solve the questions based on it.

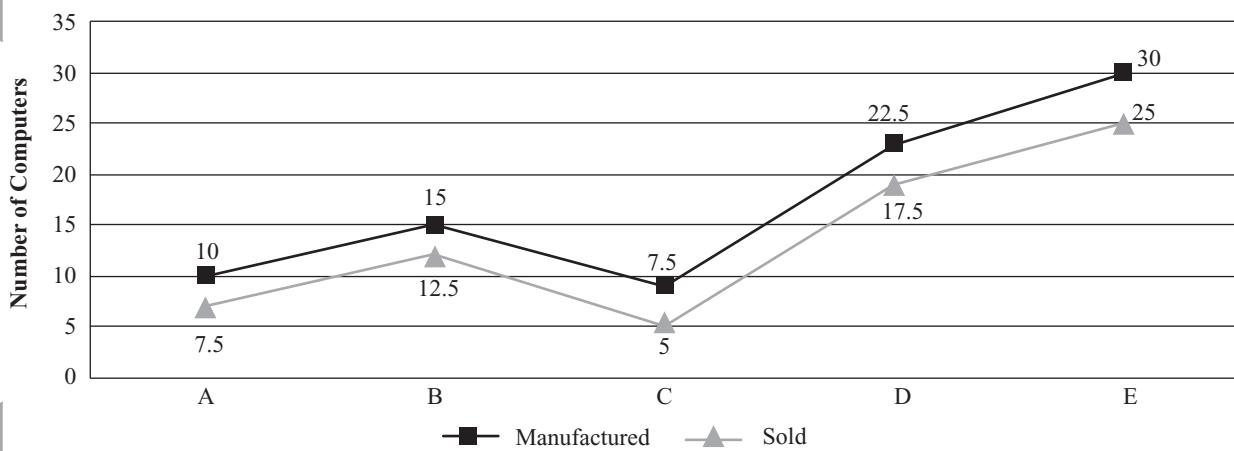
Pie charts given present the percentage of students in various courses (A, B, C, D, E, F) and percentage of girls out of these courses.



1. For which course is the number of boys the minimum?
 - (a) E
 - (b) F
 - (c) C
 - (d) A
 - (e) None of these
2. How many girls are there in course C?
 - (a) 44
 - (b) 16
 - (c) 40
 - (d) 160
 - (e) None of these
3. For course D, what is the respective ratio of boys and girls?
 - (a) 3:4
 - (b) 4:5
 - (c) 3:5
 - (d) 5:6
 - (e) None of these
4. For which pair of courses is the number of boys the same?
 - (a) E and F
 - (b) A and D
 - (c) C and F
 - (d) B and D
 - (e) None of these
5. For course E, the number of girls is how much per cent more than the boys for course E?
 - (a) 250
 - (b) 350
 - (c) 150
 - (d) 80
 - (e) None of these

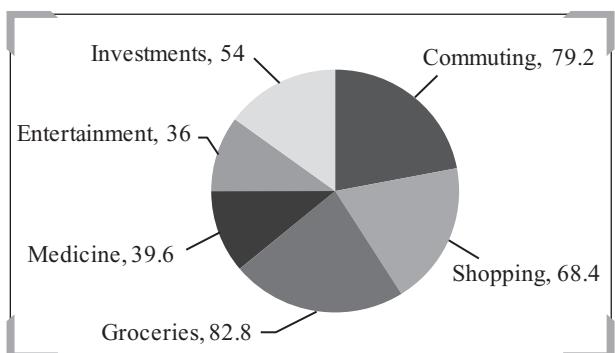
Directions for questions 6 to 10: Go through the data set given below and solve the questions based on it.

Number of Computers Manufactured and Sold by Various Companies in a Year (Number in Lakhs)



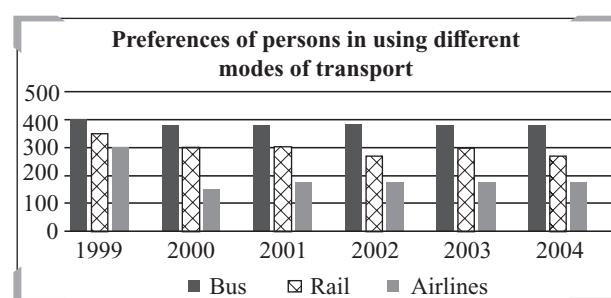
Directions for questions 11 to 15: Go through the data set given below and solve the questions based on it.

Following pie chart gives the degree wise break-up of expenditure of a family in a particular month.



Total amount spent in this month = ₹45,800.

Directions for questions 16 to 20: Go through the data set given below and solve the questions based on it.



Note - All the values are in the multiples of 25.

ANSWER KEYS

- 1.** (d) **2.** (b) **3.** (a) **4.** (c) **5.** (a) **6.** (d) **7.** (c) **8.** (a) **9.** (e) **10.** (b)
11. (a) **12.** (d) **13.** (b) **14.** (e) **15.** (c) **16.** (d) **17.** (c) **18.** (e) **19.** (a) **20.** (e)

HINTS AND EXPLANATIONS

1 to 5

- Number of boys in course A is minimum i.e., zero. Hence option (d) is the answer.
 - Number of girls in course C = 16. Hence option (b) is the answer.
 - Required ratio = 180:240 = 3:4. Hence option (a) is the answer.
 - Number of boys in each of courses C and F = 44. Hence option (c) is the answer.
 - Required percentage = $\frac{112 - 32}{32} \times 100 = \frac{80}{32} \times 100$
= 250. Hence option (a) is the answer.

6 to 10

6. Number of computers manufactured by companies A and C together = $(10 + 7.5)$ lakh = 17.5 lakhs
Number of computers sold by companies A and C together = $(7.5 + 5)$ lakh = 12.5 lakhs
Hence required ratio = $17.5 : 12.5 = 7 : 5$. Hence option (d) is the answer.

7. Average number of computers manufactured by all the companies together

$$= \left(\frac{10+15+7.5+22.5+30}{5} \right) \text{lakhs} = \left(\frac{85}{5} \right) \text{lakhs} \\ = 17 \text{ lakhs}$$

Average number of computers sold by all the companies together = $\left(\frac{7.5 + 12.5 + 5 + 17.5 + 25}{5} \right)$ lakhs

$$= \left(\frac{67.5}{5} \right) \text{lakhs} = 13.5 \text{ lakhs}$$

Hence required difference = $(17 - 13.5)$ lakhs = 3.5 lakhs = 350000. Hence option (c) is the answer.

8. Required percentage = $\frac{12.5}{15} \times 100 = 38.33\%$.
Hence option (a) is the answer.

9. Required percentage = $\frac{22.5}{30} \times 100 = 75\%$. Hence
option (e) is the answer.

10. Number of computers manufactured by all the
companies together = 85 lakhs

Number of computers manufactured by company
B = 15 lakhs

Hence required percentage = $\frac{15}{85} \times 100 = 17.65 = 18$

Hence option (b) is the answer.

11 to 15

11. Angle for commuting = $79.2^\circ \Rightarrow 360^\circ = 45800$

$$\Rightarrow 79.2^\circ = \frac{45800}{360} \times 79.2 = ₹10076.$$

Hence option (a) is the answer.

12. Ratio of amount spent must be same as ratio of respective angles = $\frac{39.6^\circ}{82.8^\circ} = 11:23$

13. Total angle of amount spent on shopping & entertainment = $36^\circ + 68.4^\circ = 104.4^\circ$.

$$\text{So, total expenditure} = \frac{104.4^\circ}{360^\circ} \times 45,800 = ₹13,282.$$

14. Total angle for expenditure on grocery, entertainment & investment = $82.8^\circ + 36^\circ + 54^\circ = 172.8^\circ$.

Angle for amount spent on commuting = 79.2° .

$$\text{Required percentage} = \frac{172.8}{79.2} \times 100\% = 218\%$$

15. Angle for amount spent on medicine = 39.6° .
Angle for amount spent on shopping = 68.4° .

$$\text{Required percentage} = \frac{39.6}{68.4} \times 100\% = 57.89\%.$$

16 to 20

16. Total number of people travelling by rail = $(350 + 300 + 300 + 275 + 300 + 275)$ millions = 1800 million. Hence option (d) is the answer.

17. Required difference = $350 - 275 = 75$ millions. Hence option (c) is the answer.

18. Total number of people travelling by buses, rail and airlines in 2001 = $375 + 300 + 175 = 850$ millions

Number of people travelling by buses = 375 millions.

$$\text{Hence, Required percentage} = \frac{375}{850} \times 100 = 45.$$

Hence option (e) is the answer.

19. Required ratio = $375 : 275 = 15 : 11$. Hence option (a) is the answer.

20. In the year 2003:

Number of people travelling by rail = 300 millions

Number of people travelling by air = 175 millions

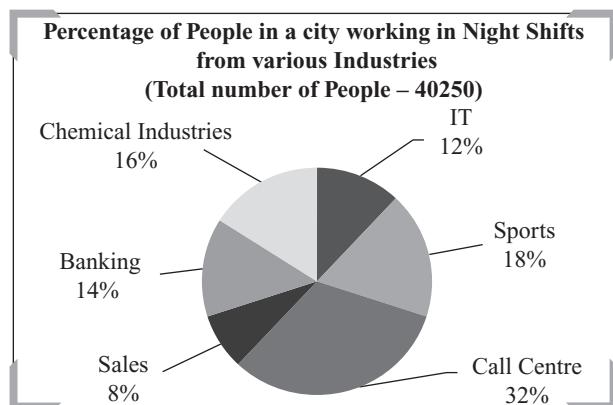
Now, 50 % of people travelling by rail shift to air.
Hence required number of people = $175 + 150 = 325$ million

Hence option (e) is the answer.

PRACTICE EXERCISE 5

Directions for questions 1 to 5: Go through the data set given below and solve the questions based on it.

Following pie chart give the percentage of people working in night shift from various industries. Table given ahead presents the percentage of females out of number of people working in night shift in different industries.

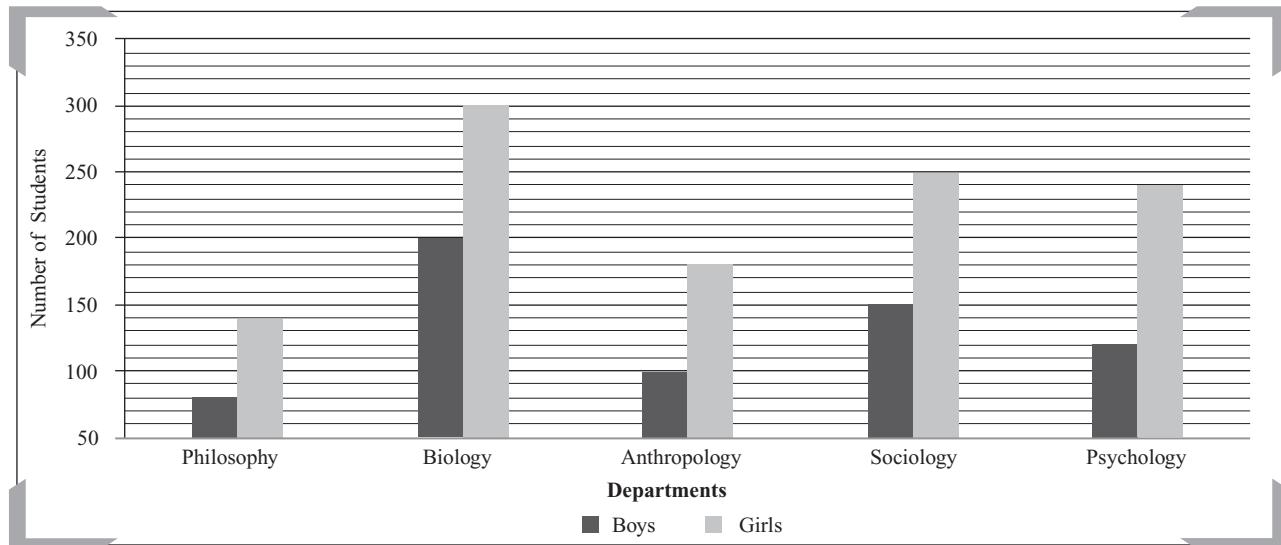


Percentage of Females from various Industries working in night shifts

Industries	Females
IT	20%
Sports	20%
Call Centre	45%
Sales	60%
Banking	40%
Chemical Industries	15%

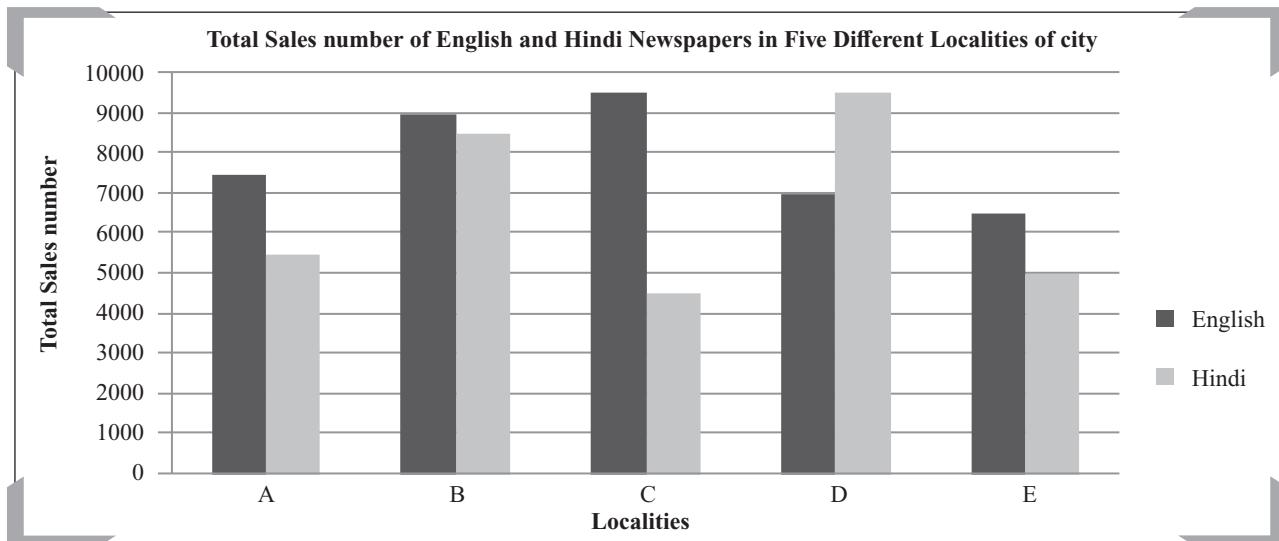
Directions for questions 6 to 10: Go through the data set given below and solve the questions based on it.

Following bar chart presents the total number of Boys and Girls in Five Different Departments in a college:



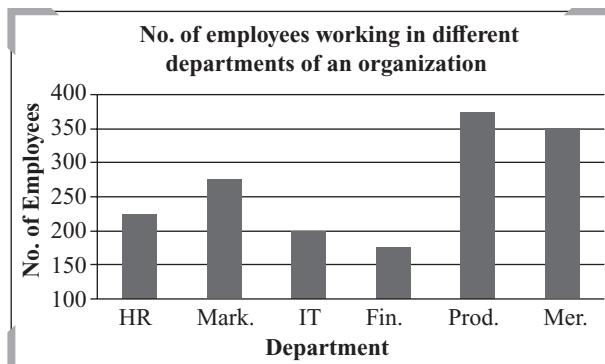
6. The number of girls from Biology department is approximately what per cent of the total number of girls from all the departments together?
 (a) 32
 (b) 21
 (c) 37
 (d) 43
 (e) 27
7. What is the difference between the total number of boys and the total number of girls from all the departments together?
 (a) 440
 (b) 520
 (c) 580
 (d) 460
 (e) None of these
8. What is the average number of boys from all the departments together?
 (a) 122
 (b) 126
9. The number of boys from Anthropology department is **approximately** what per cent of the total number of boys from all the departments together?
 (a) 15
 (b) 23
 (c) 31
 (d) 44
 (e) 56
10. What is the respective ratio of number of girls from Philosophy department to the number of girls from Psychology department?
 (a) 1:2
 (b) 7:12
 (c) 5:12
 (d) 3:4
 (e) None of these

Directions for questions 11 to 15: Go through the data set given below and solve the questions based on it.



11. What is the difference between the total sale of English newspapers and the total sale of Hindi newspapers in all the localities together?
- 6000
 - 6500
 - 7000
 - 7500
 - None of these
12. The sale of English newspaper in locality A is approximately what per cent of the total sale of English newspapers in all the localities together?
- 527
 - 25
 - 111
 - 236
 - 19
13. What is the respective ratio of the sale of Hindi newspapers in locality A to the sale of Hindi newspapers in locality D?
- 11:19
 - 6:5
 - 5:6
 - 19:11
 - None of these
14. The sale of English newspaper in localities B and D together is approximately what per cent of the sale of English newspaper in localities A, C and E together?
- 162
 - 84
 - 68
 - 121
 - 147
15. What is the average sale of Hindi newspapers in all the localities together?
- 6600
 - 8250
 - 5500
 - 4715
 - None of these

Directions for questions 16 to 20: Go through the data set given below and solve the questions based on it.



All the data values given above are in the multiples of 25. Following table presents the ratio of male and female in the organization:

Department	Males	Females
HR	9	16
Marketing	3	2
IT	9	31
Finance	2	3
Production	11	4
Merchandising	4	3

Note: Mark. – Marketing; Fin. – Finance; Prod. – Production; Mer. - Merchandising

16. What is the total number of males working in all departments together?
(a) 755 (b) 925
(c) 836 (d) 784
(e) None of these

17. What is the number of females working in the HR department?
(a) 158 (b) 128
(c) 136 (d) 144
(e) None of these

18. What is the respective ratio of total number of employees working in the production department to those working in the Merchandising department?
(a) 15 : 14 (b) 8 : 7
(c) 14 : 15 (d) 7 : 8
(e) None of these

19. Which is the department with lowest number of females working?
(a) Marketing
(b) Production
(c) HR
(d) Finance
(e) None of these

20. What is the total number of employees from all departments together in the organization?
(a) 1500
(b) 1575
(c) 1525
(d) 1625
(e) None of these

ANSWER KEYS

1. (e) 2. (a) 3. (d) 4. (b) 5. (c) 6. (e) 7. (d) 8. (c) 9. (a) 10. (b)
11. (b) 12. (e) 13. (a) 14. (c) 15. (a) 16. (c) 17. (d) 18. (a) 19. (b) 20. (e)

HINTS AND EXPLANATIONS

1 to 5

Number of people working in night shifts:

$$\text{IT industry} \rightarrow 40250 \times \frac{12}{100} = 4830 \quad \text{Number of women} = 4830 \times \frac{20}{100} = 966 \text{ and no. of men} = 4830 - 966 = 3864$$

$$\text{Sports industry} \rightarrow 40250 \times \frac{18}{100} = 7245 \quad \text{Number of women} = 7245 \times \frac{20}{100} = 1449 \text{ and no. of men} = 7245 - 1449 \\ = 5796$$

$$\text{Call centre} \rightarrow 40250 \times \frac{32}{100} = 12880 \quad \text{Number of women} = 12880 \times \frac{45}{100} = 5796 \text{ and no. of men} = 12880 - 5796 = 7084$$

$$\text{Sales} \rightarrow 40250 \times \frac{8}{100} = 3220 \quad \text{Number of women} = 3220 \times \frac{60}{100} = 1932 \text{ and no. of men} = 3220 - 1932 = 1288$$

$$\text{Banking} \rightarrow 40250 \times \frac{14}{100} = 5635 \quad \text{Number of women} = 5635 \times \frac{40}{100} = 2254 \text{ and no. of men} = 5635 - 2254 = 3381$$

Chemical industry \rightarrow $40250 \times \frac{16}{100} = 6440$ Number of women $= 6440 \times \frac{15}{100} = 966$ and no. of men $= 6440 - 966 = 5474$

- Required ratio = $7084:5796 = 11:9$. Hence option (e) is the answer.
 - Number of women = $966 + 1449 + 5796 + 1932 + 2254 + 966 = 13363$

Hence required average = $\frac{13363}{6} = 2227$. Hence option (a) is the answer.

2.90 Data Interpretation

3. Number of women = $3864 + 5796 + 7084 + 1288 + 3381 + 5474 = 26887$. Hence option (d) is the answer.
4. Total number of working people = 40250
Number of women in sports industry = 1449

Hence required percentage = $\frac{1449}{40250} \times 100 = 3.6\%$
Hence option (b) is the answer.
5. Required difference = $26887 - 13363 = 13524$. Hence option (c) is the answer.

6 to 10

6. Number of girls in all departments = $140 + 300 + 180 + 250 + 240 = 1110$
Hence required percentage = $\frac{300}{1110} \times 100 = 27\%$
Hence option (e) is the answer.
7. Total number of boys in all the departments = $80 + 200 + 100 + 150 + 120 = 650$
Number of girls = 1110
Hence required difference = $1110 - 650 = 460$
Hence option (d) is the answer.
8. Average number of boys = $\frac{650}{5} = 130$
Hence option (c) is the answer.
9. Number of all boys = 650
Number of boys from Anthropology department = 100
Hence required percentage = $\frac{100}{650} \times 100 = 15.38 = 15$
Hence option (a) is the answer.
10. Number of girls from Philosophy department = 140
Number of girls from Psychology department = 240
Required ratio = $140:240 = 7:12$
Hence option (b) is the answer.

11 to 15

11. Total sale of Hindi Newspapers = $5500 + 8500 + 4500 + 9500 + 5000 = 33000$
Total sale of English Newspapers = $7500 + 9000 + 9500 + 7000 + 6500 = 39500$
Required difference = $39500 - 33000 = 6500$
Hence option (b) is the answer.
12. Required percentage = $\frac{7500}{39500} \times 100 = 19$
Hence option (e) is the answer.

13. Required ratio = $5500:9500 = 11:19$
Hence option (a) is the answer.
14. Total sale of English Newspaper in localities B and D = $9000 + 7000 = 16000$
Total sale of English Newspaper in localities A, C and E = $7500 + 9500 + 6500 = 23500$
Hence required percentage = $\frac{16000}{23500} \times 100 = 68\%$
Hence option (c) is the answer.
15. Average sale of Hindi Newspaper = $\frac{33000}{5} = 6600$
Hence option (a) is the answer.

16 to 20

16. Number of males:
HR department $\rightarrow 225 \times \frac{9}{25} = 81$
Marketing department $\rightarrow 275 \times \frac{3}{5} = 165$
IT department $\rightarrow 200 \times \frac{9}{40} = 45$
Finance department $\rightarrow 175 \times \frac{2}{5} = 70$
Production department $\rightarrow 375 \times \frac{11}{15} = 275$
Merchandising department $\rightarrow 350 \times \frac{4}{7} = 200$

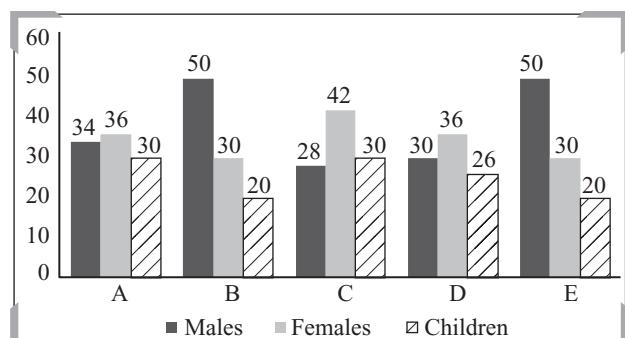
Therefore Total number of males = $81 + 165 + 45 + 70 + 275 + 200 = 836$
Hence option (c) is the answer.
17. Number of females working in the HR department = $225 \times \frac{16}{25} = 144$
Hence option (d) is the answer.
18. Required ratio = $375:350 = 15:14$
Hence option (a) is the answer.
19. Number of females in different departments:
HR department $\rightarrow 225 - 81 = 144$
Marketing department $\rightarrow 275 - 165 = 110$
IT department $\rightarrow 200 - 45 = 155$
Finance department $\rightarrow 175 - 70 = 105$
Production department $\rightarrow 375 - 275 = 100$
Merchandising department $\rightarrow 350 - 200 = 150$
Hence option (b) is the answer.
20. Total number of employees = $225 + 275 + 200 + 175 + 375 + 350 = 1600$
Hence option (e) is the answer.

2.92 Data Interpretation

7. What is the average price per kg of Bajra sold by all the farmers together?
 (a) ₹25.10 (b) ₹24.50
 (c) ₹25 (d) ₹23.40
 (e) None of these
8. Farmer D and farmer E, both sell 240 kg of Bajra each. What would be the respective ratio of their earnings?
 (a) 15 : 14 (b) 11 : 13
 (c) 14 : 15 (d) 13 : 15
 (e) None of these
9. Farmer C sells 180 kg each of Corn, Paddy and Jowar grains. How much does he earn?
 (a) ₹13,540
 (b) ₹12,550
 (c) ₹13,690
 (d) ₹12,690
 (e) None of these
10. Earnings on 150 kg of Paddy sold by farmer B is **approximately** what percentage of the earnings on the same quantity of Rice sold by the same farmer?
 (a) 65 (b) 69
 (c) 73 (d) 60
 (e) 75

Directions for questions 11 to 15: Go through the data set given below and solve the questions based on it.

Following bar chart provides the percentage of Adult Males, Adult Females and Children out of total population in five colonies A, B, C, D and E:

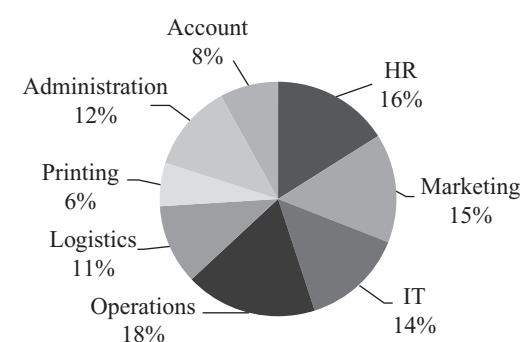


Total number of Residents in these Colonies	
Colonies	Residents
A	1250
B	2050
C	1800
D	1150
E	1620

11. What is the total number of adult females in colonies A, B and C together?
 (a) 1785 (b) 1821
 (c) 1479 (d) 1692
 (e) None of these
12. The number of children in colony A are **approximately** what per cent of the number of children in colony E?
 (a) 121 (b) 116
 (c) 75 (d) 101
 (e) 98
13. What is the respective ratio of the number of adult males to the number of adult females in colony B?
 (a) 3:5 (b) 7:5
 (c) 8:7 (d) 5:7
 (e) None of these
14. What is the average number of residents from all the colonies together?
 (a) 1654 (b) 1600
 (c) 1580 (d) 1574
 (e) None of these
15. What is the difference between the number of adult males and the number of children in colony D?
 (a) 138
 (b) 126
 (c) 136
 (d) 135
 (e) None of these

Directions for questions 16 to 20: Go through the data set given below and solve the questions based on it.

Following pie chart presents the percentage of employees working in different departments in an organization.
 Total Number of Employees = 2500



Following is the ratio of males to females in different departments in the same organization:

Male: Female Ratio			
Department	Male	:	Female
Administration	7	:	5
Accounts	2	:	3
HR	5	:	3
Marketing	7	:	8
IT	3	:	4
Operations	5	:	4
Logistics	6	:	5
Printing	2	:	1

ANSWER KEYS

- 1.** (a) **2.** (b) **3.** (e) **4.** (c) **5.** (d) **6.** (d) **7.** (a) **8.** (c) **9.** (d) **10.** (b)
11. (b) **12.** (b) **13.** (e) **14.** (d) **15.** (a) **16.** (a) **17.** (c) **18.** (d) **19.** (d) **20.** (b)

HINTS AND EXPLANATIONS

1 to 5

1. Required percentage = $\frac{42}{490} \times 100 = 9\%$
Hence option (a) is the answer.

2. Required ratio = $(120 - 30) : (30 + 30) = 90:60 = 3:2$
Hence option (b) is the answer.

3. Number of businessmen = $45 + 19 = 64$
Hence required percentage = $\frac{64}{100} \times 100 = 10\%$
Hence option (e) is the answer.

4. Required ratio = $280 : (180 + 30) = 280:210 = 4:3$
Hence option (c) is the answer.

- $$5. \text{ Required percentage} = \frac{45}{(180+45)} \times 100 \\ = \frac{45}{225} \times 100 = 20\%$$

Hence option (d) is the answer.

6 to 10

6. Farmer A's earnings = ₹(350 × 30 + 150 × 22.5 + 250 × 18) = ₹(10500 + 3375 + 4500) = ₹18375
Hence option (d) is the answer.

2.94 Data Interpretation

7. Average price of Bajra = ₹ $\left(\frac{22+24.5+21+28+30}{5} \right)$
per kg = ₹ 25.10 per kg
Hence option (a) is the answer.
8. Required ratio = $240 \times 28 : 240 \times 30 = 14:15$
Hence option (c) is the answer.
9. Farmer C's earnings = ₹ $(180 \times 24 + 180 \times 26 + 180 \times 20.5) = ₹ 180(24 + 26 + 20.5) = ₹ (180 \times 70.5) = ₹ 12690$
Hence option (d) is the answer.
10. Required percentage = $\frac{25}{36} \times 100 = 69$
Hence option (b) is the answer.

11 to 15

11. Total number of adult females in colonies A, B and C together = $\left(\frac{1250 \times 36}{100} + \frac{2050 \times 30}{100} + \frac{1800 \times 42}{100} \right)$
 $= (450 + 615 + 756) = 1821$
Hence option (b) is the answer.
12. Number of children in colony A = $\frac{1250 \times 30}{100} = 375$
Number of children in colony E = $\frac{1620 \times 30}{100} = 324$
Required percentage = $\frac{375}{324} \times 100 = 116$
Hence option (b) is the answer.
13. Required ratio = 50:30 = 5:3
Hence option (e) is the answer.
14. Average number of residents from all the colonies together = $\frac{1250+2050+1800+1150+1620}{5} = \frac{7870}{5}$
 $= 1574$
Hence option (d) is the answer.
15. Required difference = (38 - 26)% of 1150
 $= \frac{12 \times 1150}{100} = 138$
Hence option (a) is the answer.

16 to 20

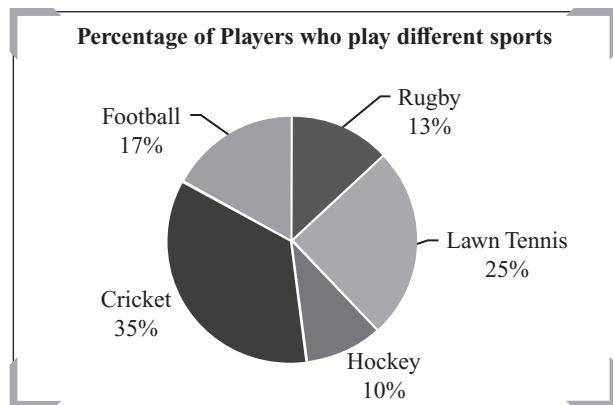
16. Total number of employees in administration department = $\frac{2500 \times 12}{100} = 300$

- Number of male employees = $\frac{7}{12} \times 300 = 175$
Total number of employees in printing department
 $= \frac{2500 \times 6}{100} = 150$
Number of male employees = $\frac{2}{3} \times 150 = 100$
Therefore Required ratio = 175:100 = 7:4
Hence option (a) is the answer.
17. Required difference = $2500 \times (18 - 14)\% = \frac{2500 \times 4}{100}$
 $= 100$
Hence option (c) is the answer.
18. Total number of employees in HR department
 $= \frac{2500 \times 16}{100} = 400$
Hence no. of males = $\frac{5}{8} \times 400 = 250$ and number of females = $400 - 250 = 150$
Number of employees in marketing department
 $= \frac{2500 \times 15}{100} = 375$
Number of males = $\frac{7}{15} \times 375 = 175$
Number of females = $375 - 175 = 200$
Therefore Required ratio = $(250 + 175) : (150 + 200)$
 $= 425:350 = 17:14$
Hence option (d) is the answer.
19. Number of employees in HR department = 16% of 2500
 $= \frac{16}{100} \times 2500$
 $= 400.$
Number of female employees in HR department
 $= \frac{3}{8}$ of total employee.
 $= 3/8 \times 400 = 150$
20. Total number of employees in logistics department
 $= \frac{2500 \times 11}{100} = 275$
Number of males = $\frac{6}{11} \times 275 = 150$
Number of females = $275 - 150 = 125$
Hence required difference = $150 - 125 = 25$
Hence option (b) is the answer.

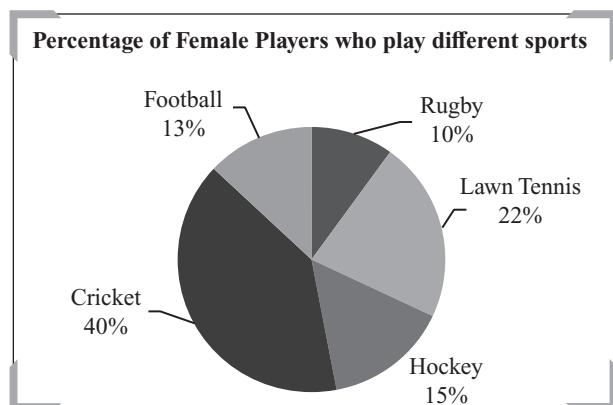
PRACTICE EXERCISE 7

Directions for questions 1 to 5: Go through the data set given below and solve the questions based on it.

Following pie chart give the percentage wise break-up of total players who play five different sports. Given that total number of players = 4200.



Out of total 4200 players, number of female players is equal to 2000. Following pie chart present the breakup of female players playing these five sports.



Directions for questions 6 to 10: Go through the data set given below and solve the questions based on it.

Number of Articles (in thousands) Manufactured (M) and Defective (D) by 5 units of a company over the Years

Year	UNIT									
	I		II		III		IV		V	
	M	D	M	D	M	D	M	D	M	D
1996	53	21	45	12	76	38	56	21	46	18
1997	49	18	32	10	45	24	63	24	36	14

2.96 Data Interpretation

Year	UNIT					IV	V			
	I	II	III	IV	V					
1998	50	18	48	18	55	16	68	30	34	15
1999	65	20	68	15	57	20	54	19	48	12
2000	70	31	72	13	82	22	48	27	58	10
2001	44	15	56	22	38	32	40	15	60	11

6. What is the ratio between total number of articles manufactured by unit III to that by Unit V for all the years together?
- 353 : 282
 - 282 : 353
 - 457 : 215
 - 215 : 457
 - None of these
7. What is the average number of defective items from Unit II for the given years?
- 21,500
 - 17,000
 - 12,500
 - 15,000
 - None of these
8. During which year the largest percentage of articles were defective out of the articles manufactured by unit IV?
- | | |
|----------|----------|
| (a) 1996 | (b) 1997 |
| (c) 1998 | (d) 1999 |
| (e) 2000 | |
9. What was the percentage (rounded off to nearest integer) of defective articles over the number of articles manufactured by all units together in the year 2001?
- 42
 - 40
 - 37
 - 33
 - None of these
10. During which year was the percentage increase/decrease in manufacture from the previous year the highest for Unit I?
- | | |
|-------------------|----------|
| (a) 1998 | (b) 2001 |
| (c) 1999 | (d) 1997 |
| (e) None of these | |

Directions for questions 11 to 15: Go through the data set given below and solve the questions based on it.

Number of Males and Females staying in various Societies:

Societies	Males	Females
A	250	350
B	400	150
C	300	275
D	280	300
E	180	250
F	325	300

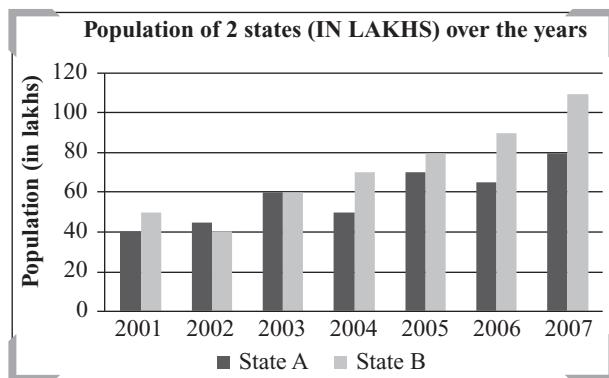
Percentage of Male and Female Children in the Societies:

Societies	Children (out of total population)	Male Children out of total children	Female Children out of total children
A	25%	40%	60%
B	40%	75%	25%
C	16%	25%	75%
D	25%	80%	20%
E	40%	50%	50%
F	24%	46%	54%

11. What is the respective ratio of the number of adult females to the total number of female children staying in all the societies together?
- 243:82
 - 112:71
 - 82:243
 - 71:112
 - None of these
12. What is the total number of female children staying in all the societies together?
- 314
 - 433
 - 410
 - 343
 - None of these
13. What is the respective ratio of the total number of adult males in societies A and B together to the total number of adult males in societies E and F together?
- 3520
 - 3360
 - 4100
 - 3000
 - None of these
14. What is the total number of members staying in all the societies together?
- 3520
 - 3360
 - 4100
 - 3000
 - None of these
15. What is the difference between the number of male children in society B and the number of male children in society F?
- 84
 - 14
 - 96
 - 26
 - None of these

Directions to questions 16 to 20: Go through the data set given below and solve the questions based on it.

Following chart gives the population of 2 states from year 2001 to year 2007:
(All the values are in the multiples of 5 lakhs)



16. Population of State B in 2002 is what per cent of the total population of State B in all the years together?
- 18%
 - 26%
 - 14%
 - 12%
 - 8%
17. What is the ratio between the total population of State A for the years 2001, 2002 and 2003 together and the total population of State B for the years 2005, 2006 and 2007 together respectively?
- 27 : 53
 - 54 : 29
 - 29 : 56
 - 53 : 27
 - None of these
18. For which State and in which year the per cent rise in population from the previous year was the highest?
- State B – 2003
 - State B – 2002
 - State A – 2004
 - State A – 2005
 - None of these
19. What is the per cent rise in population of State B from 2003 to 2004?
- $16\frac{1}{3}$
 - $16\frac{2}{3}$
 - $18\frac{2}{3}$
 - $18\frac{1}{3}$
 - None of these
20. Approximately what is the average population of State A for all the given years?
- 65 lakhs
 - 50 lakhs
 - 48 lakhs
 - 58 lakhs
 - 52 lakhs

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (d) | 2. (a) | 3. (c) | 4. (b) | 5. (a) | 6. (a) | 7. (d) | 8. (e) | 9. (b) | 10. (b) |
| 11. (a) | 12. (c) | 13. (d) | 14. (e) | 15. (c) | 16. (e) | 17. (c) | 18. (a) | 19. (b) | 20. (d) |

HINTS AND EXPLANATIONS**1 to 5**

1. Average number of players who play Football and Rugby = [(17 + 13) % of 4200]
 $= 4200 \times \frac{30}{100} = 1260$. Hence option (d) is the answer.

2. Number of players who play Rugby = $4200 \times \frac{13}{100} = 546$

Number of female players who play

$$\text{Rugby} = 2000 \times \frac{10}{100} = 200$$

Hence Number of male players who play Rugby = $546 - 200 = 346$

Number of female players who play Lawn Tennis = $2000 \times \frac{22}{100} = 440$

Hence required difference = $440 - 346 = 94$. Hence option (a) is the answer.

3. Number of female cricketers = $2000 \times \frac{40}{100} = 800$

$$\text{Number of male Hockey players} = \frac{4200 \times 10}{100} - \frac{2000 \times 15}{100} = 420 - 300 = 120$$

Hence Required ratio = 800:120 = 20:3.

Hence option (c) is the answer.

4. Number of male players who play Football, Cricket and Lawn Tennis

$$= (17 + 35 + 25)\% \text{ of } 4200 - (13 + 40 + 22)\% \text{ of } 2000 \\ = 4200 \times \frac{77}{100} - 2000 \times \frac{75}{100} = 3234 - 1500 = 1734$$

Hence option (b) is the answer.

5. Number of male players who play Rugby = $4200 \times \frac{13}{100} - 200 = 346$

Number of players who play

$$\text{Lawn Tennis} = 4200 \times \frac{25}{100} = 1050$$

$$\text{Hence required percentage} = \frac{346}{1050} \times 100 = 33$$

Hence option (a) is the answer.

6 to 10

6. Number of articles manufactured by:

$$\text{Unit III} \rightarrow (76 + 45 + 55 + 57 + 82 + 38) \text{ thousands} \\ = 353 \text{ thousands}$$

$$\text{Units V} \rightarrow (46 + 36 + 34 + 48 + 58 + 60) \text{ thousands} \\ = 282 \text{ thousands}$$

Hence Required ratio = 353:282

Hence option (a) is the answer.

7. Required average = $\frac{(12+10+18+15+13+22)}{6}$

$$\text{thousands} = \frac{90}{6} = 15 \text{ thousands}$$

Hence option (d) is the answer.

8. It was in the year 2000. Hence option (e) is the answer.

9. Number of articles manufactured in 2001 = $(44 + 56 + 38 + 40 + 60)$ thousands = 238 thousands

$$\text{Number of defective items} = (15 + 22 + 32 + 15 + 11) \text{ thousands} = 95 \text{ thousands}$$

$$\text{Hence Required percentage} = \frac{95}{238} \times 100 = 39.9 = 40$$

Hence option (b) is the answer.

10. Percentage increase in 1999 = $\frac{15}{50} \times 100 = 30\%$

$$\text{Percentage decrease in 2001} = \frac{26}{70} \times 100 = 37.14\%$$

Hence, percentage decrease was highest in 2001.

Hence option (b) is the answer.

11 to 15

11. Number of children:

$$\text{Society A} \rightarrow 600 \times \frac{25}{100} = 150$$

$$\text{Number of female children} = 150 \times \frac{60}{100} = 90$$

$$\text{Number of male children} = 150 - 90 = 60$$

$$\text{Society B} \rightarrow 550 \times \frac{40}{100} = 220$$

$$\text{Number of female children} = 220 \times \frac{25}{100} = 55$$

$$\text{Number of male children} = 220 - 55 = 165$$

$$\text{Society C} \rightarrow 575 \times \frac{16}{100} = 92$$

$$\text{Number of female children} = 92 \times \frac{75}{100} = 69$$

$$\text{Number of male children} = 92 - 69 = 23$$

$$\text{Society D} \rightarrow 580 \times \frac{25}{100} = 145$$

$$\text{Number of female children} = 145 \times \frac{20}{100} = 29$$

$$\text{Number of male children} = 145 - 29 = 116$$

$$\text{Society E} \rightarrow 340 \times \frac{40}{100} = 172$$

$$\text{Number of female children} = 172 \times \frac{50}{100} = 86$$

$$\text{Number of male children} = 172 - 86 = 86$$

$$\text{Society F} \rightarrow 625 \times \frac{24}{100} = 150$$

$$\text{Number of female children} = 150 \times \frac{54}{100} = 81$$

$$\text{Number of male children} = 150 - 81 = 69$$

$$\text{Number of adult females} = (350 + 150 + 275 + 300 + 250 + 300) - 410 = 1625 - 410 = 1215$$

$$\text{Number of female children} = 90 + 55 + 69 + 29 + 86 + 81 = 410$$

$$\text{Hence required ratio} = 1215:410 = 243:82$$

Hence option (a) is the answer.

- 12.** Using the data obtained in the previous question:

Number of all female children = 410. Hence option (c) is the answer.

- 13.** Number of adult males in societies A and B = $(250 - 60) + (400 - 165) = 190 + 235 = 425$

Number of adult males in societies E and F = $(180 - 86) + (325 - 69) = 94 + 256 = 350$

$$\text{Required ratio} = 425:350 = 17:14$$

Hence option (d) is the answer.

- 14.** Number of all members = $(250 + 350) + (400 + 150) + (300 + 275) + (280 + 300) + (180 + 250) + (325 + 300) + 150 + 220 + 92 + 145 + 172 + 150 = 4289$

Hence option (e) is the answer.

- 15.** Required difference = $165 - 69 = 96$

Hence option (c) is the answer.

16 to 20

- 16.** Total population of state B in all the years = $(50 + 40 + 60 + 70 + 80 + 90 + 100)$ lakhs = 490 lakhs

Population of state B in 2002 = 40 lakhs

$$\text{Hence required percentage} = \frac{40}{490} \times 100 = 8.16\%$$

Hence option (e) is the answer.

- 17.** Required ratio = $(40 + 45 + 60):(80 + 90 + 110) = 145:280 = 29:56$

Hence option (c) is the answer.

- 18.** It is obvious from the graph.

Hence option (a) is the answer.

- 19.** Percentage increase = $\frac{70-60}{60} \times 100 = \frac{50}{3} = 16\frac{2}{3}$

Hence option (b) is the answer.

- 20.** Average population of the state

$$A = \left(\frac{40+45+60+50+70+65+80}{7} \right) \text{Lakhs} = \frac{410}{7}$$

lakhs = 58 lakhs

Hence option (d) is the answer.

PRACTICE EXERCISE 8

Directions for questions 1 to 5: Refer to the tables given below and answer the questions that follow.

Table 1 give the transportation cost of a product from six factories F1, F2, F3, F4, F5 and F6 to five warehouses W1, W2, W3, W4 and W5.

	W1	W2	W3	W4	W5
F1	60	25	45	40	80
F2	85	40	45	60	75
F3	80	20	45	50	90
F4	90	40	55	25	70
F5	95	20	40	45	80
F6	85	35	50	50	75

Table 2 give the transportation cost of the same product from five warehouses W1, W2, W3, W4 and W5 to six retailers R1, R2, R3, R4, R5 and R6.

	R1	R2	R3	R4	R5	R6
W1	40	20	40	30	85	25
W2	50	50	45	60	70	30
W3	20	10	50	50	80	35
W4	40	30	45	40	90	40
W5	50	30	50	40	70	30

In addition to the above tables given, following table gives the transportation cost incurred from different retailers to the five different colonies C1, C2, C3, C4 and C5.

	C1	C2	C3	C4	C5
R1	10	25	10	10	10
R2	15	10	15	10	15
R3	10	20	10	15	10
R4	20	10	15	15	10
R5	15	10	20	20	20
R6	10	15	15	15	15

- What is the minimum transportation cost incurred in transferring the product from any factory to any colony?
 - ₹45
 - ₹65
 - ₹55
 - None of these
- What is the minimum transportation cost incurred in transferring the product from any factory to the colony C2?
 - ₹45
 - ₹60
 - ₹55
 - None of these
- If one unit produced in each of the factories is to be sent to each of the colonies, then what will be the total transportation cost incurred?
 - ₹1705
 - ₹1980
 - ₹2185
 - None of these
- $F_i W_j R_k C_l$ represents that the product has moved in this cycle – Factory i to warehouse j to retailer k to colony l. If $i = 2$ and $k = 2$, then what is the sum of $(j + l)$ for the lowest transportation cost incurred in one product transferred from $i = 2$ to any of the colonies?
 - 4
 - 5
 - 7
 - cannot be determined
- In the above question, if $j = 2$, then how many different value/s of $(i + k + l)$ is/are possible for the lowest transportation cost incurred in one product transferred from any of the factories to any of the colonies?
 - 1
 - 2
 - 3
 - cannot be determined

Directions for questions 6 to 10: Refer to the table given below and answer the questions that follow.

Given below are the forecasts of world and Asian energy demand for the years 1991, 2001 and 2011. The demand is given in million barrels per day, crude oil equivalent.

	1991		2001		2011	
	World	Asia	World	Asia	World	Asia
Petrol	50.0	4.0	70.0	10.0	80.0	15.0
Naphtha	30.0	0.5	40.0	2.5	50.0	5.0
Solid Fuels	50.0	4.0	60.0	5.0	75.0	10.0
Nuclear Fuel	10.0	0.5	20.0	1.0	25.0	1.3
Hydro Energy	10.0	1.0	10.0	1.5	20.0	2.0
Total	150.0	10.0	200.0	20.0	250.0	33.3

6. What can be inferred from the given table?
- Percentage increase in the number of Petrol using vehicles/agents have increased in Asia than the world in the decade 1991–2001.
 - Exploration of Naphtha is low in Asia is less than the exploration of Naphtha in the world throughout the period.
 - Both (a) and (b)
 - None of these
7. Over 1991–2011, which two fuels meet more than 60% of the total energy demand of both the world and Asia?
- Petrol and Naphtha
 - Petrol and Solid fuels
 - Naphtha and Solid fuels
 - None of these
8. Which fuel's proportion in the total energy demand increases over the decade 1991–2001 and decreases over the decade 2001–2011 for both the world and Asia?
- Petrol
 - Naphtha
 - Solid fuels
 - Nuclear Fuel
9. Which is the fuel whose proportion in the total energy demand will decrease continuously over the period 1991–2011, in Asia?
- Naphtha
 - Solids fuels
 - Nuclear Fuel
 - Hydro Energy
10. Which is the fuel whose proportions to the total energy demand of the world will remain constant over the period 1991–2011 but whose proportion will increase in the total energy demand in Asia?
- Naphtha
 - Solids fuels
 - Nuclear Fuel
 - Hydro Energy

Directions for questions 11 to 14: Refer to the table given below and answer the questions that follow.

Following table gives some incomplete information on the marks obtained by four persons Amit, Binit, Charu and Dilip in four different subjects.

	Physics	Chemistry	Maths	English	Total
Amit	80	70	—	80	—
Binit	60	—	60	—	—
Charu	—	—	60	—	220
Dilip	90	—	70	60	—

Additional Information:

- Amit's average marks was 72.5, in all the four subjects.
 - The average marks in Physics for all four persons was 67.5.
 - Binit's Average marks for all four subjects was 1.5 times Charu's marks in physics.
 - Binit and Dilip scored the same marks in English. The average English marks were the same as the average Physics marks.
 - The total marks in Chemistry was 10 less than the total marks in physics for all four persons.
11. Who scored the lowest total?
- Amit
 - Binit
 - Charu
 - Dilip
12. The average marks for all four persons (for all the four subjects) is (approx.)
- 65.625
 - 81.225
 - 99.5
 - 105.6
13. Who is the highest scorer in chemistry?
- Amit
 - Binit
 - Charu
 - Dilip
14. Who is the lowest scorer in physics?
- Amit
 - Binit
 - Charu
 - Dilip

Directions for questions 15 to 17: In each question, there are two statements: A and B, either of which can be true or false on the basis of the information given below.

2.102 Data Interpretation

A research agency collected the following data regarding the admission process of a reputed management school in India.

Year	Gender	Number bought application forms	Number appeared for written test	Number called for interviews	Number selected for the course
2002	Male	61205	59981	684	171
	Female	19236	15389	138	48
2003	Male	63298	60133	637	115
	Female	45292	40763	399	84

- Chosse (a) if only A is true
- Chosse (b) if only b is true
- Chosse (c) if both A and B are true
- Chosse (d) if neither A nor b is true

15. Statement A: The success rate of moving from written test to interview stage for males was worse than for females in 2003.

Statement B: The success rate of moving from written test to interview test to interview stage for females was better in 2002 than in 2003.

16. Statement A: In 2002, the number of females selected for the course as a proportion of the number of females who bought application forms, was higher than the corresponding proportion for males.

Statement B: In 2002, among those called for interview, males had a greater success rate than females.

17. Statement A: The percentage of absentees in the written test among females decreased from 2002 to 2003.

Statement B: The percentage of absentees in the written test among males was larger than among females in 2003.

Directions for questions 18 to 20: Answer the questions on the basis of the information given below.

The table below provides certain demographic details of 30 respondents who were part of a survey investigating the irregularities in NREGS. The demographic characteristics are: gender, number of children, and age of respondents. The first number in each cell is the

number of respondents in that group. The minimum and maximum age of respondents in each group is given in brackets. For example, there are five female respondents with no children and among these five; the youngest is 34 years old, while the oldest is 49.

No. of children	Male	Female	Total
0	1(38,38)	5(34,49)	6
1	1(32,32)	8(35,57)	9
2	8(21,65)	3(37,63)	11
3	2(32,33)	2(27,40)	4
Total	12	18	30

18. The percentage of respondents aged less than 40 years is at least

- (a) 10% (b) 16.67%
- (c) 20.0% (d) 30%

19. Given the information above, the percentage of respondents older than 35 can be at most

- (a) 30% (b) 73.33%
- (c) 76.67% (d) 90%

20. The percentage of respondents that fall into the 35 to 40 years age group (both inclusive) is at least

- (a) 6.67% (b) 10%
- (c) 13.33% (d) 26.67%

ANSWER KEYS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (d) | 2. (d) | 3. (d) | 4. (d) | 5. (d) | 6. (d) | 7. (b) | 8. (a) | 9. (d) | 10. (a) |
| 11. (c) | 12. (a) | 13. (d) | 14. (c) | 15. (d) | 16. (d) | 17. (a) | 18. (d) | 19. (c) | 20. (c) |

HINTS AND EXPLANATIONS

1 to 5

1. F3 to W2 to R6 to C1 is the lowest = $20 + 30 + 10 = ₹60$.
2. F3 to W2 to R6 to C2 is the minimum = $20 + 30 + 15 = ₹65$.
4. F2 – W3 – R2 – either C2/C4. Hence two different values possible.

5. There can be two values of $i = 3/5$, one value of $j = 2$, one value of $k = 6$ and one value of $l = 1$. Hence two different sums are possible.

6 to 10

6. Obviously cannot be inferred. (a) seems probable, but number of vehicles/agents need not be increasing. There can be other reasons also like reduction in the efficiency of the vehicle etc.

7.

		1991		2001		2011	
		World	Asia	World	Asia	World	Asia
Total energy		150	10	200	20	250	33.3
Naphtha	Value	30	0.5	40	2.5	50	5
	Proportion	20%	5%	20%	12.50%	20%	15.01
Solid fuels	Value	50	4	60	5	75	10
	Proportion	33.30%	40%	30%	25%	30%	30.03
Petrol	Value	50	4	70	10	80	15
	Proportion	33.30%	40%	35%	50%	32%	45.04

Hence, solid fuels and Petrol combined constitute more than 60 percent of total energy in both the world and Asia for the given period.

8. It can be seen from the table that Petrol is the fuel whose proportion in the total energy demand increases during 1991–2001 and decreases during 2001–2011 for both the world and Asia.
9. For the answer choices given and for Asia we can take make the following table.

		1991	2001	2011
Total energy		10	20	33
Naphtha	Value	0.5	2.5	5
	Proportion	5%	12.50%	15.15%

		1991	2001	2011
Total energy		10	20	33
Solid fuels	Value	4	5	10
	Proportion	40%	25%	30.30%
Nuclear Fuel	Value	0.5	1	1.3
	Proportion	5%	5%	3.90%
Hydro Energy	Value	1	1.5	2
	Proportion	10%	7.50%	6.06%

Hence, we can see that the proportion of Hydro Energy goes on decreasing over the period.

2.104 Data Interpretation

10. For answer choices given and for the worlds, we can make the following table.

		1991	2001	2011
	Total energy	150	200	250
Naphtha	Value	30	40	50
	Proportion	20%	20%	20%
Solid Fuels	Value	50	60	75
	Proportion	33%	30%	30%
Nuclear Fuel	Value	10	20	25
	Proportion	6.66%	10%	10%
Hydro Energy	Value	10	10	20
	Proportion	6.66%	5%	8%

Hence, we can see that the proportion of Naphtha remains constant over the given period.

11 to 14

From the given information the following table can be prepared:

	Physics	Chemistry	Maths	English	Total
Amit	80	70	60	80	290
Binit	60	60	60	60	240
Charu	40	50	60	70	220
Dilip	90	80	70	60	300

Now all the questions can be answered.

11. (c) 12. (a) 13. (d) 14. (c).

15. **Statement A:** Success rate of moving from written test to interview for male in 2003 = $\frac{637}{60133} \times 100$ & for women it is $\frac{399}{40763} \times 100$. It is clear for males it is more than 1% & for women it is less than 1% (we must avoid actual calculation)

Statement B: Success rate of moving from written test to interview for females in 2003 = $\frac{399}{40763} \times 100$ & for year 2002 it is $\frac{138}{15389} \times 100$. We can easily observe without actual calculation that it was more in 2002 as compared to 2003.

So, both Statement A & Statement B are wrong.

16. **Statement A:** Proportion of females & male selected for course as compared to total females & males who bought application form in 2002 is $\frac{48}{19236}$ & $\frac{171}{61205}$ respectively clearly proportion is more for males.

Statement B: Success rate of males & females for those who were called for interview in 2002 is $\frac{171}{684}$ & $\frac{48}{135}$ respectively. Clearly success rate of female is higher.

So, both Statement A and Statement B are wrong.

17. **Statement A:** The % of females absentees in written test in 2002 & 2003 are $\frac{19236 - 15389}{19236} \times 100 = 20\%$ & $\frac{45292 - 40763}{45292} \times 100 \approx 10\%$. Clearly Statement A is correct.

Statement B: The % of male absentees in 2003 = $\frac{63298 - 60123}{63298} \times 100\% \approx 5\%$ clearly Statement B is wrong.

18 to 20

18. The minimum number of males (or females) for any group on the basis of number of children = 0 (if lower age is more than 40)

= All (if upper age is less than 40)

= 1 (if lower age is less than 40 & upper)

So, minimum possible number of people below 40 age is 9.

Hence, required percentage = $9/3 \times 100\% = 30\%$.

19. $\frac{23}{30} \times 100 = 76.67\%$. Hence option (c) is the answer.

20. $\frac{4}{30} \times 100 = 13.33\%$. Hence option (c) is the answer.

Chapter

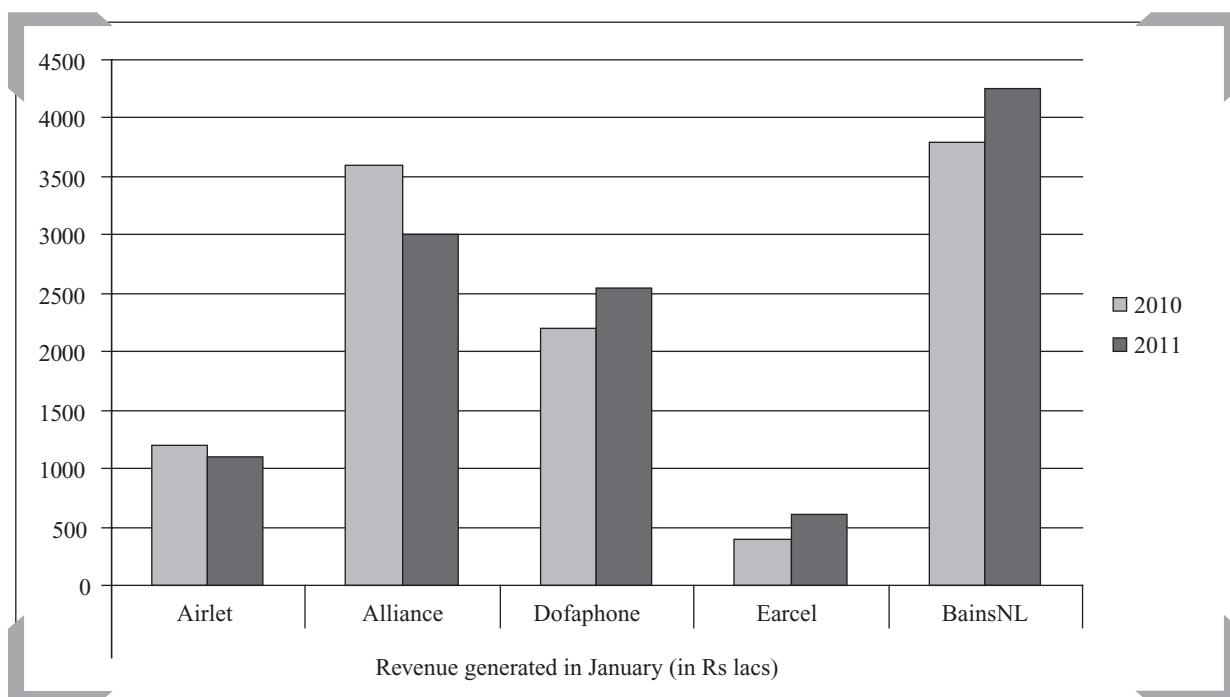
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MODERATE EXERCISES

PRACTICE EXERCISE 1

Directions for questions 1 to 4: Go through the data set given below and solve the questions based on it.

Following chart gives the revenue of 5 telecom companies generated in Jan'2010 and Jan'2011. All the values are in the multiples of 50.

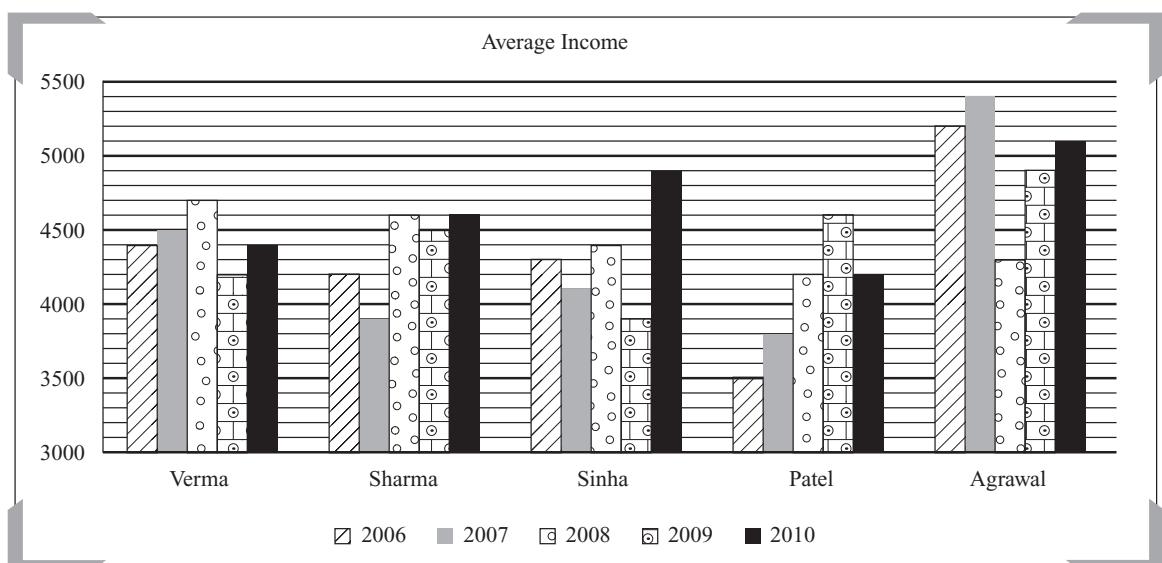


2.106 Data Interpretation

Following table provides the number of users of these telecom companies for the same two years in the month of January (in lacs):

Number of Users (in lacs)					
	AirLet	Alliance	Dofaphone	Earcel	BainsNL
2010	242	324	286	42	422
2011	259	318	294	46	440

AirLet	Alliance	Dofaphone	Earcel	BainsNL
18%	9%	12%	22%	6%



Which of the following is NOT correct for the VAS revenue generated by these companies for the year 2011?

- (a) VAS revenue of Alliance is more than the VAS revenue of BainsNL.
 - (b) VAS revenue of AirLet is more than the VAS revenue of Alliance.
 - (c) If we arrange VAS revenue of all these companies in ascending order, then VAS revenue of BainsNL will be the median.
 - (d) Cannot be determined

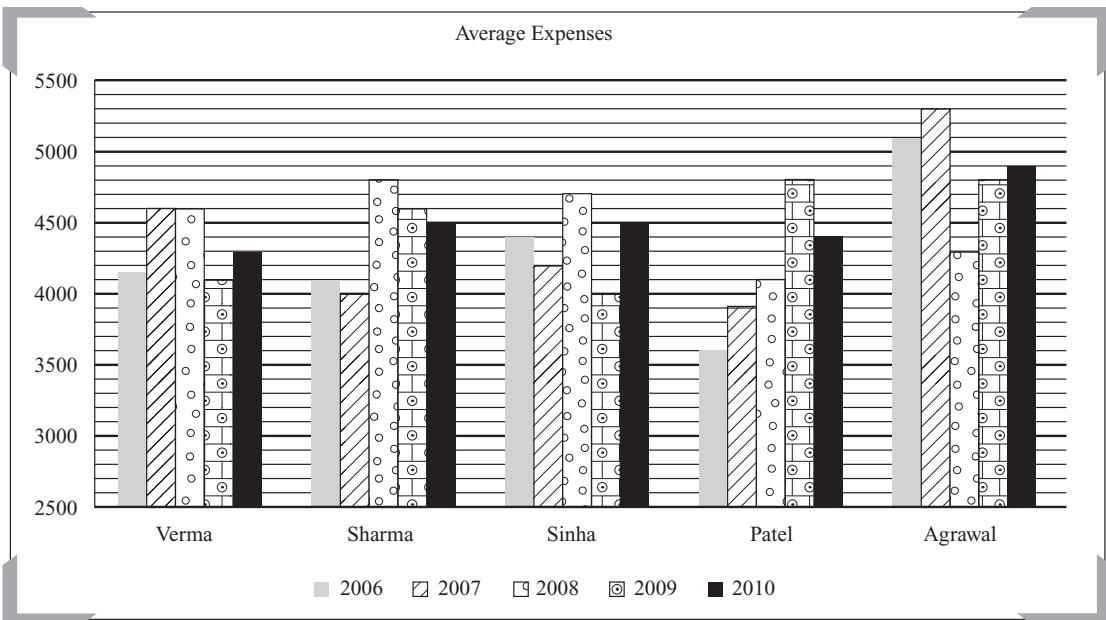
4. In January 2010, SMS Services was launched by all these five telecom companies for the first time. Following table gives the percentage of revenue generated through SMS services by these companies in the month of January 2010 (out of total revenue generated in January 2010 as given in the bar chart):

AirLet	Alliance	Dofaphone	Earcel	BainsNL
12%	16%	9%	6%	14%

What is the ratio of revenue generated through SMS services by Alliance Telecom to the revenue generated by Earcel through SMS in 2010?

Directions for questions 5 to 7: Go through the data set given below and solve the questions based on it.

Following bar charts give the average income and average expense for five families in the five years from 2006 to 2010. Average Savings for the year = Average Income – Average Expenses.



All the values are in the multiples of 100.

Directions for questions 8 to 10: Go through the data set given below and solve the questions based on it.

Following table gives the loans disbursed (only principal value and NOT the interest) across sectors (in ₹Crore) by a bank in the period 2005–2010. There is no overlapping of loan disbursals across the given sectors. All the Loans disbursed are of only two types—Standard loan or NPA Loan.

Sectors	Standard Loan	NPA Loan
Coal	1481.41	11.27
Mining	4517.06	62.97
Iron and Steel	41972.67	836.9

Sectors	Standard Loan	NPA Loan
Metal Products	8196.7	294.08
All Engineering	17903	475.6
Electricity	9052	34.77
Cotton Textiles	16907.7	593.27
Jute Textiles	275.7	17.57
Other Textiles	17264.1	536.9
Sugar	4718.9	26.1
Tea	375.3	102.5
Food Processing	13325.1	590.2

Standard loans are those loans for which repayments are regular and NPA Loan (Non Performing Asset Loan) are those loans for which repayment installments have stopped coming and bank have considered these loans as ‘bad debt’.

8. For how many sectors, NPA loan is more than 2% of the total loan?

 1. 5
 2. 6
 3. 7
 4. None of these

2.108 Data Interpretation

9. For which sector, NPA loan as a percentage of total loan maximum?
- Jute Textiles
 - Metal products
 - All Engineering
 - None of these
10. Which of the following correctly presents the range of value of standard loan as a percentage of total loan disbursed for all the sectors taken together for the whole period?
- Between 96% and 97%
 - Between 97% and 98%
 - Between 98% and 99%
 - None of these

ANSWER KEYS

1. (c) 2. (b) 3. (d) 4. (d) 5. (b) 6. (a) 7. (b) 8. (c) 9. (d) 10. (b)

HINTS AND EXPLANATIONS

1 to 4

1. Following is the list of ARPU:

	Air	Let	Alliance	Dofaphone	Earcel	Bains	NL
--	-----	-----	----------	-----------	--------	-------	----

ARPU							
Jan 10	4.7	10.49	7.5	10.7	9		
ARPU							

Jan 11 4.2 9.4 8.67 13.04 9.6

It can be seen clearly that Earcel is maximum for both the years. Hence it will be maximum combined also. Hence option (c) is the answer. Alternatively, it can be observed that all the bars except Earcel gives less than 10 ARPU in the 1st year and in 2nd year, Earcel is maximum.

2. Following is the list of ARPU:

	Air	Let	Alliance	Dofaphone	Earcel	Bains	NL
--	-----	-----	----------	-----------	--------	-------	----

ARPU							
Jan 10	4.7	10.49	7.5	10.7	9		
ARPU							

VAS	Air	Let	Alliance	Dofaphone	Earcel	Bains	NL
2011	18%	9%	12%	22%	6%		
Revenue	198	270	306	132	255		

Statements (a) and (c) are true and (b) is false. Hence answer is option (d) cannot be determined.

4. Data is given for January 2010, and question is asking for the whole year 2010. Hence cannot be determined. Hence option (d) is the answer.

Solution to Questions 5 to 7

This question set is purely based upon observation. That also, very careful observation. During online CAT, such kind of questions have been reported by the students where solving a question was more a job of ‘eyes’ than the job of ‘brain’.

5. For Verma family, saving is negative in 2007, so we do not need to check for other years.
For Sharma family also, saving is negative in 2007.
For Sinha and Patel family, savings is negative in first year itself.
For Agrawal family, this is zero for 2008, and positive for all the years. Since question is asking for non-negative value, Agrawal family’s data satisfies this condition. Hence option (b) is the answer.
6. Only two families have positive savings—Verma and Agrawal. Agrawal’s savings is more than Verma’s savings. Hence option (a) is the answer.
7. Sharma, Sinha and Patel family have negative total savings. Hence option (b) is the answer.
Following is the detailed list of savings:

	2006	2007	2008	2009	2010	Summation
Verma	200	-100	100	100	100	400
Sharma	100	-100	-200	-100	100	-200

	2006	2007	2008	2009	2010	Summation
Sinha	-100	-100	-300	-100	400	-200
Patel	-100	-100	100	-200	-200	-500
Agrawal	100	100	0	100	200	500

8 to 10

8. Following sectors have more than 2% NPA loan - Metal Products, All Engineering, Cotton Textiles,

Jute Textiles, Other Textiles, Tea and Food Processing. Hence option (c) is the answer.

9. It can be clearly seen that maximum value occurs for Tea (roughly 21%). This question was a test of observation only. Hence option (d) is the answer.
10. Total standard loan = 135989.6 cr
 Total disbursal = 139571.8
 Hence percentage = 97.43%
 Alternatively, it can be observed that NPA loan as a percentage of total loans come equal to 2% – 3%. Hence Standard loan = 100% – (2% to 3%) = 97% – 98%. Hence option (b) is the answer.

PRACTICE EXERCISE 2

Directions for questions 1 to 3 Go through the information given below and solve the questions based on it.

ABC is a firm that deals with furniture. Manufacturing of table requires three levels of assembly. The finished table is at first level. The leg assembly and tabletop are second level. The pieces that go into the leg assembly are at the third level which consists of short rails, long rails and legs. One unit of table requires one unit of tabletop and one unit of leg assembly. One unit of leg assembly requires 2 units of short rails, 2 units of long rails and 4 units of legs. Orders are placed just in time to minimize storage.

The lead time for activities are (Lead time is waiting time required to complete one activity)

Parts	Weeks
Assemble table	1
Finished leg assembly	1
Purchase legs	1
Purchase short rails	1
Purchase long rails	1
Purchase table top	2

The availability of parts at present:

Parts	Units
Finished Table	50
Leg assembly	100
Legs	150
Short rails	50
Long rails	0

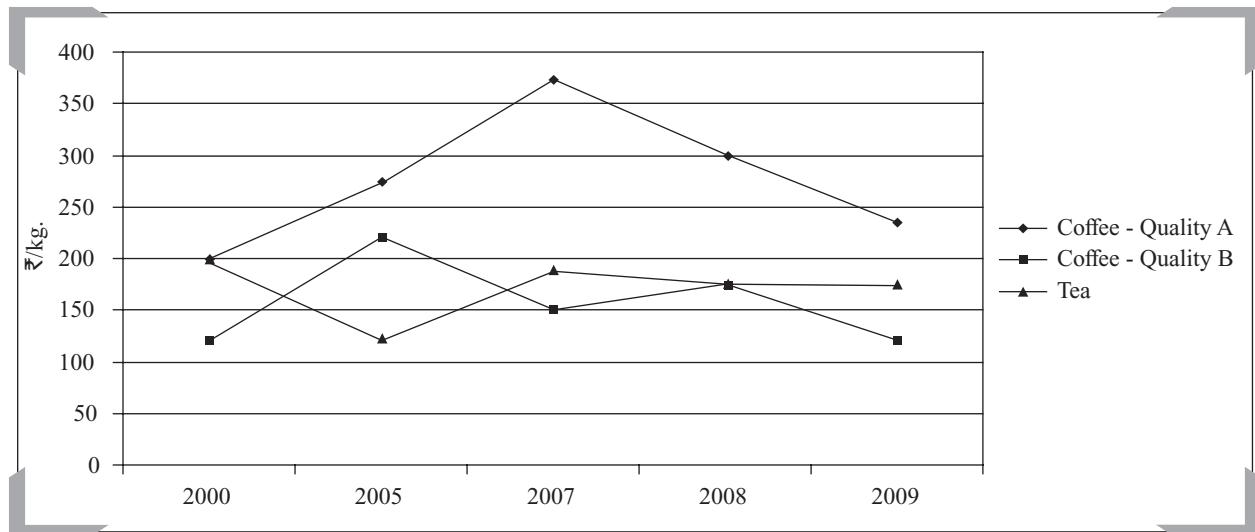
Parts	Units
Table top	50
Demand of finished tables:	
Details	Week 4
Demand (units)	200
	150
	100

For delivering any table in subsequent weeks, demand of previous weeks must be met first. First demand occurs in week 4.

1. For meeting the demand of 200 units of finished table of week 4, when would the first order of tabletops be placed?
 - (a) Week 1
 - (b) Week 3
 - (c) Week 5
 - (d) None of these
2. Keeping in mind the inventory, how many legs should be ordered for meeting the demand of week 4 finished tables?
 - (a) 200
 - (b) 50
 - (c) 400
 - (d) 800
3. Keeping in mind the inventory, when and how many units of short rail would be placed for meeting the demand of finished table of week 6?
 - (a) 100 units in week 1
 - (b) 200 units in week 3
 - (c) 300 units in week 6
 - (d) None of these

Directions for questions 4 to 7: Go through the data set given below and solve the questions based on it.

The line chart depicts the price trend of beverages (₹/kg) from 2000 to 2009.



Following table provides the price indices for agricultural commodities in the years 2000 to 2009. For the sake of calculation, base year is considered as the year 2000. In the year 2000, unit price of the items mentioned = 100.

Price indices for agricultural commodities

Item	2000	2005	2007	2008	2009
1. Beverages	100	127	158	135	104
2. Food	100	98	107	101	85
3. Raw Materials	100	113	105	84	85

Assume that the index for beverage is based on the three beverages for which the price trend is shown in the line chart given at the top.

4. In 2009, what is the quantity of tea that can be bought for ₹2,000?
 (a) 10.8 kg
 (b) 5.88 kg
 (c) 11.7 kg
 (d) 12.8 kg
5. During which period was the change in the price (₹/kg/year) the lowest for coffee quality A?

- (a) 00 – 05
- (b) 05 – 07
- (c) 07 – 08
- (d) 08 – 09

6. For which of the three beverages is the change in price between 00 and 09 not in conformity with the trend for beverage price index?
 - I. Coffee – Quality A
 - II. Coffee – Quality B
 - III. Tea
 - (a) III only
 - (b) I and II
 - (c) I and III
 - (d) II and III
7. Assuming that equal weightage is given to each of three beverages in calculating the index, which one contributes most to the rise in index from 2000 to 2009?
 (a) Tea
 (b) All contribute equally
 (c) Coffee – Quality A
 (d) Coffee – Quality B

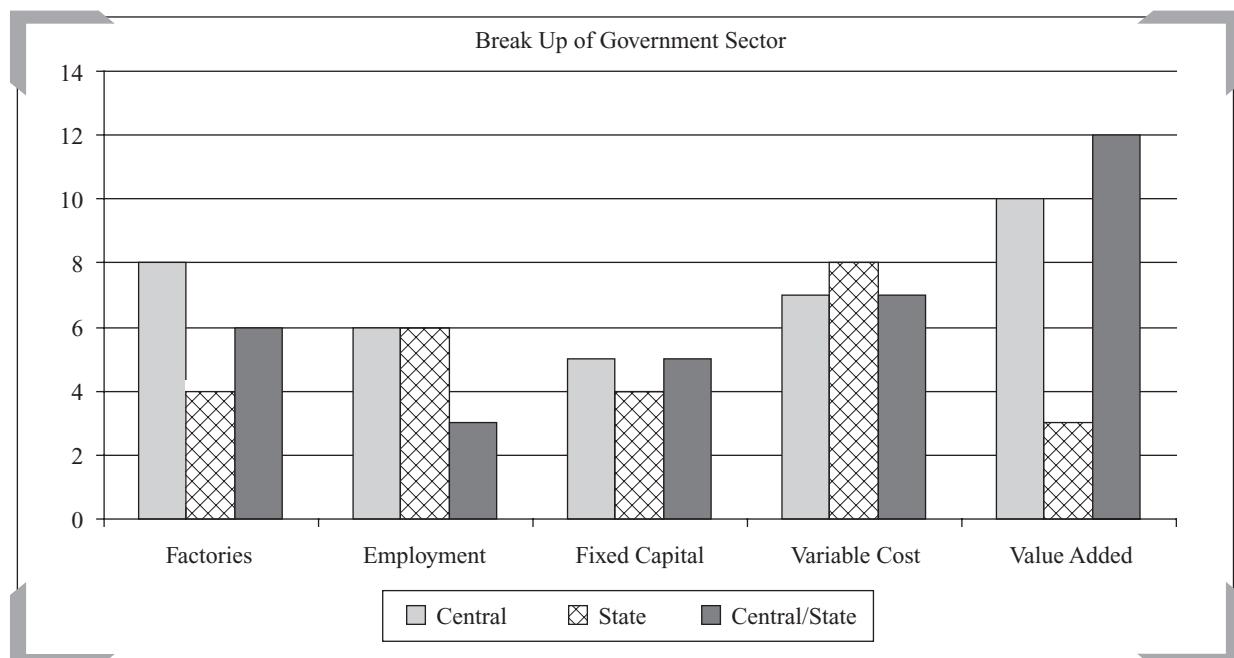
Directions for questions 8 to 11: Go through the chart given below and solve the questions based on it.

Following grid presents the percentage composition of five verticals under different sectors viz., Government, Public, Private, Joint.

Sector	Factories	Employment	Fixed Capital	Variable Cost	Value Added
Government	18	15	14	22	25
Public	12	8	6	19	8
Private	55	65	72	54	62
Joint	15	12	8	5	5
Total	100	100	100	100	100

For example, of all the factories, 18% are owned by Government.

Further, Government sector can be further broken down into three sub-sectors—Central, State, Central/State. Following bar chart gives a break-up of the government sector data (as given in Table above):



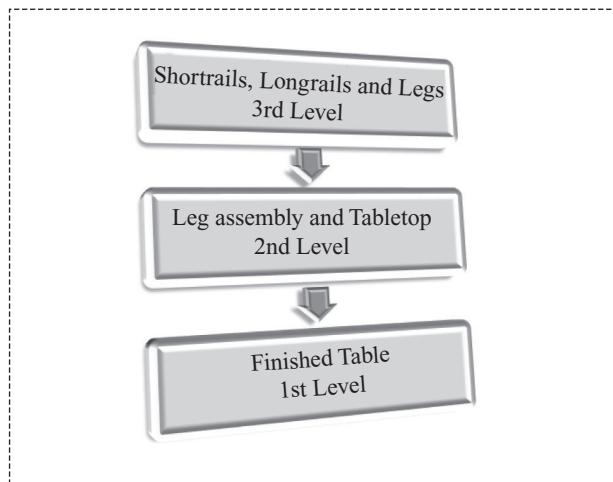
then for which of the following is the production highest?

ANSWER KEYS

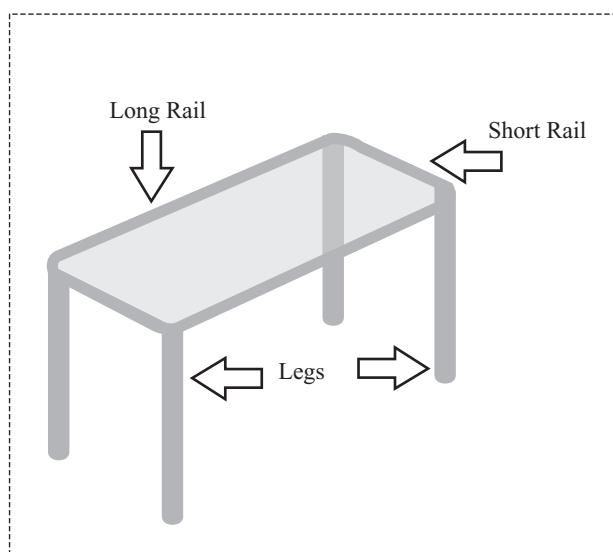
1. (a) 2. (b) 3. (d) 4. (b) 5. (a) 6. (d) 7. (c) 8. (c) 9. (b) 10. (b)
11. (a)

HINTS AND EXPLANATIONS**Storyline:**

There are three levels of work in table making:



For the sake of understanding the terms used (Short rail and long rail), have a look at the following picture (though we really don't need to understand this to solve the questions):



- 1.** We need to have 200 units of finished table in week 4.

For 200 tables, we need to have the following:
 200 units of tabletop and 200 units of leg assembly.
 $200 \text{ units of leg assembly} = 200 \times (2 \text{ units of short rails, } 2 \text{ units of long rails and } 4 \text{ units of legs}) = 400 \text{ units of long rails + 400 units of short rails + 1600 legs.}$

We already have 50 finished tables and 50 table top with us. So we need to order 100 tabletops.

Lead time involved related to table top are – Purchase table top (2 weeks) and assemble table (1 week). So Total Lead time = 3 weeks.

Since tables are to delivered in week 4, hence we need to place the order 3 weeks back (keeping a lead time of 3 week). Hence table top shall be ordered in $4 - 3 = \text{first week.}$

Hence option (a) is the answer.

- 2.** Total demand of finished table in week 4 = 200 tables.

Net availability right now:

Parts	Units
Finished Table	50
Leg assembly	100
Legs	150

We already have 50 finished table, so we need to manufacture 150 tables.

For this, we need to have $150 \times 4 = 600 \text{ legs.}$
 Out of this, following number of legs are available:
 $100 \text{ leg assembly contains} = 100 \times 4 = 400 \text{ legs.}$
 $\text{Spare legs available} = 150 \text{ legs.}$

So total number of legs available = 550 legs.

Hence we need to order $600 - 550 = 50 \text{ legs.}$

Hence option (b) is the answer.

- 3.** Before we deliver the demand of week 6, we need to deliver the demands of previous weeks – week 4 and week 5.

2.114 Data Interpretation

So, in effect, total demand to be delivered = Demand of week 4 + demand of week 5 + demand of week 6 = $200 + 150 + 100 = 450$ finished tables
So, total number of short rails required = $450 \times 2 = 900$ short rails

We are required to decide that when and how many Short rails shall be ordered?

Let us first calculate that how many short rails are present right now.

The availability of parts at present:

Parts	Units
Finished Table	50
Leg assembly	100
Legs	150
Short rails	50
Long rails	0
Table top	50

Total number of short rails present = 50×2 (in Finished Table) + 100×2 (in Leg Assembly) + 50 (Short rails) = 250 Short rails.

Hence total number of short rails required to be ordered = $900 - 250 = 650$ short rails.

Since none of the options contain 650 short rails in it, we are not required to check further that when is it required to be ordered.

Hence option (d) None of these is the answer.

Storyline of 4 to 7

Line charts are typically used for trend analysis for chronological data. A clear trend of price change can be seen through the line chart—with a word of caution because gap in number of years between two data point is not same. Table given below presents the index value for Beverages, based upon the data from line chart, and two other items. As stated in the first line, you may expect questions which ask to compare the trends of different items across the years.

Solution and Explanation for 4 to 7

4. This question needs a simple calculation. Price per kg of tea in 2009 = ₹170/kg.

Hence quantity that can be bought for

$$\frac{1000}{170} = ₹5.88/\text{kg}$$

Hence option (b) is the answer.

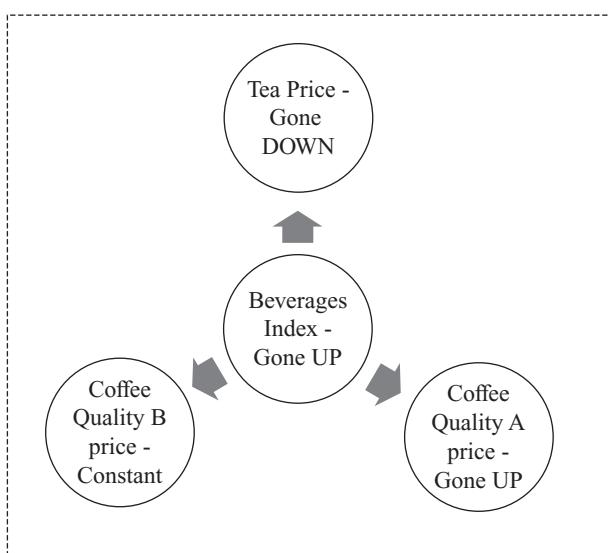
5. Question is asking for change, and not increase or decrease. So we are required to work upon with magnitude only, and sign (positive or negative) is not important.

Year Span	Total Change	Total Years	Change/year
2000 – 2005	75	5	15
2005 – 2007	105	2	52.5
2007 – 2008	80	1	80
2008 – 2009	65	1	65

It is obvious that change/year is minimum in the year 2000 – 2005. Hence option (a) is the answer.

6. Index has the following pattern: Increase – Increase – Decrease – Decrease
Only Coffee Quality A shows this trend.
Hence option (d) is the answer.
7. Beverages Index in the year 2000 = 100
Beverages Index in the year 2009 = 104. So there is a rise in index.

It can be observed that Tea price has remained same and price of Coffee Quality A has gone down in 2009 over 2000.



Only the price of Coffee Quality A has gone up. So it can be concluded that Coffee quality A has the maximum impact on the beverages index and hence contributes most.

Hence option (c) is the answer.

Storyline of 8 to 11

Table provides percentage share (or composition) of Factories, Employment, Fixed Capital, Variable cost and Value added among four sectors viz. Government sector, Public sector, Private sector and Joint sector.

Key point here is to understand that Government sector is broken down into three sub sectors. For all the data given in Government sector, corresponding data for sub sectors is provided in the bar chart.

Solution and Explanations for 8 to 11

8. Value addition per worker = $\frac{\text{Value Added}}{\text{No. of Employees}}$

Total value added = ₹225 million and Total work force = 76 million.

We go by the options and calculate Value added per worker for all the given options:

$$\text{For Central} = \frac{10\% \text{ of } ₹225 \text{ million}}{6\% \text{ of } 76 \text{ million}}$$

$$\text{For State} = \frac{3\% \text{ of } ₹225 \text{ million}}{6\% \text{ of } 76 \text{ million}}$$

$$\text{For Central/State} = \frac{12\% \text{ of } ₹225 \text{ million}}{3\% \text{ of } 76 \text{ million}}$$

$$\text{For Public} = \frac{8\% \text{ of } ₹225 \text{ million}}{8\% \text{ of } 76 \text{ million}}$$

Calculation Short Cut:

Instead of calculating the real value in the above four options, what we can do is quick ratio comparison. We can observe that $\frac{₹225 \text{ million}}{76 \text{ million}}$

is present in all the ratios. Let us assume

$$\frac{₹225 \text{ million}}{76 \text{ million}} = N.$$

So the four ratios become like the following:

$$\text{For Central} = \frac{10\% \text{ of } 225 \text{ million}}{6\% \text{ of } 76 \text{ million}} = \frac{10\%}{6\%}$$

$$\text{For State} = \frac{3\% \text{ of } ₹225 \text{ million}}{6\% \text{ of } 76 \text{ million}} = \frac{3\%}{6\%} N$$

$$\begin{aligned}\text{For Central/State} &= \frac{12\% \text{ of } ₹225 \text{ million}}{3\% \text{ of } 76 \text{ million}} \\ &= \frac{12\%}{3\%} N\end{aligned}$$

$$\text{For Public} = \frac{8\% \text{ of } ₹225 \text{ million}}{8\% \text{ of } 76 \text{ million}} = \frac{8\%}{8\%} N$$

It can be now clearly seen that the ratio is largest in case of Central/State. Hence option (c) is the answer.

In such questions, we can do the proceeding in a nutshell like the following:

Value added per worker for various sectors will be proportional to following ratios:

Central	10/6
State	3/6
Central/state	12/3
Public	8/8

9. Using the method given in A1:

Fixed capital per factory will be proportional to the following ratios:

Central	5/8
State	4/4
Central/state	5/6
Public	6/12

Hence option (b) is the answer.

10. If the variables are proportional to the number of employees and the production per employee, then we can say that the variable cost is directly proportional to the production. Since the variable cost is maximum for private sector, it will also have the maximum production.

Hence option (b) is the answer.

11. Since options are not so close, we can take 20.012% = 20%

If 20% of govt. fixed capital is equal to \$200 million \Rightarrow Total govt. sector fixed capital = \$ 1000 m which is equivalent to 14% of the total fixed capital. Now, 25% of Govt. investment in joint sector i.e., 25% of the 8% of the total = 2% of total

fixed capital will be given by: $\frac{1000 \times 2}{14} = \$ 143$ million

Value in ₹ is given by: $143 \times 55 = ₹7865$ million
Hence option (a) is the answer.

PRACTICE EXERCISE 3

Directions for questions 1 to 4: Go through the data set given below and solve the questions based on it.

Following table gives the percentage change in the sales revenue of five companies. Some of these data are missing and have been replaced by variable x and y.

Companies	From 2010 to 2011	From 2011 to 2012
A	20%	-15%
B	8%	12%
C	14%	-6%
D	20%	x%
E	Y%	-8%

Directions for questions 5 to 7: Go through the data set given below and solve the questions based on it.

The table below provides certain demographic details of 30 respondents who were part of a survey investigating the irregularities in NREGS. The demographic characteristics are: gender, number of children, and age of respondents. The first number in each cell is the number of respondents in that group. The minimum and maximum age of respondents in each group is given in

brackets. For example, there are five female respondents with no children and among these five; the youngest is 34 years old, while the oldest is 49.

No. of children	Male	Female	Total
0	1(38,38)	5(34,49)	6
1	1(32,32)	8(35,57)	9
2	8(21,65)	3(37,63)	11
3	2(32,33)	2(27,40)	4
Total	12	18	30

Directions for questions 8 to 10: Go through the information given below and solve the questions based on it.

Five friends meet every morning at Sree sagar restaurant for an idli-vada breakfast. Each consumes a different number of idli and vada. The number of idli consumed are 1,4,5,6 and 8, while the number of vadas consumed are 0,1,2,4 and 6. Below are some more facts about who eats what and how much:

- i. The number of vadas eaten by Ignesh is three times the number of vadas consumed by the person who eats four idlis.
 - ii. Three persons, including the one who eats four vadas eat without chutney.

- iii. Sandeep does not take any chutney.
- iv. The one who eats one idli does not eat any vadas or chutney. Further, he is not Mukesh.
- v. Daljits eats idli with chutney and also eats vada.
- vi. Mukesh, who does not take chutney, eats half as many vadas as the person who eats twice as many idlis as he does.
- vii. Bimal eats two more idlis than Ignesh, but Ignesh eats two more vadas than Bimal.
- 8.** Which of the following statement is true?
- Daljit eats 5 idlis
 - Ignesh eats 8 idlis
 - Bimal eats 1 idli
 - Bimal eats 6 idlis.
- 9.** Which of the following statement is true?
- Sandeep eats 2 vadas.
 - Mukesh eats 4 vadas.
 - Ignesh eats 6 vadas.
 - Bimal eats 2 vadas.
- 10.** Which of the following statements is true?
- Mukesh eats 8 idlis and 4 vada but not chutney
 - The person who eats 5 idlis and 1 vada does not take chutney.
 - The person who eats equal number of vadas and idlis also takes chutney.
 - The person who eats 4 idlis and 2 vada also takes chutney.

ANSWER KEYS

- 1.** (c) **2.** (b) **3.** (d) **4.** (d) **5.** (d) **6.** (c) **7.** (c) **8.** (a) **9.** (c) **10.** (c)

HINTS AND EXPLANATIONS**Storyline of 1 to 4**

Question mentions the percentage change in the sales revenue of five companies. Understand that unless price per article is mentioned, we cannot find out the sales volume. To solve the questions ahead, you may be required to use (a) Successive Percentage change expression, (b) Product Stability Ratio.

Solution and Explanations for 1 to 4**1.**

Company	From 2010 to 2011	From 2011 to 2012
D	20%	%x

Method 1:

It is given that company D's revenue in 2010 is same as its revenue in 2012. So the increase (in amount) in 2011 shall be compensated (negatively) in 2012. Assume that the revenue in 2010 is ₹100.

$$\text{₹}100 \xrightarrow{20\% \uparrow} \text{₹}120 \text{ (in 2011)} \xrightarrow{x\% \downarrow} \text{₹}100 \text{ (in 2012)}$$

$$\text{So percentage decrease} = \frac{\text{Decrease}}{\text{Initial Value}} \times 100 \\ = \frac{20}{120} \times 100 = 16.66\%$$

Method 2: Use product stability ratio to find out the percentage decrease. Corresponding to percentage increase of 20% (1/5), percentage decrease should be (1/6) = 16.66%

[For a detailed account on Percentage, go through the book "Quantitative Aptitude and Data Interpretation for CAT" written by me]. Hence option (c) is the answer.

$$\text{₹}100 \xrightarrow{20\% \uparrow} \text{₹}(in 2011) \xrightarrow{15\% \downarrow} \text{₹}102 \text{ (in 2012). Hence correct option is (b)}$$

3. It is like population of two countries are same this year, and we have been asked to find out a relation between their populations two years back. It is not possible to determine. Hence option (d) cannot be determined is the answer.

4. Information given in the question set is regarding the sales value. Hence any question regarding sales volume cannot be answered. Hence option (d) cannot be determined is the answer.